TABLE OF CONTENTS .................................................................................................................. 8

DIVISION 00 – PROCUREMENT AND CONTRACTING REQUIREMENTS

ADVERTISEMENT FOR BIDS ........................................................................................................ 1
00 01 01 PROJECT DIRECTORY .................................................................................................. 3
00 01 05 SEALS AND SIGNATURES ............................................................................................ 2
00 31 00 AVAILABLE PROJECT INFORMATION ........................................................................ 2
AGREEMENT FOR USE OF ELECTRONIC MEDIA ......................................................................... 3
INFORMATION FOR BIDDERS (SC-6.12) .................................................................................. 2
CONTRACTOR STATEMENT OF EXPERIENCE INSTRUCTIONS – STATE FORM SC-9.1 ...... 1
SPECIMEN OF CONTRACTOR STATEMENT OF EXPERIENCE (SC-9.1) .......................... 1
BID (SC-6.13) .......................................................................................................................... 1
BID ALTERNATES FORM (SBP-6.131) ..................................................................................... 1
UNIT PRICES FORM ................................................................................................................. 1
BASIS FOR BIDS – DRILLED MICROPILE CONSTRUCTION FORM .................................. 1
SPECIMEN OF BID BOND (SC-6.14) ....................................................................................... 1
SPECIMEN OF NOTICE OF AWARD (SC-6.15) ....................................................................... 1
SPECIMEN OF MINORITY/WOMEN BUSINESS ENTERPRISE PARTICIPATION REPORT (MWBE-1) ................................................................. 2
SPECIMEN OF CONTRACTOR’S AGREEMENT (SC-6.21) ...................................................... 4
SPECIMEN OF PERFORMANCE BOND (SC-6.22) .................................................................... 2
SPECIMEN OF LABOR AND MATERIAL BOND (SC-6.221) ................................................ 2
SPECIMEN OF NOTICE TO PROCEED (SC-6.26) ............................................................... 2
SPECIMEN OF CERTIFICATION AND AFFIDAVIT REGARDING UNAUTHORIZED IMMIGRANTS (UI-1) ................................................................. 1
GENERAL CONDITIONS OF THE CONTRACT (SC-6.23) ..................................................... 54
SPECIMEN OF NOTICE OF SUBSTANTIAL COMPLETION (SBP-07) ............................... 2
SPECIMEN OF NOTICE OF FINAL ACCEPTANCE (SC-6.27) .............................................. 1
SPECIMEN OF NOTICE OF CONTRACTOR’S SETTLEMENT (SC-7.3) ............................... 1

DIVISION 01 – GENERAL REQUIREMENTS

01 10 00 SUMMARY ............................................................................................................... 7
01 22 00 UNIT PRICES ............................................................................................................ 3
01 23 00 ALTERNATES ............................................................................................................. 2
01 25 00 SUBSTITUTION PROCEDURES ............................................................................. 3
SUBSTITUTION REQUEST FORM – CSI FORM 1.5C .......................................................... 1
01 26 00 CONTRACT MODIFICATION PROCEDURES .................................................... 3
SPECIMEN OF CHANGE ORDER – (SC 6.31) ..................................................................... 1
SPECIMEN OF CHANGE ORDER BULLETIN (SC 6.311) .................................................. 1
SPECIMEN OF CHANGE ORDER PROPOSAL (SC 6.312) ............................................... 2
01 29 00 PAYMENT PROCEDURES .................................................................................... 5
SPECIMEN OF CERTIFICATE FOR CONTRACTOR’S PAYMENT (SBP-7.2) ....................... 1
01 31 00 PROJECT MANAGEMENT AND COORDINATION .............................................. 10
01 32 00 CONSTRUCTION PROGRESS DOCUMENTATION ......................................... 10

TABLE OF CONTENTS
TOC - 1
# DIVISION 01 – GENERAL REQUIREMENTS (continued)

<table>
<thead>
<tr>
<th>Section No.</th>
<th>Section Title</th>
<th>No. of Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>01 32 33</td>
<td>PHOTOGRAPHIC DOCUMENTATION</td>
<td>3</td>
</tr>
<tr>
<td>01 33 00</td>
<td>SUBMITTAL PROCEDURES</td>
<td>12</td>
</tr>
<tr>
<td>01 35 43</td>
<td>HAZARDOUS MATERIALS AND SAFETY REQUIREMENTS</td>
<td>4</td>
</tr>
<tr>
<td>01 40 00</td>
<td>QUALITY REQUIREMENTS</td>
<td>10</td>
</tr>
<tr>
<td>01 42 00</td>
<td>REFERENCES</td>
<td>10</td>
</tr>
<tr>
<td>01 42 16</td>
<td>DEFINITIONS AND CONVENTIONS</td>
<td>4</td>
</tr>
<tr>
<td>01 50 00</td>
<td>TEMPORARY FACILITIES AND CONTROLS</td>
<td>12</td>
</tr>
<tr>
<td>01 56 39</td>
<td>TEMPORARY TREE AND PLANT PROTECTION</td>
<td>6</td>
</tr>
<tr>
<td>01 57 60</td>
<td>SITE DUST CONTROL</td>
<td>2</td>
</tr>
<tr>
<td>01 60 00</td>
<td>PRODUCT REQUIREMENTS</td>
<td>5</td>
</tr>
<tr>
<td>01 61 10</td>
<td>ENVIRONMENTAL REQUIREMENTS FOR PRODUCTS</td>
<td>6</td>
</tr>
<tr>
<td>01 73 00</td>
<td>EXECUTION</td>
<td>8</td>
</tr>
<tr>
<td>01 73 29</td>
<td>CUTTING AND PATCHING</td>
<td>7</td>
</tr>
<tr>
<td>01 74 15</td>
<td>CONSTRUCTION AND FINAL CLEANING</td>
<td>4</td>
</tr>
<tr>
<td>01 74 19</td>
<td>CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL</td>
<td>9</td>
</tr>
<tr>
<td>01 77 00</td>
<td>CLOSEOUT PROCEDURES</td>
<td>5</td>
</tr>
<tr>
<td>01 78 23</td>
<td>OPERATION AND MAINTENANCE DATA</td>
<td>8</td>
</tr>
<tr>
<td>01 78 39</td>
<td>PROJECT RECORD DOCUMENTS</td>
<td>4</td>
</tr>
<tr>
<td>01 79 00</td>
<td>DEMONSTRATION AND TRAINING</td>
<td>5</td>
</tr>
<tr>
<td>01 81 09</td>
<td>TESTING FOR INDOOR AIR QUALITY</td>
<td>4</td>
</tr>
<tr>
<td>01 81 13</td>
<td>SUSTAINABLE DESIGN REQUIREMENTS</td>
<td>10</td>
</tr>
<tr>
<td>01 81 14</td>
<td>LEED SCORECARD</td>
<td>1</td>
</tr>
<tr>
<td>01 81 19</td>
<td>CONSTRUCTION INDOOR AIR QUALITY MANAGEMENT</td>
<td>9</td>
</tr>
</tbody>
</table>

**TABLE OF CONTENTS**

TOC - 2
### TABLE OF CONTENTS

#### DIVISION 01 – GENERAL REQUIREMENTS (continued)
- 01 91 00  COMMISSIONING .......................................................... 13

#### VOLUME II

#### DIVISION 02 – EXISTING CONDITIONS
- 02 41 19  SELECTIVE STRUCTURE DEMOLITION .......................... 7

#### DIVISION 03 – CONCRETE
- 03 01 30  CLEANING OF EXISTING CONCRETE .......................... 4
- 03 30 00  CAST-IN-PLACE CONCRETE ........................................ 24
- 03 35 20  DECORATIVE CONCRETE FLOOR FINISH .................. 13
- 03 60 00  GROUT ................................................................. 2

#### DIVISION 04 – MASONRY
- 04 20 00  UNIT MASONRY ....................................................... 8

#### DIVISION 05 – METALS
- 05 12 00  STRUCTURAL STEEL FRAMING .................................. 14
- 05 31 00  STEEL DECKING ....................................................... 8
- 05 40 00  COLD-FORMED METAL FRAMING ............................ 9
- 05 50 00  METAL FABRICATIONS ............................................... 9
- 05 52 13  PIPE AND TUBE RAILINGS ....................................... 8

#### DIVISION 06 – WOOD, PLASTICS, AND COMPOSITES
- 06 06 60  PLASTIC FABRICATIONS ............................................. 8
- 06 10 00  ROUGH CARPENTRY .................................................. 7
- 06 40 23  INTERIOR ARCHITECTURAL WOODWORK ................ 16
- 06 61 40  COMPOSITE SURFACING ............................................ 6

#### DIVISION 07 – THERMAL AND MOISTURE PROTECTION
- 07 11 13  BITUMINOUS DAMPPROOFING ..................................... 4
- 07 13 53  ELASTOMERIC SHEET WATERPROOFING .................... 6
- 07 19 00  WATER REPELLENTS .................................................. 5
- 07 21 00  THERMAL INSULATION .............................................. 7
- 07 26 00  UNDERSLAB VAPOR RETARDER .................................. 3
- 07 42 43  COMPOSITE WALL PANELS ....................................... 12
- 07 53 23  ETHYLENE-PROPYLENE-DIENE-MONOMER (EPDM) ROOFING ........................................ 12
- 07 62 00  SHEET METAL FLASHING AND TRIM ......................... 12
- 07 71 29  MANUFACTURED ROOF EXPANSION JOINTS .......... 5
- 07 72 00  ROOF ACCESSORIES ................................................ 6
- 07 81 00  APPLIED FIREPROOFING .......................................... 10
- 07 84 13  PENETRATION FIRESTOPPING ................................... 7
- 07 84 46  FIRE-RESISTIVE JOINT SYSTEMS ............................... 5
- 07 92 00  JOINT SEALANTS ........................................................ 11
- 07 95 00  EXPANSION CONTROL ............................................... 9

TABLE OF CONTENTS
TOC - 3
<table>
<thead>
<tr>
<th>Section No.</th>
<th>Section Title</th>
<th>No. of Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DIVISION 08 – OPENINGS</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>08 11 13</td>
<td>HOLLOW METAL DOORS AND FRAMES</td>
<td>10</td>
</tr>
<tr>
<td>08 14 16</td>
<td>FLUSH WOOD DOORS</td>
<td>7</td>
</tr>
<tr>
<td>08 31 13</td>
<td>ACCESS DOORS AND FRAMES</td>
<td>4</td>
</tr>
<tr>
<td>08 41 13</td>
<td>ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS</td>
<td>13</td>
</tr>
<tr>
<td>08 41 26</td>
<td>ALL-GLASS ENTRANCES</td>
<td>6</td>
</tr>
<tr>
<td>08 44 13</td>
<td>GLAZED ALUMINUM CURTAIN WALLS</td>
<td>12</td>
</tr>
<tr>
<td>08 71 00</td>
<td>DOOR HARDWARE</td>
<td>44</td>
</tr>
<tr>
<td>08 80 00</td>
<td>GLAZING</td>
<td>16</td>
</tr>
<tr>
<td>08 83 00</td>
<td>MIRRORS</td>
<td>4</td>
</tr>
<tr>
<td>08 88 10</td>
<td>FIRE RATED GLASS AND FRAMING</td>
<td>5</td>
</tr>
<tr>
<td>08 90 00</td>
<td>LOUVERS AND VENTS</td>
<td>6</td>
</tr>
<tr>
<td><strong>DIVISION 09 – FINISHES</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>09 21 15</td>
<td>GYPSUM BOARD SHAFT WALL ASSEMBLIES</td>
<td>6</td>
</tr>
<tr>
<td>09 22 16</td>
<td>NON-STRUCTURAL METAL FRAMING</td>
<td>7</td>
</tr>
<tr>
<td>09 29 00</td>
<td>GYPSUM BOARD</td>
<td>9</td>
</tr>
<tr>
<td>09 30 00</td>
<td>TILING</td>
<td>11</td>
</tr>
<tr>
<td>09 51 13</td>
<td>WOOD ACOUSTICAL WALL AND CEILING PANELS</td>
<td>6</td>
</tr>
<tr>
<td>09 51 15</td>
<td>ABSORPTIVE PANEL ACOUSTICAL CEILINGS</td>
<td>7</td>
</tr>
<tr>
<td>09 51 23</td>
<td>ACOUSTICAL TILE CEILINGS</td>
<td>9</td>
</tr>
<tr>
<td>09 53 13</td>
<td>METAL PANEL SOFFIT SYSTEM</td>
<td>6</td>
</tr>
<tr>
<td>09 65 13</td>
<td>RESILIENT BASE AND ACCESSORIES</td>
<td>7</td>
</tr>
<tr>
<td>09 65 17</td>
<td>LINOLEUM FLOORING</td>
<td>6</td>
</tr>
<tr>
<td>09 66 13</td>
<td>RESTORATION OF PORTLAND CEMENT TERRAZZO</td>
<td>6</td>
</tr>
<tr>
<td>09 68 13</td>
<td>TILE CARPETING</td>
<td>7</td>
</tr>
<tr>
<td>09 75 00</td>
<td>STONE FACING</td>
<td>9</td>
</tr>
<tr>
<td>09 77 00</td>
<td>FIBERGLASS REINFORCED PANELS</td>
<td>4</td>
</tr>
<tr>
<td>09 79 00</td>
<td>GRILLE CLOTH</td>
<td>5</td>
</tr>
<tr>
<td>09 84 10</td>
<td>FABRIC WRAPPED TACKABLE WALL PANELS</td>
<td>6</td>
</tr>
<tr>
<td>09 84 33</td>
<td>SOUND-ABSORBING WALL UNITS</td>
<td>7</td>
</tr>
<tr>
<td>09 91 00</td>
<td>PAINTING</td>
<td>13</td>
</tr>
<tr>
<td><strong>DIVISION 10 – SPECIALTIES</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 11 00</td>
<td>VISUAL DISPLAY SURFACES</td>
<td>6</td>
</tr>
<tr>
<td>10 14 00</td>
<td>SIGNAGE</td>
<td>6</td>
</tr>
<tr>
<td>10 21 13</td>
<td>TOILET COMPARTMENTS</td>
<td>5</td>
</tr>
<tr>
<td>10 26 00</td>
<td>CORNER GUARDS</td>
<td>5</td>
</tr>
<tr>
<td>10 28 00</td>
<td>TOILET ACCESSORIES</td>
<td>6</td>
</tr>
<tr>
<td>10 44 13</td>
<td>FIRE EXTINGUISHER CABINETS</td>
<td>5</td>
</tr>
<tr>
<td>10 44 16</td>
<td>FIRE EXTINGUISHERS</td>
<td>3</td>
</tr>
</tbody>
</table>
## TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section No.</th>
<th>Section Title</th>
<th>No. of Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DIVISION 11 – EQUIPMENT</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11 52 13</td>
<td>PROJECTION SCREENS</td>
<td>4</td>
</tr>
<tr>
<td><strong>DIVISION 12 – FURNISHINGS</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12 21 13</td>
<td>HORIZONTAL LOUVER BLINDS</td>
<td>4</td>
</tr>
<tr>
<td>12 36 40</td>
<td>STONE COUNTER TOPS</td>
<td>6</td>
</tr>
<tr>
<td>12 49 40</td>
<td>ROLLER SHADES</td>
<td>10</td>
</tr>
<tr>
<td>12 61 00</td>
<td>FIXED AUDIENCE SEATING</td>
<td>8</td>
</tr>
<tr>
<td>12 93 00</td>
<td>SITE FURNISHINGS</td>
<td>2</td>
</tr>
<tr>
<td><strong>DIVISION 13 – SPECIAL CONSTRUCTION (Not Used)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>DIVISION 14 – CONVEYING EQUIPMENT</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14 21 00</td>
<td>ELECTRIC TRACTION ELEVATORS</td>
<td>14</td>
</tr>
<tr>
<td>14 44 00</td>
<td>ELECTRIC SIDEWALK VERTICAL RECIPROCATING CONVEYOR</td>
<td>6</td>
</tr>
<tr>
<td><strong>DIVISIONS 15 – 20 (Reserved)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>DIVISION 21 – FIRE SUPPRESSION</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21 05 00</td>
<td>COMMON WORK RESULTS FOR FIRE SUPPRESSION</td>
<td>8</td>
</tr>
<tr>
<td>21 05 13</td>
<td>COMMON MOTOR REQUIREMENTS FOR FIRE SUPPRESSION EQUIPMENT</td>
<td>3</td>
</tr>
<tr>
<td>21 05 17</td>
<td>SLEEVES AND SLEEVE SEALS FOR FIRE SUPPRESSION PIPING</td>
<td>5</td>
</tr>
<tr>
<td>21 05 18</td>
<td>ESCUTCHEONS FOR FIRE SUPPRESSION PIPING</td>
<td>2</td>
</tr>
<tr>
<td>21 12 00</td>
<td>FIRE-SUPPRESSION STANDPIPES</td>
<td>19</td>
</tr>
<tr>
<td>21 13 13</td>
<td>WET-PIPE SPRINKLER SYSTEMS</td>
<td>12</td>
</tr>
<tr>
<td>21 13 16</td>
<td>DRY-PIPE SPRINKLER SYSTEMS</td>
<td>8</td>
</tr>
<tr>
<td>21 31 13</td>
<td>ELECTRIC-DRIVE, CENTRIFUGAL FIRE PUMPS</td>
<td>6</td>
</tr>
<tr>
<td>21 34 00</td>
<td>PRESSURE MAINTENANCE PUMPS</td>
<td>3</td>
</tr>
<tr>
<td>21 39 00</td>
<td>CONTROLLERS FOR FIRE PUMP DRIVERS</td>
<td>9</td>
</tr>
<tr>
<td><strong>DIVISION 22 – PLUMBING</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22 05 00</td>
<td>COMMON WORK RESULTS FOR PLUMBING</td>
<td>10</td>
</tr>
<tr>
<td>22 05 13</td>
<td>COMMON MOTOR REQUIREMENTS FOR PLUMBING EQUIPMENT</td>
<td>3</td>
</tr>
<tr>
<td>22 05 16</td>
<td>EXPANSION FITTINGS AND LOOPS FOR PLUMBING PIPING</td>
<td>6</td>
</tr>
<tr>
<td>22 05 17</td>
<td>SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING</td>
<td>4</td>
</tr>
<tr>
<td>22 05 18</td>
<td>ESCUTCHEONS FOR PLUMBING PIPING</td>
<td>2</td>
</tr>
<tr>
<td>22 05 19</td>
<td>METERS AND GAGES FOR PLUMBING PIPING</td>
<td>4</td>
</tr>
<tr>
<td>22 05 23</td>
<td>GENERAL DUTY VALVES FOR PLUMBING PIPING</td>
<td>5</td>
</tr>
<tr>
<td>22 05 29</td>
<td>HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT</td>
<td>8</td>
</tr>
<tr>
<td>22 05 33</td>
<td>IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT</td>
<td>4</td>
</tr>
<tr>
<td>22 07 00</td>
<td>PLUMBING INSULATION</td>
<td>14</td>
</tr>
<tr>
<td>22 10 23</td>
<td>FACILITY NATURAL-GAS PIPING</td>
<td>17</td>
</tr>
<tr>
<td>22 11 16</td>
<td>DOMESTIC WATER PIPING</td>
<td>15</td>
</tr>
</tbody>
</table>
## DIVISION 22 – PLUMBING (continued)

<table>
<thead>
<tr>
<th>Section No.</th>
<th>Section Title</th>
<th>No. of Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>22 11 19</td>
<td>DOMESTIC WATER PIPING SPECIALTIES</td>
<td>16</td>
</tr>
<tr>
<td>22 11 23</td>
<td>DOMESTIC WATER PUMPS</td>
<td>4</td>
</tr>
<tr>
<td>22 11 23.13</td>
<td>DOMESTIC-WATER PACKAGED BOOSTER PUMPS</td>
<td>6</td>
</tr>
<tr>
<td>22 12 23</td>
<td>FACILITY INDOOR POTABLE-WATER STORAGE TANKS</td>
<td>5</td>
</tr>
<tr>
<td>22 13 16</td>
<td>SANITARY WASTE AND VENT PIPING</td>
<td>12</td>
</tr>
<tr>
<td>22 13 19</td>
<td>SANITARY WASTE PIPING SPECIALTIES</td>
<td>8</td>
</tr>
<tr>
<td>22 14 13</td>
<td>FACILITY STORM DRAINAGE PIPING</td>
<td>11</td>
</tr>
<tr>
<td>22 14 23</td>
<td>STORM DRAINAGE PIPING SPECIALTIES</td>
<td>2</td>
</tr>
<tr>
<td>22 14 29</td>
<td>SUMP PUMPS</td>
<td>4</td>
</tr>
<tr>
<td>22 34 00</td>
<td>FUEL-FIRED, DOMESTIC-WATER HEATERS</td>
<td>6</td>
</tr>
<tr>
<td>22 40 00</td>
<td>PLUMBING FIXTURES</td>
<td>8</td>
</tr>
<tr>
<td>22 47 00</td>
<td>DRINKING FOUNTAINS</td>
<td>4</td>
</tr>
<tr>
<td>22 95 00</td>
<td>PLUMBING SYSTEMS COMMISSIONING</td>
<td>6</td>
</tr>
</tbody>
</table>

## DIVISION 23 – HEATING, VENTILATING, AND AIR CONDITIONING

<table>
<thead>
<tr>
<th>Section No.</th>
<th>Section Title</th>
<th>No. of Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>23 05 00</td>
<td>COMMON WORK RESULTS FOR HVAC</td>
<td>11</td>
</tr>
<tr>
<td>23 05 13</td>
<td>COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT</td>
<td>3</td>
</tr>
<tr>
<td>23 05 16</td>
<td>EXPANSION FITTINGS AND LOOPS FOR HVAC PIPING</td>
<td>8</td>
</tr>
<tr>
<td>23 05 17</td>
<td>SLEEVES AND SLEEVE SEALS FOR HVAC PIPING</td>
<td>5</td>
</tr>
<tr>
<td>23 05 18</td>
<td>ESCUTCHEONS FOR HVAC PIPING</td>
<td>2</td>
</tr>
<tr>
<td>23 05 19</td>
<td>METERS AND GAGES FOR HVAC PIPING</td>
<td>6</td>
</tr>
<tr>
<td>23 05 23</td>
<td>GENERAL-DUTY VALVES FOR HVAC PIPING</td>
<td>11</td>
</tr>
<tr>
<td>23 05 29</td>
<td>HANGER AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT</td>
<td>10</td>
</tr>
<tr>
<td>23 05 33</td>
<td>HEAT TRACING FOR HVAC PIPING</td>
<td>4</td>
</tr>
<tr>
<td>23 05 48</td>
<td>VIBRATION CONTROLS FOR HVAC PIPING AND EQUIPMENT</td>
<td>7</td>
</tr>
<tr>
<td>23 05 53</td>
<td>IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT</td>
<td>6</td>
</tr>
<tr>
<td>23 05 93</td>
<td>TESTING, ADJUSTING, AND BALANCING FOR HVAC</td>
<td>19</td>
</tr>
<tr>
<td>23 07 00</td>
<td>HVAC INSULATION</td>
<td>28</td>
</tr>
<tr>
<td>23 08 00</td>
<td>COMMISSIONING OF HVAC</td>
<td>6</td>
</tr>
<tr>
<td>23 09 00</td>
<td>INSTRUMENTATION AND CONTROL FOR HVAC</td>
<td>20</td>
</tr>
<tr>
<td>23 10 23</td>
<td>VARIABLE-FREQUENCY MOTOR CONTROLLERS</td>
<td>13</td>
</tr>
<tr>
<td>23 21 13</td>
<td>HYDRONIC PIPING</td>
<td>17</td>
</tr>
<tr>
<td>23 21 23</td>
<td>HYDRONIC PUMPS</td>
<td>6</td>
</tr>
<tr>
<td>23 25 00</td>
<td>HVAC WATER TREATMENT</td>
<td>8</td>
</tr>
<tr>
<td>23 31 13</td>
<td>METAL DUCTS</td>
<td>15</td>
</tr>
<tr>
<td>23 31 16</td>
<td>NONMETAL DUCTS</td>
<td>5</td>
</tr>
<tr>
<td>23 33 00</td>
<td>AIR DUCT ACCESSORIES</td>
<td>12</td>
</tr>
<tr>
<td>23 34 13</td>
<td>AXIAL HVAC FANS</td>
<td>5</td>
</tr>
<tr>
<td>23 34 23</td>
<td>HVAC POWER VENTILATORS</td>
<td>6</td>
</tr>
<tr>
<td>23 36 13</td>
<td>CHILLED BEAMS</td>
<td>4</td>
</tr>
<tr>
<td>23 37 13</td>
<td>DIFFUSERS, REGISTERS, AND GRILLES</td>
<td>3</td>
</tr>
<tr>
<td>23 37 23</td>
<td>HVAC GRAVITY VENTILATORS</td>
<td>4</td>
</tr>
<tr>
<td>23 51 00</td>
<td>FLUE VENTS</td>
<td>3</td>
</tr>
<tr>
<td>23 52 16</td>
<td>CONDENSING BOILERS</td>
<td>7</td>
</tr>
<tr>
<td>23 57 00</td>
<td>HEAT EXCHANGERS FOR HVAC</td>
<td>3</td>
</tr>
</tbody>
</table>
DIVISION 23 – HEATING, VENTILATING, AND AIR CONDITIONING (continued)

23 64 23 MODULAR SCROLL WATER CHILLERS ................................................................. 8
23 73 13 MODULAR INDOOR CENTRAL-STATION AIR-HANDLING UNITS .................. 11
23 81 26 SPLIT-SYSTEM AIR-CONDITIONERS .................................................................. 5
23 81 46 WATER-SOURCE UNITARY HEAT PUMPS ..................................................... 10
23 82 33 CONVECTORS .................................................................................................. 3
23 82 39 UNIT HEATERS ............................................................................................... 4
23 83 16 RADIANT-HEATING HYDRONIC PIPING ......................................................... 5
23 84 13 HUMIDIFIERS .................................................................................................. 4

DIVISIONS 24 (Reserved)

DIVISIONS 25 – INTEGRATED AUTOMATION

25 95 00 BUILDING AUTOMATION SYSTEM COMMISSIONING .................................. 6

DIVISION 26 – ELECTRICAL

26 05 00 COMMON WORK RESULTS FOR ELECTRICAL ............................................ 4
26 05 03 WIRING CONNECTIONS ................................................................................ 2
26 05 19 WIRES AND CABLES ..................................................................................... 5
26 05 26 GROUNDING AND BONDING ....................................................................... 3
26 05 29 SUPPORTING DEVICES ............................................................................... 6
26 05 33 CONDUIT ......................................................................................................... 5
26 05 34 PULL, JUNCTION AND OUTLET BOXES ....................................................... 2
26 05 35 CABINETS AND ENCLOSURES .................................................................... 2
26 05 43 DUCT BANKS AND MANHOLES ................................................................ 7
26 05 53 ELECTRICAL IDENTIFICATION ................................................................... 4
26 05 73 OVERCURRENT PROTECTIVE DEVICE COORDINATION STUDY .......... 7
26 08 00 ELECTRICAL SYSTEMS COMMISSIONING .................................................. 6
26 09 13 ELECTRICAL POWER MONITORING ............................................................. 22
26 12 00 DRY-TYPE TRANSFORMERS ....................................................................... 5
26 23 00 SWITCHBOARDS ........................................................................................... 11
26 24 16 PANELBOARDS ............................................................................................ 5
26 27 13 ELECTRICITY METERING ......................................................................... 5
26 27 26 WIRING DEVICES .......................................................................................... 4
26 28 19 CIRCUIT AND MOTOR DISCONNECTS ....................................................... 3
26 28 23 OVERCURRENT PROTECTIVE DEVICES .................................................. 3
26 29 13 MOTOR STARTERS ......................................................................................... 5
26 32 13 ENGINE GENERATORS ................................................................................ 12
26 33 53 STATIC UNINTERRUPTABLE POWER SUPPLIES ....................................... 8
26 35 53 SURGE PROTECTIVE DEVICES .................................................................. 6
26 36 00 AUTOMATIC TRANSFER SWITCHES ........................................................... 9
26 51 00 LIGHTING AND ACCESSORIES ..................................................................... 12
26 57 00 LIGHTING CONTROLS .................................................................................. 13

TABLE OF CONTENTS
TOC - 7
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section No.</th>
<th>Section Title</th>
<th>No. of Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DIVISION 27 – COMMUNICATIONS</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>27 13 43</td>
<td>TELECOMMUNICATIONS RACEWAYS AND ACCESSORIES</td>
<td>11</td>
</tr>
<tr>
<td>27 40 00</td>
<td>AUDIO-VIDEO COMMUNICATIONS</td>
<td>19</td>
</tr>
<tr>
<td><strong>DIVISION 28 – ELECTRONIC SAFETY AND SECURITY</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>28 31 00</td>
<td>FIRE ALARM AND DETECTION SYSTEMS</td>
<td>39</td>
</tr>
<tr>
<td>28 32 00</td>
<td>2-WAY COMMUNICATION SYSTEM</td>
<td>5</td>
</tr>
<tr>
<td><strong>DIVISION 31 – CIVIL</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>31 10 00</td>
<td>SITE CLEARING</td>
<td>5</td>
</tr>
<tr>
<td>31 20 00</td>
<td>EARTH MOVING</td>
<td>14</td>
</tr>
<tr>
<td>31 23 33</td>
<td>TRENCHING AND BACKFILLING</td>
<td>11</td>
</tr>
<tr>
<td>31 25 00</td>
<td>TEMPORARY EROSION AND SEDIMENTATION CONTROL</td>
<td>7</td>
</tr>
<tr>
<td>31 63 33</td>
<td>DRILLED MICROPILES</td>
<td>14</td>
</tr>
<tr>
<td><strong>DIVISION 32 – LANDSCAPE</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>32 12 16</td>
<td>ASPHALT PAVING</td>
<td>10</td>
</tr>
<tr>
<td>32 13 13</td>
<td>CONCRETE PAVING</td>
<td>14</td>
</tr>
<tr>
<td>32 84 23</td>
<td>UNDERGROUND SPRINKLERS</td>
<td>16</td>
</tr>
<tr>
<td>32 90 00</td>
<td>FINE GRADING AND SOIL PREPARATION</td>
<td>8</td>
</tr>
<tr>
<td>32 92 00</td>
<td>TURF AND GRASSES</td>
<td>9</td>
</tr>
<tr>
<td>32 93 00</td>
<td>PLANTING</td>
<td>16</td>
</tr>
<tr>
<td>32 93 50</td>
<td>LANDSCAPE MAINTENANCE</td>
<td>6</td>
</tr>
<tr>
<td>32 94 00</td>
<td>PLANTING ACCESSORIES</td>
<td>8</td>
</tr>
<tr>
<td><strong>DIVISION 33 – UTILITIES</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>33 31 00</td>
<td>SANITARY UTILITY SEWERAGE PIPING</td>
<td>17</td>
</tr>
<tr>
<td>33 41 00</td>
<td>STORM UTILITY DRAINAGE PIPING</td>
<td>12</td>
</tr>
<tr>
<td><strong>DIVISIONS 34 THROUGH 49 (Not Used)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>APPENDIX</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>APPENDIX COLORADO STATE UNIVERSITY – PUEBLO, ACADEMIC RESOURCES CENTER, SOILS REPORT</td>
<td>25</td>
<td></td>
</tr>
</tbody>
</table>

END OF TABLE OF CONTENTS
SECTION 02 41 19

SELECTIVE STRUCTURE DEMOLITION

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes the following:
   1. Demolition and removal of selected portions of building or structure.
   2. Demolition and removal of selected site elements.
   3. Salvage of existing items to be reused or recycled.

B. Related Sections include the following:
   1. Division 01 Section "Summary" for use of premises, and phasing, and Owner-occupancy requirements.
   2. Division 01 Section "Photographic Documentation" for preconstruction photographs taken before selective demolition operations.
   3. Division 01 Section "Temporary Facilities and Controls" for temporary construction and environmental-protection measures for selective demolition operations.
   4. Division 01 Section "Cutting and Patching" for cutting and patching procedures.
   5. Division 01 Section "Construction Waste Management and Disposal" for disposal of demolished materials.
   6. Division 31 Section "Site Clearing" for site clearing and removal of above- and below-grade improvements.

1.02 DEFINITIONS

A. Remove: Detach items from existing construction and legally dispose of them off-site, unless indicated to be removed and salvaged or removed and reinstalled.

B. Remove and Salvage: Detach items from existing construction and deliver them to Owner ready for reuse.

C. Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.

D. 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.

1.03 MATERIALS OWNERSHIP

A. Historic items, relics, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, antiques, and other items of interest or value to Owner that may be encountered during selective demolition remain Owner's property. Carefully remove and salvage each item or object in a manner to prevent damage and deliver promptly to Owner.
1.04 SUBMITTALS

A. Qualification Data: For demolition firm and refrigerant recovery technician.

B. Schedule of Selective Demolition Activities: Indicate the following:
   1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner’s continued occupation and on-site operations are uninterrupted.
   2. Interruption of utility services. Indicate how long utility services will be interrupted.
   3. Coordination for shutoff, capping, and continuation of utility services.
   4. Use of elevator and stairs.
   5. Locations of proposed dust- and noise-control temporary partitions and means of egress, including areas of Owner’s continued occupation affected by selective demolition operations.
   6. Coordination of Owner’s continuing occupancy of portions of existing building and of Owner’s partial occupancy of completed Work.
   7. Means of protection for items to remain and items in path of waste removal from building.

C. Inventory: After selective demolition is complete, submit a list of items that have been removed and salvaged.

D. Predemolition Photographs: Show existing conditions of adjoining construction and site improvements, including finish surfaces that might be misconstrued as damage caused by selective demolition operations. Comply with Division 01 Section "Photographic Documentation." Submit before Work begins.

E. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.
   1. Comply with submittal requirements in Division 01 Section "Construction Waste Management and Disposal."

1.05 QUALITY ASSURANCE

A. Demolition Firm Qualifications: An experienced firm that has specialized in demolition work similar in material and extent to that indicated for this Project.

B. Refrigerant Recovery Technician Qualifications: Certified by an EPA-approved certification program.

C. LEED Requirements for Building Reuse:
   1. Credit MR 1.1 and 1.2: Maintain existing building structure (including structural floor and roof decking) and envelope (exterior skin and framing, excluding window assemblies and nonstructural roofing material) not indicated to be demolished; do not demolish such existing construction beyond indicated limits.
   2. Credit MR 1.3: Maintain existing interior nonstructural elements (interior walls, doors, floor coverings, and ceiling systems) not indicated to be demolished; do not demolish such existing construction beyond indicated limits.
D. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

E. Standards: Comply with ANSI A10.6 and NFPA 241.

F. Predemolition Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to selective demolition including, but not limited to, the following:
   1. Inspect and discuss condition of construction to be selectively demolished.
   2. Review structural load limitations of existing structure.
   3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
   4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
   5. Review areas where existing construction is to remain and requires protection.

1.06 PROJECT CONDITIONS

A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.
   1. Comply with requirements specified in Division 01 Section "Summary."

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

C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
   1. Hazardous materials will be removed by Owner before start of the Work.
   2. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Owner will remove hazardous materials under a separate contract.

E. Storage or sale of removed items or materials on-site is not permitted.

F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
   1. Maintain fire-protection facilities in service during selective demolition operations.

1.07 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties.
PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that utilities have been disconnected and capped.
B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.
C. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.
D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.
E. Engage a professional engineer to survey condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective demolition operations.
F. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs.
   1. Comply with requirements specified in Division 01 Section "Photographic Documentation."
G. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

3.02 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems: Maintain services/systems indicated to remain and protect them against damage during selective demolition operations.
   1. Comply with requirements for existing services/systems interruptions specified in Division 01 Section "Summary."
B. Service/System Requirements: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.
   1. Owner will arrange to shut off indicated services/systems when requested by Contractor.
   2. If services/systems are required to be removed, relocated, or abandoned, before proceeding with selective demolition provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
3. Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing.
   a. Where entire wall is to be removed, existing services/systems may be removed with removal of the wall.

3.03 PREPARATION

A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
   1. Comply with requirements for access and protection specified in Division 01 Section "Temporary Facilities and Controls."

B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
   1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
   2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
   3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
   4. Cover and protect furniture, furnishings, and equipment that have not been removed.
   5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Division 01 Section "Temporary Facilities and Controls."

C. Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
   1. Strengthen or add new supports when required during progress of selective demolition.

3.04 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
   1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
   2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
   3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain fire watch and portable fire-suppression devices during flame-cutting operations.
5. Maintain adequate ventilation when using cutting torches.
6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
7. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
8. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
9. Dispose of demolished items and materials promptly. Comply with requirements in Division 01 Section "Construction Waste Management and Disposal."

B. Reuse of Building Elements: Project has been designed to result in end-of-Project rates for reuse of building elements as follows. Do not demolish building elements beyond what is indicated on Drawings without Architect’s approval.
1. Building Structure and Shell: 95 percent.
2. Non-shell Elements: 50 percent.

C. Removed and Salvaged Items:
1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers.
3. Store items in a secure area until delivery to Owner.
4. Transport items to Owner’s storage area designated by Owner.
5. Protect items from damage during transport and storage.

D. Removed and Reinstalled Items:
1. Clean and repair items to functional condition adequate for intended reuse. Paint equipment to match new equipment.
2. Pack or crate items after cleaning and repairing. Identify contents of containers.
3. Protect items from damage during transport and storage.
4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

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

3.05 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

A. Concrete: Demolish in small sections. Cut concrete to a depth of at least 3/4 inch at junctures with construction to remain, using power-driven saw. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete indicated for selective demolition. Neatly trim openings to dimensions indicated.
B. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals, using power-driven saw, then remove concrete between saw cuts.

C. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, then break up and remove.

D. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI-WP and its Addendum.
   1. Remove residual adhesive and prepare substrate for new floor coverings by one of the methods recommended by RFCI.

E. Roofing: Remove no more existing roofing than can be covered in one day by new roofing and so that building interior remains watertight and weathertight. Refer to Division 07 Section "Ethylene Propylene Diene-Monomer (EPDM) Roofing" for new roofing requirements.
   1. Remove existing roof membrane, flashings, copings, and roof accessories.
      a. Existing wood blocking to remain.
   2. Remove existing roofing system down to substrate and clean.

F. Air-Conditioning Equipment: Remove equipment without releasing refrigerants.

3.06 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Except for items or materials indicated to be recycled, reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.
   1. Do not allow demolished materials to accumulate on-site.
   2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
   3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
   4. Comply with requirements specified in Division 01 Section "Construction Waste Management and Disposal."

B. Burning: Do not burn demolished materials.

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

3.07 CLEANING

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

END OF SECTION
SECTION 03 01 30
CLEANING OF EXISTING CONCRETE

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1.02 UNIT PRICES

A. General: Unit prices include the cost of preparing existing construction to receive the work indicated.
   1. Unit price will be for additional Owner requested cleaning not cleaning required by construction activities.

B. Concrete Cleaning: Work will be paid for by the thousand square feet computed on the basis of rectangular solid shapes approximating the actual shape of concrete to be cleaned.

1.03 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.04 SUBMITTALS

A. Product Data: For each type of cleaning product supplied for mixing or adding to products at Project site.

1.05 QUALITY ASSURANCE

A. Mockups: Build mockups to demonstrate aesthetic effects and set quality standards for materials and execution.
   1. Concrete Cleaning: Perform concrete cleaning in two separate areas, each approximately 60 inches square for each type of concrete.
   2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Comply with manufacturer's written instructions for minimum and maximum temperature requirements and other conditions for storage.
PART 2 - PRODUCTS

2.01 MATERIALS, GENERAL

A. Source Limitations: Obtain each color, grade, finish, type, and variety of product from single source with resources to provide products of consistent quality in appearance and physical properties.

B. VOC Content: Provide materials that comply with VOC limits of authorities having jurisdiction.

2.02 CLEANING AGENTS

A. Waterborne high performance blend of anionic and nonionic surface active agents that will remove oil, grease, and dirt residue from any washable surface. Cleaner shall be biodegradable, non hazardous, and VOC compliant. Cleaner shall be formulated for quick, thorough lifting and suspension of contaminants for easy rinsing.

B. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   1. “SealGreen Cleaner” as manufactured by SealGreen Concrete Cleaning & Sealing Products: www.sealgreen.com or equivalent product.

C. Technical Data:
   1. Physical State: Liquid
   2. Odor: Very Low
   3. Color: Clear Amber
   4. pH: (Typical) 10.5
   5. Weight: 8.4 Lbs./gal.
   6. Solubility in Water: Complete
   7. Abrasives: None
   8. Flash Point: Non-Flammable
   9. Rinsability: Excellent
   10. Biodegradable: Yes

PART 3 - EXECUTION

3.01 EXAMINATION

A. Notify Architect seven days in advance of dates when cleaning of concrete is to be performed.

3.02 PREPARATION

A. Ensure that supervisory personnel are on-site and on duty when concrete maintenance work begins and during its progress.
B. Protect persons, motor vehicles, surrounding surfaces of building being restored, building site, plants, and surrounding buildings from harm resulting from concrete maintenance work.
1. Comply with each product manufacturer’s written instructions for protections and precautions. Protect against adverse effects of products and procedures on people and adjacent materials, components, and vegetation.
2. Use only proven protection methods appropriate to each area and surface being protected.
3. Provide barricades, barriers, and temporary directional signage to exclude public from areas where concrete maintenance work is being performed.
4. Erect temporary protective covers over walkways and at points of pedestrian and vehicular entrance and exit that must remain in service during course of concrete maintenance work.
5. Contain debris and spray generated by concrete maintenance work and prevent it from reaching the public or adjacent surfaces.
6. Protect landscaping and other surfaces along haul routes from damage, wear, and staining.
7. Protect adjacent surfaces and equipment by covering them with heavy polyethylene film and waterproof masking tape. If practical, remove items, store, and reinstall after potentially damaging operations are complete.
8. Dispose of debris and runoff from operations by legal means and in a manner that prevents soil erosion, undermining of paving and foundations, damage to landscaping, and water penetration into building interiors.

3.03 COVERAGE
A. Mix concentrated cleaner as follows:
1. 2.6 Lb. container with 2-1/4 gallons of drinkable water for 350-500 sq ft.
2. 5 Gallon pail with 50 gallons of drinkable water for 10,600—11,000 sq ft.

3.04 APPLICATION
A. General: Comply with manufacturer’s written instructions and recommendations for application of products, including surface preparation.

B. Test each type of surface to ensure desired results. Let test area dry before inspection.

C. Application:
1. Manually remove heavy contaminants and debris.
2. Apply water sufficient to wet the surface (with no pressure) to the point of saturation starting at the base of the wall and working to the top of the wall (surface and air temperatures must be above 40 deg F). Allow to set or soak for 5 to 15 minutes, keeping all surfaces wet.
3. The cleaning solution should then be applied with a low pressure fanned spray application (not to exceed 50 psi at the wall face).
4. Wipe, broom, power scrub, or power wash surfaces.
   a. Do not allow the cleaning solution to dry on the wall.
5. Rinse thoroughly with a large volume of potable water (pressure not to exceed 300 psi at the wall face with a flow rate of 4-6 gallons/minute).
6. Rinse with water.
7. Repeat where necessary.

3.05 CLEANUP

A. Clean equipment and overspray with water.

END OF SECTION
SECTION 03 30 00
CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 SUMMARY

A. This Section specifies cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:
   1. Grade beams and pile caps.
   2. Structural slabs-on-grade.
   3. Slabs on metal decks.
   4. Concrete Toppings.
   5. Building walls.

B. Related Sections include the following:
   1. Division 03 Section "Decorative Concrete Floor Finish" for exterior decorative flatwork.
   2. Division 07 Section “Underslab Vapor Retarder.”
   3. Division 23 Section “Radiant-Heating Hydronic Piping” for in slab hydronic heat piping.
   4. Division 32 Section "Concrete Paving" for concrete pavement and walks.
   5. Division 31 Section “Drilled Micropiles”.

1.02 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume; subject to compliance with requirements.

1.03 SUBMITTALS

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

B. LEED Submittals:
   1. Product Data for Credit MR 4.1 and Credit MR 4.2: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.
      a. Include statement indicating costs for each product having recycled content.

   2. Design Mixtures for Credit ID 1.1: For each concrete mixture containing fly ash as a replacement for portland cement or other portland cement replacements, and for equivalent concrete mixtures that do not contain portland cement replacements.

C. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
   1. Indicate amounts of mixing water to be withheld for later addition at Project site.
2. Submit substantiating data for each concrete mix design contemplated for use to the Architect/Engineer not less than four weeks prior to first concrete placement. Data for each mix shall, as a minimum, include the following:
   a. Mix identification designation (unique for each mix submitted).
   b. Statement of intended use for mix.
   c. Mixture proportions and descriptions.
   d. Wet and dry unit weight.
   e. Water/cementitious materials ratio.
   f. Total air content.
   g. Design slump.
   h. Intended method of placement in field.
   i. Required average strength qualification data per ACI 301 3.9.1 and 3.9.2.
   j. Average strength qualification data per (trial mix data or field test data per ACI 301
      3.9.3.


4. Submit test data showing concrete mixes which come in contact with soils are as durable against sulfate attack as a Type V cement mix.

D. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.
   1. Show all reinforcing, top and bottom profile of concrete element, supports below, and concrete walls, grade beams, etc. framing into the element.
   2. Provide one continuous elevation at 1/4-inch scale for all grade beams or walls in a common line. Show pockets and openings in shear walls, structural slabs, grade beams, elevation at top of grade beams, walls, sections through all grade beams and pilasters, and placing sequence of reinforcing for items with more than one reinforcing layer.
   3. Show locations of approved construction joints, splices of reinforcing, type of splice used and splice location, grade of all reinforcement used and specifically identify all ASTM A706 and epoxy coated reinforcing.

E. Openings in Existing Structure: Submit to the owner’s testing agency a dimensioned drawing of all new openings through existing structure and secure approval prior to cutting. Drawing shall show vertical and horizontal location and size of proposed opening and all existing and new openings through the element. Testing agency shall evaluate proposed opening(s) for compliance with the contract documents. Testing agency shall review contractor’s x-rays to confirm proposed opening location will not cut existing reinforcing or post-tensioning tendons. Testing agency shall be present while opening is cut and shall observe core(s) extracted to confirm no steel was cut.

F. Submit Data and installation instructions for void forms. Provide Manufacturer’s data on factory-made void pieces. Submit evidence void is of proper size and extent after concrete is placed. Submit evidence void form material has degraded as specified herein.
G.  Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:
   1. Alkali-Aggregate Reactivity of Aggregates. Submit test reports indicating that fine and coarse aggregates are not “potentially reactive” based on the ASTM C295 or ASTM C1260 (or ASTM C1293) testing limits set forth in Section 5.1 of “Guide Specification for Concrete Subject to Alkali-Silica Reactions” (2007 Portland Cement Association). Alternately, submit ASTM C1567 test reports indicating that the combination of mix ingredients reduces the expansion due to alkali aggregate reactivity such that the mix complies with Section 5.2 of “Guide Specification for Concrete Subject to Alkali-Silica Reactions” (2007 Portland Cement Association). All tests for submitted reports shall have been performed within one year of the submittal date.

H.  Material Certificates: For each of the following, signed by manufacturers:
   1. Cementitious materials.
   2. Admixtures.
   3. Form materials and form-release agents.
   4. Steel reinforcement and accessories.
   5. Fiber reinforcement.
   6. Curing compounds.
   8. Repair materials.

I.  Floor surface flatness and levelness measurements to determine compliance with specified tolerances.

J.  Minutes of preinstallation conference.

K.  Placement notification: Advance notification of concrete placement, submit notification at least 24 hours in advance.

L.  Certification of chloride screen effectiveness for penetrating sealers.

M.  Proposed location of saw cut joints not indicated on the Contract Drawings.

N.  Curing compound data demonstrating specified moisture loss performance.

O.  Evaporative retarder product and application data.

1.04 QUALITY ASSURANCE

A.  Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.

B.  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."
C. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated, as documented according to ASTM E 548.
   1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-01 or an equivalent certification program.
   2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician - Grade II.
   3. Concrete reinforcing steel shall be inspected by personnel experienced in concrete construction and acceptable to the Architect/Engineer. Personnel currently certified as an ACI Concrete Construction Inspector will be accepted.

D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from one source, and obtain admixtures through one source from a single manufacturer.

E. Welding: Qualify procedures and personnel according to AWS D1.4, "Structural Welding Code--Reinforcing Steel."

F. Formwork: Design and engineering of formwork shall be the responsibility of the Contractor. Design of formwork and preparation of formwork drawings shall be under the supervision of a professional engineer registered in the state of project.

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

H. Mockups: Cast concrete formed-surface panels to demonstrate typical joints, surface finish, texture, tolerances, and standard of workmanship.
   1. Build panel approximately 100 sq. ft. for formed surface in the location indicated or, if not indicated, as directed by Architect.
   2. Apply specified finish to one face of wall.
   3. Approved panels may become part of the completed Work if undisturbed at time of Substantial Completion.

I. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination".
   1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
      a. Contractor's superintendent.
      b. Independent testing agency responsible for concrete design mixtures.
      c. Ready-mix concrete manufacturer.
      d. Concrete subcontractor.
      e. Owner’s testing/inspection agency.
2. Review special inspection and testing and inspecting agency procedures for field quality control, concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, construction contraction and isolation joints, and joint-filler strips, semirigid joint fillers, forms and form removal limitations, shoring and reshoring procedures, vapor-retarder installation, anchor rod and anchorage device installation tolerances, steel reinforcement installation, floor and slab flatness and levelness measurement, concrete repair procedures, and concrete protection.

3. Review special inspection and testing and inspecting agency procedures for field quality control, concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, construction contraction and isolation joints, and joint-filler strips, semirigid joint fillers, forms and form removal limitations, shoring and reshoring procedures, vapor-retarder installation, anchor rod and anchorage device installation tolerances, steel reinforcement installation, floor and slab flatness and levelness measurement, concrete repair procedures, and concrete protection.

3. Minutes of the meeting shall be recorded, typed, and printed by the Contractor and distributed by him to all parties concerned within 5 days of the meeting. One copy of the minutes shall also be transmitted to the following for information purposes: Owner’s Representative – Consultant Engineer.
   a. The minutes shall include a statement by the concrete contractor indicating that the proposed mix design, and placing, finishing and curing procedures can produce the concrete quality required by these specifications.

J. Record of Work: Maintain a record listing the time and date of placement of all concrete for the structure. Retain batch tickets for all concrete. Such record shall be kept until the completion of the project and shall be available to the Architect for examination at any time.

K. Pre-placement Inspection: Formwork installation, reinforcing steel placement, and installation of all items to be embedded or cast into concrete shall be verified by the Contractor prior to placement.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage. Avoid damaging coatings on steel reinforcement.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
   1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.

2.02 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.
   1. Plywood, metal, or other approved panel materials.
   2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
      a. High-density overlay, Class 1 or better.
      b. Medium-density overlay, Class 1 or better; mill-release agent treated and edge sealed.
c. Structural 1, B-B or better; mill oiled and edge sealed.
d. B-B (Concrete Form), Class 1 or better; mill oiled and edge sealed.

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.

C. Forms for Cylindrical Columns, Pedestals, and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that will produce surfaces with gradual or abrupt irregularities not exceeding specified formwork surface class. Provide units with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.

D. Void Forms: Biodegradable paper surface, treated for moisture resistance, structurally sufficient to support weight of plastic concrete and other superimposed loads. Provide factory-made sections with curved, closed faces around drilled micropiles. Curved face radius shall tightly match drilled micropile radius with no gaps. Stay-in-place void forms shall degrade within 3 months so the void form cannot impart upward load on the structure when the soil heaves.


F. Rustication Strips: Wood, metal, PVC, or rubber strips, kerfed for ease of form removal.

G. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

H. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
   1. Furnish units that will leave no corrodible metal closer than 1-1/2 inch to the plane of exposed concrete surface.
   2. Furnish ties that, when removed, will leave holes no larger than 1 inch in diameter in concrete surface.
   3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

2.03 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.

B. Low-Alloy-Steel Reinforcing Bars: where welding of reinforcement or field bending is noted on the drawings ASTM A 706/A 706M, deformed.

C. Epoxy-Coated Reinforcing Bars: ASTM A 775/A 775M for bars that may be field bent, or ASTM A 934/A 934M for prefabricated bars, epoxy coated, with less than 2 percent damaged coating in each 12-inch bar length.
D. Epoxy-Coated Wire: ASTM A 884/A 884M, Class A, Type 1 coated, as-drawn, plain steel wire, with less than 2 percent damaged coating in each 12-inch wire length.

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

2.04 REINFORCEMENT ACCESSORIES

A. Epoxy Repair Coating: Liquid, two-part, epoxy repair coating; compatible with epoxy coating on reinforcement and complying with ASTM A 775/A 775M.

B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
   1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.
   2. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer-coated wire bar supports.

C. Mechanical Splices: Full mechanical splices shall develop in tension or compression, as required, at least 125% of the bar yield strength. Shall comply with ICC-ES Evaluation Criteria AC 133.

2.05 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project. Alternate cementitious materials, when proposed to control alkali-silica reactions and tested as part of a representative complete concrete mix in accordance with ASTM C1567, may be used subject to approval:
   1. Portland Cement: ASTM C 150, Type I/II, gray unless otherwise noted. Supplement with the following:
      a. Fly Ash: ASTM C 618, Class C or F.

B. Normal-Weight Aggregates: ASTM C 33, Class 4S coarse aggregate or better, graded. All coarse and fine aggregates shall be tested per ASTM C295 or ASTM C1260 (or ASTM C 1293) in accordance with Section 5.1 of “Guide Specification for Concrete Subject to Alkali-Silica Reactions” (2007 Portland Cement Association). Provide aggregates from a single source.


2.06 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/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.
7. Non-Chloride, Non-Corrosive Accelerating Admixture: The admixture shall conform to ASTM C494, Type C or E, and not contain more chloride ions than are present in municipal drinking water. The admixture manufacturer must have long-term non-corrosive test data from an independent testing laboratory (of at least a year’s duration) using an acceptable accelerated corrosion test method such as that using electrical potential measures.
8. Mid-range water reducing admixture shall be EUCON X15 or EUCON MR by The Euclid Chemical Company, DARACEM or Mira Series by W. R. Grace or POZZOLITH997 or Rheobuild 3000 by Master Builders and shall conform to ASTM C494 Type A.

C. Non-Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, non-set-accelerating, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete.
   1. Products:
      a. Axim Concrete Technologies; Catexol 1000CI.
      c. Grace Construction Products, W. R. Grace & Co.; DCI-S.
      d. Master Builders, Inc.; Rheocrete 222+.
      e. Sika Corporation; FerroGard-901.

2.07 FIBER REINFORCEMENT

A. Macro-synthetic Fiber: Polypropylene or polyethylene fibers engineered and designed for use in concrete pavement, complying with ASTM C 1116, Type III, 1 – 1/2 to 2 inches long.
   1. Products:
      a. Grace Construction Products, W.R. Grace & Co.; STRUX 90/40 or approved equal.

2.08 VAPOR RETARDERS

A. See Division 07 Section “Underslab Vapor Retarders”.

2.09 FLOOR AND SLAB TREATMENTS

A. Penetrating Liquid Floor Treatment: Clear, chemically reactive, waterborne solution of inorganic silicate or silicate materials and proprietary components; odorless; colorless; that penetrates, hardens, and densifies concrete surfaces.
   1. Non-Vehicular Surfaces: Material suitable for application on horizontal surfaces not subjected to vehicular traffic shall be not less than 40 percent silane, or 9 percent polysiloxane, or shall be 20 percent siloxane. Provide certification of 90-percent chloride screen effectiveness when tested in accordance with the procure in NCHRP Report No. 244, “Southern Climate Exposure” at Manufacturer’s recommended rate of application.
2.10 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
   1. Available Products:
      a. Axim Concrete Technologies; Cimfilm.
      b. Burke by Edoco; BurkeFilm.
      c. ChemMasters; Spray-Film.
      d. Conspec Marketing & Manufacturing Co., Inc., a Dayton Superior Company; Aquafilm.
      e. Dayton Superior Corporation; Sure Film.
      f. Euclid Chemical Company (The); Eucobar.
      g. Kaufman Products, Inc.; Vapor Aid.
      h. Lambert Corporation; Lambco Skin.
      i. L&M Construction Chemicals, Inc.; E-Con.
      j. MBT Protection and Repair, Div. of ChemRex; Confilm.
      l. Metalcrete Industries; Waterhold.
      m. Nox-Crete Products Group, Kinsman Corporation; Monofilm.
      n. Sika Corporation, Inc.; SikaFilm.
      o. Symons Corporation, a Dayton Superior Company; Finishing Aid.
      p. Unitex; Pro-Film.
      q. US Mix Products Company; US Spec Monofilm ER.
      r. Vexcon Chemicals, Inc.; Certi-Vex EnvioAssist.

B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.

C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

D. Water: Potable.

E. Clear, Solvent-Borne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A. Have test data from an Independent Laboratory indicating a maximum moisture loss of 0.30 kg/m² at 72 hours when tested in accordance with ASTM C156.

F. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A. Have test data from an Independent Laboratory indicating a maximum moisture loss of 0.30 kg/m² at 72 hours when tested in accordance with ASTM C156.

2.11 RELATED MATERIALS


B. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.
C. Dovetail Anchor Slots: Hot-dip galvanized steel sheet, not less than 0.0336 inch thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.

2.12 REPAIR MATERIALS

A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.
   1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
   2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
   3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.
   4. Compressive Strength: Not less than 4100 psi at 28 days when tested according to ASTM C 109/C 109M.

B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.
   1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
   2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
   3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
   4. Compressive Strength: Not less than 5000 psi at 28 days when tested according to ASTM C 109/C 109M.

2.13 CONCRETE MIXTURES, GENERAL

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.
   1. Use a qualified testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.

B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows
   1. Fly Ash: 25 percent

C. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 for reinforced concrete exposed to chlorides in service, 0.30 for other reinforced concrete, and 1.00 for reinforced concrete that will be dry and protected from moisture in service percent by weight of cement.

D. Admixtures: Use admixtures according to manufacturer's written instructions.
   1. Use water-reducing, high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.

3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.


E. Performance and Design Requirements

1. Shrinkage: Shrinkage strain, determined and reported in accordance with ASTM C157 as amended and modified herein, shall not exceed the values below for each class of concrete listed.
   
a. Amendments and Modifications to ASTM C157:
      1) Storage: After the initial 24-hour comparator reading, the specimens are placed back in the lime-saturated water until the age of 7 days. At this time another comparator reading is taken. This reading is used as the base reading, which is used to calculate percent shrinkage. The specimens are then stored in a 50% humidity room at 73 degrees.
      2) Test Reports: Report gage length (average of 3) after 4, 7, 14, 28, and 56 days. In addition to the information required by ASTM C157 Section 11, shrinkage test reports shall include the gage lengths (initial length measurements) used to determine the reported shrinkage strains.
   
b. 28-day Shrinkage Strain: Shrinkage strains, determined as above after 28 days of storage, shall not exceed the following:
      1) Concrete for slabs on metal deck: 0.046%.
      2) Concrete for structural slabs: 0.054%.

2.14 CONCRETE MIXTURES FOR BUILDING ELEMENTS

A. Proportion structural normal weight concrete mixture as noted on the drawings, unless aggregates are “potentially reactive” with alkalis based on the ASTM C295 or ASTM C1260 (or ASTM C1293) testing limits of Section 5.1 of “Guide Specification for Concrete Subject to Alkali-Silica Reactions” (2007 Portland Cement Association). When aggregates are “potentially reactive”, compliance with Section 5.2 of “Guide Specification for Concrete Subject to Alkali-Silica Reactions” (2007 Portland Cement Association) must be established through ASTM C1567 testing for proposed alternate concrete mixture. Submit test reports in accordance with Part I of this specification.

B. Macro-synthetic Fiber: Uniformly disperse in concrete mixture at manufacturer's recommended rate, but not less than 4.0 lb/cu. yd.

2.15 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."
2.16 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.

PART 3 - EXECUTION

3.01 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. Concrete adjacent to elevators shall be installed within the tolerances required by the elevator manufacturer.

C. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:
   2. Class B, 1/4 inch for rough-formed finished surfaces.
   3. The permissible irregularity is a cumulative value due to all sources of error including, but not limited to, layout, plumbness, member sizes, formwork offsets, joints, and member levelness. The permissible irregularity shall also apply between adjacent concrete surfaces on opposite sides of a construction joint, expansion joint, or shrinkage pour strip.

D. Construct forms tight enough to prevent loss of concrete mortar.

E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
   1. Install keyways, reglets, recesses, and the like, for easy removal.
   2. Do not use rust-stained steel form-facing material.

F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.

G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

H. Chamfer exterior corners and edges of permanently exposed concrete.

I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

M. Protect void form materials from moisture at all times before concrete placement.

N. All formwork surfaces that will provide the finish surface of exposed concrete must be accepted by the Architect before depositing concrete.

O. Void Spaces: Provide void spaces of full size and extent shown on the drawings. Specified void form may be used at the Contractor’s option. Where void forms are used below structural slabs-on-grade or for support of reinforcing, place 1/8-inch (minimum) thick masonite or plywood sheet on top of the void forms. Place in the largest pieces practical, secure in place and seal joints to prevent leakage of concrete into the void space. Seal joints between adjacent pieces of void form and between void form and drilled piers. Prevent concrete from entering void space. Void form installation shall conform to Manufacturer’s recommendations.

3.02 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.

1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges" and with the following additional requirements:
   a. Tolerance of embedded items: Comply with ACI 117 and the following additional requirements:
      1) Anchor Bolts:
         a) Plumbness: Within + 1/16” over the projecting height of the anchor bolt.
      2) Embedded Plates and Weldment:
         a) Location: +/-1” vertical, +/- 1” horizontal.

   b. Plumb and alignment: 1/4” in 12”.

2. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.

3. Install dovetail anchor slots in concrete structures. Where masonry wall or veneer abuts concrete, provide one vertical dovetail slot for each 8–inches of masonry thickness. Where concrete serves as backup, space slots at 16 inches on center.

3.03 REMOVING AND REUSING FORMS

A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete, if concrete is hard enough to not be damaged by form-removal operations and curing and protection operations are maintained.

B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.

C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.04 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.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain concrete cover. Do not tack weld crossing reinforcing bars.

D. Size, length, number, and placing of supports shall be sufficient to hold reinforcing in the proper position within specified tolerances during construction traffic and concrete placement.

E. On vertical formwork, use approved bar chairs or spacers as required to maintain proper concrete cover and bar position. Do not staple or use any other metallic fastener to secure bolsters, chairs, etc. to formwork for concrete surfaces exposed to the exterior

1. Weld reinforcing bars according to AWS D1.4, where indicated.

F. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

G. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

H. Epoxy-Coated Reinforcement: Repair cut and damaged epoxy coatings with epoxy repair coating according to ASTM D 3963/D 3963M. Use epoxy-coated steel wire ties to fasten epoxy-coated steel reinforcement.
3.05 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.
   1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated.
   2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
   3. Locate joints for grade beams and slabs in the middle third of spans.
   4. Locate horizontal joints in walls at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
   5. Space vertical joints in walls as indicated. Locate joints beside pilasters integral with walls, near corners, and in concealed locations where possible. Locate at centerline of support or in middle third of span.

C. Joints in Slabs-on Metal Deck: Locate construction joints as noted on the drawings. For metal deck slabs with WWR, continue WWR through the construction joint and lap in the adjacent pour. For metal deck slabs without WWR provide #4x4'-0 at 12 inches on center staggered 1'-0 at construction joints. Do not provide control joints.

3.06 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. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.
   1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

C. 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. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
   2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
   3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

D. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
   1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
3. Screed slab surfaces with a straightedge and strike off to correct elevations.
4. Slope surfaces uniformly to drains where required.
5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

E. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
   1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
   2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
   3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

F. Hot-Weather Placement: Comply with ACI 301 and as follows:
   1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor’s option.
   2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

3.07 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.

C. 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.
D. Abrasive-Blast Finish: Perform abrasive blasting after compressive strength of concrete exceeds 2000 psi. Coordinate with formwork removal to ensure that surfaces to be abrasive blasted are treated at same age for uniform results.
   1. Surface Continuity: Perform abrasive-blast finishing in as continuous an operation as possible, maintaining continuity of finish on each surface or area of Work. Maintain required patterns or variances in depths of blast to match design reference sample or mockup.
   2. Abrasive Blasting: Abrasive blast corners and edges of patterns carefully, using backup boards, to maintain uniform corner or edge line. Determine type of nozzle, nozzle pressure, and blasting techniques required to match design reference sample or mockup.
   3. Depth of Cut: Use an abrasive grit of proper type and gradation to expose aggregate and surrounding matrix surfaces to match design reference sample or mockup, as follows:
      a. Light: Expose fine aggregate with occasional exposure of coarse aggregate and uniform color; with maximum reveal of 1/16 inch.

5. Aggregate Requirements at Abrasive Blasting: See architect.

3.08 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 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 to receive trowel finish.

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 exposed to view or to be covered with resilient flooring, carpet, ceramic or porcelain tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
   2. Finish surfaces to the following tolerances, according to ASTM E 1155, for a randomly trafficked floor surface:
      a. Specified overall values of flatness, F(F) 35; and of levelness, F(L) 25; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 17; for structural slabs-on-grade.
b. Specified overall values of flatness, \( F(F) \) 30; with minimum local values of flatness, \( F(F) \) 24 for slabs on metal deck.

E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces indicated where ceramic or porcelain 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.
   1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

3.09 MISCELLANEOUS CONCRETE ITEMS

A. Filling In: Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.

B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates from manufacturer furnishing machines and equipment.

3.10 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. \( \times h \) 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. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.

D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.
E.  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 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 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, 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.
   a.  Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
   b.  Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
   c.  Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies will not interfere with bonding of floor covering used on Project.

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.

3.11  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.

B.  Patching Mortar:  Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.
C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning and that are unacceptable to the Architects. Allow Architect/Engineer to observe formed concrete surfaces immediately upon removal of forms and prior to repair of surface defects. Defects in structural concrete shall be brought to the attention of the Architect/Engineer. Repair tie holes and surface defects immediately after such observation. Where the concrete surface will be textured by sandblasting or bush-hammering, repair surface defects before texturing.

1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension in solid concrete, but not less than 1 inch in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.

2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.

3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.

D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template. Submit proposed repair for acceptance prior to beginning this work.

1. Repair finished surfaces containing defects that are unacceptable to the Architect. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.

2. After concrete has cured at least 14 days, correct high areas by grinding.

3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete. Submit proposed repair for acceptance prior to beginning this work.

4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.

5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.

F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.12 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Inspections:
   1. Steel reinforcement placement, embedments, and mechanical connectors.
   2. Inspect reinforcing steel and embedments prior to placing concrete as follows:
      a. Inspect all reinforcing, verifying type of reinforcing, bar sizes, spacings, number of bars, concrete cover to bars, bar locations, splices including splice location and lap splice length or mechanical connector, in place condition of coated bars, and method of support of reinforcing.
      b. Inspect embedded bolts, plates, and steel shapes. Verify that size and number of bolts or anchors/rebar, embedment, anchorage, use of specified template and general embedment locations are as specified. Welds to embedments shall be tested as specified in Section 051200.
      c. Welding of reinforcing steel, where permitted, shall be inspected as specified in Section 051200.
      d. Inspect partially embedded reinforcement, which is field bent, or field straightened. Verify that procedures specified in ACI-301-99 Section 3.3.2.8 – “Field Bending or Straightening” are followed. Inspect all field bent bars not bent in accordance with ACI 301 using visual and magnetic particle methods after bending is complete.
      e. Test rebar anchored into hardened concrete as specified in Section 051200 for adhesive anchors.
3. Mechanical Connectors: Perform all special inspections as defined in the code approval report for mechanical connectors. As a minimum the following are required:
   a. Continuously observe the installation of the first two splices for each type of mechanical connector. Verify all aspects of installation are in accordance with Manufacturer’s instructions and code approval report.
   b. Visually inspect 100% of completed connections to verify installation is in accordance with Manufacturer’s instructions and ICC test report.

4. Steel reinforcement welding.

5. Headed bolts and studs.

6. Verification of use of required design mixture.

7. Concrete placement, including conveying and depositing. Inspect the first concrete placement of stemwalls/gradebeams, structural slab-on-grade, and slab-on-metal deck. Inspect each truck for correct mix design, addition of water to each truck and subsequent mixing, cleanliness of forms, concrete vibration, concrete finishing, and concrete curing.

8. Curing procedures and maintenance of curing temperature.

9. Verification of concrete strength before removal of shores and forms from beams and slabs.

10. Temperature of In-Place Concrete: Owner’s Testing Agency shall measure and report maximum/minimum temperature of in-place concrete during curing period when concreting in cold weather.

11. Observe all openings cut through existing structure and inspect extracted core(s) to verify no reinforcing or post-tensioning tendons were cut.

12. Observe all removal of existing topping slabs and chipping of existing concrete. Confirm existing reinforcing and remaining concrete is not damaged during process.

C. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

1. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. or fraction thereof of each concrete mixture placed each day. Obtain one sample for each 5000 square feet of shearwalls or slabs if this is less than the 100 cu. yd. requirement.
   a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day’s pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; one test for each composite sample at point of placement, but not less than one test for each day's pour of each concrete mixture.
   a. Where concrete will be exposed to deicing salts, air content tests will be made on samples from the first three batches in the placement and until three consecutive batches have air contents within the range specified, at which time every fifth batch will be tested. This test frequency will be maintained until a batch is not within the range specified, at which time testing of each batch will be resumed until three consecutive batches have air contents within the range specified. These air content tests may be taken on composite samples or on samples from the batch at any time after discharge of two cubic feet of concrete.

4. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.

5. Unit Weight: ASTM C 567, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.

6. Compression Test Specimens: ASTM C 31/C 31M.
   a. Cast and laboratory cure four standard cylinder specimens for each composite sample.

7. Compressive-Strength Tests: ASTM C 39/C 39M; test one cylinder at 7 days and one set of two specimens at 28 days. Hold one cylinder and test at 56 days if 28-day strength is not achieved.
   a. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.

8. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.

9. Test results shall be reported in writing to Architect, concrete manufacturer, Building Official and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests, concrete supplier & mix ID number. Also include amount of water added at site prior to sampling, ambient air temperature, and concrete wet unit weight. Include time concrete was batched and time when placement was finished.

10. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
11. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Architect.

12. Additional testing and inspecting, at Contractor’s expense, will be performed to determine compliance of replaced or additional work with specified requirements.

13. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

D. Measure floor and slab flatness and levelness according to ASTM E 1155 within 48 hours of finishing.

3.13 CONSTRUCTION WASTE MANAGEMENT: (CREDIT MR2)

A. Manage construction waste in accordance with provisions of Division 01 Section “Construction Waste Management and Disposal”. Submit documentation to satisfy the requirements of that section.

END OF SECTION
SECTION 03 35 20
DECORATIVE CONCRETE FLOOR FINISH

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Decorative concrete floor finish for areas as scheduled on the drawings including:
      a. Edge and face forming, reinforcing, the conveying, placement, consolidating, curing, polishing and top coating of exterior on-grade slabs.

B. Related Sections:
   1. Division 32 Section “Concrete Paving” for site concrete, including exterior decorative flatwork.

1.02 LEED SUBMITTALS

A. General:
   1. Submit material cost breakdowns for all products used as part of this work, submitted in the format of the Material Tracking Worksheets, per Division 01 Section "Sustainable Design Requirements".
   2. Submit additional materials information (e.g. recycled content, manufacturing location) to complete the information provided in the Material Tracking Worksheets where specified in this article or requested by the Architect.
   3. Submit Letters of Certification, Product Cut Sheets, Material Safety Data Sheets, or other items to support the information provided in the Material Tracking Worksheets where requested by the Architect.
   4. Submit Material Safety Data Sheets for all applicable products. If the MSDS does not show the product’s Volatile Organic Compound (VOC) content, this information must be provided through other published product literature from the manufacturer, or stated in a letter of certification (on the manufacturer's letterhead) from the product manufacturer.

B. Recycled Content Materials: (Credit MR4).
   1. Submit product data or other published information indicating separate percentages, by weight, of pre-consumer and post-consumer recycled content per unit of product. Also include material costs, excluding cost of installation.
      a. Include information on Material Tracking Worksheets.

C. Local/Regional Materials: (Credit MR5).
   1. Submit location of manufacturing facility including name, address and distance between manufacturing facility and the project site. Provide manufacturer’s documentation indicating location where the base materials were extracted, mined, quarried, harvested, etc. and the distance between this location and the project site. Also include material costs, excluding costs of installation.
      a. Include information on Material Tracking Worksheets.
D. VOC Content and Material Composition: (Credit EQ4).
   1. Submit product data and material safety data sheets (MSDS) for adhesives, sealants,
      paints, coatings and carpet products used on the interior of the building indicating
      chemical composition and VOC content of each product used. Highlight or circle
      applicable VOC content on submittal and indicate specified limit to be complied with.

1.03 SUBMITTALS

A. Product Data:
   1. Submit data for manufactured materials and products indicated including
      manufacturer’s product data and literature for decorative concrete floor finish system
      to be provided.

B. Shop Drawings:
   1. Submit layout drawings of proposed pour areas including correlation with joint pattern
      required and including a key proposing date of placement for each pour area.

C. Samples:
   1. Submit samples showing specified gradation and anticipated color range of recycled
      glass aggregate to be seeded into the concrete surface. Package in transparent, clear,
      round container weighing approximately 10 pounds.
   2. Submit 18-inch square samples no more than 3/4-inch thick showing proposed concrete
      mix, seeded aggregate and proposed sheen for Architect’s preliminary approval.
      Following Architect’s preliminary approval, continue with the construction of the
      required mock-up.

D. Installer Qualifications:
   1. Submit Installers qualifications demonstrating compliance with specified requirements
      including letter or certification from manufacturer for acceptance as an approved
      Installer for the system to be provided. Include references for completed projects in the
      last five years including name and location of project; contact information for owner,
      architect and general contractor; size and type of project; overall project construction
      cost; cost of decorative concrete work; and date of completion.

1.04 QUALITY ASSURANCE

A. Installer Qualifications:
   1. An experienced installer who has completed decorative concrete floor finish work
      similar in material, design and extent to that indicated for this Project and whose work
      has resulted in construction with a record of successful in-service performance. Installer
      must be acceptable to the manufacturer (certified in writing) of the decorative concrete
      floor finish system to be provided.
   a. Final approval of Installer to perform the work will be based on Installer’s ability
      to provide an acceptable mock-up. Architect reserves the right to require a
      different Installer be employed where Contractor’s selected installer cannot
      produce an acceptable mock-up in the sole judgment of the Architect.
2. Installers not listed herein must submit qualifications to the Architect for review and upon written approval of qualifications from the Architect must schedule visits to completed project(s) in the area prior to final approval. Acceptable installers include, but are not limited to, the following:
   a. Shawn Bullock  
      22285 East Alameda Avenue  
      Aurora, Colorado 80018  
      (720) 219-8628  
   b. Colorado Hardscapes, Inc.  
      8085 East Harvard Avenue  
      Denver, Colorado 80231  
      (303) 750-8200  
   c. Meidling Concrete Specialties  
      12411 East Empire Avenue  
      Spokane Valley, Washington 99216  
      (509) 924-7180  
   d. Rocky Mountain Construction  
      11470 Carisa Court  
      Hayden, Idaho 83835  
      (208) 772-8181  
   e. True North Polishing  
      3532 Northeast Austin Drive  
      Lee Summit, Missouri 64064  
      (401) 580-0867

B. Standards:
   1. Conform to ACI and ASTM standards as specified in Division 32 Section "Concrete Paving" and applicable PCA standards.

C. Mock-ups:
   1. Prepare slab-on-grade mock-up of not less than five, 4- by 4-foot areas which abut to one another to demonstrate differential between pours, typical joints, surface finish texture, color, slip resistance and standard of workmanship. Pour first section and following with the pouring of the second section 2 or 3 days later. Locate where acceptable to the Architect either outside of the building line or inside the building line where mock-up will remain uncovered and available for comparison through-out the construction period. Modify mock-ups or prepare additional mock-ups if directed by Architect to achieve approval of factors to be demonstrated in the mock-up. Acceptable mock-up, if inside the building, may be retained as part of permanent construction but not in an area exposed to normal view. Demolish and remove mock-ups outside of the building line when directed by the Architect.
   a. On one-quarter of each mock-up sample, finish the concrete surface by hand polishing methods and finish the balance with large field polishing method.
b. Testing of mock-up will be required to ensure compliance with the wet slip coefficient requirements specified and will be part of the determination as to whether the mock-up is acceptable or not.

D. Pre-Installation Conference:
1. Comply with the requirements of Division 01 Section "Project Management and Coordination".
2. Convene 2 weeks prior to beginning work of this section. Review and discuss:
   a. Staging and sequencing.
   b. Protection of completed work.

1.05 PROJECT/SITE CONDITIONS

A. Place decorative concrete within consistent weather conditions (within that pour and from pour to pour). Place concrete when temperatures are within a selected 10 deg F temperature range (such as 75 to 85 deg F), relative humidity is within 10% range (such as 30% to 40% relative humidity), and when recorded weather is similar (sunny, partly sunny, overcast, etc.).

B. Do not place decorative concrete in extreme conditions (under 60 deg F or over 90 deg F). Do not place decorative concrete during rain, mist or similar high humidity conditions.

C. Apply concrete treatment when ambient and surface temperatures are not less than 35 deg F.

D. Concrete Substrate: Cured a minimum of 7 days prior to application of initial cut; minimum 4000 PSI compressive strength.

E. Close areas to traffic during finishing and for minimum time period after finishing as recommended by decorative concrete floor finish system manufacturer.

1.06 MAINTENANCE

A. Submit manufacturer’s recommended maintenance procedures for system and products installed on the project for the anticipated use.

B. Included on-site training and demonstration to the Owner’s maintenance personnel.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design: Subject to compliance with requirements, provide "Polished Concrete Treatment" decorative concrete floor by Green Umbrella, www.greenumbrellatreatments.com, or by one of the following:

DECORATIVE CONCRETE FLOOR FINISH
03 35 20 - 4
2.02 GENERAL

A. Recycled Content: Materials/products shall contain the maximum amount of recycled content allowed that retains material integrity except Portland cement may not contain fly ash or other recycled material and aggregates must be from specified sources.

B. Local/Regional Materials: Preference shall be given to materials that are manufactured, harvested, extracted, mined, quarried, etc. within a 500 mile radius of the project site.

C. Installer of the work of this section shall be responsible for coordinating the concrete mix, ordering the mix and paying for the mix delivery to the site for the concrete required for the work of this section.

2.03 FORMS

A. Conform to applicable requirements of Division 32 Section "Concrete Paving".
   1. VOC Content for Form Release Agent: Not more than 250 grams per liter.

2.04 REINFORCING

A. Conform to applicable requirements of Division 32 Section "Concrete Paving" for reinforcing bars, welded wire fabric, and fibrous reinforcement.
   1. Provide fibrous reinforcement for all concrete associated with the decorative concrete floor finish system.

2.05 CONCRETE MATERIALS AND MIX

A. Conform to applicable requirements of Division 32 Section “Concrete Paving” and as follows:
   1. Compressive Strength: 4000 psi at 28 days.
   2. Portland Cement Color: Blend of 60% standard gray and 40% white.
   3. Maximum Water/Cement Ratio: 0.45.
   4. Minimum Cementitious Material Content: 564 pounds per cubic yard.
   5. Fly Ash Content: Do not use fly ash.
   6. Aggregate: Use the specified decorative aggregate in the concrete mix to achieve required finish.
   7. Slump: 2.5- to 5.5-inches.
   8. Air Content: Addition of entrained air is not acceptable.
   9. Admixtures: Do not include any admixtures except for fibrous reinforcing.

2.06 CURING MATERIALS

A. Clear, waterborne, membrane-forming, dissipating type curing compound complying with ASTM C309, Type 1, Class B. VOC Content: Not greater than 250 g/L.

B. Subject to compliance with requirements, provide one of the following:
   1. Anti-Hydro International, Inc.; AH Curing Compound #2 DR WB.
   2. BASF Construction Chemicals – Building Systems; Kure 200.
   3. ChemMasters; Safe-Cure Clear.
   4. Conspec by Dayton Superior; W.B. Resin Cure.
5. Dayton Superior Corporation; Day-Chem Rez Cure (J-11-W).
6. Edoco by Dayton Superior; Res X Cure WB.
7. Euclid Chemical Company (The), an RPM company; Kurez W VOX; TAMMSCURE WB 30C.
9. Lambert Corporation; AQUA KURE – CLEAR.
10. L&M Construction Chemicals, Inc.; L&M Cure R.
11. Meadows, W. R., Inc.; 1100-CLEAR.
12. Nox-Crete Products Group; Resin Cure E.
13. Right Pointe; Clear Water Resin.
15. Symons by Dayton Superior; Resi-Chem Clear.
16. TK Products, Division of Sierra Corporation; TK-2519 DC WB.
17. Vexcon Chemicals, Inc.; Certi-Vex Enviocure 100.

C. Use of moisture curing or cure and seal materials is not acceptable.

2.07 RELATED MATERIALS

A. Penetrating Liquid Floor Treatment:
   1. Clear, waterborne solution of lithium, inorganic silicate or silicate materials which will not contribute to alcohol silica reaction (ASR) and proprietary components; odorless; that penetrates, hardens and is suitable for polished concrete surfaces. VOC Content: Not greater than 250 g/L.
   2. Subject to compliance with requirements, provide one of the following:
      a. Advanced Floor Products; Retro-Plate 99.
      b. American Concrete Concepts; EnhancerPro.
      c. Bomanite Corporation; Stabilizer Pro.
      d. L&M Construction Chemicals, Inc.; FGS Hardener Plus.
      e. QuestMark, a division of CentiMark Corporation; DiamondQuest Densifying Impregnator Application.

B. Slab-on-Grade Joints:
   2. Construction Joints: Burke “Keyed Kold”, Jahn “Load Key Joint” or approved equal.

C. Surface Treatment:
   1. Clear, waterborne proprietary solution designed to work in conjunction with specified penetrating floor treatment to protect concrete from staining, dusting and similar damage without adding sheen or impacting the wet slip performance of the treated concrete; odorless; that is suitable for polished concrete surfaces. VOC Content: Not greater than 250 g/L.
   2. Subject to compliance with requirements, provide one of the following:
      a. American Decorative Concrete; “ProGuard Stain Shield”.
      b. Bomanite Corporation; “Stainguard”.
      c. Green Umbrella; “Microfilm”.
D. Decorative Aggregates:
   1. Concrete Aggregate: To meet the requirements of Division 32 Section "Concrete Paving" and to match the sample in the Architect's office.
   2. Surface Seeding Aggregates – seven, as follows:
      a. (3) aggregates to be 100% recycled glass, as supplied by Colorado Hardscapes:
         1) Black Glass.
         2) Light Blue Glass.
         3) Blue Glass.
      b. (4) aggregates to be stone, as supplied by Colorado Hardscapes:
         1) Quartz No. 1.
         2) Crystal White.
         3) Texas Black.
         4) Texas Blue.
   3. Seeding Rate: 3 to 10 ounces per square foot.
   4. Predominant size will be No. 1, with approximately 5% of larger size seeded in.
   5. Manufacturer shall match these colors or provide samples for review and approval by Architect.

E. Other Materials:
   1. Bonding Agent: As specified in Division 32 Section "Concrete Paving".
      a. VOC Content: Not more than 775 grams per liter.
      a. VOC Content: Not more than 250 grams per liter.

2.08 EQUIPMENT
A. Provide the following equipment as recommended by the decorative concrete floor finish system manufacturer:
   1. Polishing Equipment: Provide heavy duty commercial floor grinder/polisher which is propane powered and is designed for “wet grinding” or with a dust capture system (such as a HEPA filter) to remove 99.9% of the particles from the air.
   2. Auto Scrubber: Minimum 500 pound head pressure with recovery tank.

PART 3 - EXECUTION
3.01 EXAMINATION
A. Refer to Division 01 Section "Execution" for examination of substrate and job conditions
B. Inspect substrates to receive flatwork for conformance to specified tolerances.
C. Verify that required gravel subgrade, piping or similar work is in place.
D. Start of this work constitutes acceptance of substrates as suitable for satisfactory performance of work of this section.

3.02 PREPARATION

A. Do fine hand grading as required to assure minimum thickness of concrete as indicated prior to placing slab forms.

B. Set edge forms, bulkheads and intermediate screed strips to achieve elevations and slopes in finished concrete surfaces. Secure to support screed strips. Use strike-off templates or compacting type screeds where applicable.
   1. Achieve 4-inch slab-on-grade thickness in all locations, except where greater depth is indicated on the drawings.
   2. For floors cast over metal deck, place screeds along or perpendicular to steel joists and beam lines. Set screeds and adjust as necessary to achieve proper slab elevation and thickness, allowing for beam camber and deflection.

3.03 EMBEDDED ITEMS

A. Install nosings, sleeves, and accessories furnished under other sections for installation in this Section.

3.04 REINFORCING

A. Provide fibrous reinforcement as specified in Division 32 Section "Concrete Paving" for all decorative finish concrete.

3.05 PLACING CONCRETE

A. Convey, place and consolidate concrete in accordance with applicable portions of Division 32 Section "Concrete Paving", except as specifically required herein.

B. The addition of water or water materials (such as ice or other water containing materials) after the delivery truck has left the batch plant is not acceptable.

3.06 JOINTS

A. General:
   1. Isolate flatwork from building elements, walls, columns with control or slip joints unless otherwise indicated.
   2. Construct joints true to line with faces perpendicular to finish surface plane of concrete.
   3. Construct slabs in as large a placement area as practical. Locate construction joints on column center lines, unless shown otherwise. Provide contraction joints at intervals shown on Drawings.
B. Contraction Joints in Slabs-on-Grade:
   1. 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:
      a. Sawed Joints: Form with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

C. Isolation Joints in Slabs-on-Grade:
   1. 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.
      a. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface, unless otherwise indicated.
      b. Terminate full-width joint-filler strips not less than ½ inch or more than 1 inch below finished concrete surface where joint sealants, specified in Division 07 Section “Joint Sealants”, are indicated.
      c. Install joint-filler strips in lengths as long as practical. Where more than one length is required, lace or clip sections together.

D. Joints in Concrete Topping:
   1. Construction Joints: Form construction joints at locations indicated or as approved by Architect.
      a. Coat face of construction joint with epoxy adhesive at locations where topping is placed against hardened or partially hardened topping.
   2. Contraction Joints: Form sawed weakened-plane contraction joints at location indicated or approved by Architect.
      a. Construct contraction joints for a depth equal to one-half of topping thickness, but not less than 1/2-inch deep.

E. Routing of Joints:
   1. Following the application of the polished finish and prior to the application of the surface treatment, route all control and construction joints with a 5/16-inch v-cut to achieve a uniform appearance and edge for all joints.
   2. Following final routing, seal joints with multi-component self-leveling urethane sealant as specified in Division 07 Section “Joint Sealants”, prior to application of surface treatment.

3.07 FINISHING FLOORS AND SLABS

A. General:
B. **Float Finish:**
   1. Begin floating when the surface water has disappeared or when the concrete has stiffened sufficiently to permit the operation of a power-driven float, or both.
   2. Consolidate the surface with power-driven flat, or by hand floating if area is small or inaccessible to power units.
   3. Cut down high spots and fill all low spots. Uniformly slope surfaces to drains.
   4. Immediately after leveling, refloat the surface to a uniform, smooth, granular texture.
   5. Apply float finish to monolithic slab surfaces that are to receive trowel finish and other finishes as hereinafter specified.

C. **Trowel Finish:**
   1. After applying float finish, begin the first trowel finish operation using a power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance.
   2. Consolidate concrete surface by final hand troweling operation.
   3. Finish and measure surface so gap at any point between concrete surface and an unleveled freestanding 10-foot long straightedge, resting on two high spots and placed anywhere on the surface, does not exceed 1/8 inch.

D. **Seeding of Glass Aggregate:**
   1. Hand seed glass aggregate into top surface of the decorative concrete floor slabs to produce a random but uniform pattern to match approved mock-up.
   2. Work aggregate into slab surface as required.

### 3.08 CURING

A. Immediately upon completion of seeding of glass aggregate and disappearance of surface water, start curing operations.

B. Follow procedure specified in Division 32 Section "Concrete Paving", using specified dissipating resin curing compound.

### 3.09 SURFACE POLISHING

A. **General:**
   1. Apply polished concrete finish system to cured and prepared slabs to match accepted mockup.
   2. Verify that surfaces meet finish and profile requirements.
   3. Apply protection to adjacent surfaces which might be damaged by polishing operations.

B. **Preliminary Grinding:**
   2. Scrub and rinse floor.
   3. Grind floor using 100 grit metal pads.
   4. Scrub and rinse floor.
   5. Grind floor using 200 grit semi-metal pads.
   6. Scrub and rinse floor.
C. Penetrating Liquid Floor Treatment:
   1. Apply penetrating liquid floor treatment following preliminary grinding in polishing sequence and according to manufacturer’s written instructions, allowing recommended drying time between successive coats.
   2. Apply extended protection as specified below to protect concrete until final polishing is completed nearer to the completion of construction.

D. Final Polishing:
   1. Near the completion of construction, remove protection materials and continue polishing with progressively finer grit diamond polishing pads to gloss level to match approved mock-up.
      a. Do not proceed with polishing if surface has been damaged. Perform any required remedial measures prior to polishing.

   2. Perform final polishing to provide smooth, even semi-gloss finish using 800 grit resin pads. Scrub and rinse surfaces if required.
      a. Gloss Rating: Final polishing to provide 55 gloss rating unless another gloss level is identified with the accepted mock-up. Verify required gloss has been achieved using a Horbia 320 gloss meter. Repolish is required to achieve specified gloss rating.

   3. Control and dispose of waste products produced by grinding and polishing operations.

3.10 SURFACE TREATMENT

A. After final polishing, neutralize and clean polished floor surfaces. Remove debris. Remove residues using non-corrosive cleaning products.

B. Apply treatment in accordance with manufacturer’s instructions.

C. Apply treatment in single application using spreader or sprayer.

D. Distribute using exploded-tip bristle broom to uniform coverage.

E. Allow to air dry.

F. At ambient temperatures above 95 deg F, keep surfaces hydrated for one hour after application.

G. After drying, remove un-reacted material using broom.

H. Just before inspection to establish completion of the project, burnish surface of the decorative concrete floor finish to provide a uniform, un-abraded surface. Follow with another application of surface treatment if required to achieve uniform appearance.
3.11 PROTECTION

A. General:
1. No satisfactory chemical or cleaning procedure is available to remove petroleum stains from the decorative concrete floor surface. Damage from rust and acids can occur. Take steps to essentially eliminate these possibilities. Prevention is essential. The Contractor will be required to ensure that all Subcontractors and workers on the site comply with the following:
   a. Diaper all hydraulic powered equipment to avoid staining of the concrete.
   b. Prohibit parking of vehicles on the decorative concrete slabs even where protected. If necessary to complete their scope of work, required installers to provide drop cloths placed under vehicles at all times.
   c. Prohibit pipe cutting machines on the decorative concrete slabs.
   d. Prohibit placement of steel on decorative concrete slabs to avoid rust staining.
   e. Do not allow acids and acidic detergents to come in contact with decorative concrete slabs to avoid staining and etching.
   f. Inform all workers that the decorative concrete slabs must be protected at all times.

B. Protection During Initial Placement and Cuts:
1. Installer of the work of this section shall provide protection as required to ensure work is without damage in accordance with the requirements of the system manufacturer.
2. Do not utilize plastic membrane over the slab surfaces.
3. Unless otherwise specifically recommended by the manufacturer, provide breathable weed barrier fabric covered with 1/4-inch minimum thickness masonite, plywood, or OSB.
4. Contractor will be responsible for ensuring required protection remains in place and is providing the required protection.

C. Protection Following Final Cut and Surface Treatment:
1. Installer of the work of this section shall provide Ramboard or Transguard 4000 placed over the completed decorative concrete slab to avoid scratching, chipping, gouging and general damage of the surface during the balance of the construction period.
2. Do not remove such protection until just before observations to establish completion and final slab burnishing.

3.12 FIELD QUALITY CONTROL

A. Owner will engage and pay for an independent testing agency to perform the field quality control tests specified in Division 32 Section “Concrete Paving”.

B. The Owner will engage and pay for a testing agency to test the project mock-ups as part of the approval process and in-place decorative concrete floor finish for acceptable wet-slip coefficient performance.
1. Perform wet-slip coefficient testing in accordance with ANSI A1264-2 using a BOT-3000 slip-tester by Universal Walkway Testing or other system acceptable to the Architect.
2. Concrete with a wet-slip coefficient of 0.6 and above will not be acceptable and will require remedial measures or replacement as required to achieve listed performance. Remedial measures are subject to the Architect’s approval of final appearance.

3. Perform up to two tests on each 10- by 10-foot mock-up panel.

4. Perform up to two tests per 400 square feet of completed work or portion thereof.

5. Quality of tests is to be considered an allowance of the number of tests required. The Architect and the Owner will select locations where tests will be performed. All tests could be performed in one area or in groups with other 400 square foot areas not receiving any tests.

6. Should additional testing be required because the work fails to conform to the specified requirements and remedial or replacement work is necessary, additional testing of remedial or replacement work shall be borne by the Contractor.

3.13 CONSTRUCTION WASTE MANAGEMENT: (Credit MR2)

A. Manage construction waste in accordance with provisions of Division 01 Section “Construction Waste Management and Disposal”. Submit documentation to satisfy the requirements of that section.
SECTION 03 60 00

GROUT

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Non-shrink grout for architectural applications.

B. Related Sections:
   1. Division 03 Section “Cast-in Place Concrete”.
   2. Division 05 Section “Structural Steel” for grout for structural applications.

1.02 SUBMITTALS

A. Product Data:
   1. Submit manufacturer’s catalog data, mixing and installation instructions and
      specifications on grout proposed for use.

1.03 DELIVERY, STORAGE, AND HANDLING

A. Deliver in original unopened containers and store in a dry place under cover.

1.04 PROJECT/SITE CONDITIONS

A. Environmental Requirements: Maintain temperature of 40 degrees F. or above for at least 72
   hours following placement.

PART 2 - PRODUCTS

2.01 NON-SHRINK GROUT OR DRYPACK

A. Acceptable Manufacturers and Products:
   1. Non-Metallic Grout: Meet performance requirements of ASTM C1107. Use one of the
      following:
      b. Euclid Chemical Company “HiFlow”: www.euclidchemical.com
      c. L&M Chemicals “Crystex”: www.lmcc.com
   
   2. Provide white colored grout, or as selected by Architect.
PART 3 - EXECUTION

3.01 INSTALLATION

A. Mix, install, and cure grout according to manufacturer’s recommendations.

B. Pack grout in a manner to assure that no voids remain.

END OF SECTION
SECTION 04 20 00

UNIT MASONRY

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Concrete masonry units (CMU's).
   2. Mortar and grout.
   3. Reinforcing steel.
   4. Masonry joint reinforcement.
   5. Ties and anchors.

1.02 DEFINITIONS

A. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.03 PERFORMANCE REQUIREMENTS

A. Provide structural unit masonry that develops compressive strengths \(f' \text{m}\) at 28 days as indicated on the Drawings.

B. Determine net-area compressive strength \(f' \text{m}\) of masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.

1.04 SUBMITTALS

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

B. LEED Submittals:
   1. Product Certificates for Credit MR 5.1 - Regional Materials: For products and materials required to comply with requirements for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.

C. Material Certificates: For each type and size of product indicated. For masonry units include data on material properties.

D. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.
   1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C 109/C 109M for compressive strength, ASTM C 1506 for water retention, and ASTM C 91 for air content.
   2. Include test reports, according to ASTM C 1019, for grout mixes required to comply with compressive strength requirement.
1.05 QUALITY ASSURANCE

A. Masonry Standard: Comply with ACI 530.1/ASCE 6/TMS 602 unless modified by requirements in the Contract Documents.

1.06 PROJECT CONDITIONS

A. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

B. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

PART 2 - PRODUCTS

2.01 MASONRY UNITS, GENERAL

A. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not use units where such defects will be exposed in the completed Work.

B. Fire-Resistance Ratings: Where indicated, provide units that comply with requirements for fire-resistance ratings indicated as determined by testing according to ASTM E 119, by equivalent masonry thickness, or by other means, as acceptable to authorities having jurisdiction.

2.02 CONCRETE MASONRY UNITS (CMU)

A. Regional Materials: Provide CMUs that have been manufactured within 500 miles of Project site from aggregates and cement that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.
B. **Shapes:** Provide shapes indicated and for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.

C. **CMUs:** ASTM C 90.
   1. **Unit Compressive Strength:** Provide units with minimum average net-area compressive strength of 2800 psi (19.3 MPa).
   2. **Density Classification:** Lightweight.

**2.03 MASONRY LINTELS**

A. **Masonry Lintels:** Prefabricated or built-in-place masonry lintels made from bond beam CMUs with reinforcing bars placed as indicated and filled with coarse grout. Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured.

**2.04 MORTAR AND GROUT MATERIALS**

A. **Regional Materials:** Provide aggregate for mortar and grout, cement, and lime that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.

B. **Portland Cement:** ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.

C. **Hydrated Lime:** ASTM C 207, Type S.

D. **Portland Cement-Lime Mix:** Packaged blend of portland cement and hydrated lime containing no other ingredients

E. **Aggregate for Mortar:** ASTM C 144.
   1. For joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.

F. **Aggregate for Grout:** ASTM C 404.

G. **Water:** Potable.

**2.05 REINFORCEMENT**

A. **Uncoated Steel Reinforcing Bars:** ASTM A 615/A 615M, Grade 60 (Grade 420).

B. **Masonry Joint Reinforcement, General:** ASTM A 951/A 951M.
   1. **Interior Walls:** Mill- galvanized, carbon steel.
   2. **Wire Size for Side Rods:** 0.148-inch diameter.
   3. **Wire Size for Cross Rods:** 0.148-inch diameter.
   4. **Spacing of Cross Rods, Tabs, and Cross Ties:** Not more than 16 inches o.c.
   5. **Provide in lengths of not less than 10 feet, with prefabricated corner and tee units.

C. **Masonry Joint Reinforcement for Single-Wythe Masonry:** Either ladder or truss type with single pair of side rods.
2.06 TIES AND ANCHORS

A. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated.

B. Adjustable Anchors for Connecting to Concrete: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
   1. Tie Section: Triangular-shaped wire tie, sized to extend within 1 inch of masonry face, made from 0.187-inch- diameter, hot-dip galvanized steel wire.

C. Partition Top anchors: 0.105-inch- thick metal plate with 3/8-inch- diameter metal rod 6 inches long welded to plate and with closed-end plastic tube fitted over rod that allows rod to move in and out of tube. Fabricate from steel, hot-dip galvanized after fabrication.

2.07 MISCELLANEOUS MASONRY ACCESSORIES

A. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).

2.08 MORTAR AND GROUT MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.
   1. Do not use calcium chloride in mortar or grout.
   2. Use portland cement-lime mortar unless otherwise indicated.

B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.

C. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification. Provide the following types of mortar for applications stated unless another type is indicated.
   1. For reinforced masonry, use Type S.

D. Grout for Unit Masonry: Comply with ASTM C 476.
   1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 1.15.1 in ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
   2. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C 143/C 143M.
PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

A. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

3.02 TOLERANCES

A. Dimensions and Locations of Elements:
   1. For dimensions in cross section or elevation do not vary by more than plus 1/2 inch or minus 1/4 inch.
   2. For location of elements in plan do not vary from that indicated by more than plus or minus 1/2 inch.
   3. For location of elements in elevation do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2 inch total.

B. Lines and Levels:
   1. For bed joints and top surfaces of bearing walls do not vary from level by more than 1/4 inch in 10 feet, or 1/2 inch maximum.
   2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
   3. For vertical lines and surfaces do not vary from plumb by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch maximum.
   4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
   5. For lines and surfaces do not vary from straight by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch maximum.

C. Joints:
   1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch.
   2. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch or minus 1/4 inch.
   3. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch.

3.03 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.
B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.

C. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.

D. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.

E. Fill cores in hollow CMUs with grout 24 inches under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.

3.04 MORTAR BEDDING AND JOINTING

A. Lay hollow CMU as follows:
   1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.
   2. With webs fully bedded in mortar in all courses of piers, columns, and pilasters.
   3. With webs fully bedded in mortar in grouted masonry, including starting course on footings.
   4. With entire units, including areas under cells, fully bedded in mortar at starting course on footings where cells are not grouted.

B. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

3.05 MASONRY JOINT REINFORCEMENT

A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.
   1. Space reinforcement not more than 16 inches o.c.
   2. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings.

B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.

C. Provide continuity at corners by using prefabricated L-shaped units.

3.06 ANCHORING MASONRY TO CONCRETE

A. Anchor masonry to concrete where masonry abuts or faces concrete to comply with the following:
   1. Provide an open space not less than 1/2 inch wide between masonry and structural steel or concrete unless otherwise indicated. Keep open space free of mortar and other rigid materials.
   2. Anchor masonry with anchors embedded in masonry joints and attached to structure.
   3. Space anchors as indicated, but not more than 24 inches o.c. vertically and 36 inches o.c. horizontally.
3.07 REINFORCED UNIT MASONRY INSTALLATION

A. Placing Reinforcement: Comply with requirements in ACI 530.1/ASCE 6/TMS 602.

B. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.
   1. Comply with requirements in ACI 530.1/ASCE 6/TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
   2. Limit height of vertical grout pours to not more than 60 inches.

3.08 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas, as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.

B. Inspections: Level 1 special inspections according to the "International Building Code."
   1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
   2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
   3. Place grout only after inspectors have verified proportions of site-prepared grout.

C. Testing Prior to Construction: One set of tests.

D. Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C 140 for compressive strength.

E. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C 780.

F. Mortar Test (Property Specification): For each mix provided, according to ASTM C 780. Test mortar for mortar air content and compressive strength.

G. Grout Test (Compressive Strength): For each mix provided, according to ASTM C 1019.

3.09 REPAIRING, POINTING, AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.

B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.
C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooing joints.

D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
1. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes.
2. Protect surfaces from contact with cleaner.
3. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
4. Clean masonry with a proprietary acidic cleaner applied according to manufacturer’s written instructions.
5. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.

3.10 MASONRY WASTE DISPOSAL

A. Construction waste shall be managed in accordance with provisions of Division 01 Section “Construction Waste Management and Disposal”. Documentation shall be submitted to satisfy the requirements of that section.

B. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor’s property. At completion of unit masonry work, remove from Project site.

C. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.
1. Do not dispose of masonry waste as fill within 18 inches of finished grade.

D. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above, and other masonry waste, and legally dispose of off Owner’s property.

END OF SECTION
SECTION 05 12 00
STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes the following:
1. Structural steel.
2. Prefabricated building columns.

B. Related Sections include the following:
1. Division 01 Section "Quality Requirements" for independent testing agency procedures and administrative requirements.
2. Division 05 Section "Steel Decking" for field installation of shear connectors.
3. Division 05 Section "Metal Fabrications" for steel lintels or shelf angles not attached to structural-steel frame miscellaneous steel fabrications and other metal items not defined as structural steel.
4. Division 09 painting Sections for surface preparation and priming requirements.

1.02 DEFINITIONS

A. Structural Steel: Elements of structural-steel frame, as classified by AISC's "Code of Standard Practice for Steel Buildings and Bridges," that support design loads.

1.03 PERFORMANCE REQUIREMENTS

A. Connections
1. Provide connections as shown or noted on drawings. The design of connections not shown or noted shall be provided by the Structural Engineer-of-Record upon request.
2. Alternate connections designed by the Contractor's Engineer may be submitted with one set of stamped calculations for record. Alternate connection concepts shall be pre-approved during bidding. All alternate connections shall be designed for the value noted on plan. The Contractor shall compensate the Structural Engineer-of-Record for time spent reviewing alternate connection designs and revising Contract Documents.

1.04 SUBMITTALS

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

B. LEED Submittal:
1. Product Data for Credit MR 4.1 and Credit MR 4.2: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating costs for each product having recycled content.
C. 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.
   4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical high-strength bolted connections.

D. Erection Drawings:
   1. Submit erection drawings defining location of each assembly or piece within the structure. Provide sufficient details to describe all field welding. Clearly identify all high strength bolts not required to be tensioned ("snug tight" as defined by AISC). If drawings are submitted in multiple packages, each submittal shall be complete with all erection drawings, details and piece drawings. Subsequent submittals of erection drawings which modify or add to earlier versions will be clearly marked.
   2. Submit setting drawings for bolts and plates installed by others.

E. Welding certificates.

F. Qualification Data: For Installer and fabricator.

G. Mill Test Reports: If requested, submit signed by manufacturers certifying that the products comply with requirements.

1.05 QUALITY ASSURANCE

A. Fabricator Qualifications: A qualified fabricator who participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category STD.

B. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code-Steel."

C. Fabrication and erection shall comply with applicable provisions of the following specifications and documents
      a. Section 3.1: Revise the second paragraph to read: "The Contract Documents shall clearly show the work that is to be performed and shall give the following information with sufficient dimensions to accurately convey the quantity and nature of the structural steel to be fabricated".
      b. Section 3.2: Replace the entire section with the following: "Requirements for structural steel including dimensions, arrangement, and details shall be shown in the overall contract document package. Fabricator shall be responsible for incorporating all such information from structural, architectural, mechanical, electrical drawings, as well as those of other disciplines".
      c. Section 3.5: Delete all text after the first sentence.
d. Section 3.6: Page 19, Replace the text of the entire section with the following: “When the fast-track project delivery system is selected, release of structural drawings shall constitute release for construction only, if specifically noted on the drawing. Drawings that indicate “not for construction” shall not be used for detailing”

e. Section 4.2: Page 21, 2nd Paragraph; Eliminate the following: “When requested to do so by the Owner’s Designated Representative for Design”

f. Section 4.4: Page 23; Revise 2nd sentence to read the following: “These drawings shall be returned in accordance with the schedule defined in Division 1 of the project specification. In the absence of this requirement, the Owner’s Designated Representative for Design shall return submittals within 14 days of receipt from the Owner’s Designated Representative for Design for Construction”

g. Section 6.4.4: Page 33; Revise statement “For the purpose of inspection, camber shall be measured in the fabricator’s shop in the unstressed condition”, to read “camber specified on the drawings is intended to be camber at the time of erection with decking placed prior to placing concrete. Owner’s Designated Representative for Construction shall submit methods for controlling deflections on beams with inadequate camber prior to placing concrete on deck”

h. Section 6.5.3: Page 38; Revise definition to read “two mils”.

i. Section 7.10.3, Page 47 - Refer to the design criteria in the general notes on the drawings for definition of the complete lateral load resisting system for the steel frame. The Contractor shall notify the Erector in accordance with Section 7.10 of the AISC Code of Standard Practice for Steel Buildings and Bridges of all bracing requirements beyond those required to support the bare steel frame.

2. AISC's "Specification for Structural Steel Buildings".
3. AISC's "Specification for the Design of Steel Hollow Structural Sections."
4. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

D. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1.06 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 erosion and deterioration.

1. Store fasteners in a protected place. Clean and relubricate bolts and nuts that become dry or rusty before use.

2. 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.

1.07 COORDINATION

A. Furnish 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

2.01 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 unless noted otherwise.

C. Channels and Angles-Shapes: ASTM A 36/A 36M.

D. Plate and Bar: ASTM A 36/A 36M, unless noted otherwise.

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 noted.
   2. Finish: Black, except where indicated to be galvanized.

G. Welding Electrodes: Comply with AWS requirements, 70 Series.

2.02 BOLTS, CONNECTORS, AND ANCHORS

A. Use Tension control bolts whenever possible.

B. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy hex steel structural bolts; ASTM A 563 heavy hex carbon-steel nuts; and ASTM F 436 hardened carbon-steel washers.
   1. Finish: Plain, except use hot-dipped where exposed to weather.

C. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F 1852, Type 1, heavy hex or round head steel structural bolts with splined ends; ASTM A 563 heavy hex carbon-steel nuts; and ASTM F 436 hardened carbon-steel washers.
   1. Finish: Plain, except use hot-dipped where exposed to weather.

D. Shear Connectors: ASTM A 108, Grades 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1, Type B.

E. Headed Anchor Rods: ASTM F 1554, Grade 55, weldable, straight.
   4. Finish: Plain, except use hot-dipped galvanized where exposed to weather.

F. Threaded Rods: ASTM A 36/A 36M.
   3. Finish: Plain, except use hot-dipped where exposed to weather.


K. Rebar: Rebar used for welding shall meet the requirements of ASTM A-706. Rebar bends shall meet the minimum bend diameters listed in the ACI 318, latest edition.

   1. Interior Use: For use in conditioned environments free from potential moisture, provide carbon steel anchors conforming to ASTM A307 with zinc plating in accordance with FS 22-Z-235.
   2. Exterior or Exposed Use: In exposed or potentially wet environments, and for attachment of exterior cladding materials, provide galvanized or stainless steel anchors. Galvanized anchors shall conform to ASTM A133. Stainless steel anchors shall be Series 300 stainless steel bolts with Series 300 or Type 18-8 stainless steel nuts and washers.

   1. Exterior or Exposed Use: In exposed or potentially wet environments and for attachment of exterior cladding materials, provide galvanized or stainless steel anchors. Galvanized anchors shall conform to ASTM A153. Stainless steel anchors shall be Series 300 stainless steel threaded rods with Series 300 or Type 18-8 stainless steel nuts and washers.

2.03 PRIMER

A. Primer: Fabricator’s standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer.

B. Galvanizing Repair Paint: MPI#18, MPI#19, or SSPC-Paint 20.

C. Where steel is to be field painted, provide shop coat of paint compatible with paint finish system specified in Division 09.

2.04 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time. 6000 psi.
2.05 FABRICATION

   1. Camber structural-steel members where indicated.
   2. Identify high-strength structural steel according to ASTM A 6/ A 6M and maintain markings until structural steel has been erected.
   3. Mark and match-mark materials for field assembly.

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.
   2. Beam Copes and Weld Access Holes: Thermally cut surfaces in material exceeding 1-1/2" thickness in rolled and built up shapes shall be ground to bright metal in accordance with Section J.18 of the AISC specification.

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. Cleaning: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP 3, "Power Tool Cleaning."

F. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1 and manufacturer's written instructions.

G. Holes: Provide holes required for securing other work to structural steel and for passage of other work 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. Base-Plate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.

H. Splices: Splicing of members to obtain the required lengths will not be permitted without prior acceptance of the Structural Engineer-of-Record unless shown on the drawings.

I. Substitutions: Where exact sizes and weights called for are not readily available, secure the Structural Engineer-of-Record’s acceptance of suitable sizes in time to prevent delay due to such substitutions.

2.06 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: As noted on drawings.

B. Weld Connections: Comply with AWS D1.1 for welding procedure specifications, tolerances, appearance, and quality of welds and for methods used in correcting welding work.
2.07 PREFABRICATED BUILDING COLUMNS

A. General: Prefabricated building columns consisting of load-bearing structural-steel members encased in manufacturer's standard insulating concrete for fire protection and enclosed in an outer non-load-bearing steel shell.
   1. Concrete Fill: Manufacturer's standard-mix structural concrete, with a minimum 28-day compressive strength of 5000 psi, machine mixed and mechanically vibrated during placement to produce concrete fill free of voids.

B. Fire-Resistance Ratings: Provide prefabricated building column listed and labeled by UL or another testing and inspecting agency acceptable to authorities having jurisdiction for ratings indicated, based on testing according to ASTM E 119.
   1. Fire-Resistance Rating: As shown on the drawings.

C. Column Configuration: Provide columns of sizes and shapes indicated. Fabricate connections to comply with details shown or as required to suit type of structure indicated.

D. Manufacturers: Subject to compliance with requirements, provide prefabricated building columns by one of the following:
   1. Black Rock Column, Inc.
   2. Dean, George H. Inc.
   3. Fire-Trol Division; Dean Lally L.P.

2.08 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.
   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.
   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 3, "Power Tool Cleaning."

C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a dry film thickness of not less than 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.
   1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
   2. Apply two coats of shop paint to inaccessible surfaces after assembly or erection. Change color of second coat to distinguish it from first.

D. Painting: Apply a 1-coat, nonasphaltic primer complying with SSPC-PS Guide 7.00, "Painting System Guide 7.00: Guide for Selecting One-Coat Shop Painting Systems," to provide a dry film thickness of not less than 1.5 mils.
2.09 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 holes and grind smooth after galvanizing.
   2. Galvanize lintels and shelf angles attached to structural-steel frame and located in exterior walls.

2.10 SOURCE QUALITY CONTROL

A. 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 100% visual inspection, shop-welded connections will be tested and inspected according to AWS D1.1 and the following inspection percentages and procedures, at testing agency's option:
   1. All full or partial penetration groove welded connections and splices: 100% ultrasonic.
   2. All other welds: 10% magnetic particle.

E. In addition to visual inspection, embedded plates and assemblies manufactured by the Steel Fabricator, shall be tested and inspected according to requirements in AWS D1.1 for stud welding and as follows:
   1. Assemblies supporting structural elements: 100%.

F. Test components of those embedded plates and assemblies to be tested as follows:
   1. Welded reinforcing bars and deformed anchors: 100% visual and 10% magnetic particle. Complete penetration groove welds to reinforcing bars: 100% ultrasonic.
   2. Stud connectors shall have all studs visually and acoustically tested. Studs which have visual defects and/or do not ring when struck with a hammer shall be tested by magnetic particle.
   3. Plates:
      a. Embedded plates thicker than 3/8" shall be ultrasonically tested along the center line of the plate width. Such tests shall be made after stud/rebar shop welding.
      b. Any discontinuity shall be cause for rejection.

G. Shop inspection by the Testing Agency for all columns and 20% of beams and girders shall include examination of steel for straightness and alignment, conformance to length and camber tolerances, fissures, mill scale and other defects and deformities, as described in ASTM A6 and examination of aforementioned fabricated pieces for conformity with approved shop drawings. Testing of welding will be performed as required.
PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments, with steel erector present, for compliance with requirements.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 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.

1. Do not remove temporary shoring supporting composite deck construction until cast-in-place concrete has attained its design compressive strength.

2. Contractor shall coordinate installation of all non-structural steel items which will load the non-self supporting structural steel frame. The structural steel frame temporary supports shall resist all loads from these non-structural steel items.

3. Field Modification: Obtain written acceptance from the Structural Engineer-of-Record before the use of flame cutting for field modification or refabrication of structural steel. The Structural Steel Fabricator shall be responsible for errors in fabrication and for correct fit in the field.

4. Support of Other Work: No permanent loading other than the weight of supported metal deck and concrete slabs shall be imposed on composite beams and girders without prior approval by the Structural Engineer-of-Record until the concrete in such slabs has achieved 75 percent of its design strength. Contractor shall submit calculations prepared by an Engineer registered in the state of Colorado verifying the adequacy of the non-composite members to support the anticipated loading prior to developing composite strength. All costs associated with the accommodation of such loading, including review of submittals and modification of structural members and/or details, shall be borne by the Contractor.

3.03 ERECTION

A. Set structural steel accurately in locations and to elevations indicated and according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and "Specification for Structural Steel Buildings".


1. Set base and bearing plates for structural members on wedges, shims, or setting nuts as required.

2. Weld plate washers to top of base plate.
3. Snug-tighten 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 base or bearing plate before packing with grout.

4. Promptly pack grout solidly between bearing surfaces and base or bearing 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. Clean and moisten surfaces to be grouted. Remove all free water immediately prior to placing grout. Mix and install grout in accordance with Manufacturer's instructions. Completely fill all spaces to be grouted. After grout has acquired its initial set, trim to lower edge of bearing plate and remove excess material. Consolidate exposed edges to a dense uniform surface.

C. Maintain erection tolerances of structural steel and architecturally exposed structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges." Except as follows:
1. Cambered Steel Beams: Fabrication camber shall be adjusted to compensate for conditions of shipping, handling and erection. Maximum deviation of vertical camber at mid span of beam after erection, prior to placing deck +1/2"; -0" maximum.
2. Leveling and Plumbing: Base leveling and plumbing on a mean temperature of 70 degrees F. Compensate for difference in temperature at time of erection.

D. Align and adjust various members forming 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 unless approved by Architect. Finish thermally cut sections within smoothness limits in AWS D1.1.

G. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

H. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1 and manufacturer's written instructions.

I. Compression Splices: Fasten splices in compression after bearing surfaces have been brought into contact. Clean bearing surfaces before assembling. Close all gaps 1/32" wide or greater by driving non-tapered mild steel shims full depth of the bearing surface along the full length of the gap.
3.04 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: As noted on the drawings.

B. Weld Connections: Comply with AWS D1.1 for welding procedure specifications, tolerances, appearance, and quality of welds and for methods used in correcting welding work.
   2. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for mill material.

C. Drilled-In Inserts: Install in accordance with Manufacturer's recommendations in accurately drilled holes of required diameter and depth. Where adhesive inserts are used, thoroughly clean hole of all debris and drill dust by wire brushing and compressed air prior to installation of insert and adhesive system. Do not drill holes in concrete or masonry until material has achieved full design strength.

3.05 PREFabricated BUILDING COLUMNS

A. Install prefabricated building columns to comply with AISC's "Specification for Structural Steel Buildings" manufacturer's written recommendations, and requirements of testing and inspecting agency that apply to the fire-resistance rating indicated.

3.06 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 and drilled-in inserts.

B. 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."
   1. Visually inspect all bolted connections to ascertain that all bolts, nuts and required washers have been installed and are of proper type and that all faying surfaces have been brought into snug contact. Verify the specified surface preparation of the faying surface has been correctly prepared.
   2. Tensioned High Strength Bolts:
      a. Standard Bolts:
         1) Inspect the bolt tightness of 10% of the bolts (minimum of 2), selected at random in each high strength bolted connection. If rejectable bolts are found in any connection, all remaining bolts in that connection shall be inspected for tightness. Inspection procedure shall be in accordance with "Specification for Structural Joints Using ASTM A325 or A490 Bolts" approved by Research Council on Riveted and Bolted Structural Joints of the Engineering Foundation (Research Council on Structural Connections, latest edition.)
b. **Twist Off (Self-Indicating) Bolts and Bolts With Direct Tension Indicator Washers:**
   1. Perform a visual inspection of all high strength bolted connections to assure that all torque-off splines have been sheared. For bolts with Direct Tension Indicator Washers, inspect all washers with feeler gage to assure that all washers have been deformed the correct amount.
   2. When splines are not sheared, or Indicator Washers are not properly deformed, the Testing Agency shall determine that proper bolt tension has been achieved by the application of a properly calibrated testing torque or the Contractor may, at his option, remove and replace all bolts with unsheared splines all bolts without properly deformed Indicator Washers. All cost of additional inspection required by this paragraph shall be borne by the Contractor.

C. **Welded Connections:** Field inspection of welding by the Testing Agency shall be such as to assure that the work conforms to specified requirements, and will include:
   - Field welds shall be tested according to AWS D1.1 and the following inspection procedures:
     1. Ascertainment that electrodes used for manual shielded metal-arc welding and the electrodes and flux used for submerged are welding conform to the requirements herein.
     2. Ascertainment that the welding is performed only by welding operators and welders who are properly certified. The Testing Agency shall witness such qualification testing of welding operator and welders, as may be required.
     3. Ascertainment that the fit-up, joint preparation, size, contour, extent of reinforcement, and length and location of welds conform to specified requirements and the Contract Drawings, and that no specified welds are omitted or unspecified welds added without approval of the Structural Engineer-of-Record.

D. The Testing Agency shall test field welds as follows:
   1. All welds including curtain wall and shoring connections: 100% visual.
   2. All full or partial penetration groove welds: 100% ultrasonic.
   3. All other welds, including curtain wall and shoring connections: 10% magnetic particle.
   4. Stud connectors on composite beams shall be tested as follows:
      a. In addition to 100% visual inspection and the requirements on AWS D1.1 for stud welding, all studs shall be acoustically inspected. Studs which do not ring when struck with a hammer shall be bent 15 degrees. If the bent stud does not fracture, stud is acceptable and may be left bent.
      b. In addition to the above, not less than one of each 100 studs shall be tested by bending 15 degrees. If no fracture occurs, stud is considered acceptable and left bent.
   5. If defective welds are discovered, the remaining uninspected welds shall receive such ultrasonic or magnetic particle inspection as may be required by the Structural Engineer-of-Record. All cost of additional inspection required by this paragraph shall be borne by the Contractor.
   6. The welding inspector will have the authority to reject weldments. Such rejection may be based on visual inspection where in his opinion the weldment would not pass a more detailed investigation.
7. Reports by the Testing Agency’s Inspector will contain, as a minimum, an adequate
description of each weld tested, the identifying mark of the welder responsible for the
weld, critique of any defects noted by visual inspection or testing, and a statement
regarding the acceptability of the weld tested, as judged by current A.W.S. standards.
Reports shall be distributed as early as possible, but not later than one workweek after
the tests have been performed. The Structural Engineer-of-Record shall be notified by
phone if, in the judgment of the Inspector, test results require immediate comment.
8. Radio graphic testing may be substituted for ultrasonic.

E. In addition to visual inspection, test and inspect field-welded shear connectors according to
requirements in AWS D1.1 for stud welding and as follows:
1. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree
   flash or welding repairs to any shear connector.
2. Conduct tests on additional shear connectors if weld fracture occurs on shear
   connectors already tested, according to requirements in AWS D1.1.

F. Correct deficiencies in Work that test reports and inspections indicate does not comply with
the Contract Documents.

G. Drilled-in Anchors and Drilled-in Rebar:
1. Self-Expanding Anchors: The Testing Agency shall inspect self-expanding Drilled-in
   Anchors shown on the structural drawings as follows:
   a. Prior to installation, the Testing Agency shall determine that the installing
      contractor has the proper materials and equipment for drilling holes in the
      receiving surface of required diameter and length.
   b. All anchors shall be visually inspected after installation to ensure that they have
      been installed perpendicular to the receiving surface and to proper depth.
   c. Pull test the first 3 and 1% of all remaining anchors for a tension load of 100% of
      the manufacturer’s recommended allowable working loads in tension.

2. Adhesive-Bonded Anchors/Rebar: The Testing Agency shall inspect adhesive-bonded,
   drilled-in anchors as follows:
   a. The Testing Agency shall be present at the site to observe the installation of all
      anchors/rebar placed. Such observation shall be to ensure that drilled holes are of
      required diameter and depth, holes are properly cleaned prior to installation of
      the anchors, and that holes are completely filled with properly mixed adhesive
      after installation.
   b. All anchors/rebar shall be visually inspected after installation to ensure that the
      anchor has been installed perpendicular to the receiving surface and to proper
      depth.
   c. Pull test the first 3 and 1% of all remaining anchors for a tension load of 100% of
      the Manufacturer’s recommended allowable working loads in tension.

H. Verification of Erection Tolerances:
1. The contractor shall survey the structure after erection and prior to placing deck.
   a. Submit report to the Architect and Owner within 24 hours after recording the
      data. Report shall identify all deviations of member locations and/or elevations in
      excess of allowable tolerance specified.
3.07 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 and accessories, bearing plates, and abutting structural steel.
   1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.
   2. Apply a compatible primer of same type as shop primer used on adjacent surfaces.

C. Touchup Painting: Cleaning and touchup painting are specified in Division 09 painting Sections.

3.08 CONSTRUCTION WASTE MANAGEMENT: (CREDIT MR2)

A. Manage construction waste in accordance with provisions of Division 01 Section “Construction Waste Management and Disposal”. Submit documentation to satisfy the requirements of that section.

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes the following:
1. Roof deck.
2. Composite floor 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.

1.02 SUBMITTALS

A. Product Data: For each type of deck, accessory, and product indicated.

B. LEED Submittal:
1. Product Data for Credit MR 4.1 and Credit MR 4.2: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.
   a. Include statement indicating costs for each product having recycled content.

C. 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.

D. Stud Layout Drawings: Show number of studs per flute for beams. Show stud layout for all skewed girders. Show positions of studs in metal deck valleys.

E. 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.

1.03 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to AWS D1.3, "Structural Welding Code - Sheet Steel."
B. Fire-Test-Response Characteristics: Where indicated, provide steel deck units identical to those tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.

1. Fire-Resistance Ratings: Indicated by design designations of applicable testing and inspecting agency.

2. Steel deck units shall be identified with appropriate markings of applicable testing and inspecting agency.

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."


1.04 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

2.01 MANUFACTURERS

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. Steel Deck:
   a. ASC Profiles, Inc.
   c. Consolidated Systems, Inc.
   d. DACS, Inc.
   e. D-Mac Industries Inc.
   f. Epic Metals Corporation.
   g. Marlyn 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.
2.02 ROOF DECK

A. Steel Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "ANSI/SDI-RD1.0 Standard For Steel Roof Deck" in SDI Publication No. 31, and with the following:
   1. Prime-Painted Steel Sheet: ASTM A 1008/A 1008M, Structural Steel (SS), Grade as indicated. Shop primed with manufacturer's standard baked-on, rust-inhibitive primer.
   2. Galvanized Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade as indicated, G60 zinc coating. Use at exterior locations not exposed to view.
   3. Galvanized and Shop-Primed Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade as indicated. G60 zinc coating; cleaned, pretreated, and primed with manufacturer's standard baked-on, rust-inhibitive primer. Use at exterior locations exposed to view.
   4. Deck Profile: As indicated.
   5. Profile Depth: As indicated.
   6. Design Uncoated-Steel Thickness: As indicated.
   7. Span Condition: As indicated.

2.03 COMPOSITE FLOOR DECK

A. Composite Steel Floor Deck: Fabricate panels, with integrally embossed or raised pattern ribs and interlocking side laps, to comply with "ANSI/SDI-C1.0 Standard For Composite Steel Floor Deck" in SDI Publication No. 31 with the minimum section properties indicated, and with the following:
   1. Galvanized Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade as indicated G60 (min) zinc coating. Use G90 (Z 275) where exposed to moisture.
   2. Profile Depth: As indicated.
   3. Design Uncoated-Steel Thickness: As indicated.
   4. Span Condition: As indicated.

2.04 NONCOMPOSITE FORM DECK

A. Noncomposite Steel Form Deck: Fabricate ribbed-steel sheet noncomposite form-deck panels to comply with "ANSI/SDI-NC1.0 Standard For Non-Composite Steel Floor Deck," in SDI Publication No. 31, with the minimum section properties indicated, and with the following:
   2. Galvanized Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade as indicated, G60 (min) zinc coating. Use G90 where exposed to moisture.
   3. Profile Depth: As indicated.
   4. Design Uncoated-Steel Thickness: As indicated.
   5. Span Condition: As indicated.
2.05 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 minimum diameter.

D. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi, not less than 0.0359-inch design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.

E. Pour Stops and Girder Fillers: Steel sheet, minimum yield strength of 33,000 psi, of same material and finish as deck, and of thickness and profile indicated but not less than recommended by SDI Publication No. 31 for overhang and slab depth.

F. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck, unless otherwise indicated.

G. Weld Washers: Uncoated steel sheet, shaped to fit deck rib, 0.0598 inch thick, with factory-punched hole of 3/8-inch minimum diameter.

H. Flat Sump Plate: Single-piece steel sheet, 0.0747 inch thick, of same material and finish as deck. For drains, cut holes in the field.


J. Repair Paint: Manufacturer’s standard rust-inhibitive primer of same color as primer.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance.

B. When stud shear connectors are to be welded through metal deck and/or corrugated metal forming, the top flange of beams to receive such studs shall be unpainted and free of debris prior to installation of the deck and/or forming.

3.02 INSTALLATION, GENERAL

A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 31, manufacturer’s written instructions, and requirements in this Section.
B. Install temporary shoring before placing deck panels, if required to meet deflection limitations. Obtain prior written approval before installing shoring.

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.
   1. All openings through metal deck shown on the drawings, and other openings greater than 10" in any direction, shall be reinforced.
   2. Miscellaneous openings not shown on the drawings such as those required for vents, risers, conduits, etc., shall be cut and reinforced if necessary, by the trade requiring the opening.

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.

3.03 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 long,
   1. Weld Diameter: As indicated.
   2. Weld Spacing: Weld edge and interior ribs of deck units at each support as indicated, with a minimum of two welds per deck unit at each support. Space welds as indicated.
   3. Weld Washers: Install weld washers at each weld location when the minimum uncoated steel thickness is less than 0.028 inch.
   4. Self Drilling Screws: Size as indicated.

B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals as indicated, and as follows:
   1. Mechanically fasten with self-drilling, No. 10 diameter or larger, carbon-steel screws.
   2. Fasten with a minimum of 1-1/2-inch-long welds.

C. End Bearing: Install deck ends over supporting frame with a minimum end bearing length as indicated, with end joints as follows:
   1. End Joints: Lapped as indicated.
D. Roof Sump Pans and Sump Plates: Install over openings provided in roof deck and weld or mechanically fasten flanges to top of deck. Space welds or mechanical fasteners not more than 12 inches apart with at least one weld or fastener at each corner.

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 to substrate to provide a complete deck installation.
   1. Weld cover plates at changes in direction of roof-deck panels, unless otherwise indicated.

3.04 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: As indicated, nominal.
   2. Weld Spacing: As Indicated.
   3. Weld Washers: Install weld washers at each weld location when the minimum uncoated steel thickness is less than 0.028 inch.
   4. Where welded studs are field applied through deck, such studs may be substituted for a deck connection on a one for one basis.

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, and as indicated and as follows:
   1. Mechanically fasten with self-drilling, No. 10 diameter or larger, carbon-steel screws.
   2. Mechanically clinch or button punch.
   3. Fasten with a minimum of 1-1/2-inch-long welds.

C. End Bearing: Install deck ends over supporting frame with a minimum end bearing length as indicated, with end joints as follows:
   1. End Joints: As indicated.

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.

F. Fastening Corrugated Metal Forming: Secure to supporting member with 1/2" minimum diameter fusion welds made through 14 gauge welding washers. Minimum weld requirements are as follows:
   1. End Laps: In valley of side laps and at center of sheet.
   2. Intermediate Supports: In valley of side lap on every other support and in valley of center corrugation on the remaining supports (to form an X pattern).
   3. Exterior Edges: 12" on center.
   4. Minimum Number of Welds Per 100 square foot of Deck Area:
      a. 27 gauge and thinner - 25
      b. All heavier gauges - 15
G. Studs shall be field welded to the structural members only after all steel framing, deck is in place and shored when required. Deck shall be installed so that the bottom rib plate is in continuous contact with the surface to receive the studs.

H. Stud Shear Connector Capacity: Number of shear connectors indicated on the drawings is based on the allowable capacity for shear connectors in normal weight or light weight concrete as listed in AISC Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings for the composite deck specified. If additional shear connectors are required due to decreases in the capacity of shear connectors for the type of deck and stud placement supplied, such additional shear connectors shall be provided at no additional cost to the Owner.

I. Installation:
1. Install shear connectors in accordance with Manufacturer’s instructions. Use only personnel and equipment authorized by the Manufacturer.
2. Use through-deck shear connector welding where deck material thickness permits proper weld fusion to develop required connector capacity. Provide adequate test results to verify the feasibility of through-deck welding for the particular connector sizes and deck thicknesses involved.
3. If through-deck shear connector welding is not feasible, install shear connectors through prepunched holes in the deck. Provide prepunched holes only for the shear connectors involved and keep hole oversize to the minimum required to develop a proper weld.
4. At the beginning of each shift of work, and after each time welding equipment has been moved, two test studs shall be installed and bent to 45 degrees by the Contractor. If failure occurs, adjust equipment and repeat test. Two consecutive test studs shall be welded and found satisfactory before production for that shift begins or is resumed.

3.05 FIELD QUALITY CONTROL
A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. The Testing Agency shall visually inspect all metal deck to observe that the deck is the proper type, depth, finish, is not damaged or rusted, and has been properly installed. Verify the overlapping edges of panels are in close contact at sidelpaps.

C. The Testing Agency shall visually inspect all deck welds and fasteners prior to being covered by other work. Verify weld and fastener size, spacing, and quality of attachment. Verify that screw threads are not stripped. Verify that stand-off of powder actuated fasteners are within Manufacturer’s recommendations.

D. Verification of proper size, number and location of stud shear connectors installed directly to steel and through metal deck.

E. Weld testing of shear stud connectors installed through metal deck shall be tested as specified in Division 5 Section, "Structural Steel."

F. Field welds will be subject to inspection.
G. Testing agency will report inspection results promptly and in writing to Contractor and Architect.

H. Remove and replace work that does not comply with specified requirements.

I. Additional inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

J. Qualify welding processes and welding operators in accordance with "Welder Qualification" Procedures of AWS.

3.06 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.

C. Provide final protection and maintain conditions to ensure that steel deck is without damage or deterioration at time of Substantial Completion.
   1. Do not use deck units for storage or as a working platform until permanently secured in position.
   2. The General Contractor shall assure that completed deck is not damaged by use as a runaway, storage of materials or subsequent work. He is to assure that construction loads are not allowed which exceed the safe carrying capacity of the deck.

3.07 CONSTRUCTION WASTE MANAGEMENT: (CREDIT MR2)

A. Manage construction waste in accordance with provisions of Division 01 Section "Construction Waste Management and Disposal". Submit documentation to satisfy the requirements of that section.

END OF SECTION
SECTION 05 40 00
COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes the following:
   1. Exterior non-load-bearing and soffit wall framing.

B. Related Sections include the following:
   1. Division 05 Section "Metal Fabrications" for masonry shelf angles and connections.
   2. Division 09 Section "Non-Structural Metal Framing" for interior non-load-bearing, metal-stud framing and ceiling-suspension assemblies.
   3. Division 09 Section "Gypsum Board Shaft Wall Assemblies" for interior non-load-bearing, metal-stud-framed, shaft-wall assemblies.

1.02 SUBMITTALS

A. Product Data: For each type of cold-formed metal framing product and accessory indicated.

B. LEED Submittal:
   1. Product Data for Credit MR 4.1 and Credit MR 4.2: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.
      a. Include statement indicating costs for each product having recycled content.

C. Shop Drawings: Show layout, spacings, sizes, thicknesses, and types of cold-formed metal framing; fabrication; and fastening and anchorage details, including mechanical fasteners. Show reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.
   1. For cold-formed metal framing indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

D. Welding certificates.

E. Product Test Reports: From a qualified testing agency, unless otherwise stated, indicating that each of the following complies with requirements, based on evaluation of comprehensive tests for current products:
   1. Vertical deflection clips.
   2. Horizontal drift deflection clips.
   3. Stiff Clips.
   4. Proprietary Deflection Tracks, if used.
1.03 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM E 329 to conduct the testing indicated.


C. AISI Specifications and Standards: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" and its "Standard for Cold-Formed Steel Framing - General Provisions."
   1. Comply with AISI's "Standard for Cold-Formed Steel Framing - Header Design."

D. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1.04 DELIVERY, STORAGE, AND HANDLING

A. Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Store cold-formed metal framing, protect with a waterproof covering, and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering cold-formed metal framing that may be incorporated into the Work include, but are not limited to, the following:
   1. Allied Studco.
   2. AllSteel Products, Inc.
   4. Clark Steel Framing.
   5. consolidated Fabricators Corp.; Building Products Division.
   6. Craco Metals Manufacturing, LLC.
   7. Custom Stud, Inc.
   8. Dale/Incor.
   10. Dietrich Metal Framing; a Worthington Industries Company.
   11. Formetal Co. Inc. (The).
   12. Innovative Steel Systems.
   13. MarinoWare; a division of Ware Industries.
   15. SCAFCO Corporation.
2.02 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. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:
   1. Grade: Not less than 33 ksi for studs 18 gauge and lighter 50 ksi for studs 16 gage and heavier.
   2. Coating: G60, or equivalent.

C. Steel Sheet for Vertical Deflection, Stiff, and Drift Clips: ASTM A 653/A 653M, structural steel, zinc coated, of grade and coating as follows:
   1. Grade: 50, Class 1 or 2.
   2. Coating: G90.

2.03 EXTERIOR NON-LOAD-BEARING WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:
   1. Minimum Base-Metal Thickness: As indicated.
   2. Minimum Flange Width: As indicated.
   3. Section Properties: As indicated.

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:
   1. Minimum Base-Metal Thickness: As indicated.
   2. Minimum Flange Width: As indicated.

C. Vertical Deflection Clips: Manufacturer's standard bypass and head clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web. Maximum deflection of the clip/stud assembly under design load shall be the smaller of 1/8” or the elastic limit load.
   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. Dietrich Metal Framing; a Worthington Industries Company.
      b. MarinoWare, a division of Ware Industries.
      c. SCAFCO Corporation
      d. The Steel Network, Inc.
D. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal and lateral loads and transfer them to the primary structure, and as follows: Maximum track lateral deflection under design load shall be 1/16” and shall be 1/8-inch under the lesser of the design or elastic load limit.
   1. Minimum Base-Metal Thickness: As indicated.
   2. Flange Width: As indicated.

E. Drift Clips: Manufacturer's standard bypass or head clips, capable of isolating wall stud from upward and downward vertical displacement and lateral drift of primary structure.

F. Stiff Clips: Clip capable of supporting design loads indicated through positive mechanical attachment to the stud web. Maximum deflection of the clip/stud assembly under design loads shall be the smaller of 1/8” or the elastic limit load.

2.04 EXTERIOR SOFFIT JOIST FRAMING

A. Steel Soffit Joists: Manufacturer's standard C-shaped steel sections, of web depths indicated, with stiffened flanges, and as follows:
   1. Minimum Base-Metal Thickness: As indicated.
   2. Flange Width: As indicated.
   3. Section Properties: As indicated.

2.05 FRAMING ACCESSORIES

A. Fabricate steel-framing accessories from steel sheet, ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members.

B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:
   1. Supplementary framing.
   2. Bracing, bridging, and solid blocking.
   3. Web stiffeners.
   4. Anchor clips.
   5. End clips.
   6. Foundation clips.
   7. Gusset plates.
   8. Stud kickers, knee braces, and girts.
   9. Joist hangers and end closures.

2.06 ANCHORS, CLIPS, AND FASTENERS

A. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.
B. Anchor Bolts: ASTM F 1554, Grade 55, threaded carbon-steel heavy hex-headed bolts and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A 153/A 153M, Class C where exposed to weather.

C. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times design load, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

D. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times design load, as determined by testing per ASTM E 1190 conducted by a qualified independent testing agency.

E. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping steel drill screws.
   1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.

F. Welding Electrodes: Comply with AWS standards.

2.07 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: SSPC-Paint 20 or DOD-P-21035.

B. Cement Grout: Portland cement, ASTM C 150, Type I; and clean, natural sand, ASTM C 404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.

C. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, and plasticizing and water-reducing agents, complying with ASTM C 1107, with fluid consistency and 30-minute working time.

D. Shims: Load bearing, high-density multimonomer plastic, nonleaching.

E. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to match width of bottom track or rim track members.

2.08 FABRICATION

A. Fabricate cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.
   1. Fabricate framing assemblies using jigs or templates.
   2. Cut framing members by sawing or shearing; do not torch cut.
3. Fasten cold-formed metal framing members by welding, screw fastening, clinch fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.
   a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
   b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by not less than three exposed screw threads.

4. Fasten other materials to cold-formed metal framing by welding, bolting, or screw fastening, according to Shop Drawings.

B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.

C. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:
   1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
   2. Squareness: Fabricate each cold-formed metal framing assembly to a maximum out-of-square tolerance of 1/8 inch.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine supporting substrates 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.

3.02 PREPARATION

A. Before sprayed fire-resistive materials are applied, attach continuous angles, supplementary framing, or tracks to structural members indicated to receive sprayed fire-resistive materials.

B. After applying sprayed fire-resistive materials, remove only as much of these materials as needed to complete installation of cold-formed framing without reducing thickness of fire-resistive materials below that are required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.

3.03 INSTALLATION, GENERAL

A. Cold-formed metal framing may be shop or field fabricated for installation, or it may be field assembled.

B. Install cold-formed metal framing according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions" and to manufacturer's written instructions unless more stringent requirements are indicated.
C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.
   1. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch.

D. Install cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened.
   1. Cut framing members by sawing or shearing; do not torch cut.
   2. Fasten cold-formed metal framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.
      a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
      b. Locate mechanical fasteners and install according to Shop Drawings, and complying with requirements for spacing, edge distances, and screw penetration.

E. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.

F. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

G. Do not bridge building expansion and control joints with cold-formed metal framing. Independently frame both sides of joints.

H. Install insulation, specified in Division 07 Section "Thermal Insulation," in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.

I. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer’s standard punched openings.

J. Erection Tolerances: Install cold-formed metal framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:
   1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.04 EXTERIOR NON-LOAD-BEARING WALL INSTALLATION

A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.

B. Fasten both flanges of studs to top and bottom track, unless otherwise indicated. Space studs as follows:
   1. Stud Spacing: As indicated.
C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.

D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.
   1. Install single-leg deflection tracks and anchor to building structure.
   2. Connect vertical deflection clips to bypassing and/or infill studs and anchor to building structure.
   3. Connect drift clips to cold formed metal framing and anchor to building structure.

E. Install horizontal bridging in wall studs, spaced in rows indicated on Shop Drawings but not more than 48 inches apart. Fasten at each stud intersection.
   1. Top Bridging for Single Deflection Track: Install row of horizontal bridging within 12 inches of single deflection track. Install a combination of flat, taut, steel sheet straps of width and thickness indicated and stud or stud-track solid blocking of width and thickness matching studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.

F. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, fasteners, and stud girts, to provide a complete and stable wall-framing system.

3.05 FIELD QUALITY CONTROL

A. Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Field and shop welds will be subject to testing and inspecting.

C. Testing agency will report test results promptly and in writing to Contractor and Architect.

D. Remove and replace work where test results indicate that it does not comply with specified requirements.

E. Additional testing and inspecting, at Contractor’s expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.06 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed metal framing with galvanized repair paint according to ASTM A 780 and manufacturer’s written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer that ensure that cold-formed metal framing is without damage or deterioration at time of Substantial Completion.
3.07 CONSTRUCTION WASTE MANAGEMENT: (CREDIT MR2)

A. Manage construction waste in accordance with provisions of Division 01 Section "Construction Waste Management and Disposal". Submit documentation to satisfy the requirements of that section.

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
1. Steel framing and supports for ceiling-hung toilet compartments.
2. Steel framing and supports for countertops.
3. Steel framing and supports for mechanical and electrical equipment.
4. Steel framing and supports for applications where framing and supports are not specified in other Sections.
5. Elevator machine beams, and hoist beams.
6. Steel shapes for supporting elevator door sills.
7. Metal ladders.
8. Loose bearing and leveling plates for applications where they are not specified in other Sections.
9. Steel weld plates and angles for casting into concrete for applications where they are not specified in other Sections.
10. Miscellaneous metal fabrications, including, but not limited to:
   a. Golf cart posts.
   b. Pedestals for automatic door operators.
   c. Pedestals for card-swipes.

B. Related Sections:
1. Division 03 Section "Cast-in-Place Concrete" for installing anchor bolts, steel pipe sleeves, slotted-channel inserts, wedge-type inserts, and other items cast into concrete.
2. Division 05 Section "Structural Steel Framing."
3. Division 05 Section "Pipe and Tube Railings."

1.02 PERFORMANCE REQUIREMENTS

A. Supports for toilet partitions must be capable of supporting a single 250-lb concentrated load applied in any direction at any point at grab-bars as well as dead load of toilet partition.

B. Delegated Design: Design ladders and toilet partition supports, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.
1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.
1.03 SUBMITTALS

A. Product Data: For the following:
   1. Nonslip aggregates and nonslip-aggregate surface finishes.
   2. Paint products.

B. LEED Submittals:
   1. Product Data for Credit MR 4.1 and Credit MR 4.2: Indicating percentages by weight of
      postconsumer and preconsumer recycled content for products having recycled content.
      Include statement indicating costs for each product having recycled content.

C. Shop Drawings: Show fabrication and installation details for metal fabrications.
   1. Include plans, elevations, sections, and details of metal fabrications and their
      connections. Show anchorage and accessory items.

D. Samples for Verification: For each type and finish of extruded nosing.

E. Mill Certificates: Signed by manufacturers of stainless-steel certifying that products furnished
   comply with requirements.

F. Welding certificates.

G. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers
   certifying that shop primers are compatible with topcoats.

H. Delegated Design Submittal: For supports for toilet partitions indicated to comply with
   performance requirements and design criteria, including analysis data signed and sealed by
   the qualified professional engineer responsible for their preparation.

1.04 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:
   1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
   2. AWS D1.6, "Structural Welding Code - Stainless Steel."

1.05 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with
   metal fabrications by field measurements before fabrication.

1.06 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with
   paint and coating manufacturers' written recommendations to ensure that shop primers and
   topcoats are compatible with one another.
B. Coordinate installation of anchorages and steel weld plates for casting into concrete. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.01 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

2.02 FERROUS METALS

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. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

C. Stainless-Steel Sheet, Strip, and Plate: ASTM A 240/A 240M or ASTM A 666, Type 304.

D. Stainless-Steel Bars and Shapes: ASTM A 276, Type 304.

E. Steel Tubing: ASTM A 500, cold-formed steel tubing.

F. Steel Pipe: ASTM A 53/A 53M, standard weight (Schedule 40) unless otherwise indicated.

G. Slotted Channel Framing: Cold-formed metal box channels (struts) complying with MFMA-4.
   1. Size of Channels: 1-5/8 by 1-5/8 inches or as indicated.
   2. Material: Cold-rolled steel, ASTM A 1008/A 1008M, structural steel, Grade 33; minimum thickness as required for use; coated with rust-inhibitive, baked-on, acrylic enamel.

H. Cast Iron: Either gray iron, ASTM A 48/A 48M, or malleable iron, ASTM A 47/A 47M, unless otherwise indicated.

2.03 FASTENERS

A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.
   1. Provide stainless-steel fasteners for fastening aluminum.

B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated, flat washers.
C. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563; and, where indicated, flat washers.
   1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.

D. Eyebolts: ASTM A 489.

E. Machine Screws: ASME B18.6.3.

F. Lag Screws: ASME B18.2.1.

G. Wood Screws: Flat head, ASME B18.6.1.


J. Anchors, General: 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.

K. Cast-in-Place Anchors in Concrete: Either threaded type or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A 47/A 47M malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F 2329.

L. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors.
   1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.

M. Slotted-Channel Inserts: Cold-formed, hot-dip galvanized-steel box channels (struts) complying with MFMA-4, 1-5/8 by 7/8 inches by length indicated with anchor straps or studs not less than 3 inches long at not more than 8 inches o.c. Provide with temporary filler and tee-head bolts, complete with washers and nuts, all zinc-plated to comply with ASTM B 633, Class Fe/Zn 5, as needed for fastening to inserts.

2.04 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

B. Shop Primers: Provide primers that comply with Division 09 painting Sections.
C. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
   1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.

D. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.

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. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

G. Nonshrink, Metallic Grout: Factory-packaged, ferrous-aggregate grout complying with ASTM C 1107, specifically recommended by manufacturer for heavy-duty loading applications.


I. Concrete: Comply with requirements in Division 03 Section "Cast-in-Place Concrete" for normal-weight, air-entrained, concrete with a minimum 28-day compressive strength of 3000 psi.

2.05 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D. Form exposed work with accurate angles and surfaces and straight edges.

E. Weld corners and seams continuously to comply with the following:
   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 welding flux immediately.
   4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.

G. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
   1. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches, with a minimum 6-inch embedment and 2-inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.

2.06 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.

B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.
   1. Fabricate units from slotted channel framing where indicated.
   2. Furnish inserts for units installed after concrete is placed.

C. Galvanize miscellaneous framing and supports where indicated.

2.07 METAL LADDERS

A. General:
   1. Comply with ANSI A14.3 unless otherwise indicated.
   2. For elevator pit ladders, comply with ASME A17.1.

B. Steel Ladders:
   1. Space siderails 18 inches apart unless otherwise indicated.
   2. Space siderails of elevator pit ladders 12 inches apart.
   5. Fit rungs in centerline of siderails; plug-weld and grind smooth on outer rail faces.
   6. Provide nonslip surfaces on top of each rung, either by coating rung with aluminum-oxide granules set in epoxy-resin adhesive or by using a type of manufactured rung filled with aluminum-oxide grout.
   7. Provide nonslip surfaces on top of each rung by coating with abrasive material metallically bonded to rung.
8. Provide platforms as indicated fabricated from welded or pressure-locked steel bar grating, supported by steel angles. Limit openings in gratings to no more than 3/4 inch in least dimension.
9. Support each ladder at top and bottom and not more than 60 inches o.c. with welded or bolted steel brackets.
10. Galvanize exterior ladders, including brackets and fasteners.
11. Prime ladders, including brackets and fasteners, with zinc-rich primer.

2.08 LOOSE BEARING AND LEVELING PLATES
A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.
B. Galvanize plates.
C. Prime plates with zinc-rich primer.

2.09 PERFORATED STEEL PLATE
A. Plain steel, 12-gauge, with 1/4-inch round holes at 3/8-inch staggered centers, 40% open area.

2.10 BAR GRATING

2.11 STEEL WELD PLATES AND ANGLES
A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with no fewer than two integrally welded steel strap anchors for embedding in concrete.

2.12 FINISHES, GENERAL
A. Comply with NAAMM’s "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
B. Finish metal fabrications after assembly.
C. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.13 STEEL AND IRON FINISHES
A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.
1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
B. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.  
   1. Shop prime with universal shop primer unless zinc-rich primer is indicated.

C. Preparation for Shop Priming: Prepare surfaces to comply with SSPC-SP 3, "Power Tool Cleaning."

D. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.  
   1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

C. Field Welding: Comply with the following requirements:  
   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 welding flux immediately.
   4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.

E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

3.02 INSTALLING BEARING AND LEVELING PLATES

B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.
1. Use non-shrink grout, either metallic or nonmetallic, in concealed locations where not exposed to moisture; use non-shrink, nonmetallic grout in exposed locations unless otherwise indicated.
2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.03 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting, to comply with SSPC-PA 1 for touching up shop-painted surfaces.
1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Division 09 painting Sections.

C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION
SECTION 05 52 13

PIPE AND TUBE RAILINGS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Steel tube railings and posts.
   2. Aluminum tube railings and mounting brackets.

B. Related Sections:
   1. Division 06 Section "Rough Carpentry" for wood blocking for anchoring railings.
   2. Division 09 Section "Non-Structural Metal Framing" for metal backing for anchoring railings.

1.02 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design railings, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. General: In engineering railings to withstand structural loads indicated, determine allowable design working stresses of railing materials based on the following:
   1. Steel: 72 percent of minimum yield strength.
   2. Aluminum: The lesser of minimum yield strength divided by 1.65 or minimum ultimate tensile strength divided by 1.95.

C. 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. applied in any direction.
      b. Concentrated load of 200 lbf applied in any direction.
      c. Uniform and concentrated loads need not be assumed to act concurrently.

D. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1.03 SUBMITTALS

A. Product Data: For the following:
   1. Manufacturer’s product lines of mechanically connected railings.
   2. Railing brackets.

B. LEED Submittals:
   1. Product Data for Credit MR 4.1 and Credit MR 4.2: Indicating percentages by weight of postconsumer and preconsumer recycled content for products having recycled content. Include statement indicating costs for each product having recycled content.
C. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

D. Samples: For each type of exposed finish required.
   1. Sections of each distinctly different linear railing member.
   2. Fittings and brackets.

E. Welding certificates.

F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, according to ASTM E 894 and ASTM E 935.

G. Delegated-Design Submittal: For pipe and tube railings indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.04 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of railing from single source from single manufacturer.

B. Welding Qualifications: Qualify procedures and personnel according to the following:
   1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
   2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."

1.05 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

1.06 COORDINATION AND SCHEDULING

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

C. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not satisfy structural performance requirements.
PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Steel Pipe and Tube Railings:
   a. Pisor Industries, Inc.

2. Aluminum Pipe and Tube Railings:

2.02 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.

B. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails unless otherwise indicated.

2.03 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.
   1. Provide galvanized finish for exterior installations and where indicated.

C. Plates, Shapes, and Bars: ASTM A 36/A 36M.

2.04 ALUMINUM

A. Aluminum, General: Provide alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than the strength and durability properties of alloy and temper designated below for each aluminum form required.

B. Extruded Bars and Tubing: ASTM B 221, Alloy 6063-T5/T52.

C. Drawn Seamless Tubing: ASTM B 210, Alloy 6063-T832.


2.05 FASTENERS

A. General: Provide the following:
   1. 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.
   2. Aluminum Railings: Type 304 or Type 316 stainless-steel fasteners.

B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.

C. Fasteners for Interconnecting Railing Components:
   1. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless exposed fasteners are unavoidable or are the standard fastening method for railings indicated.
   2. Provide square or hex socket flat-head machine screws for exposed fasteners unless otherwise indicated.

D. Post-Installed Anchors: Torque-controlled expansion anchors or chemical 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.
   1. Material for Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.

2.06 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
   1. For aluminum railings, provide type and alloy as recommended by producer of metal to be welded and as required for color match, strength, and compatibility in fabricated items.

B. Etching Cleaner for Galvanized Metal: Complying with MPI#25.

C. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
   1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.

D. Intermediate Coats and Topcoats: Provide products that comply with Division 09 painting Sections.
E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

F. Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound.
   1. Water-Resistant Product: At exterior locations provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended by manufacturer for exterior use.

2.07 FABRICATION

A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.

B. Assemble railings in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.

C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

D. Form work true to line and level with accurate angles and surfaces.

E. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.

F. Connections: Fabricate railings with nonwelded connections unless otherwise indicated.

G. 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.

H. Non-welded Connections: Connect members with concealed mechanical fasteners and fittings. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.
   1. Fabricate splice joints for field connection using an epoxy structural adhesive if this is manufacturer's standard splicing method.

I. Bend members in jigs to produce uniform curvature for each configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.

J. Close exposed ends of railing members with prefabricated end fittings.
K. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch or less.

L. 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, or other means to transfer loads through wall finishes to structural supports and prevent bracket or fitting rotation and crushing of substrate.

M. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.

2.08 FINISHES, GENERAL

A. Comply with NAAMM’s "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

D. Provide exposed fasteners with finish matching appearance, including color and texture, of railings.

2.09 STEEL AND IRON FINISHES

A. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with SSPC-SP 3, "Power Tool Cleaning."

B. 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. Primer need not be applied to surfaces to be embedded in concrete or masonry.
   1. Shop prime uncoated railings with universal shop primer unless indicated.

2.10 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.
PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine gypsum board assemblies, where reinforced to receive anchors, to verify that locations of concealed reinforcements have been clearly marked for Installer. Locate reinforcements and mark locations if not already done.

3.02 INSTALLATION, GENERAL

A. Fit exposed connections together to form tight, hairline joints.

B. Perform cutting, drilling, and fitting required for installing railings. 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. 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.

C. Adjust railings before anchoring to ensure matching alignment at abutting joints.

D. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.03 RAILING CONNECTIONS

A. Nonwelded Connections: Use mechanical or adhesive joints for permanently connecting railing components. Seal recessed holes of exposed locking screws using plastic cement filler colored to match finish of railings.

B. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article whether welding is performed in the shop or in the field.

C. Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve extending 2 inches beyond joint on either side, fasten internal sleeve securely to one side, and locate joint within 6 inches of post.

3.04 ANCHORING POSTS

A. Use metal sleeves preset and anchored into concrete for installing posts. After posts have been inserted into sleeves, fill annular space between post and sleeve with anchoring cement, mixed and placed to comply with anchoring material manufacturer’s written instructions.

B. Form or core-drill holes not less than 5 inches deep and 3/4 inch larger than OD of post for installing posts in concrete. Clean holes of loose material, insert posts, and fill annular space.
between post and concrete with anchoring cement, mixed and placed to comply with anchoring material manufacturer's written instructions.

C. Leave anchorage joint exposed with 1/8-inch buildup, sloped away from post.

3.05 ATTACHING RAILINGS

A. Attach railings to wall with wall brackets. Provide brackets with 1-1/2-inch clearance from inside face of handrail and finished wall surface. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.
   1. Use type of bracket with predrilled hole for exposed bolt anchorage.
   2. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.

B. Secure wall brackets and railing end flanges to building construction as follows:
   1. For steel-framed partitions, use hanger or lag bolts set into fire-retardant-treated wood backing between studs. Coordinate with stud installation to locate backing members.
   2. For steel-framed partitions, use toggle bolts installed through flanges of steel framing or through concealed steel reinforcements.

3.06 ADJUSTING AND CLEANING

A. Clean aluminum by washing thoroughly with clean water and soap and rinsing with clean water.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

3.07 PROTECTION

A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.

END OF SECTION
SECTION 06 06 60

PLASTIC FABRICATIONS

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes:
   1. Plastic Fabrications for the following applications:
      a. Partitions.
      b. Shelving.
      c. Signage.
      e. Marker Board Trays.
      f. Mounting Hardware.
   2. Mounting Hardware.

B. Related Sections:
   1. Division 06 Section “Interior Architectural Woodwork” for casework as substrate.
   2. Division 08 Section “Glazing”.
   3. Division 10 Section “Visual Display Surfaces”
   4. Division 10 Section “Signage”.
   5. Division 10 Section “Corner Guards”.
   6. Division 10 Section “Toilet Accessories”.

1.02 SUBMITTALS

A. General: Submit the following in accordance with Division 01 Section “Submittal Procedures”.

B. Product Data: Submit manufacturer’s product data; include product description, fabrication information, and compliance with specified performance requirements.

C. Submit product test reports from a qualified independent 3rd party testing agency indicating each type and class of panel system complies with the project performance requirements, based on comprehensive testing of current products. Previously completed test reports will be acceptable if for current manufacturer and indicative of products used on this project.

1. Test reports required are:
   a. Rate of Burning (ASTM D 635)
   b. Self-Ignition Temperature (ASTM D 1929)
   c. Density of Smoke (ASTM D 2843)
   d. Flame spread and Smoke developed testing (ASTM E 84)
   e. Room Corner Burn Test (NFPA 286)
   f. Extent of Burning (UL 94)
   g. Impact strength (ASTM D 3763)
   h. Safety glazing impact resistance (ANSI Z97.1-2004)
   i. UPITT Test for Combustion Product Toxicity
   j. Dynamic environmental testing (ASTM standards D 5116 and D 6670)
D. Building Approvals: Plastic Fabrications are to have been evaluated and must be registered with and comply to requirements of the following jurisdictions:
   1. New York Department of Buildings (Product must have an MEA Materials and Equipment Acceptance number) for use as Interior Finishes
   2. Los Angeles Department of Building and Safety (Product must have a LARR Los Angeles Research Report number) for use as Light-transmitting Panels

E. Shop Drawings: Include plans, elevations, sections, panel dimensions, details, and attachments to other work.

F. Samples for Initial Selection:
   1. Submit minimum 2-inch by 2-inch samples in proper thicknesses of each type. Indicate full color, texture and pattern variation.
   2. Provide a sample of hanging and post hardware.

G. Samples for Verification:
   1. Submit minimum 4-inch by 4-inch sample in proper thickness for each type, texture, pattern and color of solid plastic fabrication.

H. LEED Submittals:
   1. Recycled Content (credit MR-4):
      a. Indicate recycled content; indicate percentage of pre-consumer and post-consumer recycled content per unit of product.
      b. Indicate relative dollar value of recycled content product to total dollar value of product included in project.
      c. If recycled content product is part of an assembly, indicate the percentage of recycled content product in the assembly by weight.
      d. If recycled content product is part of an assembly, indicate relative dollar value of recycled content product to total dollar value of assembly.
      e.
   2. Local/Regional Materials (credit MR-5):
      a. Sourcing location(s): Indicate location of extraction, harvesting, and recovery; indicate distance between extraction, harvesting, and recovery and the project site.
      b. Manufacturing location(s): Indicate location of manufacturing facility; indicate distance between manufacturing facility and the project site.
      c. Product Value: Indicate dollar value of product containing local/regional materials; include materials cost only.
      d. Product Component(s) Value: Where product components are sourced or manufactured in separate locations, provide location information for each component. Indicate the percentage by weight of each component per unit of product.
3. VOC Data (Credit EQ-4):
   a. Adhesives:
      1) Submit manufacturer’s product data for adhesives. Indicate VOC limits of the product. Submit MSDS highlighting VOC limits.
      2) Submit Green Seal Certification to GS-36 and description of the basis for certification.

I. Mockups:
   1. Build mockups to verify selections made under sample Submittals and to demonstrate aesthetic effects.
   2. Build mockup of each type of Plastic Fabrication.
   3. Following review and approval by Architect, approved mockups may become part of the completed Work.

J. Maintenance Data: Submit manufacturer’s care and maintenance data, including care, repair and cleaning instructions. Include in Project closeout documents.

1.03 QUALITY ASSURANCE

A. Manufacturers Qualifications:
   1. Materials and systems shall be manufactured by a company continuously and regularly employed in the manufacture of specified materials for a period of at least five consecutive years and which can show evidence of those materials being satisfactorily used on at least six projects of similar size, scope and location. At least three of the projects shall have been successful for use five years or longer.
   2. Manufactured panels must be produced from a minimum of 40% post-industrial recycle content. This recycle content must be certified by a recognized third party certification group, such as Scientific Certification Systems (SCS).
   3. Manufacturer must offer a documented reclaim process that will take back, at the manufacturers cost, panels that are at their end-of life cycle.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver Plastic Fabrications, systems and specified items in manufacturer’s standard protective packaging.

B. Do not deliver Plastic Fabrications, system, components and accessories to Project site until areas are ready for installation.

C. Store materials in a flat orientation in a dry place that is not exposed to exterior elements.

D. Handle materials to prevent damage to finished surfaces. Provide protective coverings to prevent damage or staining following installation for duration of project.

E. Before installing Plastic Fabrications, permit them to reach room temperature.
1.05 PROJECT CONDITIONS

A. Environmental Limitations: Do not install Solid Polymer Fabrications until spaces are enclosed and weatherproof, and ambient temperatures and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1.06 WARRANTY

A. Manufacturer’s Special Warranty on Plastic Fabrications: Manufacturer’s standard form agreeing to repair or replace units that fail in material or workmanship within the specified warranty period.

B. Warranty Period: 1 year after the date of substantial completion.

C. The warranty shall not deprive the owner of other rights or remedies the Owner may have under other provisions of the Contract Documents, and is in addition to and runs concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

PART 2 - PRODUCTS

2.01 MANUFACTURER

A. Basis of Design Products: The design of Plastic Fabrications and accessories is based on products as manufactured by 3form, Inc. [www.3-form.com].

2.02 VARIA PANELS

A. “Varia” Plastic Panels:
   1. Engineered polyester resin.
   2. Sheet Size: Maximum 4- by 10-feet.
   3. Thickness: Minimum 1/16-inch.
   4. Basis of Design Product: “Varia” as manufactured by 3Form, Inc. or equivalent product as approved by Architect.

B. Interlayer Materials: Compatible with polyesters and bonding process to create a monolithic sheet of material when complete.

C. Sheet Minimum Performance Attributes:
   1. Rate of Burning (ASTM D 635). Material must attain CC1 Rating for a nominal thickness of 1.5 mm (0.060 in.) and greater.
   2. Self-Ignition Temperature (ASTM D 1929). Material must have a Self-ignition temperature greater than 650 deg F.
   3. Density of Smoke (ASTM D 2843). Material must have a smoke density less than 75%.
   4. Flame spread and Smoke developed testing (ASTM E 84). Material must be able to meet a level of Class A (Flame spread less than 25 and smoke less than 450) at thickness of 1-inch.
5. Room Corner Burn Test (NFPA 286). Material must meet Class A criteria at 1/4-inch thickness as described by the 2003 International Building Code.
9. UPITT Test for Combustion Product Toxicity: Product must be recorded as “not more toxic than wood”.
10. Dynamic environmental testing (ASTM standards D 5116 and D 6670). Panels must not have detectable VOC off-gassing agents and must be have “Greenguard” Indoor Air Quality certified.
11. Panels must be produced from a minimum of 40% post-industrial recycle content. This recycle content must be certified by a recognized third party certification group, such as Scientific Certification Systems (SCS).
12. Building Approvals: Plastic Fabrications are to have been evaluated and must be registered with and comply to requirements of the following jurisdictions:
   a. New York Department of Buildings (Product must have an MEA Materials and Equipment Acceptance number) for use as Interior Finishes
   b. Los Angeles Department of Building and Safety (Product must have a LARR Los Angeles Research Report number) for use as Light-transmitting Panels

D. Varia Fabrications (PFPxx – See Drawings for References and Uses):
   1. Color: As shown on drawings or as selected by Architect.
   2. Gauge: As indicated on Drawings.
   4. UV Protection: Not required.
   5. Edge Sealing: Required.
   7. Orientation: Varies with application.

2.03 CHROMA PANELS

A. Chroma Plastic Panels:
   1. Engineered acrylic resin.
   2. Sheet Size: Maximum 4- by 10-feet.
   3. Thickness: Minimum 1/4-inch.
   4. Basis of Design Product: “Chroma” as manufactured by 3form, Inc. or equivalent product as approved by Architect.

B. Sheet Minimum Performance Attributes:
   1. Rate of Burning (ASTM D 635). Material must attain CC2 Rating for a nominal thickness of 1.5 mm (0.060 in.) and greater.
   2. Self-Ignition Temperature (ASTM D 1929). Material must have a Self-ignition temperature greater than 850 deg F.
   3. Density of Smoke (ASTM D 2843). Material must have a smoke density less than 10%.
   4. Color infusion must use water soluble dyes and penetrate at least 150 microns into material.
5. Applied coatings must be low-VOC, contain non-toxic pigments, not contain any heavy metals and be approved for exterior use.
6. Matte surface should be completely renewable onsite.

C. Chroma Fabrication (PFPS – See Drawings for References and Uses):
1. Color: As shown on drawings or as selected by Architect.
2. Gauge: As indicated on Drawings.
3. Surface Finish: As shown on drawings or as selected by Architect for application.
4. UV Protection: Not required.
5. Edge Sealing: Required.
7. Orientation: Varies with application.

2.04 SUSPENSION ACCESSORIES

A. Drill-thru Fastening System Accessories, “Curve Collection” from 3-form. Include:
1. Ceiling and floor cable track.
2. Cable couplers.
3. Cable.
4. Cable track nuts.
5. Tensioners.
6. Drill-thru Connector with cap.

B. Anchoring System Accessories, “Versa” from 3-form. Include:
1. Sleeve - Pressure Fit (3-15-1741-K): 14-inch Aluminum 2-piece profile that snaps to cover the top pressure fit assembly.
2. Thicker gauge 2-piece cap head kit (3-15-1719-K): Standard 2-piece cap head kit with all necessary washers and bushings for 5/16-inch gauge material and above.
   a. Provide rods as required for mounting. Lengths vary.
   b. 
3. Thinner gauge 2-piece cap head kit (3-15-1716-K): Standard 2-piece cap head kit with all necessary washers and bushings for 1/4-inch gauge material and below.
   a. Provide rods as required for mounting. Lengths vary.

C. Anchoring System Accessories “Stand-Off” from 3form. Include:
1. For Single Point Connections:
   a. Threaded inserts or toggle bolts as appropriate to substrate.
   b. Threaded rods.
   c. Flanges.
   d. Barrels.
   e. Spacers.
   f. Caps (20 mm diameter).
   g. All exposed parts to be stainless steel or brushed aluminum.

2. For Multiple Point Connections:
   a. Threaded inserts or toggle bolts as appropriate to substrate.
   b. Threaded rods.
   c. Flanges.
d. Barrels.
e. 2-point or 4-point spiders.
f. Spacers.
g. Caps (20 mm diameter).
h. All exposed parts to be stainless steel or brushed aluminum.

3. Provide number of anchors for each panel as shown on Drawings, or as required to support the weight and visible deflection per the gauge of the panels. If the recommended number of anchors is different from the number shown on Drawings, consult with Architect regarding placement of additional supports.

2.05 MISCELLANEOUS MATERIALS

A. General: Provide products of material, size, and shape required for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaner: Type recommended by manufacturer.

C. Fasteners: Use screws designed specifically for plastics. Self-threading screws are acceptable for permanent installations. Provide threaded metal inserts for applications requiring frequent disassembly such as light fixtures.

D. Bonding Cements: May be achieved with solvents or adhesives, suitable for use with product and application.
   1. Do not exceed 350 g/L VOC for Plastic Cement Welding Compounds.

2.06 FABRICATION

A. General: Fabricate Plastic Fabrications to designs, sizes, and thicknesses indicated and to comply with indicated standards. Sizes, profiles, and other characteristics are indicated on the Drawings.

B. Comply with manufacturer’s written recommendations for fabrication.

C. Machining: Acceptable means of machining are listed below. Ensure that material is not chipped or warped by machining operations.
   1. Sawing: Select equipment and blades suitable for type of cut required.
   2. Drilling: Drills specifically designed for use with plastic products.
   4. Routing.
   5. Tapping.

D. Forming: Form products to shapes indicated using the appropriate method listed below. Comply with manufacturer’s written instructions.
   1. Cold Bending.
   2. Hot Bending.
   3. Thermoforming: Acceptable only on uncoated material.
   4. Drape Forming.
6. Mechanical Forming.

E. Laminating: Laminate to substrates indicated using adhesives and techniques recommended by manufacturer.

F. Ease all edges to not be sharp. Approximately 3/32-inch radius.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions where installation of Plastic Fabrications will occur, with Installer present, for compliance with manufacturer’s requirements. Verify that substrates and conditions are satisfactory for installation and comply with requirements specified.

3.02 INSTALLATION

A. General: Comply with manufacturer’s written instructions for the installation of Plastic Fabrications.

B. Manufacturer’s shop to fabricate items to the greatest degree possible.

C. Utilize fasteners, adhesives and bonding agents recommended by manufacturer for type of installation indicated. Material that is chipped, warped, hazed or discolored as a result of installation or fabrication methods will be rejected.

D. Install components plumb, level and rigid, scribed to adjacent finishes, in accordance with approved shop drawings and product data.

E. Form field joints using manufacturer’s recommended procedures. Locate seams in panels so that they are not directly in line with seams in substrates.

3.03 CLEANING AND PROTECTION

A. Protect surfaces from damage until date of substantial completion. Repair work or replace damaged work, which cannot be repaired to Architect’s satisfaction.

END OF SECTION
SECTION 06 10 00
ROUGH CARPENTRY

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes the following:
   1. Miscellaneous dimension lumber.
   2. Wood blocking and nailers.
   3. Wood furring.
   4. Plywood backing panels.

B. Related Sections include the following:
   1. Division 06 Section "Interior Finish Carpentry."
   2. Division 06 Section "Interior Architectural Woodwork."

1.02 DEFINITIONS

A. **Dimension Lumber**: Lumber of 2 inches nominal or greater but less than 5 inches nominal in least dimension.

B. Lumber grading agencies, and the abbreviations used to reference them, include the following:
   1. NLGA: National Lumber Grades Authority.
   2. WCLIB: West Coast Lumber Inspection Bureau.
   3. WWPA: Western Wood Products Association.

1.03 SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
   1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
   2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
   3. For fire-retardant treatments specified to be High-Temperature (HT) type, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5664.
   4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
   5. Include copies of warranties from chemical treatment manufacturers for each type of treatment.
B. LEED Submittals:
1. Product Data for Credit EQ 4.1: For adhesives, including printed statement of VOC content.
2. Product Data for Credit EQ 4.4: For composite-wood products, documentation indicating that product contains no urea formaldehyde.
3. Credit MR 5.1 - Local/Regional Materials:
   a. Indicate location of manufacturing facility, including name, address, and distance between manufacturing facility and the project site. Provide manufacturer’s documentation indicating location where the base materials were extracted, mined, quarried, harvested, etc., and the distance between this location and the project site. Also include material costs, excluding cost of installation.
4. Certificates for Credit MR 7: Chain-of-custody certificates certifying that products specified to be made from certified wood comply with forest certification requirements. Include evidence that mill is certified for chain of custody by an FSC-accredited certification body.
   a. Include statement indicating costs for each certified wood product.

C. Research/Evaluation Reports: For the following, showing compliance with building code in effect for Project:
1. Wood-preservative-treated wood.
2. Fire-retardant-treated wood.
5. Expansion anchors.

1.04 QUALITY ASSURANCE

A. Forest Certification: For the following wood products, provide materials produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship":
1. Dimension lumber framing.
2. Laminated-veneer lumber.
3. Miscellaneous lumber.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.
PART 2 - PRODUCTS

2.01 WOOD PRODUCTS, GENERAL

A. Local / Regional Materials:
   1. Preference shall be given to supplier whose facilities are within a 500 mile radius of the project site.
   2. Preference shall also be given to materials that are harvested, extracted, mined, quarried, etc. within a 500 mile radius of the project site.

B. Lumber fabricated from old growth timber is not permitted.

C. Lumber salvaged from deconstruction or demolition of existing buildings or structures is permitted provided it is clean, denailed, and free of paint and finish materials, and other contamination; identify source; see Division 01 Section "Sustainable Design Requirements" for requirements for reused products.

D. Lumber fabricated from recovered timber (abandoned in transit) is permitted, unless otherwise noted, provided it meets the specified requirements for new lumber and is free of contamination; identify source.

E. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
   1. Factory mark each piece of lumber with grade stamp of grading agency.
   2. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece or omit grade stamp and provide certificates of grade compliance issued by grading agency.
   3. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
   4. Provide dressed lumber, S4S, unless otherwise indicated.

2.02 WOOD-PRESERVATIVE-TREATED LUMBER

A. Preservative Treatment by Pressure Process: AWPA C2.
   1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

D. Application: Treat items indicated on Drawings, and the following:
1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
2. Wood sills, sleepers, blocking, and similar concealed members in contact with masonry or concrete.

2.03 FIRE-RETARDANT-TREATED MATERIALS

A. General: Comply with performance requirements in AWPA C20 (lumber) and AWPA C27 (plywood).
   1. Use Exterior type for exterior locations and where indicated.
   2. Use Interior Type A, unless otherwise indicated.

B. Identify fire-retardant-treated wood with appropriate classification marking of testing and inspecting agency acceptable to authorities having jurisdiction.

C. Application: Treat items indicated on Drawings, and the following:
   1. Concealed blocking and panels.
   2. Plywood backing panels.

2.04 DIMENSION LUMBER, GENERAL

A. Maximum Moisture Content: 19 percent for 2-inch nominal thickness or less.

B. Provide dimensional lumber of grades indicated according to the American Lumber Standards Committee “National Grading Rules” provisions of the grading agency indicated:
   1. Hem-fir; WCLIB or WWPA.
   2. Spruce-pine-fir; WCLIB or WWPA.

2.05 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
   1. Blocking.
   2. Nailers.
   3. Rooftop equipment bases and support curbs.
   4. Furring.
   5. Grounds.

B. For items of dimension lumber size, provide Construction or No. 2 grade lumber with 19 percent maximum moisture content of any species.

C. For concealed boards, provide lumber with 19 percent maximum moisture content and any of the following species and grades:
   1. Hem-fir or hem-fir (north), Construction or 2 Common grade; NLGA, WCLIB, or WWPA.
   2. Western woods, Construction or No. 2 Common grade; WCLIB or WWPA.
2.06 PLYWOOD PANELS FOR BACKING AND BLOCKING

A. Exterior Sheathing: DOC PS 1, Exterior, AC, in thickness indicated or, if not indicated, not less than 3/4-inch nominal thickness.

B. Telephone and Electrical Equipment Backing Panels: DOC PS 1, Exposure 1, C-D Plugged, fire-retardant treated, in thickness indicated or, if not indicated, not less than 3/4-inch nominal thickness.

2.07 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.

1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M or of Type 304 stainless steel.
   a. “High relative humidity areas” shall be defined as within all toilet rooms and areas within 3-feet of sinks.

B. Nails, Brads, and Staples: ASTM F 1667.


D. Wood Screws: ASME B18.6.1.

E. Lag Bolts: ASME B18.2.1.

F. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers.

G. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.

2. Material: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2.

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

A. Select material sizes to minimize waste.

B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.
C. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate nailers, blocking, and similar supports to comply with requirements for attaching other construction.

D. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
   1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches o.c.

E. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.
   1. Use inorganic boron for items that are continuously protected from liquid water.
   2. Use copper naphthenate for items not continuously protected from liquid water.

F. Select fasteners that will support loads for locations indicated, and of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood; do not countersink nail heads, unless otherwise indicated.

G. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
   1. NES NER-272 for power-driven fasteners.

H. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.

3.02 WOOD BLOCKING AND NAILER INSTALLATION

A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated.

C. Blocking is required at, but not limited to, the following locations:
   1. Dimension Lumber Blocking (2 x 12) or 2-layers 3/4-inch plywood is required for:
      a. Handrails.
      b. Door stops.
      c. Grab Bars.
      d. Casework.
      e. Wall mounted A/V equipment, flat panel displays, and other mounting brackets.
      f. Plumbing fixtures.
2. Minimum 3/4-inch Plywood Blocking is required for:
   a. Luminaires.
   b. Visual display boards.
   c. Wall mounted door holders (magnetic and mechanical).
   d. Shelves.

3. For miscellaneous equipment and all other surface mounted items, as required for proper anchorage.

4. Contractor Option: Use of flat strap and backing plate blocking as specified in Division 09 Section “Non-Structural Metal Framing” is acceptable for visual display boards, wall mounted luminaires, and similar items being mounted under 3.02-C-2, above.

3.03 CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

A. Construction waste shall be managed in accordance with provisions of Division 01 Section “Construction Waste Management and Disposal”. Documentation shall be submitted to satisfy the requirements of that section.

B. Waste Disposal: Comply with the requirements of Division 01 Section “Construction Waste Management and Disposal”, and as follows:
   1. Comply with applicable regulations.
   2. Do not burn scrap on project site.
   3. Do not burn scraps that have been pressure treated.
   4. Do not send materials treated with pentachlorophenol, CCA, or ACA to co-generation facilities or “waste-to-energy” facilities.

C. Do not leave any wood, shavings, sawdust, etc. on the ground or buried in fill.

D. Prevent sawdust and wood shavings from entering the storm drainage system.

END OF SECTION
SECTION 06 40 23

INTERIOR ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.01 SUMMARY

A. This section includes:
1. Fabrication and installation of custom wood casework components, including base cabinets, wall cabinets, storage cabinets, shelf units, and other units as indicated.
2. Fabrication and installation of custom plastic laminate faced casework as indicated.
3. Flush wood paneling.
4. Loose shelving and mounting hardware.
5. Stair guard rails.
6. Recycled-surfacing-material window sills.
7. Sliding glass door hardware.
8. Closet and utility shelving.
10. Lecterns.

B. Related Sections:
1. Division 05 Section “Metal Fabrications” for steel support structures required to support countertops.
2. Division 06 Section "Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing casework and concealed within other construction before casework installation.
3. Division 06 Section “Composite Surfacing” for composite countertops.
4. Division 08 Section “All Glass Entrances” for patch-fitting locks to be installed on sliding glass doors specified in this section.
5. Division 08 Section “Glazing” for glass to be installed as part of components of this section.
6. Division 09 Section "Stone Facing" for marble facing applied to casework.
7. Division 12 Section "Stone Countertops" for stone countertops.
8. Division 22 Section “Plumbing” for sinks mounted in casework.

1.02 DEFINITIONS

A. **Interior Architectural Woodwork**: Includes wood furring, blocking, shims, and hanging strips for installing woodwork items unless concealed within other construction before woodwork installation.

B. The following definitions apply to plastic faced casework units:
1. **Exposed** portions of casework include all surfaces and edges visible when doors and drawers are closed, bottoms of cases more than 4'-0" above floor, and visible members in open cases or behind glass doors.
2. **Semi-exposed** portions of casework includes those surfaces behind opaque doors and drawer fronts, such as shelves, dividers, interior faces of ends, backs, tops and bottoms, drawer sides, backs and bottoms and the back face of doors. Tops of cases 5'-9" or
more above floor and underside of bottoms of casework between 2 feet and 4 feet from floor shall be considered as semi-exposed.

3. **Concealed** portions of casework include sleepers, web frames, dust panels, and other surfaces not usually visible after installation, including underside of bottoms of casework less than 2 feet above floor.

1.03 SUBMITTALS

A. Product Data: For panel products, high-pressure decorative laminate, adhesive for bonding plastic laminate, recycled-surfacing material, fire-retardant-treated materials, cabinet hardware and accessories, and finishing materials and processes.
   1. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements.

B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
   1. Show details full size.
   2. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
   3. Show locations and sizes of cutouts and holes for plumbing fixtures and other items installed in architectural woodwork.
   4. Show veneer leaves with dimensions, grain direction, exposed face, and identification numbers indicating the flitch and sequence within the flitch for each leaf.
   5. Coordinate shop drawings with other work involved.

C. Samples for Initial Selection:
   1. Plastic Laminate: Submit two, 2 by 3-inch samples of manufacturer's plastic laminate colors, patterns, and textures for exposed and semi-exposed materials for Architect's selection. Samples will be reviewed by Architect for color, texture, and pattern only. Compliance with other specified requirements is the exclusive responsibility of the Contractor.
   2. Edge Banding: Submit 6-inch long samples of manufacturer’s standard range.

D. Full Sized Sample: Submit one full-size sample of finished base cabinet unit complete with hardware, doors, and drawers. Finish top not required.
   1. Acceptable sample units will be used for comparison inspections at the project. Unless otherwise directed, acceptable sample units may be incorporated in the work. Notify Architect of their exact locations. If not incorporated in the work, retain acceptable sample units in the building until completion and acceptance of the work.
      a. Remove sample units from the premises when directed by the Architect.

E. LEED Submittals:
   1. Product Data for Credit EQ 4.1: For installation adhesives, including printed statement of VOC content.
   2. Product Data for Credit EQ 4.4:
      a. For each composite-wood product used, documentation indicating that the bonding agent contains no urea formaldehyde.
b. For each adhesive used, documentation indicating that the adhesive contains no urea formaldehyde.

3. Product Data for Credit(s) MR 4.1 and MR 4.2: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content
   a. Include statement indicating costs for each product having recycled content.

4. Certificates for Credit MR 7: Chain-of-custody certificates certifying that products specified to be made from certified wood comply with forest certification requirements. Include evidence that mill is certified for chain of custody by an FSC-accredited certification body.
   a. Include statement indicating costs for each certified wood product.

F. Product Certificates: For each type of product, signed by product manufacturer.

G. Woodwork Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.

H. Qualification Data: For installer and fabricator.

1.04 QUALITY ASSURANCE

A. General: Provide plastic laminate faced casework from one source and from a single manufacturer.

B. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate products similar to those required for this Project and whose products have a record of successful in-service performance. Shop is a certified participant in AWI's Quality Certification Program.

C. Installer Qualifications: Certified participant in AWI's Quality Certification Program.

D. Source Limitations: Engage a qualified woodworking firm to assume undivided responsibility for production of interior architectural woodwork with sequence-matched wood veneers.

E. Quality Standard: Unless otherwise indicated, comply with AWI's "Architectural Woodwork Quality Standards" for grades of interior architectural woodwork indicated for construction, finishes, installation, and other requirements.
   1. Provide AWI Quality Certification Program labels and certificates indicating that woodwork, including installation, complies with requirements of grades specified.

F. Fire-Test-Response Characteristics: Where fire-retardant materials or products are indicated, provide materials and products with specified fire-test-response characteristics as determined by testing identical products per test method indicated by UL, ITS, or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify with appropriate markings of applicable testing and inspecting agency in the form of separable paper label or, where required by authorities having jurisdiction, imprint on surfaces of materials that will be concealed from view after installation.
G. Forest Certification: Provide interior architectural woodwork produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."

H. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
1. Following review and approval by Architect, approved mockups may become part of the completed Work.
2. Mock-ups shall include:
   a. Wood cabinet, representative of a common unit, or as designated by Architect. Include luminous facing.
   b. Plastic laminate faced cabinet, representative of a common unit, or as designated by Architect.
   c. Café casework, to include sliding glass wall system, section as designated by Architect.
   d. Fifth Floor Display Casework, section as designated by Architect.
   e. Typical Stack End Panel.

I. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1.05 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver woodwork until painting and similar operations that could damage woodwork have been completed in installation areas. If woodwork must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Project Conditions" Article.

B. Deliver casework as factory assembled units, packaged individually, and shipped each in its own carton, or with faces and backs protected and banded if shipped by manufacturer's carrier.

C. Store completed plastic laminate faced casework in a ventilated place, protected from the weather, with relative humidity therein of 50% or less at 70 degrees F.

D. Protect finished surfaces from soiling and damage before handling and installation. Keep covered with polyethylene film or other protective covering.

1.06 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install interior finish carpentry materials until building is enclosed and weatherproof, wet work in space is completed and nominally dry, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

B. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F during the remainder of the construction period.
C. Do not install materials that are wet, moisture damaged, or mold damaged.
   1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
   2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

D. Field Measurements: Where casework is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
   1. Locate concealed framing, blocking, and reinforcements that support casework by field measurements before being enclosed, and indicate measurements on Shop Drawings.
   2. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating casework without field measurements. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.07 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that casework can be supported and installed as indicated.

PART 2 - PRODUCTS

2.01 WOODWORK FABRICATORS

A. Millwork to be manufactured by a shop is a certified participant in AWI's Quality Certification Program. Manufacturer’s include, but are not limited to the following:
   2. Eurocase Architectural Cabinets & Millwork: www.eurocase.biz
   3. Gold Plane Custom Cabinets, LLC, Denver, CO
   4. John Murphy Millworks, Erie, CO.
   5. LSI: wwwlsi-casework.com
   6. Sidney Millwork, Sidney, MT: www.sidneymillwork.com
   7. TMI Systems Design Corp.: www.tmisystems.com

2.02 MATERIALS

A. General: Provide materials that comply with requirements of AWI's quality standard for each type of woodwork and quality grade specified, unless otherwise indicated.

B. Wood Species and Cut for Transparent Finish: White oak, rift sawn or cut.

C. Wood Products: Comply with the following:
3. Particle Board: ANSI A208.1 mat-formed particle board, Grade 1-M-2 with minimum density of 45pcf, internal bond of 60 psi, and minimum screw holding capacity of 225 lbs. on faces and 200 lbs. on edges, not less than 3/4 inch thickness to provide 0.81 inch finish panel thickness, except as follows:
   a. Shelves spanning 36 to 48 inches: 1 inch.
   b. Straw-based particleboard complying with requirements in ANSI A208.1, Grade M-2, except for density, is acceptable.

4. Softwood Plywood: DOC PS 1, Medium Density Overlay.

   b. Adhere veneer to prevent rippling over time.

D. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or, if not indicated, as required by woodwork quality standard.
   1. Manufacturer: Subject to compliance with requirements, provide high-pressure decorative laminates by one of the following:
      a. Abet Laminati, Inc. www.abetlaminati.com
      b. Arborite; Division of ITW Canada, Inc. www.arborite.com
      c. Formica Corporation: www.formica.com
      d. Lamin-Art, Inc. www.laminart.com
      e. Nevamar Company, LLC; Decorative Products Div. www.nevamar.com
      g. Wilsonart International; Div. of Premark International, Inc. www.wilsonart.com

E. Recycled Wood Surfacing Material (SL):
   1. Surfacing material composed of FSC certified fiber that is a 50/50 blend of rapidly renewable bamboo fiber and post-consumer recycled paper. Materials shall be bound together with a 100% water-based co-polymer resin formula and be VOC and benzene free.

F. Sliding Glass Doors:
   2. System shall consist of an extruded aluminum ceiling-mounted track, rolling carriers capable of supporting 3/8-inch thick by maximum 40-inch wide glass panels weighing up to 264 pounds, and aluminum trim pieces.
      a. Provide a doubled (4-sliding glass panels) track system as shown on Drawings, overlapping track 1-1/2 to 2-inches.
   3. All exposed aluminum shall be clear anodized.
   4. Provide 3/8-inch tempered clear glass for doors as specified in Division 08 Section “Glazing” with polished edges and slight aris at edges.
   5. Provide sliding glass doors with patch-fitting lock and recessed floor-strike as specified in Division 08 Section – All Glass Entrances.
G. Decorative Glass for Cabinet Doors: Provide decorative glass complying with Division 08 Section “Glazing” and as shown on Drawings.

2.03 FIRE-RETARDANT-TREATED MATERIALS

A. General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this Article that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified.
   1. Do not use treated materials that do not comply with requirements of referenced woodworking standard or that are warped, discolored, or otherwise defective.
   2. Use fire-retardant-treatment formulations that do not bleed through or otherwise adversely affect finishes. Do not use colorants to distinguish treated materials from untreated materials.
   3. Identify fire-retardant-treated materials with appropriate classification marking of UL, U.S. Testing, Timber Products Inspection, or another testing and inspecting agency acceptable to authorities having jurisdiction.

B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Comply with performance requirements of AWPA C20 (lumber) and AWPA C27 (plywood). Use the following treatment type:
   1. Interior Type A: Low-hygroscopic formulation.
   2. Mill lumber after treatment within limits set for wood removal that do not affect listed fire-test-response characteristics, using a woodworking plant certified by testing and inspecting agency.
   3. Mill lumber before treatment and implement special procedures during treatment and drying processes that prevent lumber from warping and developing discolorations from drying sticks or other causes, marring, and other defects affecting appearance of treated woodwork.
   4. Kiln-dry materials before and after treatment to levels required for untreated materials.

C. Fire-Retardant Particleboard: Panels complying with the following requirements, made from softwood particles and fire-retardant chemicals mixed together at time of panel manufacture to achieve flame-spread index of 25 or less and smoke-developed index of 25 or less per ASTM E 84.
   1. For panels 3/4 inch thick and less, comply with ANSI A208.1 for Grade M-2 except for the following minimum properties: modulus of rupture, 1600 psi; modulus of elasticity, 300,000 psi; internal bond, 80 psi; and screw-holding capacity on face and edge, 250 and 225 lbf, respectively.
   2. For panels 13/16 to 1-1/4 inches thick, comply with ANSI A208.1 for Grade M-1 except for the following minimum properties: modulus of rupture, 1300 psi; modulus of elasticity, 250,000 psi linear expansion, 0.50 percent; and screw-holding capacity on face and edge, 250 and 175 lbf, respectively.
D. Fire-Retardant Fiberboard: Medium-density fiberboard panels complying with ANSI A208.2, made from softwood fibers, synthetic resins, and fire-retardant chemicals mixed together at time of panel manufacture to achieve flame-spread index of 25 or less and smoke-developed index of 200 or less per ASTM E 84.
1. Product: Subject to compliance with requirements, provide "Medite FR" by SierraPine Ltd.; Medite Div. [www.sierrapine.com](http://www.sierrapine.com).

2.04 CABINET HARDWARE AND ACCESSORIES

A. Hardware:
1. Provide manufacturer's standard, complying with ANSI A156.9, brushed chrome finish hardware units, unless otherwise indicated.
2. Hinges: Self-closing, concealed European Duomatic hinges to achieve a minimum 170-degree door swing. Provide two hinges for each door up to 35-inches high and three hinges for each door over 35-inches high. Provide 5 screw attachment to doors and 4 screw attachment to cabinets.
   a. Provide 2 hinges at each half-height door at Café.
   b. Provide Model 2060R as manufactured by Stanley Hardware: [www.stanleyhardware.com](http://www.stanleyhardware.com).
4. Pulls: Surface mounted solid metal for drawers and swing doors, mounted from back. Provide 2 pulls for drawers over 24-inches wide.
   a. Provide No. 117.05.600 pulls as manufactured by Hafele: [www.hafele.com](http://www.hafele.com).
   b. Finish: Stainless Steel.
5. Magnetic Catch: BHMA B43142 magnetic type. Use two per door where height exceeds 40-inches. Use BHMA B83021 elbow catch for locked pairs of doors.
6. Drawer Guides: "BS230E" as manufactured by Blum, Inc. [www.blum.com](http://www.blum.com). Provide bottom mount type, of correct size for drawer depth. Use full-extension type for drawers over 6-inches deep and where indicated. Provide 1 pair for each drawer with a minimum 100-pound static load rating. Include lifetime warranty.
   a. Provide positive open and close stops.
8. Casework Shelf Supports: “No. 346 (B80421)" as manufactured by Knape and Vogt Manufacturing Company, [www.knapecandvogt.com](http://www.knapecandvogt.com) or equivalent. Provide 4 per shelf. Provide pre-drilled holes in cabinet sides spaced at 1.25-inches o.c. and not more than 1-1/2-inches from shelf edges. 2-pin, self-locking shelf clip rated at 250 pounds, minimum. Provide units which are adjustable without the use of tools.
9. Drawer and Cabinet Locks: Half-mortise type, 5-pin disc tumbler and cam bolt, round cylinder only exposed, plated finish, with strike. Provide two keys per lock. Key all locks in each room alike. Provide “RemovaCore” locks as manufactured by National Lock with a minimum of 50 lock changes. Provide locks on all doors and drawers unless indicated otherwise on Drawings.

    3-inch diameter unless otherwise shown on Drawings.  Color as selected by Architect.

12. CPU Holder: Designed to mount under a work surface and hold a Central Processing  
    Unit (CPU) in a vertical or horizontal position. Holder shall slide out 11-1/2-inches and  
    swivel 360-degrees for access to back or CPU. Holder shall support up to 75 pounds and  
    a maximum outside dimension of 64-inches.  
    a.   CPU Holder: “Model Y7813” as manufactured by Herman Miller, Inc.  

13. Pencil Drawer: “Model Y5010” as manufactured by Herman Miller, Inc.  
    www.hermanmiller.com.  Plastic drawer designed to mount under a hanging or  
    freestanding work surface.  Include mounting hardware.  Color: Black Umber.

14. Counter Support Brackets: Light-weight 90-degree brackets manufactured from 2- by 3-  
    inch “T” shaped 6063 T-6 Aluminum, 3/16-inches thick.  Brackets shall be capable of  
    supporting countertops up to 30-inches deep and 450-pounds per bracket.  
    a.   Finish: Clear anodized.  
    b.   Provide Rakks Model EH-1824 as manufactured by The Rangine Corporation:  

15. Glass Shelf Supports: Metal, round, 5mm pins for insertion into drilled holes to support  
    glass shelves.  
    b.   Provide No. 282.38.708 shelf supports as manufactured by Hafele:  

B. Glass Door Hardware:  
1.   Inset Glass Door Hinge: “Model No. GH-34/0” as manufactured by Sugatsune Corp.  
     www.sugatsune.com.  For glass between 4mm and 6mm thick.  Chrome finish.
2.   Sliding Glass Door Lock: “Model No. 1100GL” as manufactured by Sugatsune Corp.  
     www.sugatsune.com.  18mm diameter cylinder, chrome finish.  Provide each lock with 2  
     keys with minimum of 25 key changes.  Provide with counter plate, washers, and all  
     required screws and hardware.

C. Adhesives, General: Do not use adhesives that contain urea formaldehyde.

D. VOC Limits for Installation Adhesives and Glues: Use installation adhesives that comply with  
   the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA  
   Method 24):  
1.   Wood Glues: 30 g/L.  
2.   Contact Adhesive: 250 g/L.

E. Adhesive for Bonding Plastic Laminate: Unpigmented contact cement.  
F. Miscellaneous:
   1. Provide all miscellaneous plastic laminate items such as scribes, aprons, skirts, fillers, and closures required or as indicated on the Drawings. Miscellaneous plastic laminate items shall be constructed of materials and by methods as specified for other casework components. All exposed surfaces of miscellaneous items shall be finished the same as door and drawer faces.
   2. Countertop Braces and Supports: See Division 05 Section “Metal Fabrications”.

G. Concealed Framing Connectors: Manufacturer’s standard.

H. Stainless Steel Tubes and Reveal Trim: ASTM A 276, Type 304.
   2. Reveal Trim: 1/8-inch or 1/4-inch, profile as shown on Drawings.

2.05 SHOP FABRICATION

A. Interior Woodwork Grade: Unless otherwise indicated, provide Premium-grade interior woodwork complying with referenced quality standard.

B. Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to ambient relative humidity during fabrication and in installation areas.

C. Sand fire-retardant-treated wood lightly to remove raised grain on exposed surfaces before fabrication.

D. Fabricate plastic laminate faced casework to dimensions, profiles, and details shown. Ease edges to radius indicated for the following:

E. Fabricate panels with plastic laminate face on both sides, or with balancing sheet on concealed faces.

F. Fabricate face construction for base, wall and full-height units, with drawer fronts, doors and fixes panels as follows:
   1. Flush overlay, concealing face frames of cabinet body, or as shown on Drawings.

G. Complete fabrication, including assembly, finishing, and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
   1. Notify Architect seven days in advance of the dates and times woodwork fabrication will be complete.
   2. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be
removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements indicated on Shop Drawings before disassembling for shipment.

H. Shop-cut openings to maximum extent possible to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

I. Assemble units in the shop in as large components as practicable to minimize field cutting and jointing.

J. Mortise and tenon, glue and screw joints for maximum strength using precision jigs and clamps to ensure square corners and plumb vertical surfaces.

2.06 INTERIOR STANDING AND RUNNING TRIM FOR TRANSPARENT FINISH

A. Grade: Premium.

B. Wood Species and Cut: Match species and cut indicated for other types of transparent-finished architectural woodwork located in same area of building, unless otherwise indicated.

C. Backout or groove backs of flat trim members and kerf backs of other wide, flat members, except for members with ends exposed in finished work.

D. Assemble casings in plant except where limitations of access to place of installation require field assembly.

E. Assemble moldings in plant to maximum extent possible. Miter corners in plant and prepare for field assembly with bolted fittings designed to pull connections together.

2.07 INTERIOR FRAMES AND JAMBS FOR TRANSPARENT FINISH

A. Grade: Premium.

B. Wood Species and Cut: Match species and cut indicated for other types of transparent-finished architectural woodwork located in same area of building, unless otherwise indicated.

C. For frames or jambs wider than available lumber, use veneered construction. Do not glue for width.

2.08 STAIR GUARD RAILS

A. Grade: Premium.

B. Wood Species and Cut for Transparent Finish: White oak, quarter sawn.
2.09 FLUSH WOOD PANELING

A. Grade: Premium.

B. Wood Species and Cut: White oak, rift cut.
   1. Lumber Trim and Edges: At fabricator’s option, trim and edges indicated as solid wood (except moldings) may be either lumber or veneered construction compatible with grain and color of veneered panels.

C. Matching of Adjacent Veneer Leaves: Book match.

D. Veneer Matching within Panel Face: Balance match.

E. Panel-Matching Method: No matching between panels is required. Select and arrange panels for similarity of grain pattern and color between adjacent panels.

F. Fire-Retardant-Treated Paneling: Provide panels consisting of wood veneer and fire-retardant particleboard or fire-retardant medium-density fiberboard. Panels shall have flame-spread index of 75 or less and smoke-developed index of 450 or less per ASTM E 84.

2.10 WOOD CABINETS FOR TRANSPARENT FINISH

A. Grade: Premium.

B. AWI Type of Cabinet Construction: Flush overlay or as indicated.

C. Wood Species and Cut for Exposed Surfaces: White Oak, rift cut.
   1. Grain Direction: Vertically for drawer fronts, doors, and fixed panels or as selected by Architect.
   5. Veneer Matching within Room: Provide cabinet veneers in each room or other space from a single flitch with doors, drawer fronts, and other surfaces matched in a sequenced set with continuous match where veneers are interrupted perpendicular to the grain.
   6. Comply with veneer and other matching requirements indicated for blueprint-matched paneling.

D. Semiexposed Surfaces: Provide surface materials indicated below:
   1. Surfaces Other Than Drawer Bodies: Compatible species to that indicated for exposed surfaces, stained to match.
   2. Drawer Sides and Backs: Solid-hardwood lumber, same species indicated for exposed surfaces.
   3. Drawer Bottoms: Hardwood plywood.

E. Provide dust panels of 1/4-inch plywood or tempered hardboard above compartments and drawers, unless located directly under tops.
2.11 PLASTIC LAMINATE CABINETS

A. Grade: Premium.

B. AWI Type of Cabinet Construction: Flush overlay or as indicated.

C. Drawer Fronts: Provide double front drawers. Inner drawer front shall be dowelled, dovetailed, or otherwise mechanically joined to drawer sides. Drawer faces shall be screwed to inner drawer fronts.

D. Door and Drawer Spreaders: Provide full width hardwood spreaders behind all door/drawer and all multiple drawer horizontal joints, size as required by quality standard. Exposed edges shall have minimum 1mm PVC edging.

E. Sub-tops: Full 3/4-inch thick particle board.

F. Toe Base: Unit side panel continuous to floor.

G. Case Backs: Manufacturer's standard prefinished tempered hardboard, thickness as required by quality standard. Provide removable back where piping or other utilities are routed behind casework.

H. Plastic Faces: Colors, patterns, finishes to be selected from casework manufacturer's full line of standard selections.
   1. Exposed Surfaces: Comply with NEMA LD-3, GP-28, high pressure decorative laminate 0.028 inch thickness, general purpose type.
   2. Semi-Exposed Surfaces: Comply with the above except provide CL-20 cabinet liner type for backs of doors, backs of drawer fronts, and inside face of exposed ends.
   3. All Other Semi-Exposed Surfaces: Thermoset decorative overlay (low pressure melamine), 0.015 inch thick complying with ALA-1988 and tested to meet NEMA Test LD 3.
   4. Concealed Surfaces: Comply with above except BK-20, backer type, 0.020 inches thick.
   5. Filler Panels and Scribes: Panels shall be finished with surface laminate for full height of filler.
   6. Exposed cabinet body edges and shelves shall be edged with minimum 3mm PVC edge banding, machine applied with hot melt glue. Door and drawer front edges shall be covered with minimum 5mm PVC edge banding. Color shall be selected by Architect.

2.12 CLOSET AND UTILITY SHELVING

A. Grade: Custom.

B. Shelf Material: 3/4-inch veneer-faced panel product with veneer edge banding.

C. Cleats: 3/4-inch solid lumber.

D. Wood Species: Any closed-grain hardwood.
2.13 SHOP FINISHING

A. Grade: Provide finishes of same grades as items to be finished.

B. General: Finish architectural woodwork at fabrication shop as specified in this Section. Defer only final touchup, cleaning, and polishing until after installation.

C. Preparation for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing architectural woodwork, as applicable to each unit of work.

1. Backpriming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of woodwork. Apply two coats to back of paneling and to end-grain surfaces. Concealed surfaces of plastic-laminate-clad woodwork do not require backpriming when surfaced with plastic laminate, backing paper, or thermoset decorative panels.

D. Transparent Finish:

1. Grade: Premium.
2. AWI Finish System: Catalyzed polyurethane.
3. Staining: None required.
4. Sheen: Satin, 31-45 gloss units measured on 60-degree gloss meter per ASTM D 523, or as selected by Architect.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Refer to Division 01 Section: “Execution” for examination of substrate and job conditions.

B. Verify rough-ins for mechanical and electrical services for sizes, locations and adequacy. Verify installation of blocking and supports for wall mounted items and floors for compliance with specified tolerances.

3.02 PREPARATION

A. Before installation, condition casework to average prevailing humidity conditions in installation areas.

B. Condition plastic faced casework to average prevailing humidity conditions in installation areas prior to installing.

C. Examine the substrates and the conditions under which the work of this section is to be performed. Do not proceed with work until unsatisfactory conditions have been corrected.
3.03 INSTALLATION

A. Grade: Install woodwork to comply with requirements for the same grade specified in Part 2 for fabrication of type of woodwork involved.

B. Install plumb, level, straight and true with no distortions. Use concealed shims. Where plastic faced casework abuts other finished work scribe and cut for accurate fit.

C. Scribe and cut woodwork to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

D. Fire-Retardant-Treated Wood: Handle, store, and install fire-retardant-treated wood to comply with chemical treatment manufacturer's written instructions, including those for adhesives used to install woodwork.

E. Anchor casework securely in place with concealed fasteners, anchored into structural support members of wall construction. Comply with manufacturer's instructions for support of units. Attach all parts and accessories, closures, panels, aprons, etc. to basic units as detailed and as required. Install shelving.

F. Standing and Running Trim: Install with minimum number of joints possible, using full-length pieces (from maximum length of lumber available) to greatest extent possible. Do not use pieces less than 96 inches long, except where shorter single-length pieces are necessary. Scarf running joints and stagger in adjacent and related members.
   1. Fill gaps, if any, between top of base and wall with plastic wood filler, sand smooth, and finish same as wood base if finished.
   2. Install wall railings on indicated metal brackets securely fastened to wall framing.
   3. Install standing and running trim with no more variation from a straight line than 1/8 inch in 96 inches.

G. Paneling: Anchor paneling to supporting substrate with concealed panel-hanger clips. Do not use face fastening, unless covered by trim or otherwise indicated.
   1. Install flush paneling with no more than 1/16 inch in 96-inch vertical cup or bow and 1/8 inch in 96-inch horizontal variation from a true plane.

H. Adjust casework and hardware so that doors and drawers operate smoothly without warp or bind. Lubricate operating hardware as recommended by manufacturer.

I. Repair or remove and replace defective work as directed by the Architect.

J. Touch up finishing work specified in this Section after installation of woodwork. Fill nail holes with matching filler where exposed.
3.04 SHELVING INSTALLATION

A. Cut shelf cleats at ends of shelves about 1/2 inch less than width of shelves and sand exposed ends smooth.

B. Install shelf cleats by fastening to framing or backing with finish nails or trim screws, set below face and filled. Space fasteners not more than 16 inches o.c.

C. Install shelf brackets according to manufacturer's written instructions, spaced not more than 36 inches o.c. Fasten to framing members, blocking, or metal backing, or use toggle bolts or hollow wall anchors.

D. Cut shelves to neatly fit openings with only enough gap to allow shelves to be removed and reinstalled. Install shelves, fully seated on cleats, brackets, and supports.

3.05 CLEANING AND PROTECTION

A. Protect all exposed surfaces during and after fabrication and installation. Clean plastic surfaces. Repair minor damage per plastic laminate manufacturer's recommendations.

B. Clean plastic surfaces, repair minor damage per plastic laminate manufacturer's recommendations. Replace other damaged parts or units.

C. Protection: Execute all procedures and precautions necessary for protection of materials and installed plastic laminate faced casework from damage by the work of other trades until acceptance of the work by the Owner.

3.06 CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

A. Construction waste shall be managed in accordance with provisions of Division 01 Section “Construction Waste Management and Disposal”.

END OF SECTION
SECTION 06 61 40

COMPOSITE SURFACING

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes composite surfacing for the following applications:
   1. Countertops and backsplash.
   2. Vanity tops.

B. Related Sections:
   1. Division 06 Section “Rough Carpentry” for wood blocking.
   2. Division 06 Section “Interior Architectural Woodwork” for plywood substrate.
   3. Division 07 Section “Joint Sealers” for joint sealants and backing materials.
   4. Division 09 Section “Stone Facing” for stone wall cladding.
   5. Division 23 Section “Plumbing Fixtures” for sinks and faucets.

C. References:
   1. ASTM C 97 - Test Method for Absorption and Bulk Specific Gravity of Dimensional Stone.
   3. ASTM C 293 - Standard Test Method for Flexural Strength of Concrete (Using Simple Beam with Center-Point Loading).
   5. ASTM C 666 - Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing (Superseded).

1.02 SUBMITTALS

A. Submit under provisions of Division 01 Section “Submittal Requirements”.

B. Product Data: Manufacturer’s data sheets on each product to be used, including:
   1. Product description.
   2. Fabrication instructions and recommendations.
   3. Storage and handling requirements and recommendations.
   4. Installation methods.
C. Shop Drawings:
   1. Indicate dimensions, edge configurations, cutouts, and relationship to adjacent construction.
   2. Show locations and sizes of furring, blocking, including concealed blocking and reinforcement specified in other Sections.
   3. Show locations and sizes of cutouts and holes for plumbing fixtures, faucets, soap dispensers, waste receptacle and other items installed in durable surfaces.

D. Samples:
   1. For each type of product indicated.
      a. Submit minimum (3) 4- by 4-inch samples in specified gloss.
      b. Cut sample and seam together for representation of inconspicuous seam.
      c. Indicate full range of color and pattern variation.
   2. Approved samples will be retained as a standard for Work.

E. Manufacturer Certificates:
   2. Food Contact Certification: Certify that materials meet NSF/ANSI 51 for Food Contact.

F. Maintenance Data: Cleaning instructions, scratch removal procedures, and materials harmful to countertops.

G. LEED Submittals: Submit the following in accordance with Division 01 Section “LEED Requirements”.
   1. Credit MR 4.1, Recycled Content: 10 percent (post-consumer plus 1/2 pre-consumer.)
   2. Credit MR 4.2, Recycled Content: 20 percent (post-consumer plus 1/2 pre-consumer).
   3. Credit ID 1, Innovation in Design: Exemplary Performance: Recycled Content: 30 percent or greater.
   5. Credit MR 5.1, Regional Materials: 20 percent manufactured regionally.
   6. Credit ID 1, Innovation in Design: Cradle to Cradle Certification.

1.03 QUALITY ASSURANCE

A. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
   1. Finish areas designated by Architect.
   2. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.
   3. Refinish mock-up area as required to produce acceptable work.

B. Installer: Trained and approved by composite surface manufacturer.
1.04 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver components to project site until products are ready for installation.
B. Store components indoors prior to installation.
C. Handle materials to prevent damage.
D. Provide protective coverings to prevent physical damage or staining following installation for duration of project.

1.05 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturer: Subject to compliance with requirements, provide Recycled Glass Surfacing as manufactured by Vetrazzo, LLC: www.vetrazzo.com.
   1. Subject to compliance with requirements and approval by Architect, other manufacturers include:

2.02 MATERIAL

A. Vetrazzo Recycled Glass Surfaces (RG):
   1. Composition: 100 percent recycled glass in a cement matrix.
   2. Physical Performance Characteristics:
      a. Food Safety: NSF / ANSI 51 NSF, splash zone certified
      b. Compressive Strength: ASTM C39 6,295 psi
      c. Absorption: ASTM C-97-02 - 0.79%
      d. Scratch Resistance: Mohs Hardness: 7.5 Glass / 4.75 Matrix
      e. Modulus of Rupture: ASTM C-99 1,004 psi
      f. Radon - EPA-402-R-92-004: < 0.5 pCi/L
         * This is the lowest value reported for Radon testing. For comparison, the average indoor Radon concentration is 1.3 pCi/L and outdoors is 0.4.
         ** Additional testing results will be added as completed.
      g. Polished Finish, Coefficient of Static Friction: 0.69 (dry); 0.61 (wet), ASTM C 1028.
      h. Honed Finish, Coefficient of Static Friction: 0.71 (dry); 0.62 (wet), ASTM C 1028.
      i. Sandblasted Finish, Coefficient of Static Friction: 0.85 (dry); 0.77 (wet), ASTM C 1028.
3. Weight and Size:
   a. Weight: 14.6 pounds per square foot at 3 centimeters thick.
   b. Maximum Slab Size: 60-inches wide by 108-inches long.
   c. Finished Thickness: 3-centimeters.

4. Edge Detail: As indicated on Drawings.
5. Color: As indicated on Drawings or as selected by Architect.
6. Surface Finish: As selected by Architect from manufacturer’s full range.

2.03 ACCESSORIES

A. Sealant: Low-VOC or no-VOC mildew-resistant sealant, FDA-compliant, NSF 51-compliant for food contact, to match durable surface.
   1. Product: As recommended by composite surface manufacturer.

B. Sink/Lavatory Mounting Hardware: Stainless steel bowl clips, panel inserts and fasteners and epoxy for attachment of self-rimming sinks and lavatories.

C. Sealer: Hydro and oleo-phobic, protecting against water and oil based stain agents. Provide one of the following or as recommended by composite surface manufacturer:

2.04 FACTORY FABRICATION

A. Shop Assembly: Fabricate using standard stone cutting equipment in accordance with manufacturer’s fabrication and installation guidelines.
   1. Fabricate components to greatest extent practical to sizes and shapes indicated, in accordance with approved shop drawings and manufacturer’s printed instructions.
   2. Form joints between components without conspicuous joints.
   3. Provide factory cutouts for plumbing fittings and bath accessories as indicated on Drawings.
   4. Rout and finish component edges with minimum radius of 1/8-inch.
      a. Rout cutouts, radii and contours to template.
      b. Shape inside corner radius to minimum of 1/4-inch to relieve corner stress.
      c. Smooth edges.
      d. Repair or replace defective and inaccurate work.
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 including but not limited to the following:
   1. Perimeter Support: Provide support on all sides of countertops and substrates as recommended by composite surface manufacturer.
      a. In designs where part of the countertop is spanning between supports, the length of the span shall be limited to 2'-0”.
   2. Cantilevers: Do not cantilever composite materials beyond manufacturer’s recommendations.
   3. Cutouts and Rod Supports: Make cutouts and openings in accordance with composite surface manufacturers recommendations. Provide support for cutouts and openings.
   4. Self-Rimming sinks can be mounted using standard stone practices. If the material span in front of the sink is less than 4-inches, it should be reinforced by insertion of an I-rod or other accepted strengthening practice.

B. Seal composite surfaces with a penetrating sealer. Sealant may be applied to damp surfaces one hour after standing water has been removed. Apply liberally with a clean brush or roller, distributing evenly. Allow sealant to penetrate the surface for 15-30 minutes. Wipe entire surface thoroughly with clean dry towel. Always follow manufacturer’s recommendations.
   1. Sealant must be applied to any surface area exposed onsite during installation, including joints and any field edge cuts.

C. Clean and polish surfaces in accordance with manufacturer’s care and maintenance instructions including the following:

3.04 INSTALLATION TOLERANCES

A. Joint (seam) Widths: Between two slabs the joint should be 1/16-inch with a tolerance of ±1/64-inch for a typical countertop application.

B. Lippage: Maximum permissible height difference should be 1/32-inch limited to the center, front to back. The front planes need to align visually, the rear planes need to align enough to allow for successful backsplash installation.

C. Slab Thickness: Variance should be limited to 1/8-inch for slabs used in the same project.

D. Slab Flatness: Individual slabs should be within 1/16-inch flatness when measured with a 4-foot straight edge.

3.05 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion, as directed by Architect.

END OF SECTION
SECTION 07 11 13

BITUMINOUS DAMPPROOFING

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes the following:
   1. Cold-applied, emulsified-asphalt dampproofing.

B. Related Sections include the following:
   1. Division 07 Section "Elastomeric Sheet Waterproofing" for waterproofing.
   2. Division 07 Section "Thermal Insulation" for polystyrene protection board.

1.02 SUBMITTALS

A. Product Data: For each type of product indicated. Include recommendations for method of application, primer, number of coats, coverage or thickness, and protection course.

B. Material Certificates: For each product, signed by manufacturers.

C. LEED Submittal:
   1. Product Data for Credit EQ 4.2: For dampproofing, including printed statement of VOC content.

1.03 QUALITY ASSURANCE

A. Source Limitations: Obtain primary dampproofing materials and primers through one source from a single manufacturer. Provide secondary materials recommended by manufacturer of primary materials.

1.04 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit dampproofing to be performed according to manufacturers' written instructions.

B. Ventilation: Provide adequate ventilation during application of dampproofing in enclosed spaces. Maintain ventilation until dampproofing has cured.

PART 2 - PRODUCTS

2.01 COLD-APPLIED, EMULSIFIED-ASPHALT DAMPPROOFING

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:
   2. Degussa Building Systems; Sonneborn Brand Products: www.buildingsystems.basf.com


b. VOC Content:  30 g/L or less.

2.02 PROTECTION COURSE

A. Protection Course:  Unfaced, extruded-polystyrene board insulation, nominal thickness 2-inches, ASTM C 578, Type X, 15 psi minimum, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84.

2.03 MISCELLANEOUS MATERIALS

A. Emulsified-Asphalt Primer:  ASTM D 1227, Type III, Class 1, except diluted with water as recommended by manufacturer.

B. Asphalt-Coated Glass Fabric:  ASTM D 1668, Type I.

C. Patching Compound:  Manufacturer’s fibered mastic of type recommended by dampproofing manufacturer.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for surface smoothness and other conditions affecting performance of work.

   1. Proceed with dampproofing application only after substrate construction and penetrating work have been completed and unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Protection of Other Work:  Mask or otherwise protect adjoining exposed surfaces from being stained, spotted, or coated with dampproofing. Prevent dampproofing materials from entering and clogging weep holes and drains.

B. Clean substrates of projections and substances detrimental to work; fill voids, seal joints, and apply bond breakers if any, as recommended by prime material manufacturer.

C. Apply patching compound for filling and patching tie holes, honeycombs, reveals, and other imperfections; cover with asphalt-coated glass fabric.
3.03 APPLICATION, GENERAL

A. Comply with manufacturer’s written recommendations unless more stringent requirements are indicated or required by Project conditions to ensure satisfactory performance of dampproofing.
   1. Apply additional coats if recommended by manufacturer or if required to achieve coverages indicated.
   2. Allow each coat of dampproofing to cure 24 hours before applying subsequent coats.
   3. Allow 24 hours minimum, or manufacturer’s recommended, drying time prior to backfilling.

B. Apply dampproofing to footings and foundation walls where opposite side of wall faces building interior.
   1. Apply from finished-grade line to top of footing, extend over top of footing, and down a minimum of 6 inches over outside face of footing.
   2. Extend 12 inches onto intersecting walls and footings, but do not extend onto surfaces exposed to view when Project is completed.
   3. Install flashings and corner protection stripping at internal and external corners, changes in plane, construction joints, cracks, and where shown as “reinforced,” by embedding an 8-inch- wide strip of asphalt-coated glass fabric in a heavy coat of dampproofing. Dampproofing coat for embedding fabric is in addition to other coats required.

C. Apply dampproofing to provide continuous plane of protection on interior face of above-grade, exterior concrete walls unless walls are indicated to receive direct application of paint.

3.04 COLD-APPLIED, EMULSIFIED-ASPHALT DAMPPROOFING

A. On Concrete Foundations: Apply 2 brush or spray coats at not less than 1.5 gal./100 sq. ft. for first coat and 1 gal./100 sq. ft. for second coat, 1 fibered brush or spray coat at not less than 3 gal./100 sq. ft., or 1 trowel coat at not less than 4 gal./100 sq. ft.

B. On Unexposed Face of Concrete Retaining Walls: Apply 1 brush or spray coat at not less than 1.25 gal./100 sq. ft.

C. On Interior Face of Exterior Concrete Walls: Where above grade and indicated to be furred and finished, apply 1 brush or spray coat at not less than 1 gal./100 sq. ft.

3.05 INSTALLATION OF PROTECTION COURSE

A. Where indicated, install protection course over completed-and-cured dampproofing. Comply with dampproofing material manufacturer’s written recommendations for attaching protection course.
   1. Support protection course with spot application of adhesive of type recommended by protection board manufacturer over cured coating.

3.06 CLEANING

A. Remove dampproofing materials from surfaces not intended to receive dampproofing.
3.07 SCHEDULE

A. Apply cold-applied bituminous dampproofing at the following locations:
   1. Exterior, below-grade surfaces of concrete foundation walls and grade beams.
   2. Back side of concrete retaining walls, below grade.
   3. Interior face of exterior concrete walls, above grade.

END OF SECTION
SECTION 07 13 53

ELASTOMERIC SHEET WATERPROOFING

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes the following:
   1. Butyl rubber sheet waterproofing.
   2. Insulation drainage panels.

B. Related Sections:
   1. Division 07 Section "Joint Sealants" for joint-sealant materials and installation.

1.02 SUBMITTALS

A. Product Data: Include manufacturer's written instructions for evaluating, preparing, and treating substrate, technical data, and tested physical and performance properties of waterproofing.

B. Shop Drawings: Show locations and extent of waterproofing. Include details for substrate joints and cracks, sheet flashings, penetrations, inside and outside corners, tie-ins with adjoining waterproofing, and other termination conditions.

C. Samples: For the following products:
   1. 12-by-12-inch square of waterproofing.
   2. 12-by-12-inch square of insulated drainage panel.

D. Installer Certificates: Signed by manufacturers certifying that installers comply with requirements.

E. Qualification Data: For Installer.

F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for waterproofing.

G. Warranties: Special warranties specified in this Section.

1.03 QUALITY ASSURANCE

A. Installer Qualifications: A firm that is acceptable to waterproofing manufacturer for installation of units required for this Project.

B. Source Limitations: Obtain waterproofing materials and drainage panels through one source from a single manufacturer.
C. **Mockups:** Before beginning installation, install waterproofing to 100 sq. ft. of wall to demonstrate surface preparation, crack and joint treatment, corner treatment, and execution quality.
   1. After review and approval by Architect, approved mockups may become part of the completed Work.

D. **Preinstallation Conference:** Conduct conference at Project site.
   1. Review waterproofing requirements including surface preparation, substrate condition and pretreatment, minimum curing period, forecasted weather conditions, special details and sheet flashings, installation procedures, testing and inspection procedures, and protection and repairs.

### 1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver liquid materials to Project site in original packages with seals unbroken, labeled with manufacturer's name, product brand name and type, date of manufacture, and directions for storing and mixing with other components.

B. Store liquid materials in their original undamaged packages in a clean, dry, protected location and within temperature range required by waterproofing manufacturer.

C. Remove and replace liquid materials that cannot be applied within their stated shelf life.

D. Store rolls according to manufacturer's written instructions.

E. Protect stored materials from direct sunlight.

### 1.05 PROJECT CONDITIONS

A. **Environmental Limitations:** Apply waterproofing within the range of ambient and substrate temperatures recommended by waterproofing manufacturer. Do not apply waterproofing to a damp or wet substrate.
   1. Do not apply waterproofing in snow, rain, fog, or mist.

B. Maintain adequate ventilation during preparation and application of waterproofing materials.

### 1.06 WARRANTY

A. **Special Manufacturer's Warranty:** Manufacturer's standard form in which manufacturer agrees to replace waterproofing material that does not comply with requirements or that fails to remain watertight within specified warranty period.
   1. Warranty Period: 15 years from date of Substantial Completion.

B. **Special Installer's Warranty:** Specified form, signed by Installer, covering Work of this Section, for warranty period of two years.
PART 2 - PRODUCTS

2.01 SHEET WATERPROOFING

A. Butyl Rubber Sheet: ASTM D 6134, Type II, 90-mil- thick flexible sheet, unreinforced, formed from isobutylene-isoprene rubber.
   1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
      a. “Sure-Seal Butyl” as manufactured by Carlisle Coatings & Waterproofing Inc.

2.02 AUXILIARY MATERIALS

A. General: Furnish auxiliary materials recommended by waterproofing manufacturer for intended use and compatible with sheet waterproofing.
   1. Furnish liquid-type auxiliary materials that comply with VOC limits of authorities having jurisdiction.

B. Concealed Sheet Flashing: Same material, construction, and thickness as sheet waterproofing or 60-mil- thick, uncured EPDM as required by manufacturer.

C. Exposed Sheet Flashing: 60-mil- thick EPDM, cured or uncured, as required by manufacturer.

D. Bonding Adhesives: Adhesive for bonding polymeric sheets and sheet flashings to substrates and projections.

   1. Butyl Gum Tape: 30-mil- thick-by-6-1/4-inch- wide, uncured butyl with polyethylene release film.

F. Lap Sealant: Single-component sealant.

G. Water Cutoff Mastic: Butyl mastic sealant.

H. Waterproofing and Sheet Flashing Accessories: Provide sealants, pourable sealers, cone and vent flashings, inside and outside corner flashings, termination reglets, and other accessories recommended by waterproofing manufacturer for intended use.

I. Metal Termination Bars: Manufacturer’s standard aluminum bars, approximately 1 inch wide, prepunched, with zinc-alloy-body fasteners and stainless-steel pins.
2.03 INSULATION DRAINAGE PANEL

A. Geotextile-Faced Wall Insulation Drainage Panels: Extruded-polystyrene board insulation complying with ASTM C 578, Type VI, 40-psi minimum compressive strength; fabricated with tongue-and-groove edges and with 1 side having grooved drainage channels faced with nonwoven geotextile filter fabric.
   1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
   2. Thickness: 2-inches.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance.
   1. Do not proceed with installation until after the minimum concrete curing period recommended by waterproofing manufacturer.
   2. Verify that substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
   4. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 SURFACE PREPARATION

A. Clean, prepare, and treat substrates according to manufacturer's written instructions. Provide clean, dust-free, and dry substrates for waterproofing application.

B. Mask off adjoining surfaces not receiving waterproofing to prevent spillage and overspray affecting other construction.

C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.

D. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids.

E. Prepare, fill, prime, and treat joints and cracks in substrates. Remove dust and dirt from joints and cracks according to ASTM D 4258.

F. Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations through waterproofing and at drains and protrusions.
3.03 FULLY ADHERED SHEET INSTALLATION

A. Install fully adhered sheets over entire area to receive waterproofing according to manufacturer’s written instructions and recommendations in ASTM D 5843.

B. Accurately align sheets and maintain uniform side and end laps of minimum dimensions required. Stagger end laps.

C. Apply bonding adhesive to substrates at required rate and allow to partially dry.

D. Apply bonding adhesive to sheets and firmly adhere sheets to substrates. Do not apply bonding adhesive to splice area of sheet.

E. Repair tears, voids, and lapped seams in waterproofing not complying with requirements. Slit and flatten fishmouths and blisters. Patch with sheet waterproofing extending beyond repaired areas in all directions.

F. Horizontal Application: Apply sheets with side laps shingled with slope of deck where possible.
   1. Spread sealant bed over deck drain flange at deck drains and securely seal sheet waterproofing in place with clamping ring.

3.04 SEAM INSTALLATION

A. Cement and Tape Splice: Clean splice areas, apply splicing cement and butyl gum tape, and firmly roll side and end laps of overlapping sheets according to manufacturer’s written instructions to ensure a watertight seam installation. Apply lap sealant and seal exposed edges of sheet terminations.

3.05 SHEET FLASHING INSTALLATION

A. Install sheet flashings and preformed flashing accessories and adhere to substrates according to waterproofing manufacturer’s written instructions.

B. Form wall flashings using exposed sheet flashing.

C. Terminate and seal top of sheet flashings with mechanically anchored termination bars.

3.06 INSULATION PANEL INSTALLATION

A. Install insulation drainage panels over waterproofed surfaces. Cut and fit to within 3/4 inch of projections and penetrations.

B. On vertical surfaces, place and secure insulation units according to manufacturer’s written instructions.

C. On horizontal surfaces, loosely lay insulation units according to manufacturer’s written instructions. Stagger end joints and tightly abut insulation units.
3.07 PROTECTION AND CLEANING

A. Protect waterproofing from damage and wear during remainder of construction period.

B. Protect installed insulation drainage panels from damage due to UV light, harmful weather exposures, physical abuse, and other causes. Provide temporary coverings where insulation will be subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

C. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

3.08 SCHEDULE

A. Apply sheet waterproofing at the following locations:
   1. Elevator pit walls (4 sides) and underneath pit floor slab.
   2. Face of grade beam as indicated on the drawings.
   3. Wall at grid 3.3 from G to G.6+. New and existing grade beams and slab edges exposed to view at building perimeter.

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY

A. Section includes penetrating water-repellent treatments for the following vertical and horizontal surfaces:
   1. Cast-in-place concrete at exposed to view locations, grade beams, and slab edges at building perimeter, new and existing.

B. References:
   2. VOC Content: EPA Method 24.
   5. Water Repellency Test – 2-1/2 inch Hydrostatic Head: "Grace Construction Products, Method HU 698."
   6. Accelerated Weathering: QUV (2,000 hours).

1.02 PERFORMANCE REQUIREMENTS

A. General Performance: Water repellents shall meet performance requirements indicated without failure due to defective manufacture, fabrication, or installation.
   1. Water Repellents: Comply with performance requirements specified, as determined by preconstruction testing substrate assemblies representing those indicated for this Project.

B. Water Absorption: Minimum 80 percent reduction of water absorption after 24 hours in comparison of treated and untreated specimens.
   1. Cast-in Place Concrete: ASTM C 642.
   2. Precast Concrete: ASTM C 642.

C. Water-Vapor Transmission: Comply with one or both of the following:
   1. Maximum 10 percent reduction in rate of vapor transmission in comparison of treated and untreated specimens, according to ASTM E 96/E 96M.
   2. Minimum 80 percent water-vapor transmission in comparison of treated and untreated specimens, according to ASTM D 1653.

D. Durability: Maximum 5 percent loss of water-repellent properties after 2500 hours of weathering according to ASTM G 154 in comparison to water-repellent-treated specimens before weathering.

E. Chloride-Ion Intrusion in Concrete: NCHRP Report 244, Series II tests.
   1. Reduction of Water Absorption: 80 percent.
   2. Reduction in Chloride Content: 80 percent.
1.03 PRECONSTRUCTION TESTING

A. Preconstruction Testing: Installed water repellents shall comply with performance requirements indicated, as evidenced by reports based on Project-specific preconstruction testing of existing substrate assemblies by a qualified testing agency.
   1. Select sizes and configurations of assemblies to adequately demonstrate capability of water repellents to comply with performance requirements.
   2. In addition to verifying performance requirements, use test applications to verify manufacturer's written instructions for application procedure and optimum rates of product application to substrate assemblies.
   3. Notify Architect seven days in advance of the dates and times when assemblies will be tested.

1.04 SUBMITTALS

A. Product Data: For each type of product indicated.
   1. Include manufacturer's printed statement of VOC content.
   2. Include manufacturer's standard colors.
   3. Include manufacturer's recommended number of coats for each type of substrate and spreading rate for each separate coat.

B. Samples: For each type of water repellent and substrate indicated, 12 by 12 inches in size, with specified water-repellent treatment applied to half of each Sample.

C. Qualification Data: For qualified Applicator.

D. Product Certificates: For each type of water repellent, from manufacturer.

E. Preconstruction Testing Reports: Performed For water-repellent-treated substrate assemblies by a qualified testing agency.

F. Field quality-control reports.

G. Warranty: Special warranty specified in this Section.

1.05 QUALITY ASSURANCE

A. Applicator Qualifications: An employer of workers trained and approved by manufacturer.

B. Preinstallation Conference: Conduct conference at Project site.

1.06 PROJECT CONDITIONS

A. Limitations: Proceed with application only when the following existing and forecasted weather and substrate conditions permit water repellents to be applied according to manufacturers' written instructions and warranty requirements:
   1. Concrete surfaces and mortar have cured for not less than 28 days.
   2. Building has been closed in for not less than 30 days before treating wall assemblies.
3. Ambient temperature is above 40 deg F and below 100 deg F and will remain so for 24 hours.
4. Substrate is not frozen and substrate-surface temperature is above 40 deg F and below 100 deg F.
5. Rain or snow is not predicted within 24 hours.
6. Not less than seven days have passed since surfaces were last wet.
7. Windy conditions do not exist that might cause water repellent to be blown onto vegetation or surfaces not intended to be treated.

PART 2 - PRODUCTS

2.01 PENETRATING WATER REPELLENTS

A. Silane/Siloxane-Blend, Penetrating Water Repellent: Clear, silane and siloxane blend with 600 g/L or less of VOCs.
   1. Products: Subject to compliance with requirements, provide one of the following as appropriate:
      a. Advanced Chemical Technologies, Inc.; Sil-Act Dri-Treat.
      b. BASF Construction Chemicals, LLC; Enviroseal line of products.
      c. Conproco Corporation; Conpro Shield W-line of products.
      d. Degussa Corporation; Protectosil Aqua-Trete EM.
      e. Fabrikem Manufacturing Ltd.; Fabrishield 700 or 900 series6.
      g. Kryton International Inc., Kryton Group of Companies (The); Hydrostop WB.
      h. Lambert Corporation; Waterban 90.
      i. L&M Construction Chemicals, Inc.; Aquapel or Hydro- series.
      j. LymTal International, Inc.; Iso-Flex 628.
      k. OKON Co., Inc., Division of ZINSSER Co., Inc., an RPM company; S-line of products.
      l. Pecora Corporation; KlereSeal 900-series.
      m. PROSOCO, Inc.; Siloxane or WeatherSeal line of products.
      n. Rainguard Products Company; Blok-Lok.
      o. Sika Corporation, Inc.; Sikagard 701W.
      p. Tamms Industries, Inc., Euclid Chemical Company (The); Baracade or Chemstop line of products.
      q. Tnemec Inc.; Dur A Pell orPrime-A-Pell Series.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements and conditions affecting performance of the Work.
   1. Verify that surfaces are clean and dry according to water-repellent manufacturer’s requirements. Check moisture content in three representative locations by method recommended by manufacturer.
   2. Inspect for previously applied treatments that may inhibit penetration or performance of water repellents.
3. Verify that there is no efflorescence or other removable residues that would be trapped beneath the application of water repellent.
4. Verify that required repairs are complete, cured, and dry before applying water repellent.

B. Test pH level according to water-repellent manufacturer’s written instructions to ensure chemical bond to silica-containing or siliceous minerals.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Cleaning: Before application of water repellent, clean substrate of substances that could impair penetration or performance of product according to water-repellent manufacturer’s written instructions and as follows:
1. Cast-in-Place Concrete and Precast Concrete: Remove oil, curing compounds, laitance, and other substances that inhibit penetration or performance of water repellents according to ASTM E 1857.

B. Protect adjoining work, including mortar and sealant bond surfaces, from spillage or blow-over of water repellent. Cover adjoining and nearby surfaces of aluminum and glass if there is the possibility of water repellent being deposited on surfaces. Cover live vegetation.

C. Coordination with Sealant Joints: Do not apply water repellent until sealants for joints adjacent to surfaces receiving water-repellent treatment have been installed and cured.
1. Water-repellent work may precede sealant application only if sealant adhesion and compatibility have been tested and verified using substrate, water repellent, and sealant materials identical to those required.

3.03 APPLICATION

A. Manufacturer’s Field Service: Engage a factory-authorized service representative to inspect the substrate before application of water repellent and to instruct Applicator on the product and application method to be used.

B. Apply a heavy-saturation coating of water repellent, on surfaces indicated for treatment, using 15 psi- pressure spray with a fan-type spray nozzle, roller, or brush to the point of saturation. Apply coating in dual passes of uniform, overlapping strokes. Remove excess material; do not allow material to puddle beyond saturation. Comply with manufacturer’s written instructions for application procedure unless otherwise indicated.

C. Apply a second saturation coating, repeating first application. Comply with manufacturer’s written instructions for limitations on drying time between coats and after rainstorm wetting of surfaces between coats. Consult manufacturer’s technical representative if written instructions are not applicable to Project conditions.
3.04 FIELD QUALITY CONTROL

A. Testing of Water-Repellent Material: Owner reserves the right to invoke the following procedure at any time and as often as Owner deems necessary during the period when water repellent is being applied:
   1. Owner will engage the services of a qualified testing agency to sample water-repellent material being used. Samples of material delivered to Project site will be taken, identified, sealed, and certified in presence of Contractor.
   2. Testing agency will perform tests for compliance of water-repellent material with product requirements.
   3. Owner may direct Contractor to stop applying water repellents if test results show material being used does not comply with product requirements. Contractor shall remove non-complying material from Project site, pay for testing, and correct deficiency of surfaces treated with rejected materials, as approved by Architect.

B. Coverage Test: In the presence of Architect, hose down a dry, repellent-treated surface to verify complete and uniform product application. A change in surface color will indicate incomplete application.
   1. Notify Architect seven days in advance of the dates and times when surfaces will be tested.
   2. Reapply water repellent until coverage test indicates complete coverage.

3.05 CLEANING

A. Immediately clean water repellent from adjoining surfaces and surfaces soiled or damaged by water-repellent application as work progresses. Correct damage to work of other trades caused by water-repellent application, as approved by Architect.

B. Comply with manufacturer's written cleaning instructions.

3.06 SCHEDULE

A. Apply Water Repellents in the following locations:
   1. New and existing grade beams and slab edges exposed to view at building perimeter.

END OF SECTION
SECTION 07 21 00

THERMAL INSULATION

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Foam-plastic board insulation (rigid, faced, extruded).
   2. Glass-fiber board insulation (semi-rigid, faced).
   3. Glass-fiber blanket insulation (batt, faced).
   4. Spray polyurethane foam insulation.
   5. Vapor Retarders.

B. Related Sections:
   1. Division 07 Section "Elastomeric Sheet Waterproofing for insulated drainage panels installed with waterproofing.
   2. Division 07 Section "Ethylene-Propylene-Diene-Monomer (EPDM) Roofing for insulation specified as part of roofing construction.
   3. Division 07 Section "Fire-Resistive Joint Systems" for insulation installed as part of a perimeter fire-resistive joint system.
   4. Division 09 Section "Gypsum Board" for mineral-wool blanket insulation.

1.02 SUBMITTALS

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

B. LEED Submittals:
   1. Product Data for Credit MR 4.1 and Credit MR 4.2: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating costs for each product having recycled content.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each product.

D. Research/Evaluation Reports: For foam-plastic insulation, from ICC-ES.

1.03 QUALITY ASSURANCE

A. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
1.04 DELIVERY, STORAGE, AND HANDLING

A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

B. Protect foam-plastic board insulation as follows:
   1. Do not expose to sunlight except to necessary extent for period of installation and concealment.
   2. Protect against ignition at all times. Do not deliver foam-plastic board materials to Project site before installation time.
   3. Quickly complete installation and concealment of foam-plastic board insulation in each area of construction.

PART 2 - PRODUCTS

2.01 FOAM-PLASTIC BOARD (RIGID) INSULATION

A. Extruded-Polystyrene Board Insulation: ASTM C 578, of type and minimum compressive strength indicated below, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   2. Type X, 15 psi.
   3. Type VI, 40 psi.
   4. Thickness: 2-inches

B. Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation securely to substrates without damaging insulation and substrates.

2.02 GLASS-FIBER BOARD (SEMI-RIGID) INSULATION

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   3. Knauf Insulation: www.knaufusa.com
B. Foil-Faced, Flexible Glass-Fiber Board Insulation:  ASTM C 612, Type IA or ASTM C 553, Types I, II, and III; faced on one side with foil-scrim-kraft vapor retarder; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84.
   1. Nominal density of not less than 1.5 lb/cu. ft. or more than 1.7 lb/cu. ft., thermal resistivity of 4 deg F x h x sq. ft./Btu x in. at 75 deg F.

C. Foil-Faced, Glass-Fiber Board Insulation:  ASTM C 612, Type IA; faced on one side with foil-scrim-kraft or foil-scrim-polyethylene vapor retarder, with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84.
   1. Nominal density of 3 lb/cu. ft., thermal resistivity of 4.3 deg F x h x sq. ft./Btu x in. at 75 deg F.

D. Sustainability Requirements:  Provide glass-fiber board insulation as follows:
   1. Free of Formaldehyde: Insulation manufactured with 100 percent acrylic binders and no formaldehyde.
   2. Low Emitting: Insulation tested according to ASTM D 5116 and shown to emit less than 0.05-ppm formaldehyde.

2.03 GLASS-FIBER BLANKET (BATT) INSULATION

A. Manufacturers:  Subject to compliance with requirements, provide products by one of the following:

B. Unfaced, Glass-Fiber Blanket Insulation:  ASTM C 665, Type I; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.

C. Polypropylene-Scrim-Kraft-Faced, Glass-Fiber Blanket Insulation:  ASTM C 665, Type II (non-reflective faced), Class A (faced surface with a flame-spread index of 25 or less); Category 1 (membrane is a vapor barrier).

2.04 SPRAY POLYURETHANE FOAM INSULATION

A. Closed-Cell Polyurethane Foam Insulation:  ASTM C 1029, Type II, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84.
   1. Manufacturers:  Subject to compliance with requirements, provide products by one of the following:
      g. NCFI; Division of Barnhardt Mfg. Co.  www.ncfi.com.
2. Minimum density of 1.5 lb/cu. ft., thermal resistivity of 6.2 deg F x h x sq. ft./Btu x in. at 75 deg F.

2.05 VAPOR RETARDERS

A. Polyethylene Vapor Retarder: ASTM D 4397, 10mils thick, with maximum permeance rating of 0.13 perm.

B. Vapor-Retarder Tape: Pressure sensitive tape of type recommended by vapor-retarder manufacturer for sealing joints and penetration in vapor retarder.

2.06 INSULATION FASTENERS

A. Adhesively Attached, Spindle-Type Anchors: Plate welded to projecting spindle; capable of holding insulation of specified thickness securely in position indicated with self-locking washer in place.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   a. AGM Industries, Inc.; Series T TACTOO Insul-Hangers: www.agmind.com
   b. Gemco; Spindle Type: www.gemcoinsulation.com

2. Plate: Perforated, galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
3. Spindle: Copper-coated, low-carbon steel; fully annealed; 0.105 inch in diameter; length to suit depth of insulation indicated.

B. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick galvanized-steel sheet, with beveled edge for increased stiffness, sized as required to hold insulation securely in place, but not less than 1-1/2 inches square or in diameter.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   a. AGM Industries, Inc.
   b. Gemco.

2. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in the following locations:
   a. Ceiling plenums.
   b. Attic spaces.
   c. Where indicated.

C. Anchor Adhesive: Product with demonstrated capability to bond insulation anchors securely to substrates indicated without damaging insulation, fasteners, and substrates.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   a. AGM Industries, Inc.; TACTOO Adhesive.
   b. Gemco; Tuff Bond Hanger Adhesive.
PART 3 - EXECUTION

3.01 PREPARATION

A. Clean substrates of substances that are harmful to insulation or vapor retarders, including removing projections capable of puncturing vapor retarders, or that interfere with insulation attachment.

3.02 INSTALLATION, GENERAL

A. Comply with insulation manufacturer’s written instructions applicable to products and applications indicated.

B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.

C. Extend insulation to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

D. Provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

3.03 INSTALLATION OF BELOW-GRADE INSULATION

A. On vertical footing and foundation wall surfaces, set insulation units using manufacturer’s recommended adhesive according to manufacturer’s written instructions.
   1. If not otherwise indicated, extend insulation a minimum of 36 inches below exterior grade line.

B. On horizontal surfaces under slabs, loosely lay insulation units according to manufacturer’s written instructions. Stagger end joints and tightly abut insulation units.
   1. If not otherwise indicated, extend insulation a minimum of 36 inches in from exterior walls.

3.04 INSTALLATION OF INSULATION FOR FRAMED CONSTRUCTION

A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.

B. Foam-Plastic Board Insulation: Seal joints between units by applying adhesive, mastic, or sealant to edges of each unit to form a tight seal as units are shoved into place. Fill voids in completed installation with adhesive, mastic, or sealant as recommended by insulation manufacturer.
C. Glass-Fiber Insulation: Install in cavities formed by framing members according to the following requirements:

1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
3. Maintain 3-inch clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
4. Install eave ventilation troughs between roof framing members in insulated attic spaces at vented eaves.
5. For metal-framed wall cavities where cavity heights exceed 96 inches, support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.
6. Vapor-Retarder-Faced Blankets (batts): Tape joints and ruptures in vapor-retarder facings, and seal each continuous area of insulation to ensure airtight installation.
   a. Exterior Walls: Set units with facing placed toward interior of construction.

D. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:

1. Spray Polyurethane Insulation: Apply according to manufacturer's written instructions.

3.05 INSTALLATION OF INSULATION IN CEILINGS FOR SOUND ATTENUATION

A. Where glass-fiber blankets are indicated for sound attenuation above ceilings, install blanket insulation over entire ceiling area in thicknesses indicated. Extend insulation 48 inches up either side of partitions.

3.06 INSTALLATION OF INSULATION FOR CONCRETE SUBSTRATES

A. Install board insulation on concrete substrates by adhesively attached, spindle-type insulation anchors as follows:

1. Fasten insulation anchors to concrete substrates with insulation anchor adhesive according to anchor manufacturer's written instructions. Space anchors according to insulation manufacturer's written instructions for insulation type, thickness, and application indicated.
2. Where insulation will not be covered by other building materials, apply capped washers to tips of spindles.

3.07 INSTALLATION OF CURTAIN-WALL INSULATION

A. Install board insulation in curtain-wall construction where indicated on Drawings according to curtain-wall manufacturer's written instructions.

1. Hold insulation in place by securing metal clips and straps or integral pockets within window frames, spaced at intervals recommended in writing by insulation manufacturer to hold insulation securely in place without touching spandrel glass. Maintain cavity width of dimension indicated between insulation and glass.
2. Install insulation where it contacts perimeter fire-containment system to prevent insulation from bowing under pressure from perimeter fire-containment system.

3.08 INSTALLATION OF VAPOR RETARDERS

A. Place vapor retarders on side of construction indicated on Drawings. Extend vapor retarders to extremities of areas to protect from vapor transmission. Secure vapor retarders in place with adhesives or other anchorage system as indicated. Extend vapor retarders to cover miscellaneous voids in insulated substrates, including those filled with loose-fiber insulation.

B. Seal vertical joints in vapor retarders over framing by lapping no fewer than two studs.
   1. Fasten vapor retarders to wood framing at top, end, and bottom edges; at perimeter of wall openings; and at lap joints. Space fasteners 16 inches o.c.
   2. Before installing vapor retarders, apply urethane sealant to flanges of metal framing including runner tracks, metal studs, and framing around door and window openings. Seal overlapping joints in vapor retarders with vapor-retarder tape according to vapor-retarder manufacturer's written instructions. Seal butt joints with vapor-retarder tape. Locate all joints over framing members or other solid substrates.
   3. Firmly attach vapor retarders to metal framing and solid substrates with vapor-retarder fasteners as recommended by vapor-retarder manufacturer.

C. Seal joints caused by pipes, conduits, electrical boxes, and similar items penetrating vapor retarders with vapor-retarder tape to create an airtight seal between penetrating objects and vapor retarders.

D. Repair tears or punctures in vapor retarders immediately before concealment by other work. Cover with vapor-retarder tape or another layer of vapor retarders.

3.09 PROTECTION

A. Protect installed insulation and vapor retarders from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION
SECTION 07 26 00
UNDERSLAB VAPOR RETARDER

PART 1 - GENERAL

1.01 SUMMARY

A. This Section Includes:
   1. Underslab vapor retarder/barrier membrane that forms an integral bond to poured concrete for use below slabs on grade.

B. Related Sections:
   1. Division 03 Section “Cast-In-Place Concrete”.

C. References:
   1. The following standards and publications are applicable to the extent referenced in the text.
      e. ASTM E 154: Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover.
      f. ASTM E 1643: Standard Practice for Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.
      g. ASTM E 1745: Plastic Vapor Retarders Used in Contact with Soil or Granular fill under Concrete Slabs.
      h. ACI 302.1R-96 Addendum Vapor Retarder Location: For slabs with vapor-sensitive floor coverings, locate retarder in direct contact with the slab (not beneath a layer of granular fill).

1.02 SUBMITTALS

A. Submit manufacturer's product data, installation instructions and membrane samples for approval.

1.03 QUALITY ASSURANCE

A. Materials: For each type of material required for the work of this section, provide primary materials that are the products of one manufacturer.

B. Schedule Coordination: Schedule work such that membrane will not be left exposed to weather for longer than that recommended by the manufacturer.
1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in labeled packages. Store and handle in strict compliance with manufacturer’s instructions. Protect from damage from weather, excessive temperature and construction operations. Remove and dispose of damaged material in accordance with applicable regulations.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Subject to compliance with requirements, provide products by one of the following:

2.02 MATERIALS

A. Integrally Bonded Vapor Protection: “Florprufe 120 Membrane” by Grace Construction Products, a 0.5mm (0.021-inch) nominal thickness composite sheet membrane comprising 0.4 mm (0.016-inches) of polyolefin film, and layers of specially formulated synthetic adhesive layers. The membrane shall form an integral and permanent bond to poured concrete to prevent vapor migration at the interface of the membrane and structural concrete. Provide membrane with the following physical properties:

   PHYSICAL PROPERTIES FOR MEMBRANE

   Florprufe 120 is a Class A vapor barrier and exceeds the requirements as defined by ASTM E 1745

<table>
<thead>
<tr>
<th>Property</th>
<th>Typical Value</th>
<th>Test Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thickness (nominal)</td>
<td>0.5mm (0.021 in)</td>
<td>ASTM D3767 Method A</td>
</tr>
<tr>
<td>Water Vapor Permeance</td>
<td>0.03 perms</td>
<td>ASTM E96 Method B *</td>
</tr>
<tr>
<td>Tensile Strength</td>
<td>65 lb./in</td>
<td>ASTM E154 *</td>
</tr>
<tr>
<td>Elongation</td>
<td>300%</td>
<td>ASTM D412</td>
</tr>
<tr>
<td>Puncture Resistance</td>
<td>3300 grams</td>
<td>ASTM D1709 *</td>
</tr>
<tr>
<td>Peel Adhesion to Concrete</td>
<td>&gt;4 lb./in</td>
<td>ASTM D903</td>
</tr>
</tbody>
</table>

   * ASTM E 1745 Requirements.


C. Miscellaneous Materials: Tape and other accessories specified or acceptable to manufacturer of sheet applied vapor protection membrane.
PART 3 - EXECUTION

3.01 EXECUTION

A. The installer shall examine conditions of substrates and other conditions under which this work is to be performed and notify the Contractor, in writing, of circumstances detrimental to the proper completion of the work. Do not proceed with work until unsatisfactory conditions are corrected.

3.02 INSTALLATION

A. Earth and stone substrates shall be well compacted to produce an even, solid substrate. Remove loose aggregate or sharp protrusions. Concrete substrates shall be smooth or broom finished and monolithic. Remove standing water prior to membrane applications.

B. Installation shall be in accordance with manufacturer’s instructions and ASTM E 1643–98, including but not limited to, the following:
   1. Apply membrane with the HDPE film facing the prepared substrate. Remove the release liner during application.
   2. Apply succeeding sheets by overlapping the previous sheet 50-mm (2-inches) along the marked lap line. End Laps should be staggered to avoid a build-up of layers.
      a. Mechanical Fastening Method: To prevent the membrane from moving and gaps opening, the laps should be fastened together at 1.0m (39 -inches) maximum centers. Fix through the center of the lap area using 12mm (0.5 -inches) long washer-head self-tapping galvanized screws or similar allowing the head of the screw to bed into the adhesive compound to self-seal. Ensure the membrane lays flat and no openings occur. Additional fastening may be required at corners, details etc.
      OR
      b. Taped Lap Method: For additional security use Grace "Preprufe" Tape to secure and seal the overlaps. Overband the lap with the 100mm (4 -inches) wide "Preprufe" Tape using the lap line for alignment. Remove plastic release liner to ensure bond to concrete.

3. Mix and apply Grace liquid detailing compound to seal around penetrations such as drainage pipes, etc.

3.03 CONCRETE PLACEMENT

A. Place concrete within 30 days. Inspect membrane and repair any damage with patches of Preprufe Tape. Ensure all liner is removed from membrane and tape before concrete placement.

END OF SECTION
SECTION 07 42 43

COMPOSITE WALL PANELS

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes metal-faced composite wall panels.

B. Related Sections:
   1. Division 05 Section "Cold-Formed Metal Framing" for cold-formed metal framing supporting metal-faced composite wall panels.
   2. Division 07 Section "Sheet Metal Flashing and Trim" for field-formed flashings and other sheet metal work not part of metal-faced composite wall panel assemblies.

1.02 DEFINITION

A. Metal-Faced Composite Wall Panel Assembly: Metal-faced composite wall panels, attachment system components, miscellaneous metal framing, and accessories necessary for a complete weathertight wall system.

1.03 PERFORMANCE REQUIREMENTS

A. General Performance: Metal-faced composite wall panel assemblies shall comply with performance requirements without failure due to defective manufacture, fabrication, installation, or other defects in construction.

B. Delegated Design: Design metal-faced composite wall panel assembly, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

C. Air Infiltration: Air leakage through assembly of not more than 0.06 cfm/sq. ft. of wall area when tested according to ASTM E 283 at the following test-pressure difference:
   1. Test-Pressure Difference: 1.57 lbf/sq. ft.

D. Water Penetration Under Static Pressure: No water penetration when tested according to ASTM E 331 at the following test-pressure difference:

E. Structural Performance: Provide metal-faced composite wall panel assemblies capable of withstanding the effects of the following loads and stresses within limits and under conditions indicated, based on testing according to ASTM E 330:
   1. Wind Loads: Determine loads based on the following minimum design wind pressures:
      a. Uniform pressure of not less than 20 lbf/sq. ft. acting inward or outward, and not less than 30 lbf/sq. ft. at corners and parapets.
2. **Deflection Limits:** Metal-faced composite wall panel assemblies shall withstand wind loads with horizontal deflections no greater than 1/175 of the span at the perimeter and 1/60 of the span anywhere in the panel.

F. **Thermal Movements:** Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. **Temperature Change (Range):** 120 deg F, ambient; 180 deg F, material surfaces.

### 1.04 SUBMITTALS

A. **Product Data:** For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of metal-faced composite wall panel and accessory.

B. **Shop Drawings:** Show fabrication and installation layouts of metal-faced composite wall panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details. Distinguish among factory-, shop-, and field-assembled work.

1. **Accessories:** Include details of the following items, at a scale of not less than 1-1/2 inches per 12 inches:
   a. Flashing and trim.
   b. Anchorage systems.

C. **Samples for Initial Selection:** For each type of metal-faced composite wall panel indicated with factory-applied color finishes.

1. Include similar Samples of trim and accessories involving color selection.
2. Include manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each sealant exposed to view.

D. **Samples for Verification:** For each type of exposed finish required, prepared on Samples of size indicated below:

1. **Metal-Faced Composite Wall Panels:** Minimum 12- by 12-inches. Include fasteners, closures, and other metal-faced composite wall panel accessories.
   a. **Composite Panels:** Include four-way joint.

   2. **Trim and Closures:** 12 inches long. Include fasteners and other exposed accessories.
   3. **Accessories:** 12-inch long Samples for each type of accessory.
   4. **Exposed Gaskets:** 12 inches long.
   5. **Exposed Sealants:** For each type and color of joint sealant required. Install joint sealants in 1/2-inch wide joints formed between two 6-inch- long strips of material matching the appearance of metal-faced composite wall panels adjacent to joint sealants.

E. **Delegated-Design Submittal:** For metal-faced composite wall panel assembly indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
F. Coordination Drawings: Exterior elevations, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
1. Wall panels and attachments.
2. Stud framing.
3. Wall-mounted items including doors, windows, louvers, and lighting fixtures.
4. Penetrations of wall by pipes and utilities.

G. Qualification Data: For professional engineer.

H. Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating the following:
1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.

I. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each product.

J. Field quality-control reports.

K. Maintenance Data: For metal wall panels to include in maintenance manuals.

L. Warranties: Samples of special warranties.

1.05 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of metal-faced composite wall panel from single source from single manufacturer.

B. Installer Qualifications: Installer shall be acceptable to the composite panel manufacturer and have minimum 5 years experience of metal panel work similar in scope and size to this project.

C. Preconstruction Compatibility and Adhesion Testing: Submit samples of materials that will contact joint sealants to joint-sealant manufacturers for testing indicated in subparagraphs below:
1. Use manufacturer’s standard test methods to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
   a. Perform tests under environmental conditions replicating those that will exist during installation.
2. Submit no fewer than nine pieces of each type of material, including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.
3. Schedule enough time for testing and analyzing results to prevent delaying the Work.
4. For materials failing tests, obtain joint-sealant manufacturer’s written instructions for corrective measures, including use of specially formulated primers.

D. Preinstallation Conference: Conduct conference at Project site.
1. Meet with Owner, Architect, Owner’s insurer if applicable, testing and inspecting agency representative, metal-faced composite wall panel Installer, metal-faced composite wall panel manufacturer's representative, structural-support Installer, and installers whose work interfaces with or affects metal-faced composite wall panels including installers of doors, windows, and louvers.

2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

3. Review methods and procedures related to metal-faced composite wall panel installation, including manufacturer’s written instructions.

4. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.

5. Review flashings, special siding details, wall penetrations, openings, and condition of other construction that will affect metal-faced composite wall panels.

6. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.

7. Review temporary protection requirements for metal-faced composite wall panel assembly during and after installation.

8. Review wall panel observation and repair procedures after metal-faced composite wall panel installation.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, sheets, metal-faced composite wall panels, and other manufactured items so as not to be damaged or deformed. Package metal-faced composite wall panels for protection during transportation and handling. Protect edges in accordance with panel manufacturer's recommendations.

B. Unload, store, and erect metal-faced composite wall panels in a manner to prevent bending, warping, twisting, and surface damage.

C. Store metal-faced composite wall panels vertically, covered with suitable weathertight and ventilated covering. Store metal-faced composite wall panels to ensure dryness, with positive slope for drainage of water. Do not store metal-faced composite wall panels in contact with other materials that might cause staining, denting, or other surface damage. Do not allow storage space to exceed 120 deg F.

D. Retain strippable protective covering on metal-faced composite wall panel for period of panel installation.

1.07 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal-faced composite wall panels to be performed according to manufacturer’s written instructions and warranty requirements.

B. Field Measurements: Verify locations of structural members and wall opening dimensions by field measurements before metal-faced composite wall panel fabrication and indicate measurements on Shop Drawings.
1.08 COORDINATION

A. Coordinate metal-faced composite wall panel assemblies with rain drainage work, flashing, trim, and construction of studs, soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.09 WARRANTY

A. Special Warranty: Manufacturer’s standard form in which manufacturer agrees to repair or replace components of metal-faced composite wall panel assemblies that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
   a. Structural failures, including rupturing, cracking, or puncturing.
   b. Deterioration of metals and other materials beyond normal weathering.

2. Warranty Period: Two years from date of Substantial Completion.

B. Special Warranty on Panel Finishes: Manufacturer’s standard form in which manufacturer agrees to repair finish or replace metal-faced composite wall panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
   a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
   b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
   c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 5 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 PANEL MATERIALS

A. Aluminum Sheet: Coil-coated sheet, ASTM B 209, alloy as standard with manufacturer, with temper as required to suit forming operations and structural performance required.

1. Surface: Smooth, flat finish.

2. Exposed Anodized Finishes:
   a. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

3. Concealed Finish: Apply pretreatment and manufacturer’s standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.
B. Panel Sealants:
   1. Joint Sealant: ASTM C 920; elastomeric polyurethane, polysulfide, or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal-faced composite wall panels and remain weathertight; and as recommended in writing by panel manufacturer.

2.02 MISCELLANEOUS METAL FRAMING

A. Miscellaneous Metal Framing, General: ASTM C 645, cold-formed metallic-coated steel sheet, ASTM A 653/A 653M, G40 hot-dip galvanized or coating with equivalent corrosion resistance unless otherwise indicated.

B. Subgirts: Manufacturer's standard C- or Z-shaped sections 0.064-inch nominal thickness.

C. Zee Clips: 0.079-inch nominal thickness.

D. Base or Sill Channels (drainage): 0.079-inch nominal thickness.

E. Hat-Shaped, Rigid Furring Channels:
   1. Nominal Thickness: As required to meet performance requirements.
   2. Depth: As indicated.

F. Cold-Rolled Furring Channels: Minimum 1/2-inch wide flange.
   1. Nominal Thickness: As required to meet performance requirements.
   2. Depth: As indicated.
   3. Furring Brackets: Adjustable, corrugated-edge type of steel sheet with nominal thickness of 0.040 inch.
   4. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch diameter wire, or double strand of 0.048-inch diameter wire.

G. Fasteners for Miscellaneous Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten miscellaneous metal framing members to substrates.

2.03 MISCELLANEOUS MATERIALS

A. Aluminum Extrusions: ASTM B 221, alloy and temper recommended by manufacturer for type of use and finish indicated.

B. Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads. Provide exposed fasteners with heads matching color of metal-faced composite wall panels by means of plastic caps or factory-applied coating. Provide EPDM, PVC, or neoprene sealing washers.
2.04 METAL-FACED COMPOSITE WALL PANELS

A. General: Provide factory-formed and -assembled, metal-faced composite wall panels fabricated from two metal facings bonded, using no glues or adhesives, to solid, extruded thermoplastic core; formed into profile for installation method indicated. Include attachment system components and accessories required for weathertight system.
   1. Fire-Retardant Core: Noncombustible, with the following surface-burning characteristics as determined by testing identical products per ASTM E 84 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
      a. Flame-Spread Index: 25 or less.
      b. Smoke-Developed Index: 450 or less.

   2. Basis of Design Products: Subject to compliance with requirements, provide “Alucobond” composite aluminum panels, by Alcan Composites, USA, Inc. www.alucobondusa.com or comparable products by:

B. Aluminum-Faced Composite Wall Panels: Formed with 0.020-inch-thick, anodized aluminum sheet facings.
   1. Panel Thickness: 0.236 inch.
   2. Core: Standard.

C. Attachment System Components: Formed from extruded aluminum or material compatible with panel facing.
   1. Include manufacturer’s standard perimeter extrusions with integral weather stripping, panel stiffeners, panel clips, and anchor channels.

2.05 ACCESSORIES

A. Wall Panel Accessories: Provide components required for a complete metal-faced composite wall panel assembly including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal-faced composite wall panels unless otherwise indicated.

B. Flashing and Trim: Formed from 0.018-inch- minimum thickness, zinc-coated (galvanized) steel sheet or aluminum-zinc alloy-coated steel sheet prepainted with coil coating. Provide flashing and trim as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, bases, drips, sills, jambs, corners, endwalls, framed openings, rakes, fasciae, parapet caps, soffits, reveals, and fillers. Finish flashing and trim with same finish system as adjacent metal-faced composite wall panels.
2.06 FABRICATION

A. General: Fabricate and finish metal-faced composite wall panels and accessories at the factory to greatest extent possible, by manufacturer’s standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

B. Fabricate metal-faced composite wall panels in a manner that eliminates condensation on interior side of panel and with joints between panels designed to form weathertight seals.

C. Metal-Faced Composite Wall Panels: Factory form panels in a continuous process with no glues or adhesives between dissimilar materials. Trim and square edges of sheets with no displacement of face sheets or protrusion of core material.
   1. Form panel lines, breaks, and angles to be sharp and true, with surfaces free from warp and buckle.
   2. Fabricate panels with sharply cut edges, with no displacement of face sheets or protrusion of core material.
   3. Fabricate panels with panel stiffeners, as required to comply with deflection limits, attached to back of panels with structural silicone sealant or bond tape.
   4. Dimensional Tolerances:
      a. Panel Bow: 0.8 percent maximum of panel length or width.
      b. Squareness: 0.25 inch maximum.

D. Sheet Metal Accessories: Fabricate flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.
   1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
   3. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
   4. Sealed Joints: Form non-expansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA standards.
   5. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
   6. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended by metal-faced composite wall panel manufacturer.
      a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal-faced composite wall panel manufacturer for application, but not less than thickness of metal being secured.

2.07 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal-faced composite wall panel supports, and other conditions affecting performance of the Work.

1. Examine wall framing to verify that girts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by metal-faced composite wall panel manufacturer.

2. Examine wall sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal-faced composite wall panel manufacturer.

3. Verify that weather-resistant sheathing paper has been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

B. Examine roughing-in for components and systems penetrating metal-faced composite wall panels to verify actual locations of penetrations relative to seam locations of panels before panel installation.

C. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Miscellaneous Framing: Install subgirts, base angles, sills, furring, and other miscellaneous wall panel support members and anchorage according to ASTM C 754 and metal-faced composite wall panel manufacturer's written instructions.
3.03 METAL-FACED COMPOSITE WALL PANEL INSTALLATION

A. General: Install metal-faced composite wall panels according to manufacturer’s written instructions in orientation, sizes, and locations indicated on Drawings. Install panels perpendicular to girts and subgirts unless otherwise indicated. Anchor panels and other components of the Work securely in place, with provisions for thermal and structural movement.
1. Commence metal-faced composite wall panel installation and install minimum of 300 sq. ft. in presence of factory-authorized representative.
2. Shim or otherwise plumb substrates receiving metal-faced composite wall panels.
3. Flash and seal metal-faced composite wall panels at perimeter of all openings. Do not begin installation until weather barrier and flashings that will be concealed by panels are installed.
4. Install flashing and trim as metal-faced composite wall panel work proceeds.
5. Apply elastomeric sealant continuously between metal base channel (sill angle) and concrete, and elsewhere as indicated or, if not indicated, as necessary for waterproofing.
6. Provide weathertight escutcheons for pipe and conduit penetrating exterior walls.

B. Fasteners:
1. Aluminum Wall Panels: Use aluminum or stainless-steel fasteners for surfaces exposed to the exterior and aluminum or galvanized-steel fasteners for surfaces exposed to the interior.

C. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action as recommended by metal-faced composite wall panel manufacturer.

D. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weathertight performance of metal-faced composite wall panel assemblies. Provide types of gaskets, fillers, and sealants indicated or, if not indicated, types recommended by panel manufacturer.
1. Prepare joints and apply sealants to comply with requirements in Division 07 Section "Joint Sealants."

E. Attachment System Installation, General: Install attachment system required to support metal-faced composite wall panels and to provide a complete weathertight wall system, including subgirts, perimeter extrusions, tracks, drainage channels, panel clips, and anchor channels.
1. Include attachment to supports, panel-to-panel joinery, panel-to-dissimilar-material joinery, and panel-system joint seals.
2. Do not begin installation until weather barrier and flashings that will be concealed by composite panels are installed.

F. Clip Installation: Attach panel clips to supports at each metal-faced composite wall panel joint at locations, spacings, and with fasteners recommended by manufacturer. Attach routed-and-returned flanges of wall panels to panel clips with manufacturer’s standard fasteners.
1. Seal horizontal and vertical joints between adjacent panels with sealant backing and sealant. Install sealant backing and sealant according to requirements specified in Division 07 Section "Joint Sealants."

G. Track-Support Installation: Provide manufacturer's standard horizontal and vertical tracks that provide support and complete secondary drainage system, draining to the exterior at horizontal joints. Install support system at locations, spacings, and with fasteners recommended by manufacturer. Attach panels to wall by interlocking tracks with perimeter extrusions attached to wall panels. Fully engage integral gaskets and leave horizontal and vertical joints with open reveal.
   1. Attach routed-and-returned flanges of wall panels to perimeter extrusions with manufacturer's standard fasteners.
   2. Install wall panels to allow individual panels to "free float" and be installed and removed without disturbing adjacent panels.
   3. Do not apply sealants to joints unless otherwise indicated on Drawings.

H. Subgirt-and-Spline Installation: Provide manufacturer's standard subgirts and splines that provide support and complete secondary drainage system, draining to the exterior at horizontal joints. Install support system at locations, spacings, and with fasteners recommended by manufacturer. Attach wall panels by interlocking perimeter extrusions attached to routed-and-returned flanges of wall panels with subgirts and splines. Fully engage integral subgirt-and-spline gaskets and leave horizontal and vertical joints with open reveal.
   1. Install wall panels to allow individual panels to "free float" and be installed and removed without disturbing adjacent panels.
   2. Do not apply sealants to joints unless otherwise indicated on Drawings.

3.04 ACCESSORY INSTALLATION

A. General: Install accessories with positive anchorage to building and weathertight mounting and provide for thermal expansion. Coordinate installation with flashings and other components.
   1. Install components required for a complete metal-faced composite wall panel assembly including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.

B. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.
   1. Install exposed flashing and trim that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance.
   2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of
intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

3.05 ERECTION TOLERANCES
A. Installation Tolerances: Shim and align metal-faced composite wall panel units within installed tolerance of 1/4 inch in 20 feet, non-accumulative, on level, plumb, and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.06 FIELD QUALITY CONTROL
A. Manufacturer’s Field Service: Engage a factory-authorized service representative to inspect, test, and adjust completed metal-faced composite wall panel installation, including accessories.
B. Metal-faced composite wall panels will be considered defective if they do not pass tests and inspections.
C. Additional tests and inspections, at Contractor’s expense, will be performed to determine compliance of replaced or additional work with specified requirements.
D. Prepare test and inspection reports.

3.07 CLEANING
A. Remove temporary protective coverings and strippable films, if any, as metal-faced composite wall panels are installed unless otherwise indicated in manufacturer’s written installation instructions. On completion of metal-faced composite wall panel installation, clean finished surfaces as recommended by panel manufacturer. Maintain in a clean condition during construction.
B. After metal-faced composite wall panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.
C. Replace metal-faced composite wall panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION
SECTION 07 53 23

ETHYLENE-PROPYLENE-DIENE-MONOMER (EPDM) ROOFING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Adhered EPDM membrane roofing system.
   2. Roof insulation.

B. Related Sections:
   1. Division 06 Section "Rough Carpentry" for preservative treated wood nailers, curbs, and blocking.
   2. Division 07 Section "Thermal Insulation" for insulation beneath the roof deck.
   3. Division 07 Section "Sheet Metal Flashing and Trim" for metal roof penetration flashings, flashings, and counter-flashings.
   4. Division 07 Section "Manufactured Roof Expansion Joints" for proprietary manufactured roof expansion-joint assemblies.
   5. Division 07 Section "Joint Sealants" for joint sealants, joint fillers, and joint preparation.

1.02 DEFINITIONS

A. Roofing Terminology: See ASTM D 1079 and glossary of NRCA’s "The NRCA Roofing and Waterproofing Manual" for definitions of terms related to roofing work in this Section.

1.03 PERFORMANCE REQUIREMENTS

A. General Performance: Installed membrane roofing and base flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Membrane roofing and base flashings shall remain watertight.

B. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by membrane roofing manufacturer based on testing and field experience.

C. Roofing System Design: Provide membrane roofing system that is identical to systems that have been successfully tested by a qualified testing and inspecting agency to resist uplift pressure calculated according to ASCE/SEI 7.
   1. Corner Uplift Pressure: 46.7 lbf/sq. ft.
   2. Perimeter Uplift Pressure: 73.3 lbf/sq. ft.
D. FM Approvals Listing: Provide membrane roofing, base flashings, and component materials that comply with requirements in FM Approvals 4450 and FM Approvals 4470 as part of a membrane roofing system, and that are listed in FM Approvals' "RoofNav" for Class 1 or noncombustible construction, as applicable. Identify materials with FM Approvals' markings.
   1. Fire/Windstorm Classification: Class 1A-90.
   2. Hail Resistance: SH.

E. Energy Performance: Provide roofing system with initial Solar Reflectance Index not less than 78 when calculated according to ASTM E 1980 based on testing identical products by a qualified testing agency.

F. Energy Performance: Provide roofing system that is listed on the DOE's ENERGY STAR "Roof Products Qualified Product List" for low-slope roof products.

1.04 SUBMITTALS

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

B. LEED Submittals:
   1. Product Test Reports for Credit SS 7.2: For roof materials, documentation indicating that roof materials comply with Solar Reflectance Index requirement.
   2. Product Data for Credit EQ 4.1: For adhesives and sealants, including printed statement of VOC content.

C. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other work.
   1. Base flashings and membrane terminations.
   2. Tapered insulation, including slopes.
   3. Roof plan showing orientation of steel roof deck and orientation of membrane roofing and fastening spacings and patterns for mechanically fastened membrane roofing.
   4. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.

D. Samples for Verification: For the following products, in manufacturer's standard sizes:
   1. Sheet roofing, of color specified, including T-shaped side and end lap seam.
   2. Roof insulation.
   3. Walkway pads or rolls.
   4. Termination bars.
   5. Battens.
   6. Six insulation fasteners of each type and finish.
   7. Six roof cover fasteners of each type and finish.

E. Qualification Data: For qualified Installer and manufacturer.

F. Manufacturer Certificate: Signed by roofing manufacturer certifying that membrane roofing system complies with requirements specified in "Performance Requirements" Article.
   1. Submit evidence of complying with performance requirements.
G. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for components of membrane roofing system.

H. Research/Evaluation Reports: For components of membrane roofing system, from the ICC-ES.

I. Field quality-control reports.

J. Maintenance Data: For membrane roofing system to include in maintenance manuals.

K. Warranties: Sample of special warranties.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is FM Approvals for membrane roofing system identical to that used for this Project.

B. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by membrane roofing system manufacturer to install manufacturer’s product and that is eligible to receive manufacturer’s special warranty.

C. Source Limitations: Obtain components including roof insulation and fasteners for membrane roofing system from same manufacturer as membrane roofing or approved by membrane roofing manufacturer.

D. Exterior Fire-Test Exposure: ASTM E 108, Class A; for application and roof slopes indicated, as determined by testing identical membrane roofing materials by a qualified testing agency. Materials shall be identified with appropriate markings of applicable testing agency.

E. Fire-Resistance Ratings: Where indicated, provide fire-resistance-rated roof assemblies identical to those of assemblies tested for fire resistance per ASTM E 119 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

F. Preliminary Roofing Conference: Before starting roof deck construction, conduct conference at Project site.
   1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
   2. Review methods and procedures related to roofing installation, including manufacturer’s written instructions.
   3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
   4. Review requirements for deck substrate conditions and finishes, including flatness and fastening.
   5. Review structural loading limitations of roof deck during and after roofing.
   6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.
7. Review governing regulations and requirements for insurance and certificates if applicable.
8. Review temporary protection requirements for roofing system during and after installation.
9. Review roof observation and repair procedures after roofing installation.

G. Preinstallation Roofing Conference: Conduct conference at Project site.
1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
5. Review structural loading limitations of roof deck during and after roofing.
6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.
7. Review governing regulations and requirements for insurance and certificates if applicable.
8. Review temporary protection requirements for roofing system during and after installation.
9. Review roof observation and repair procedures after roofing installation.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.

B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.
1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.

C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.

D. Handle and store roofing materials and place equipment in a manner to avoid permanent deflection of deck.
1.07 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

1.08 WARRANTY

A. Special Warranty: Manufacturer's standard customized form, without monetary limitation, in which manufacturer agrees to repair or replace components of membrane roofing system that fail in materials or workmanship within specified warranty period.

1. Special Warranty includes membrane roofing, base flashings, roof insulation, fasteners, cover boards, substrate board, roofing accessories, and other components of membrane roofing system.

2. Warranty Period: 20 years from date of Substantial Completion.

B. Special Project Warranty: Submit roofing Installer's warranty, on warranty form at end of this Section, signed by Installer, covering Work of this Section, including all components of membrane roofing system such as membrane roofing, base flashing, roof insulation, fasteners, cover boards, substrate boards, vapor retarders, roof pavers, and walkway products, for the following warranty period:

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

PART 2 - PRODUCTS

2.01 EPDM MEMBRANE ROOFING

A. EPDM: ASTM D 4637, Type I, non-reinforced, uniform, flexible EPDM sheet.

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

   a. Carlisle SynTec Incorporated: www.carlisle-syntec.com
   b. Firestone Building Products: www.firestonebpco.com
   c. Johns Manville: www.jm.com
   d. Versico Incorporated: www.versico.com

2. Thickness: 60 mils, nominal.


   a. Provide light gray coating at Classroom Addition.

2.02 AUXILIARY MEMBRANE ROOFING MATERIALS

A. General: Auxiliary membrane roofing materials recommended by roofing system manufacturer for intended use and compatible with membrane roofing.

1. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.
2. Adhesives and sealants that are not on the exterior side of weather barrier shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
   a. Plastic Foam Adhesives: 50 g/L.
   b. Gypsum Board and Panel Adhesives: 50 g/L.
   c. Multipurpose Construction Adhesives: 70 g/L.
   d. Fiberglass Adhesives: 80 g/L.
   e. Contact Adhesive: 80 g/L.
   f. Single-Ply Roof Membrane Sealants: 450 g/L.
   g. Nonmembrane Roof Sealants: 300 g/L.
   h. Sealant Primers for Nonporous Substrates: 250 g/L.
   i. Sealant Primers for Porous Substrates: 775 g/L.
   j. Other Adhesives and Sealants: 250 g/L.

B. Sheet Flashing: 60-mil-thick EPDM, partially cured or cured, according to application.

C. Protection Sheet: Epichlorohydrin or neoprene non-reinforced flexible sheet, 55- to 60-mil-thick, recommended by EPDM manufacturer for resistance to hydrocarbons, non-aromatic solvents, grease, and oil.

D. Bonding Adhesive: Manufacturer's standard, low V.O.C. solvent based or water-based, as recommended by the manufacturer.

E. Seaming Material: Manufacturer's standard, synthetic-rubber polymer primer and 6-inch-wide minimum, butyl splice tape with release film.

F. Lap Sealant: Manufacturer's standard, single-component sealant, colored to match membrane roofing.

G. Water Cutoff Mastic: Manufacturer's standard butyl mastic sealant.

H. Metal Termination Bars: Manufacturer's standard, predrilled stainless-steel or aluminum bars, approximately 1 by 1/8 inch thick; with anchors.

I. Metal Battens: Manufacturer's standard, aluminum-zinc-alloy-coated or zinc-coated steel sheet, approximately 1 inch wide by 0.05 inch thick, prepunched.

J. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening membrane to substrate, and acceptable to roofing system manufacturer.

K. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, reinforced EPDM securement strips, T-joint covers, in-seam sealants, termination reglets, cover strips, and other accessories.

2.03 SUBSTRATE BOARDS

A. Substrate Board: ASTM C 1177/C 1177M, glass-mat, water-resistant gypsum substrate, Type X, 5/8 inch thick.
1. Products: Subject to compliance with requirements, provide products that qualify for manufacturer's special warranty for roofing system.

B. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening substrate panel to roof deck.

2.04 ROOF INSULATION

A. General: Preformed roof insulation boards manufactured or approved by EPDM membrane roofing manufacturer, selected from manufacturer's standard sizes suitable for application, of thicknesses indicated and that produce FM Approvals-approved roof insulation. Provide products that qualify for manufacturer's special warranty for roofing system.

1. Insulation thickness to provide R-Value of R-35 average.

B. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, Class 1, Grade 2, felt or glass-fiber mat facer on both major surfaces.

C. Tapered Insulation: Provide factory-tapered insulation boards fabricated to slope of 1/4 inch per 12 inches unless otherwise indicated.

1. Slope crickets at 1/2-inch per foot minimum.

D. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.

2.05 INSULATION ACCESSORIES

A. General: Furnish roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with membrane roofing.

B. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roof insulation and cover boards to substrate, and acceptable to roofing system manufacturer.

C. For Non-Nailable Concrete Deck and Canopies with Exposed undersides: Full-Spread Applied Insulation Adhesive: Insulation manufacturer's recommended spray-applied, low-rise, two-component urethane adhesive formulated to attach roof insulation to substrate or to another insulation layer.

D. For Metal Deck and Canopies with Concealed undersides: Mechanically Fastened and Adhered Insulation: Insulation manufacturer's recommended mechanical fasteners specifically designed and sized for fastening first-layer specified board-type roof insulation to deck type, and full spread insulation adhesive for subsequent layers.

E. Cover Board: ASTM C 1177/C 1177M, glass-mat, water-resistant gypsum substrate, 1/4 inch thick, factory primed.

1. Products: Subject to compliance with requirements, provide products that qualify for manufacturer's special warranty for roofing system.

a. Georgia-Pacific Corporation; Dens Deck Prime.
2.06 ASPHALT MATERIALS

A. Asphalt Primer: ASTM D 41.

2.07 WALKWAYS

A. Flexible Walkways: Factory-formed, non-porous, heavy-duty, solid-rubber, slip-resisting, surface-textured walkway pads or rolls, approximately 3/16 inch thick, and acceptable to membrane roofing system manufacturer.

1. Provide manufacturer’s standard size, 24- by 24-inch minimum.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with the following requirements and other conditions affecting performance of roofing system:

1. Verify that roof openings and penetrations are in place and curbs are set and braced and that roof drain bodies are securely clamped in place.
2. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
3. Verify that surface plane flatness and fastening of steel roof deck complies with requirements in Division 05 Section "Steel Decking."
4. Verify that minimum concrete drying period recommended by roofing system manufacturer has passed.
5. Verify that concrete substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
6. Verify that concrete curing compounds that will impair adhesion of roofing components to roof deck have been removed.

B. Proceed with installation only after unsatisfactory conditions have been corrected.
3.02 PREPARATION

A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer’s written instructions. Remove sharp projections.

B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.

C. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at the end of the workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.

D. Install acoustical roof deck rib insulation strips, specified in Division 05 Section "Steel Decking," according to acoustical roof deck manufacturer’s written instructions, immediately before installation of overlying construction and to remain dry.

3.03 SUBSTRATE BOARD

A. Install substrate board with long joints in continuous straight lines, perpendicular to roof slopes with end joints staggered between rows. Tightly butt substrate boards together.
   1. Fasten substrate board to top flanges of steel deck according to recommendations in FM Approvals' "RoofNav" and FM Global Loss Prevention Data Sheet 1-29 for specified Windstorm Resistance Classification.
   2. Fasten substrate board to top flanges of steel deck to resist uplift pressure at corners, perimeter, and field of roof according to membrane roofing system manufacturers' written instructions.

3.04 INSULATION INSTALLATION

A. Coordinate installing membrane roofing system components so insulation is not exposed to precipitation or left exposed at the end of the workday.

B. Comply with membrane roofing system and insulation manufacturer’s written instructions for installing roof insulation.

C. Install tapered insulation under area of roofing to conform to slopes indicated.

D. Install insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 2.7 inches or greater, install two or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches in each direction.
   1. Where installing composite and noncomposite insulation in two or more layers, install noncomposite board insulation for bottom layer and intermediate layers, if applicable, and install composite board insulation for top layer.

E. Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.
F. Install insulation with long joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch with insulation.
   1. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.

G. For Non-Nailable Concrete Deck: Full-Spread Applied Insulation Adhesive: Insulation manufacturer's recommended spray-applied, low-rise, two-component urethane adhesive formulated to attach roof insulation to substrate or to another insulation layer.

H. For Metal Deck and Canopy: Mechanically Fastened and Adhered Insulation: Install first layer of insulation to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.
   1. Fasten first layer of insulation according to requirements in FM Approvals' "RoofNav" for specified Windstorm Resistance Classification.
   2. Fasten first layer of insulation to resist uplift pressure at corners, perimeter, and field of roof.
   3. Set each subsequent layer of insulation in a uniform coverage of full-spread insulation adhesive, firmly pressing and maintaining insulation in place.

I. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of 6 inches in each direction. Loosely butt cover boards together and fasten to roof deck.
   1. Fasten cover boards according to requirements in FM Approvals' "RoofNav" for specified Windstorm Resistance Classification.

3.05 ADHERED MEMBRANE ROOFING INSTALLATION

A. Adhere membrane roofing over area to receive roofing according to membrane roofing system manufacturer's written instructions. Unroll membrane roofing and allow to relax before installing. Comply with SPR RP-4 System 3.

B. Start installation of membrane roofing in presence of membrane roofing system manufacturer's technical personnel.

C. Accurately align membrane roofing and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.

D. Bonding Adhesive: Apply to substrate and underside of membrane roofing at rate required by manufacturer and allow to partially dry before installing membrane roofing. Do not apply to splice area of membrane roofing.

E. In addition to adhering, mechanically fasten membrane roofing securely at terminations, penetrations, and perimeters.

F. Apply membrane roofing with side laps shingled with slope of roof deck where possible.
G. Adhesive Seam Installation: Clean both faces of splice areas, apply splicing cement, and firmly roll side and end laps of overlapping membrane roofing according to manufacturer's written instructions to ensure a watertight seam installation. Apply lap sealant and seal exposed edges of membrane roofing terminations.
   1. Apply a continuous bead of in-seam sealant before closing splice if required by membrane roofing system manufacturer.

H. Repair tears, voids, and lapped seams in roofing that does not comply with requirements.

I. Spread sealant or mastic bed over deck drain flange at roof drains and securely seal membrane roofing in place with clamping ring.

J. Install membrane roofing and auxiliary materials to tie in to existing membrane roofing to maintain weather-tightness of transition and to not void warranty for existing membrane roofing system.

K. Adhere protection sheet over membrane roofing at locations indicated.

3.06 BASE FLASHING INSTALLATION

A. Install sheet flashings and preformed flashing accessories and adhere to substrates according to membrane roofing system manufacturer's written instructions.

B. Apply bonding adhesive to substrate and underside of sheet flashing at required rate and allow to partially dry. Do not apply to seam area of flashing.

C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.

D. Clean splice areas, apply splicing cement, and firmly roll side and end laps of overlapping sheets to ensure a watertight seam installation. Apply lap sealant and seal exposed edges of sheet flashing terminations.

E. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

3.07 WALKWAY INSTALLATION

A. Flexible Walkways: Install walkway products in locations indicated. Adhere walkway products to substrate with compatible adhesive according to roofing system manufacturer's written instructions.

3.08 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing agency to perform inspections.
B. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion.

C. Repair or remove and replace components of membrane roofing system where inspections indicate that they do not comply with specified requirements.

D. Additional inspections, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.09 PROTECTING AND CLEANING

A. Protect membrane roofing system from damage and wear during remainder of construction period. When remaining construction will not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.

B. Correct deficiencies in or remove membrane roofing system that does not comply with requirements, repair substrates and repair or reinstall membrane roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION
SECTION 07 62 00

SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Manufactured Products:
      a. Manufactured reglets and counterflashing.
      b. Counterflashing wind-restraint clips.
   2. Formed Products:
      a. Formed roof drainage sheet metal fabrications.
      b. Formed low-slope roof sheet metal fabrications.
      c. Formed wall sheet metal fabrications.
      d. Formed equipment support flashing.

B. Related Sections:
   1. Division 06 Section "Rough Carpentry" for wood nailers, curbs, and blocking.
   2. Division 07 Section "Ethylene-Propylene-Diene-Monomer (EPDM) Roofing" for installing sheet metal flashing and trim integral with membrane roofing.
   3. Division 07 Section "Composite Metal Panels" for sheet metal flashing and trim integral with metal wall panels.
   4. Division 07 Section "Roof Accessories" for set-on-type curbs, equipment supports, roof hatches, vents, and other manufactured roof accessory units.
   5. Division 07 Section "Expansion Control" for manufactured sheet metal expansion-joint covers.

1.02 PERFORMANCE REQUIREMENTS

A. General: Sheet metal flashing and trim assemblies as indicated shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.

B. Fabricate and install roof edge flashing and copings capable of resisting the following forces according to recommendations in FMG Loss Prevention Data Sheet 1-49:
   1. Wind Zone 2: For velocity pressures of 31 to 45 lbf/sq. ft.: 90-lbf/sq. ft. perimeter uplift force, 120-lbf/sq. ft. corner uplift force, and 45-lbf/sq. ft. outward force.
   2. Match requirements for adjacent roofing/flashing.

C. Thermal Movements: Provide sheet metal flashing and trim that allows for thermal movements from ambient and surface temperature changes.
   1. Temperature Change (Range): 120 deg F, ambient; 180 deg F material surfaces.
1.03 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.

B. Shop Drawings: Show fabrication and installation layouts of sheet metal flashing and trim, including plans, elevations, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled work. Include the following:
1. Identification of material, thickness, weight, and finish for each item and location in Project.
2. Details for forming sheet metal flashing and trim, including profiles, shapes, seams, and dimensions.
3. Details for joining, supporting, and securing sheet metal flashing and trim, including layout of fasteners, cleats, clips, and other attachments. Include pattern of seams.
4. Details of termination points and assemblies, including fixed points.
5. Details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction.
6. Details of edge conditions, including eaves, ridges, valleys, rakes, crickets, and counterflashings as applicable.
7. Details of special conditions.
8. Details of connections to adjoining work.
9. Detail formed flashing and trim at a scale of not less than 1-1/2 inches per 12 inches.

C. Samples for Initial Selection: For each type of sheet metal flashing, trim, and accessory indicated with factory-applied color finishes involving color selection.

D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below:
1. Sheet Metal Flashing: 12 inches long by actual width of unit, including finished seam and in required profile. Include fasteners, cleats, clips, closures, and other attachments.
2. Trim, Metal Closures, Expansion Joints, Joint Intersections, and Miscellaneous Fabrications: 12 inches long and in required profile. Include fasteners and other exposed accessories.
3. Accessories and Miscellaneous Materials: Full-size Sample.

E. Qualification Data: For qualified fabricator.

F. Maintenance Data: For sheet metal flashing, trim, and accessories to include in maintenance manuals.

G. Warranty: Sample of special warranty.

1.04 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.
B. Sheet Metal Flashing and Trim Standard: Comply with SMACNA’s "Architectural Sheet Metal Manual" unless more stringent requirements are specified or shown on Drawings.

C. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
   1. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
   2. Following review and approval by Architect, approved mockups may become part of the completed Work.

D. Preinstallation Conference: Conduct conference at Project site.
   1. Meet with Owner, Architect, Owner’s insurer if applicable, Installer, and installers whose work interfaces with or affects sheet metal flashing and trim including installers of roofing materials, roof accessories, unit skylights, and roof-mounted equipment.
   2. Review methods and procedures related to sheet metal flashing and trim.
   3. Examine substrate conditions for compliance with requirements, including flatness and attachment to structural members.
   4. Review special roof details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect sheet metal flashing.
   5. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.

B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to the extent necessary for the period of sheet metal flashing and trim installation.

1.06 WARRANTY

A. Special Warranty on Finishes: Manufacturer’s standard form in which manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.
   1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
      a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
      b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
      c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
   2. Finish Warranty Period: 5 years from date of Substantial Completion.
PART 2 - PRODUCTS

2.01 SHEET METALS

A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying a strippable, temporary protective film before shipping.

B. Metallic-Coated Steel Sheet: Restricted flatness steel sheet, metallic coated by the hot-dip process and prepainted by the coil-coating process to comply with ASTM A 755/A 755M.
   1. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 coating designation; structural quality.
   2. Surface: Smooth, flat.
   3. Exposed Coil-Coated Finish:
      a. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
   4. Color: "Sierra Tan" or as selected by Architect from manufacturer's full range, at all exposed flashing and termination bars at roofing levels two and three.
   5. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.

C. Stainless-Steel Sheet: ASTM A 240/A 240M or ASTM A 666, Type 304, dead soft, fully annealed.
   1. Finish: 2D (dull, cold rolled).
   2. Surface: Smooth, flat.

2.02 UNDERLAYMENT MATERIALS

A. Self-Adhering, High-Temperature Sheet: Minimum 30 to 40 mils thick, consisting of slip-resisting polyethylene-film top surface laminated to layer of butyl or SBS-modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.
   2. Low-Temperature Flexibility: ASTM D 1970; passes after testing at minus 20 deg F.
   3. Products: Subject to compliance with requirements, provide “Ice & Water Shield” as manufactured by Grace Construction Products: www.graceconstructionproducts.com.

B. Slip Sheet: Building paper, 3-lb/100 sq. ft. minimum, rosin sized.

2.03 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.
B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.
   1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
      a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating.
      b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.

2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
3. Fasteners for Zinc-Coated (Galvanized) Steel Sheet: Hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329 or Series 300 stainless steel.

C. Solder:
   1. For Zinc-Coated (Galvanized) Steel: ASTM B 32, Grade Sn50, 50 percent tin and 50 percent lead or Grade Sn60, 60 percent tin and 40 percent lead.

D. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.

E. Elastomeric Sealant: ASTM C 920, elastomeric polymer sealant; low modulus; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

F. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.

G. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187.


2.04 MANUFACTURED SHEET METAL FLASHING AND TRIM

A. Reglets: Units of type, material, and profile indicated, formed to provide secure interlocking of separate reglet and counterflashing pieces, and compatible with flashing indicated with factory-mitered and -welded corners and junctions.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

2. Material: Galvanized steel, 0.022 inch thick.
3. Surface-Mounted Type: Provide with slotted holes for fastening to substrate, with neoprene or other suitable weatherproofing washers, and with channel for sealant at top edge.

4. Stucco Type: Provide with upturned fastening flange and extension leg of length to match thickness of applied finish materials.

5. Concrete Type: Provide temporary closure tape to keep reglet free of concrete materials, special fasteners for attaching reglet to concrete forms, and guides to ensure alignment of reglet section ends.

6. Masonry Type: Provide with offset top flange for embedment in masonry mortar joint.

7. Accessories:
   a. Flexible-Flashing Retainer: Provide resilient plastic or rubber accessory to secure flexible flashing in reglet where clearance does not permit use of standard metal counterflashing or where Drawings show reglet without metal counterflashing.
   b. Counterflashing Wind-Restraint Clips: Provide clips to be installed before counterflashing to prevent wind uplift of counterflashing lower edge.

8. Finish: Manufacturer’s standard color coating, at roof levels two and three.
   a. Color: “Sierra Tan” or as selected by Architect from manufacturer’s full range.

2.05 FABRICATION, GENERAL

A. General: Custom fabricate sheet metal flashing and trim to comply with recommendations in SMACNA’s "Architectural Sheet Metal Manual" that apply to design, dimensions, geometry, metal thickness, and other characteristics of item indicated. Fabricate items at the shop to greatest extent possible.

1. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.

2. Obtain field measurements for accurate fit before shop fabrication.

3. Form sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.

4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces exposed to view.

B. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet on slope and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

C. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant.

D. Expansion Provisions: Where lapped expansion provisions cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.

E. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.
F. Fabricate cleats and attachment devices of sizes as recommended by SMACNA's "Architectural Sheet Metal Manual" and by FMG Loss Prevention Data Sheet 1-49 for application, but not less than thickness of metal being secured.

G. Seams: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use. Rivet joints where necessary for strength.

H. Do not use graphite pencils to mark metal surfaces.

2.06 ROOF DRAINAGE SHEET METAL FABRICATIONS

A. Downspouts: Fabricate open-face downspouts complete with mitered elbows. Furnish with metal hangers, from same material as downspouts, and anchors.
   1. Hanger Style: "U" shape.
   2. Fabricate from the following materials:
      a. Galvanized Steel: 0.022 inch thick.

B. Parapet Scuppers: Fabricate scuppers of dimensions required with closure flange trim to exterior, 4-inch- wide wall flanges to interior, and base extending 4 inches beyond cant or tapered strip into field of roof. Fasten gravel guard angles to base of scupper. Fabricate from the following materials:
   1. Galvanized Steel: 0.028 inch thick.

C. Conductor Heads: Fabricate conductor heads with flanged back and stiffened top edge and of dimensions and shape indicated complete with outlet tubes, exterior flange trim, and built-in overflows. Fabricate from the following materials:
   1. Galvanized Steel: 0.028 inch thick.

D. Splash Pans: Fabricate from the following materials:
   1. Zinc-Tin Alloy-Coated Stainless Steel: 0.018 inch thick.

2.07 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

A. Roof-Edge Flashing (Gravel Stop): Fabricate in minimum 96-inch- long, but not exceeding 10-foot- long, sections. Furnish with 6-inch- wide, joint cover plates.
   2. Fabricate with scuppers spaced as indicated on the drawings, of dimensions required with 4-inch- wide flanges and base extending 4 inches beyond cant or tapered strip into field of roof. Fasten gravel guard angles to base of scupper.
   3. Fabricate from the following materials:
      a. Galvanized Steel: 0.028 inch (22 ga.) thick.

B. Copings: Fabricate in minimum 96-inch- long, but not exceeding 10-foot- long, sections. Fabricate joint plates of same thickness as copings. Furnish with continuous cleats to support edge of external leg and drill elongated holes for fasteners on interior leg. Miter corners, seal, and solder or weld watertight.
   1. Coping Profile: As indicated on the drawings or SMACNA equal.
3. Fabricate from the following materials:
   a. Galvanized Steel: 0.040 inch thick.

C. Roof and Roof to Wall Transition, Roof to Roof Edge Flashing (Gravel Stop) Transition Expansion-Joint Cover: Fabricate from the following materials:
   1. Galvanized Steel: 0.034 inch thick.

D. Base Flashing: Fabricate from the following materials:
   1. Aluminum-Zinc Alloy-Coated Steel: 0.028 inch thick.

E. Counterflashing: Fabricate from the following materials:
   1. Galvanized Steel: 0.022 inch thick.

F. Flashing Receivers: Fabricate from the following materials:
   1. Galvanized Steel: 0.022 inch thick.

G. Roof-Penetration Flashing: Fabricate from the following materials:
   1. Galvanized Steel: 0.028 inch thick.

H. Roof-Drain Flashing: Fabricate from the following materials:
   1. Stainless Steel: 0.016 inch thick.

2.08 WALL SHEET METAL FABRICATIONS

A. Wall Expansion-Joint Cover: Fabricate from the following materials:
   1. Galvanized Steel: 0.028 inch thick.

2.09 MISCELLANEOUS SHEET METAL FABRICATIONS

A. Equipment Support Flashing: Fabricate from the following materials:
   1. Galvanized Steel: 0.028 inch thick.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions and other conditions affecting performance of the Work.
   1. Verify compliance with requirements for installation tolerances of substrates.
   2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.

B. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

C. Proceed with installation only after unsatisfactory conditions have been corrected.
3.02 UNDERLAYMENT INSTALLATION

A. General: Install underlayment as indicated on Drawings.

B. Polyethylene Sheet: Install polyethylene sheet with adhesive for anchorage to minimize use of mechanical fasteners under sheet metal flashing and trim. Apply in shingle fashion to shed water, with lapped and taped joints of not less than 2 inches.

C. Felt Underlayment: Install felt underlayment with adhesive for temporary anchorage to minimize use of mechanical fasteners under sheet metal flashing and trim. Apply in shingle fashion to shed water, with lapped joints of not less than 2 inches.

D. Self-Adhering Sheet Underlayment: Install self-adhering sheet underlayment, wrinkle free. Apply primer if required by underlayment manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation; use primer rather than nails for installing underlayment at low temperatures. Apply in shingle fashion to shed water, with end laps of not less than 6 inches staggered 24 inches between courses. Overlap side edges not less than 3-1/2 inches. Roll laps with roller. Cover underlayment within 14 days.

3.03 INSTALLATION, GENERAL

A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.

1. Install sheet metal flashing and trim true to line and levels indicated. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.

2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.

3. Space cleats not more than 12 inches apart. Anchor each cleat with two fasteners. Bend tabs over fasteners.

4. Install exposed sheet metal flashing and trim without excessive oil canning, buckling, and tool marks.

5. Install sealant tape where indicated.

6. Torch cutting of sheet metal flashing and trim is not permitted.

7. Do not use graphite pencils to mark metal surfaces.

B. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by SMACNA.

1. Coat back side of uncoated aluminum and stainless-steel sheet metal flashing and trim with bituminous coating where flashing and trim will contact wood, ferrous metal, or cementitious construction.

2. Underlayment: Where installing metal flashing directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet or install a course of polyethylene sheet.
C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently watertight, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.

D. Fastener Sizes: Use fasteners of sizes that will penetrate metal decking not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.
1. Exposed heads of all fasteners shall all be coated in sealant.

E. Seal joints as shown and as required for watertight construction.
1. Where sealant-filled joints are used, embed hooked flanges of joint members not less than 1 inch into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is moderate, between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F.
2. Prepare joints and apply sealants to comply with requirements in Division 07 Section "Joint Sealants."

F. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets to be soldered to a width of 1-1/2 inches, except reduce pre-tinning where pre-tinned surface would show in completed Work.
1. Do not solder metallic-coated steel sheet.
2. Do not use torches for soldering. Heat surfaces to receive solder and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.
3. Stainless-Steel Soldering: Tin edges of uncoated sheets using solder recommended for stainless steel and acid flux. Promptly remove acid flux residue from metal after tinning and soldering. Comply with solder manufacturer’s recommended methods for cleaning and neutralization.

G. Rivets: Rivet joints where indicated and where necessary for strength.

3.04 ROOF DRAINAGE SYSTEM INSTALLATION

A. General: Install sheet metal roof drainage items to produce complete roof drainage system according to SMACNA recommendations and as indicated. Coordinate installation of roof perimeter flashing with installation of roof drainage system.

B. Downspouts: Join sections with 1-1/2-inch telescoping joints.
1. Provide hangers with fasteners designed to hold downspouts securely to walls. Locate hangers at top and bottom and at approximately 60 inches o.c. in between.
2. Provide elbows at base of downspout to direct water away from building.
3. Connect downspouts to underground drainage system indicated.

D. Parapet Scuppers: Install scuppers where indicated through parapet. Continuously support scupper, set to correct elevation, and seal flanges to interior wall face, over cants or tapered edge strips, and under roofing membrane.
   1. Anchor scupper closure trim flange to exterior wall and solder or seal with elastomeric sealant to scupper.
   2. Loosely lock front edge of scupper with conductor head.
   3. Solder or seal with elastomeric sealant exterior wall scupper flanges into back of conductor head.

E. Conductor Heads: Anchor securely to wall with elevation of conductor head rim 1 inch below scupper discharge.

F. Expansion-Joint Covers: Install expansion-joint covers at locations and of configuration indicated. Lap joints a minimum of 4 inches in direction of water flow.

3.05 ROOF FLASHING INSTALLATION

A. General: Install sheet metal flashing and trim to comply with performance requirements, sheet metal manufacturer’s written installation instructions, and SMACNA’s "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, set units true to line, and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

B. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations in FMG Loss Prevention Data Sheet 1-49 for specified wind zone and as indicated. Interlock bottom edge of roof edge flashing with continuous cleat anchored to substrate at 16-inch centers.

C. Copings: Anchor to resist uplift and outward forces according to recommendations in FMG Loss Prevention Data Sheet 1-49 for specified wind zone and as indicated.
   1. Interlock exterior bottom edge of coping with continuous cleat anchored to substrate at 16-inch centers.
   2. Anchor interior leg of coping with screw fasteners and washers at 20-inch centers.

D. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending a minimum of 4 inches over base flashing. Install stainless-steel draw band and tighten.

E. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches over base flashing. Lap counterflashing joints a minimum of 4 inches and bed with sealant. Secure in a waterproof manner by means of anchor and washer at 36-inch centers.

F. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with elastomeric sealant and clamp flashing to pipes that penetrate roof.
3.06 WALL FLASHING INSTALLATION

A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to SMACNA recommendations and as indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.

3.07 MISCELLANEOUS FLASHING INSTALLATION

A. Equipment Support Flashing: Coordinate installation of equipment support flashing with installation of roofing and equipment. Weld or seal flashing with elastomeric sealant to equipment support member.

3.08 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet on slope and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

B. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerances specified in MCA's "Guide Specification for Residential Metal Roofing."

3.09 CLEANING AND PROTECTION

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean and neutralize flux materials. Clean off excess solder.

C. Clean off excess sealants.

D. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of installation, remove unused materials and clean finished surfaces. Maintain in a clean condition during construction.

E. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes the following:
   1. Metal-flanged, bellows-type roof expansion assemblies.
   2. Aluminum roof expansion assemblies.

B. Related Sections include the following:
   1. Division 06 Section "Rough Carpentry" for wooden curbs for mounting roof expansion assemblies.
   2. Division 07 Section "Ethylene-Propylene-Diene-Monomer (EPDM) Roofing."
   3. Division 07 Section "Sheet Metal Flashing and Trim" for shop- and field-fabricated sheet metal expansion-joint systems, flashing, and other sheet metal items.
   4. Division 07 Section "Roof Accessories" for other manufactured roof items.
   5. Division 07 Section "Fire-Resistive Joint Systems" for fire-resistive joint systems in construction other than roofs.

1.02 PERFORMANCE REQUIREMENTS

A. General: Provide roof expansion assemblies that, when installed, remain watertight within movement limitations specified by manufacturer.

1.03 SUBMITTALS

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

B. Shop Drawings: Include plans, elevations, sections, details, joints, splices, locations of joints and splices, intersections, transitions, fittings, and attachments to other work. Where joint assemblies change planes, provide isometric drawings depicting how components interconnect to achieve continuity.

C. Research/Evaluation Reports: For roof expansion assemblies.

D. Warranties: Special warranties specified in this Section.

E. Qualification Data: For Installer.

1.04 QUALITY ASSURANCE


B. Source Limitations: Obtain metal-flanged, bellows-type roof expansion assemblies approved by roofing membrane manufacturer and that are part of roofing membrane warranty.
C. Product Options: Drawings indicate size, profiles, and dimensional requirements of roof expansion assemblies and are based on the specific system indicated. Refer to Division 01 Section "Product Requirements."
   1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

D. Fire-Test-Response Characteristics: Provide fire-barrier assemblies with fire-test-response characteristics not less than that of adjacent construction, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Assemblies shall be capable of anticipated movement while maintaining fire rating. Identify assemblies with appropriate markings of applicable testing and inspecting agency.

1.05 DELIVERY, STORAGE AND HANDLING

A. Exercise proper care in the handling of all work so as not to injure the finished surface, and take proper precautions to protect the work from damage after it is in place.

B. Deliver materials to the job site ready for use, and fabricated in as large sections and assemblies as practical. Assemblies shall be identical to submitted and reviewed shop drawings, samples and certificates.

C. Store materials under cover in a dry and clean location off the ground. Remove materials that are damaged or otherwise not suitable for installation from the job site and replace with acceptable materials at no additional cost.

1.06 PROJECT CONDITIONS

A. Where necessary, check actual locations of walls and other construction to which work must fit, by accurate field measurements before fabrication. Show recorded measurements on final shop drawings and coordinate fabrication schedule with construction progress to avoid delay of work.

1.07 SCHEDULING

A. Coordinate delivery and installation of roof expansion assemblies to prevent damage and provide timely integration of units with roofing membranes and flashing.

1.08 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer and Installer agree to repair or replace roof expansion assemblies that leak, deteriorate in excess of rates specified in manufacturer's published product literature, or otherwise fail to perform within specified warranty period.
   1. Warranty Period: Two years from date of Substantial Completion.
PART 2 - PRODUCTS

2.01 MATERIALS

A. Aluminum: ASTM B221, alloy 6063-T5 for extrusions; ASTM B209, alloy 6061-T6 for sheet and plate.
   1. Protect aluminum surfaces in contact with cementitious materials with heavy metal free high solids primer or chromate conversion coating.

B. Stainless Steel: ASTM A167, Type 304 with 2B finish, unless indicated otherwise, for plates, sheets and strips.

C. Extruded Preformed Seals – Single or multi-layered rubber extrusions as classified under ASTM D2000, designed with or without continuous, longitudinal, internal baffles and formed to fit compatible frames, in color indicated or if not indicated, as selected by architect from manufacturer’s standard colors.

D. Exterior Seals: Typically two single layered flexible extrusions, one interior PVC and one exterior Santoprene 8000 series non-hydroscopic, thermoplastic rubber, as classified under ASTM D2000, retained in a set of compatible frames, in color indicated or if not indicated, as selected by architect from manufacturer’s standard colors.

E. Fire Barriers: Designed for indicated or required dynamic structural movement without material degradation or fatigue in accordance with ASTM E1966. Tested in maximum joint width condition as a component of an expansion joint cover in accordance with UL 2079 including hose stream testing of wall assemblies at full-rated period by Underwriters Laboratories Inc.

F. Accessories: Manufacturer’s standard anchors, fasteners, set screws, spacers, flexible vapor seals and filler materials, drain tubes, adhesives, and other accessories compatible with material in contact, as indicated or required for complete installations.

2.02 BELLOWS-TYPE ROOF EXPANSION ASSEMBLIES

A. Metal-Flanged, Bellows-Type Roof Expansion Assemblies: Provide manufacturer’s standard assemblies of sizes and types indicated, with prefabricated units for corner and joint intersections and horizontal and vertical transitions including those to other building expansion joints, splicing units, adhesives, coatings, and other components as recommended by roof expansion assembly manufacturer for complete installation. Fabricate assemblies specifically for roof-to-roof, roof-to-wall, and curb-to-wall applications.

B. Provide assemblies consisting of exposed polymeric sheet over foam bellows, securely anchored at both edges to 3- to 4-inch- wide sheet metal nailing flanges, either flat or angle formed to fit cant or curbs as required. Insulate bellows with closed-cell, flexible rubber or plastic foam not less than 5/16 inch thick; adhere bellows to underside of polymeric sheet.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide “BRJ” and “BRJW” as manufactured by Construction Specialties Inc. (C/S Group), www.c-sgroup.com, or approved equal product by one of the following:
b. Balco Metalines, a division of Balco, Inc. [www.balcousa.com].
c. Johns Manville: [www.specjm.com].
d. JointMaster, a division of InPro Corporation: [www.inprocorp.com].
e. MM Systems Corporation: [www.mmsystemscorp.com].
f. Watson Bowman Acme Corp. [www.wbacorp.com].

2. Polymeric Sheet: EPDM, 60 mils thick, white.
3. Metal Flanges: Galvanized Steel or Stainless steel, minimum 0.015 inch thick or Sheet aluminum, minimum 0.032 inch thick, mill finish.
4. Moisture Barrier: Manufacturer's standard, flexible, continuous, polymeric moisture barrier looped under roof expansion assemblies at locations indicated. Fill space with blanket-type, mineral-fiber insulation.
5. Movement: 4-way movement.
6. Fire Barrier: Provide manufacturer's standard fire barrier- 1 HR minimum.

PART 3 - EXECUTION

3.01 PREPARATION

A. Verify all measurements and dimensions at the job site and cooperate in the coordination and scheduling of the work of this section with the work of related trades, with particular attention given to the installation of items embedded in concrete and masonry so as not to delay job progress.

B. Provide all templates as required to related trade for location of all support and anchorage items.

3.02 INSTALLATION

A. Comply with manufacturer's written instructions for handling and installing roof expansion assemblies and materials unless more stringent requirements are indicated.

B. Coordinate installation of roof expansion assembly materials and associated work so complete assemblies comply with assembly performance requirements.

C. Provide anchorage devices and fasteners where necessary for securing expansion joint cover assemblies to in-place construction, including threaded fasteners with drilled-in fasteners for masonry and concrete where anchoring members are not embedded in concrete. Provide fasteners of metal, type and size to suit type of construction indicated and provide for secure attachment of expansion joint cover assemblies.

D. Install fire barriers to provide continuous, uninterrupted fire resistance throughout length of roof expansion assembly, including transitions and end joints.
E. Extend roof expansion assemblies over curbs, and other elements in the construction profile, with factory-fabricated intersections and transitions to provide continuous, uninterrupted, waterproof roof expansion assemblies.
   1. Install factory-fabricated transitions between roof expansion assemblies and building architectural joint systems, specified in Division 07 Section "Expansion Control," to provide continuous, uninterrupted, watertight construction.

F. Splice roof expansion assemblies with materials provided by roof expansion assembly manufacturer for this purpose, according to manufacturer’s written instructions, to provide continuous, uninterrupted, waterproof roof expansion assemblies.

G. Provide uniform profile of roof expansion assembly throughout length of each installation; do not stretch polymeric sheets.

H. Install mineral-fiber blanket insulation to fill joint space within joint and moisture barrier.

I. On single-ply roofing, install roof expansion assemblies complying with manufacturer's written instructions. Anchor to cants or curbs and seal to membrane with sealant compatible with roofing membrane and roof expansion assembly. Cover flanges with stripping or flashing and install according to requirements in Division 07 Section "Ethylene-Propylene-Diene-Monomer (EPDM) Roofing."

3.03 PROTECTION

A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensures that roof expansion assemblies are without damage or deterioration at time of Substantial Completion.

END OF SECTION
SECTION 07 72 00

ROOF ACCESSORIES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Roof hatches (replacement for existing opening).

B. Related Sections:
   1. Division 05 Section "Metal Fabrications" for metal vertical ladders, ships' ladders, and
      stairs for access to roof hatches.
   2. Division 07 Section “Ethylene-Propylene-Diene-Monomer (EPDM) Roofing” for roofing
      accessories.
   3. Division 07 Section "Sheet Metal Flashing and Trim" for shop- and field-formed metal
      flashing, roof-drainage systems, roof expansion-joint covers, and miscellaneous sheet
      metal trim and accessories.
   4. Division 07 Section "Manufactured Roof Expansion Joints" for manufactured roof
      expansion-joint covers.
   5. Division 09 Section "Painting" for field painted finishes

1.02 PERFORMANCE REQUIREMENTS

A. General Performance: Roof accessories shall withstand exposure to weather and resist
   thermally induced movement without failure, rattling, leaking, or fastener disengagement due
   to defective manufacture, fabrication, installation, or other defects in construction.

1.03 SUBMITTALS

A. Product Data: For each type of roof accessory indicated. Include construction details, material
   descriptions, dimensions of individual components and profiles, and finishes.

B. Samples: For each exposed product and for each color and texture specified, prepared on
   Samples of size to adequately show color.

C. Coordination Drawings: Roof plans, drawn to scale, and coordinating penetrations and roof-
   mounted items. Show the following:
   1. Size and location of roof accessories specified in this Section.
   2. Method of attaching roof accessories to roof or building structure.
   3. Other roof-mounted items including mechanical and electrical equipment, ductwork,
      piping, and conduit.
   4. Required clearances.

D. Operation and Maintenance Data: For roof accessories to include in operation and
   maintenance manuals.

E. Warranty: Sample of special warranty.
1.04  COORDINATION

A. Coordinate layout and installation of roof accessories with roofing membrane and base flashing and interfacing and adjoining construction to provide a leakproof, weathertight, secure, and noncorrosive installation.

B. Coordinate dimensions with rough-in information or Shop Drawings of equipment to be supported.

1.05  WARRANTY

A. Special Warranty on Painted Finishes: Manufacturer's standard form in which manufacturer agrees to repair finishes or replace roof accessories that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:
   a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
   b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
   c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01  METAL MATERIALS

A. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 (Z275) coating designation.
   1. Mill-Phosphatized Finish: Manufacturer's standard for field painting.
   2. Factory Prime Coating: Where field painting is indicated, apply pretreatment and white or light-colored, factory-applied, baked-on epoxy primer coat, with a minimum dry film thickness of 0.2 mil (0.005 mm).
   3. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester-backer finish consisting of prime coat and wash coat, with a minimum total dry film thickness of 0.5 mil.

B. Stainless-Steel Sheet and Shapes: ASTM A 240/A 240M or ASTM A 666, Type 304.

C. Steel Shapes: ASTM A 36/A 36M, hot-dip galvanized according to ASTM A 123/A 123M unless otherwise indicated.

D. Steel Tube: ASTM A 500, round tube.

E. Galvanized-Steel Tube: ASTM A 500, round tube, hot-dip galvanized according to ASTM A 123/A 123M.

2.02 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items required by manufacturer for a complete installation.

B. Glass-Fiber Board Insulation: ASTM C 726, thickness as indicated.

C. Polyisocyanurate Board Insulation: ASTM C 1289, thickness as indicated.

D. Wood Nailers: Softwood lumber, pressure treated with waterborne preservatives for aboveground use, acceptable to authorities having jurisdiction, containing no arsenic or chromium, and complying with AWPA C2; not less than 1-1/2 inches thick.

E. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187.

F. Underlayment:
   1. Felt: ASTM D 226, Type II (No. 30), asphalt-saturated organic felt, nonperforated.

G. Fasteners: Roof accessory manufacturer's recommended fasteners suitable for application and metals being fastened. Match finish of exposed fasteners with finish of material being fastened. Provide nonremovable fastener heads to exterior exposed fasteners. Furnish the following unless otherwise indicated:
   1. Fasteners for Zinc-Coated or Aluminum-Zinc Alloy-Coated Steel: Series 300 stainless steel or hot-dip zinc-coated steel according to ASTM A 153/A 153M or ASTM F 2329.
   2. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.

H. Gaskets: Manufacturer's standard tubular or fingered design of neoprene, EPDM, PVC, or silicone or a flat design of foam rubber, sponge neoprene, or cork.

I. Elastomeric Sealant: ASTM C 920, elastomeric polymer sealant as recommended by roof accessory manufacturer for installation indicated; low modulus; of type, grade, class, and use classifications required to seal joints and remain watertight.

J. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for expansion joints with limited movement.

2.03 ROOF HATCH

A. Roof Hatches: Metal roof-hatch units with lids and insulated double-walled curbs, welded or mechanically fastened and sealed corner joints, continuous lid-to-curb counterflashing and weathertight perimeter gasketing, and integrally formed deck-mounting flange at perimeter bottom.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

B. Type and Size: Single-leaf lid, 36 by 78 inches. Field verify size with existing roof opening.


D. Hatch Material: Zinc-coated (galvanized) steel sheet, 0.079 inch thick.
   1. Finish: Factory prime coating

E. Construction:
   1. Curb and Cover Insulation: Manufacturer's standard insulation.
   2. Hatch Lid: Opaque, insulated, and double walled, with manufacturer's standard metal liner of same material and finish as outer metal lid. Cover shall have a heavy extruded EPDM rubber gasket that is bonded to the cover interior to assure a continuous seal when compressed to the top surface of the curb.
   3. Curb Liner: Manufacturer's standard, of same material and finish as metal curb.
   4. Sloping Roofs: Fabricate curb with perimeter curb height that is tapered to accommodate roof slope so that top surfaces of perimeter curb are level, and curbs are minimum height of 12 inches above adjacent roof insulation at low point. Equip hatch with water diverter or cricket on side that obstructs water flow.

F. Hardware: Galvanized steel spring latch with turn handles, butt- or pintle-type hinge system, and padlock hasps inside and outside.
   1. Provide two-point latch on lids larger than 84 inches.

H. Ladder-Assist Post: Roof-hatch manufacturer's standard device for attachment to roof-access ladder.
   1. Operation: Post locks in place on full extension; release mechanism returns post to closed position.
   2. Height: 42 inches above finished roof deck.
5. Finish: Manufacturer’s standard.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.

B. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.

C. Verify dimensions of roof openings for roof accessories.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. General: Install roof accessories according to manufacturer's written instructions.
   1. Install roof accessories level, plumb, true to line and elevation, and without warping, jogs in alignment, excessive oil canning, buckling, or tool marks.
   2. Anchor roof accessories securely in place so they are capable of resisting indicated loads.
   3. Use fasteners, separators, sealants, and other miscellaneous items as required to complete installation of roof accessories and fit them to substrates.
   4. Install roof accessories to resist exposure to weather without failing, rattling, leaking, or loosening of fasteners and seals.

B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.
   1. Coat concealed side of uncoated roof accessories with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
   2. Underlayment: Where installing roof accessories directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet, or install a course of polyethylene sheet.

C. Roof Curb Installation: Install each roof curb so top surface is level.

D. Equipment Support Installation: Install equipment supports so top surfaces are level with each other.

E. Roof-Hatch Installation:
   1. Install roof hatch so top surface of hatch curb is level.
   2. Verify that roof hatch operates properly. Clean, lubricate, and adjust operating mechanism and hardware.
3. Attach safety railing system to roof-hatch curb.
4. Attach ladder-assist post according to manufacturer's written instructions.

F. Preformed Flashing-Sleeve Installation: Secure flashing sleeve to roof membrane according to flashing-sleeve manufacturer's written instructions.

G. Seal joints with sealant as required by roof accessory manufacturer.

3.03 REPAIR AND CLEANING

A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing according to ASTM A 780.

B. Touch up factory-primed surfaces with compatible primer ready for field painting according to Division 09 painting Sections.

C. Clean exposed surfaces according to manufacturer's written instructions.

D. Clean off excess sealants.

E. Replace roof accessories that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION
SECTION 07 81 00

APPLIED FIREPROOFING

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes the following:
   1. Concealed SFRM.
   2. Exposed SFRM.
   3. Installation accessories.

B. Related Sections include the following:
   1. Division 05 Section "Structural Steel Framing" for surface conditions required for structural steel receiving SFRM.
   2. Division 07 Section "Thermal Insulation" for fire-safing insulation.
   3. Division 07 Section "Penetration Firestopping" for fire-resistance-rated firestopping systems.
   4. Division 07 Section "Fire-Resistive Joint Systems" for fire-resistance-rated joint systems.

1.02 DEFINITIONS

A. SFRM: Sprayed fire-resistive material.

B. Concealed: Fire-resistive materials applied to surfaces that are concealed from view behind other construction when the Work is completed and have not been defined as exposed.

C. Exposed: Fire-resistive materials applied to surfaces that are exposed to view when the Work is completed, that are accessible through suspended ceilings, that are in elevator shafts and machine rooms, that are in mechanical rooms, that are in air-handling plenums, and that are identified as exposed on Drawings.

1.03 SUBMITTALS

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

B. Shop Drawings: Structural framing plans indicating the following:
   1. Locations and types of surface preparations required before applying SFRM.
   2. Extent of SFRM for each construction and fire-resistance rating, including the following:
      a. Applicable fire-resistance design designations of a qualified testing and inspecting agency acceptable to authorities having jurisdiction.
      1) For steel joist assemblies, include applicable fire-resistance design designations, with each steel joist tested with the same maximum tensile stress as each steel joist indicated on Drawings. Design designations with steel joists tested at lower maximum tensile stress than those indicated are not permitted.
b. Minimum thicknesses needed to achieve required fire-resistance ratings of structural components and assemblies.

3. Treatment of SFRM after application.

C. Product Certificates: For each type of SFRM, signed by product manufacturer.

D. Qualification Data: For Installer, manufacturer and testing agency.

E. Compatibility and Adhesion Test Reports: From SFRM manufacturer indicating the following:
   1. Materials have been tested for bond with substrates.
   2. Materials have been verified by SFRM manufacturer to be compatible with substrate primers and coatings.
   3. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.

F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for proposed SFRM.

G. Research/Evaluation Reports: For SFRM.

H. Warranties: Special warranties specified in this Section.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: A firm or individual certified, licensed, or otherwise qualified by SFRM manufacturer as experienced and with sufficient trained staff to install manufacturer’s products according to specified requirements. A manufacturer’s willingness to sell its SFRM to Contractor or to an installer engaged by Contractor does not in itself confer qualification on the buyer.

B. Source Limitations: Obtain SFRM through one source from a single manufacturer.

C. SFRM Testing: By a qualified testing and inspecting agency engaged by Contractor or manufacturer to test for compliance with specified requirements for performance and test methods.
   1. SFRMs are randomly selected for testing from bags bearing the applicable classification marking of UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
   2. Testing is performed on specimens of SFRMs that comply with laboratory testing requirements specified in Part 2 and are otherwise identical to installed fire-resistive materials, including application of accelerant, sealers, topcoats, tamping, troweling, rolling, and water overspray, if any of these are used in final application.
   3. Testing is performed on specimens whose application the independent testing and inspecting agency witnessed during preparation and conditioning. Include in test reports a full description of preparation and conditioning of laboratory test specimens.
D. Compatibility and Adhesion Testing: Engage a qualified testing and inspecting agency to test for compliance with requirements for specified performance and test methods.
   2. Verify that manufacturer, through its own laboratory testing or field experience, has not found primers or coatings to be incompatible with SFRM.

E. Fire-Test-Response Characteristics: Provide SFRM with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify bags containing SFRM with appropriate markings of applicable testing and inspecting agency.
   1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" acceptable to authorities having jurisdiction, for SFRM serving as direct-applied protection tested per ASTM E 119.

F. Provide products containing no detectable asbestos as determined according to the method specified in 40 CFR 763, Subpart E, Appendix E, Section 1, "Polarized Light Microscopy."

G. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to SFRM including, but not limited to, the following:
   1. Review products, exposure conditions, design ratings, restrained and unrestrained conditions, calculations, densities, thicknesses, bond strengths, and other performance requirements.
   2. Review and finalize construction schedule and verify sequencing and coordination requirements.
   3. Review weather predictions, ambient conditions, and proposed temporary protections for SFRM during and after installation.
   4. Review surface conditions and preparations.
   5. Review field quality-control testing procedures.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to Project site in original, unopened packages with intact and legible manufacturers' labels identifying product and manufacturer, date of manufacture, shelf life if applicable, and fire-resistance ratings applicable to Project.

B. Use materials with limited shelf life within period indicated. Remove from Project site and discard materials whose shelf life has expired.

C. Store materials inside, under cover, and aboveground; keep dry until ready for use. Remove from Project site and discard wet or deteriorated materials.
1.06 PROJECT CONDITIONS

A. Environmental Limitations: Do not apply SFRM when ambient or substrate temperature is 40 deg F or lower unless temporary protection and heat are provided to maintain temperature at or above this level for 24 hours before, during, and for 24 hours after product application.

B. Ventilation: Ventilate building spaces during and after application of SFRM. Use natural means or, if they are inadequate, forced-air circulation until fire-resistive material dries thoroughly.

1.07 COORDINATION

A. Sequence and coordinate application of SFRM with other related work specified in other Sections to comply with the following requirements:
1. Provide temporary enclosure as required to confine spraying operations and protect the environment.
2. Provide temporary enclosures for applications to prevent deterioration of fire-resistive material due to exposure to weather and to unfavorable ambient conditions for humidity, temperature, and ventilation.
3. Avoid unnecessary exposure of fire-resistive material to abrasion and other damage likely to occur during construction operations subsequent to its application.
4. Do not apply fire-resistive material to metal roof deck substrates until concrete topping, if any, has been completed. For metal roof decks without concrete topping, do not apply fire-resistive material to metal roof deck substrates until roofing has been completed; prohibit roof traffic during application and drying of fire-resistive material.
5. Do not apply fire-resistive material to metal floor deck substrates until concrete topping has been completed.
6. Do not begin applying fire-resistive material until clips, hangers, supports, sleeves, and other items penetrating fire protection are in place.
7. Defer installing ducts, piping, and other items that would interfere with applying fire-resistive material until application of fire protection is completed.
8. Do not install enclosing or concealing construction until after fire-resistive material has been applied, inspected, and tested and corrections have been made to defective applications.

1.08 WARRANTY

A. Special Warranty: Manufacturer's standard form, signed by Contractor and by Installer, in which manufacturer agrees to repair or replace SFRMs that fail in materials or workmanship within specified warranty period.
1. Failures include, but are not limited to, the following:
   a. Cracking, flaking, spalling, or eroding in excess of specified requirements; peeling; or delaminating of SFRM from substrates.
   b. Not covered under the warranty are failures due to damage by occupants and Owner's maintenance personnel, exposure to environmental conditions other than those investigated and approved during fire-response testing, and other causes not reasonably foreseeable under conditions of normal use.
2. Warranty Period: Two years from date of Substantial Completion.
PART 2 - PRODUCTS

2.01 CONCEALED SFRM

A. Products: Subject to compliance with requirements, provide one of the following:
   1. Concealed Cementitious SFRM:
      d. Southwest Fireproofing Products Company; Type 5: www.type5.com.

B. Material Composition: Manufacturer’s standard product, or either of the following:
   1. Concealed Cementitious SFRM: Factory-mixed, dry formulation of gypsum or portland cement binders, additives, and lightweight mineral or synthetic aggregates mixed with water at Project site to form a slurry or mortar for conveyance and application.

C. Physical Properties: Minimum values, unless otherwise indicated, or higher values required to attain designated fire-resistance ratings, measured per standard test methods referenced with each property as follows:
   1. Dry Density: 15 lb/cu. ft. for average and individual densities, or greater if required to attain fire-resistance ratings indicated, per ASTM E 605 or AWCI Technical Manual 12-A, Section 5.4.5, "Displacement Method."
   2. Thickness: Minimum average thickness required for fire-resistance design indicated according to the following criteria, but not less than 0.375 inch, per ASTM E 605:
      a. Where the referenced fire-resistance design lists a thickness of 1 inch or more, the minimum allowable individual thickness of SFRM is the design thickness minus 0.25 inch.
      b. Where the referenced fire-resistance design lists a thickness of less than 1 inch but more than 0.375 inch, the minimum allowable individual thickness of SFRM is the greater of 0.375 inch or 75 percent of the design thickness.
      c. No reduction in average thickness is permitted for those fire-resistance designs whose fire-resistance ratings were established at densities of less than 15 lb/cu. ft.
   3. Bond Strength: 150 lbf/sq. ft. minimum per ASTM E 736 based on laboratory testing of 0.75-inch minimum thickness of SFRM.
   4. Compressive Strength: 5.21 lbf/sq. in. minimum per ASTM E 761. Minimum thickness of SFRM tested shall be 0.75 inch and minimum dry density shall be as specified but not less than 15 lb/cu. ft.
   6. Deflection: No cracking, spalling, or delamination per ASTM E 759.
   7. Effect of Impact on Bonding: No cracking, spalling, or delamination per ASTM E 760.
   8. Air Erosion: Maximum weight loss of 0.025 g/sq. ft. in 24 hours per ASTM E 859. For laboratory tests, minimum thickness of SFRM is 0.75 inch, maximum dry density is 15 lb/cu. ft., test specimens are not prepurged by mechanically induced air velocities, and tests are terminated after 24 hours.
9. Fire-Test-Response Characteristics: Provide SFRM with the following surface-burning characteristics as determined by testing identical products per ASTM E 84 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
   a. Flame-Spread Index: 10 or less.
   b. Smoke-Developed Index: 0.

10. Fungal Resistance: No observed growth on specimens per ASTM G 21.

2.02 EXPOSED SFRM

A. Products: Subject to compliance with requirements, provide one of the following:
   1. Exposed Cementitious SFRM:
      c. Isolatek International Corp.; Cafco 400: [www.cafco.com](http://www.cafco.com).
      e. Southwest Fireproofing Products Company; SMD: [www.type5.com](http://www.type5.com).

B. Material Composition: Manufacturer’s standard product, as follows:
   1. Exposed Cementitious SFRM: Factory-mixed, dry, cement aggregate formulation; or chloride-free formulation of gypsum or portland cement binders, additives, and inorganic aggregates mixed with water at Project site to form a slurry or mortar for conveyance and application.

C. Physical Properties: Minimum values, unless otherwise indicated, or higher values required to attain designated fire-resistance ratings, measured per standard test methods referenced with each property as follows:
   1. Dry Density: Values for average and individual densities as required for fire-resistance ratings indicated, per ASTM E 605 or AWCI Technical Manual 12-A, Section 5.4.5, "Displacement Method," but with an average density of not less than: 22 lb/cu. ft. for Cementitious and Sprayed-Fiber Types.
   2. Bond Strength: 434 lbf/sq. ft. minimum per ASTM E 736.
   3. Compressive Strength: 51 lbf/sq. in. minimum per ASTM E 761.
   5. Deflection: No cracking, spalling, or delamination per ASTM E 759.
   6. Effect of Impact on Bonding: No cracking, spalling, or delamination per ASTM E 760.
   7. Air Erosion: Maximum weight loss of 0.025 g/sq. ft. per ASTM E 859.
   9. Fire-Test-Response Characteristics: Provide SFRM with the following surface-burning characteristics as determined by testing identical products per ASTM E 84 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
      a. Flame-Spread Index: 10 or less.
      b. Smoke-Developed Index: 0.
   10. Fungal Resistance: No observed growth on specimens per ASTM G 21.
2.03 AUXILIARY FIRE-RESISTIVE MATERIALS

A. General: Provide auxiliary fire-resistive materials that are compatible with SFRM and substrates and are approved by UL or another testing and inspecting agency acceptable to authorities having jurisdiction for use in fire-resistance designs indicated.

B. Substrate Primers: For use on each substrate and with each sprayed fire-resistive product, provide primer that complies with one or more of the following requirements:
   2. Primer is identical to those used in assemblies tested for fire-test-response characteristics of SFRM per ASTM E 119 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.

C. Adhesive for Bonding Fire-Resistive Material: Product approved by manufacturer of SFRM.

D. Metal Lath: Expanded metal lath fabricated from material of weight, configuration, and finish required to comply with fire-resistance designs indicated and fire-resistive material manufacturer’s written recommendations. Include clips, lathing accessories, corner beads, and other anchorage devices required to attach lath to substrates and to receive SFRM.

E. Sealer for Sprayed-Fiber Fire-Resistive Material: Transparent-drying, water-dispersible, tinted protective coating recommended in writing by manufacturer of sprayed-fiber fire-resistive material.
   1. Product: Subject to compliance with requirements, provide “Cafco Bond-Seal” by Isolatek International Corp. www.cafco.com.

F. Topcoat: Type recommended in writing by manufacturer of each SFRM for application over concealed and exposed SFRM.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrates and other conditions affecting performance of work. A substrate is in satisfactory condition if it complies with the following:
   1. Substrates comply with requirements in the Section where the substrate and related materials and construction are specified.
   2. Substrates are free of dirt, oil, grease, release agents, rolling compounds, mill scale, loose scale, incompatible primers, incompatible paints, incompatible encapsulants, or other foreign substances capable of impairing bond of fire-resistive materials with substrates under conditions of normal use or fire exposure.
   3. Objects penetrating fire-resistive material, including clips, hangers, support sleeves, and similar items, are securely attached to substrates.
   4. Substrates are not obstructed by ducts, piping, equipment, and other suspended construction that will interfere with applying fire-resistive material.
B. Verify that concrete work on steel deck has been completed.

C. Verify that roof construction, installation of roof-top HVAC equipment, and other related work are completed.

D. Conduct tests according to fire-resistive material manufacturer's written recommendations to verify that substrates are free of substances capable of interfering with bond.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Cover other work subject to damage from fallout or overspray of fire-resistive materials during application.

B. Clean substrates of substances that could impair bond of fire-resistive material, including dirt, oil, grease, release agents, rolling compounds, mill scale, loose scale, and incompatible primers, paints, and encapsulants.

C. Prime substrates where recommended in writing by SFRM manufacturer unless compatible shop primer has been applied and is in satisfactory condition to receive SFRM.

D. For exposed applications, repair substrates to remove surface imperfections that could affect uniformity of texture and thickness in finished surface of SFRM. Remove minor projections and fill voids that would telegraph through fire-resistive products after application.

3.03 APPLICATION, GENERAL

A. Comply with fire-resistive material manufacturer's written instructions for mixing materials, application procedures, and types of equipment used to mix, convey, and spray on fire-resistive material, as applicable to particular conditions of installation and as required to achieve fire-resistance ratings indicated.

B. Apply SFRM that is identical to products tested as specified in Part 1 "Quality Assurance" Article and substantiated by test reports, with respect to rate of application, accelerator use, sealers, topcoats, tamping, troweling, water overspray, or other materials and procedures affecting test results.

C. Coat substrates with bonding adhesive before applying fire-resistive material where required to achieve fire-resistance rating or as recommended in writing by SFRM manufacturer for material and application indicated.

D. Extend fire-resistive material in full thickness over entire area of each substrate to be protected. Unless otherwise recommended in writing by SFRM manufacturer, install body of fire-resistive covering in a single course.

E. Spray apply fire-resistive materials to maximum extent possible. Following the spraying operation in each area, complete the coverage by trowel application or other placement method recommended in writing by SFRM manufacturer.
F. Where sealers are used, apply products that are tinted to differentiate them from SFRM over which they are applied.

3.04 APPLICATION, CONCEALED SFRM
A. Apply concealed SFRM in thicknesses and densities not less than those required to achieve fire-resistance ratings designated for each condition, but apply in greater thicknesses and densities if specified in Part 2 "Concealed SFRM" Article.
B. Apply water overspray to concealed sprayed-fiber fire-resistive material as required to obtain designated fire-resistance rating.
C. Cure concealed SFRM according to product manufacturer's written recommendations.
D. Apply sealer to concealed SFRM.
E. Apply topcoat to concealed SFRM.

3.05 APPLICATION, EXPOSED SFRM
A. Apply exposed SFRM in thicknesses and densities not less than those required to achieve fire-resistance ratings designated for each condition, but apply in greater thicknesses and densities if indicated.
   1. For steel beams and bracing, provide a thickness of not less than 1 inch.
   2. For metal floor or roof decks, provide a thickness of not less than 1/2 inch.
B. Cure exposed SFRM according to product manufacturer's written recommendations.

3.06 FIELD QUALITY CONTROL
A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspection and prepare reports:
   1. SFRM.
B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections and prepare test reports.
   1. Testing and inspecting agency will interpret tests and state in each report whether tested work complies with or deviates from requirements.
C. Tests and Inspections: Testing and inspecting of completed applications of SFRM shall take place in successive stages, in areas of extent and using methods as follows. Do not proceed with application of SFRM for the next area until test results for previously completed applications of SFRM show compliance with requirements. Tested values must equal or exceed values indicated and required for approved fire-resistance design.
   1. Thickness for Floor, Roof, and Wall Assemblies: For each 1000-sq. ft. area, or partial area, on each floor, from the average of 4 measurements from a 144-sq. in. sample area, with sample width of not less than 6 inches per ASTM E 605.
   2. Thickness for Structural Frame Members: From a sample of 25 percent of structural members per floor, taking 9 measurements at a single cross section for structural frame
beams or girders, 7 measurements of a single cross section for joists and trusses, and 12 measurements of a single cross section for columns per ASTM E 605.

3. Density for Floors, Roofs, Walls, and Structural Frame Members: At frequency and from sample size indicated for determining thickness of each type of construction and structural framing member, per ASTM E 605 or AWCI Technical Manual 12-A, Section 5.4.5, "Displacement Method."

4. Bond Strength for Floors, Roofs, Walls, and Structural Framing Members: For each 10,000-sq. ft. area, or partial area, on each floor, cohesion and adhesion from one sample of size indicated for determining thickness of each type of construction and structural framing member, per ASTM E 736.
   a. Field test SFRM that is applied to flanges of wide-flange, structural-steel members on surfaces matching those that will exist for remainder of steel receiving fire-resistant material.
   b. If surfaces of structural steel receiving SFRM are primed or otherwise painted for coating materials, perform series of bond tests specified in UL's "Fire Resistance Directory." Provide bond strength indicated in referenced UL fire-resistance criteria, but not less than 150 lbf/sq. ft. minimum per ASTM E 736.

5. If testing finds applications of SFRM are not in compliance with requirements, testing and inspecting agency will perform additional random testing to determine extent of noncompliance.

D. Remove and replace applications of SFRM that do not pass tests and inspections for cohesion and adhesion, for density, or for both and retest as specified above.

E. Apply additional SFRM, per manufacturer's written instructions, where test results indicate that thickness does not comply with specified requirements, and retest as specified above.

3.07 CLEANING, PROTECTING, AND REPAIR

A. Cleaning: Immediately after completing spraying operations in each containable area of Project, remove material overspray and fallout from surfaces of other construction and clean exposed surfaces to remove evidence of soiling.

B. Protect SFRM, according to advice of product manufacturer and Installer, from damage resulting from construction operations or other causes so fire protection will be without damage or deterioration at time of Substantial Completion.

C. Coordinate application of SFRM with other construction to minimize need to cut or remove fire protection. As installation of other construction proceeds, inspect SFRM and patch any damaged or removed areas.

D. Repair or replace work that has not successfully protected steel.

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
1. Penetrations in fire-resistance-rated walls.
2. Penetrations in horizontal assemblies.
3. Penetrations in smoke barriers.

B. Related Sections:
1. Division 07 Section "Fire-Resistive Joint Systems" for joints in or between fire-resistance-rated construction, at exterior curtain-wall/floor intersections, and in smoke barriers.

1.02 SUBMITTALS

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

B. LEED Submittal:
1. Product Data for Credit EQ 4.1: For penetration firestopping, including printed statement of VOC content and chemical components.

C. Product Schedule: For each penetration firestopping system. Include location and design designation of qualified testing and inspecting agency.
1. Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping condition, submit illustration, with modifications marked, approved by penetration firestopping manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

D. Qualification Data: For qualified Installer.

E. Installer Certificates: From Installer indicating penetration firestopping has been installed in compliance with requirements and manufacturer's written recommendations.

F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for penetration firestopping.

1.03 QUALITY ASSURANCE

A. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with its "Qualified Firestop Contractor Program Requirements."
B. Fire-Test-Response Characteristics: Penetration firestopping shall comply with the following requirements:
   1. Penetration firestopping tests are performed by a qualified testing agency acceptable to authorities having jurisdiction.
   2. Penetration firestopping is identical to those tested per testing standard referenced in "Penetration Firestopping" Article. Provide rated systems complying with the following requirements:
      a. Penetration firestopping products bear classification marking of qualified testing and inspecting agency.
      b. Classification markings on penetration firestopping correspond to designations listed by the following:
         1) UL in its "Fire Resistance Directory."
         2) FM Global in its "Building Materials Approval Guide."

C. Preinstallation Conference: Conduct conference at Project site.

1.04 PROJECT CONDITIONS

A. Environmental Limitations: Do not install penetration firestopping when ambient or substrate temperatures are outside limits permitted by penetration firestopping manufacturers or when substrates are wet because of rain, frost, condensation, or other causes.

B. Install and cure penetration firestopping per manufacturer’s written instructions using natural means of ventilations or, where this is inadequate, forced-air circulation.

1.05 COORDINATION

A. Coordinate construction of openings and penetrating items to ensure that penetration firestopping is installed according to specified requirements.

B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration firestopping.

C. Notify Owner’s testing agency at least seven days in advance of penetration firestopping installations; confirm dates and times on day preceding each series of installations.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
2.02 PENETRATION FIRESTOPPING

A. Provide penetration firestopping that is produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.

B. Penetrations in Fire-Resistance-Rated Walls: Provide penetration firestopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
   1. Fire-resistance-rated walls include fire walls, smoke-barrier walls, and fire partitions.
   2. F-Rating: Not less than the fire-resistance rating of constructions penetrated.

C. Penetrations in Horizontal Assemblies: Provide penetration firestopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
   1. Horizontal assemblies include floors.
   2. F-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated.
   3. T-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.

D. Penetrations in Smoke Barriers: Provide penetration firestopping with ratings determined per UL 1479.
   1. L-Rating: Not exceeding 5.0 cfm/sq. ft. of penetration opening at 0.30-inch wg at both ambient and elevated temperatures.

E. W-Rating: Provide penetration firestopping showing no evidence of water leakage when tested according to UL 1479.

F. Exposed Penetration Firestopping: Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.

G. VOC Content: Provide penetration firestopping that complies with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
   1. Architectural Sealants: 250 g/L.
   2. Sealant Primers for Nonporous Substrates: 250 g/L.
   3. Sealant Primers for Porous Substrates: 775 g/L.
2.03 FILL MATERIALS

A. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer metallic sleeve lined with an intumescent strip, a radial extended flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.

B. Latex Sealants: Single-component latex formulations that do not re-emulsify after cure during exposure to moisture.

C. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.

D. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced elastomeric sheet bonded to galvanized-steel sheet.

E. Intumescent Putties: Nonhardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds.

F. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.

G. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.

H. Pillows/Bags: Reusable heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives. Where exposed, cover openings with steel-reinforcing wire mesh to protect pillows/bags from being easily removed.
I. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

J. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below:
   1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces, and nonsag formulation for openings in vertical and sloped surfaces, unless indicated firestopping limits use of nonsag grade for both opening conditions.

2.04 MIXING
   
   A. For those products requiring mixing before application, comply with penetration firestopping manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.01 EXAMINATION
   
   A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.

   B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION
   
   A. Surface Cleaning: Clean out openings immediately before installing penetration firestopping to comply with manufacturer's written instructions and with the following requirements:
      1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of penetration firestopping.
      2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping. Remove loose particles remaining from cleaning operation.
      3. Remove laitance and form-release agents from concrete.

   B. Priming: Prime substrates where recommended in writing by manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

   C. Masking Tape: Use masking tape to prevent penetration firestopping from contacting adjoining surfaces that will remain exposed on completion of the Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove stains. Remove tape as soon as possible without disturbing firestopping's seal with substrates.
3.03 INSTALLATION

A. General: Install penetration firestopping to comply with manufacturer’s written installation instructions and published drawings for products and applications indicated.

B. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
   1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of firestopping.

C. Install fill materials for firestopping by proven techniques to produce the following results:
   1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
   2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
   3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.04 IDENTIFICATION

A. Identify penetration firestopping with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of firestopping edge so labels will be visible to anyone seeking to remove penetrating items or firestopping. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:
   1. The words "Warning - Penetration Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
   2. Contractor’s name, address, and phone number.
   3. Designation of applicable testing and inspecting agency.
   4. Date of installation.
   5. Manufacturer’s name.
   6. Installer’s name.

3.05 FIELD QUALITY CONTROL

A. Owner will engage a qualified testing agency to perform tests and inspections.

B. Where deficiencies are found or penetration firestopping is damaged or removed because of testing, repair or replace penetration firestopping to comply with requirements.

C. Proceed with enclosing penetration firestopping with other construction only after inspection reports are issued and installations comply with requirements.
3.06 CLEANING AND PROTECTION

A. Clean off excess fill materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping manufacturers and that do not damage materials in which openings occur.

B. Provide final protection and maintain conditions during and after installation that ensure that penetration firestopping is without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, immediately cut out and remove damaged or deteriorated penetration firestopping and install new materials to produce systems complying with specified requirements.

3.07 PENETRATION FIRESTOPPING SCHEDULE

A. Where UL-classified systems are indicated, they refer to system numbers in UL's "Fire Resistance Directory" under product Category XHEZ.

B. Where FM Global-approved systems are indicated, they refer to design numbers listed in FM Global's "Building Materials Approval Guide" under "Wall and Floor Penetration Fire Stops."

3.08 THROUGH-PENETRATION FIRESTOP SYSTEMS

<table>
<thead>
<tr>
<th>Wall/Floor Type</th>
<th>Penetration Item</th>
<th>Fire Rating</th>
<th>UL No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large Openings – Multiple Penetrations</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Concrete/Concrete Block</td>
<td>Multiple cables and non-insul. Steel, EMT/conduit</td>
<td>2-hour</td>
<td>WJ-8004</td>
</tr>
<tr>
<td>Gypsum Wallboard</td>
<td>Multiple insulated or non-insulated steel, copper, conduit, or EMT</td>
<td>1- or 2-hour</td>
<td>WJ-8013</td>
</tr>
<tr>
<td>Gypsum Wallboard</td>
<td>Multiple steel, copper conduit</td>
<td>2-hour</td>
<td>WL-8004</td>
</tr>
<tr>
<td>Non-insulated Metal Pipe</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gypsum Wallboard</td>
<td>Steel, copper conduit or EMT</td>
<td>1- or 2-hour</td>
<td>WL-1085</td>
</tr>
<tr>
<td>Insulated Metal Pipe</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gypsum Wallboard</td>
<td>Steel, copper conduit, or EMT with glass-fiber insulation (sleeved or unsleeved)</td>
<td>1- or 2-hour</td>
<td>WL-5025</td>
</tr>
</tbody>
</table>

END OF SECTION
SECTION 07 84 46

FIRE-RESISTIVE JOINT SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Joints in or between fire-resistance-rated constructions.
   2. Joints at exterior curtain-wall/floor intersections.

B. Related Sections:
   1. Division 07 Section "Penetration Firestopping" for penetrations in fire-resistance-rated walls, horizontal assemblies, and smoke barriers.
   2. Division 07 Section "Expansion Control" for fire-resistive architectural joint systems.

1.02 SUBMITTALS

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

B. LEED Submittal:
   1. Product Data for Credit EQ 4.1: For fire-resistive joint systems, including printed statement of VOC content.

C. Product Schedule: For each fire-resistive joint system. Include location and design designation of qualified testing agency.
   1. Where Project conditions require modification to a qualified testing agency's illustration for a particular fire-resistive joint system condition, submit illustration, with modifications marked, approved by fire-resistive joint system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

D. Qualification Data: For qualified Installer, shall be an FM Global-approved firestop contractor or a UL-qualified firestop contractor.

E. Installer Certificates: From Installer indicating fire-resistive joint systems have been installed in compliance with requirements and manufacturer's written recommendations.

F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for fire-resistive joint systems.

1.03 QUALITY ASSURANCE

A. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with UL's "Qualified Firestop Contractor Program Requirements."
B. Installer Qualifications: A firm experienced in installing fire-resistive joint systems similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful performance. Qualifications include having the necessary experience, staff, and training to install manufacturer's products per specified requirements. Manufacturer's willingness to sell its fire-resistive joint system products to Contractor or to Installer engaged by Contractor does not in itself confer qualification on buyer.

C. Fire-Test-Response Characteristics: Fire-resistive joint systems shall comply with the following requirements:
   1. Fire-resistive joint system tests are performed by a qualified testing agency acceptable to authorities having jurisdiction.
   2. Fire-resistive joint systems are identical to those tested per testing standard referenced in "Fire-Resistive Joint Systems" Article. Provide rated systems complying with the following requirements:
      a. Fire-resistive joint system products bear classification marking of qualified testing agency.
      b. Fire-resistive joint systems correspond to those indicated by reference to designations listed by the following:
         1) UL in its "Fire Resistance Directory."

D. Preinstallation Conference: Conduct conference at Project site.

1.04 PROJECT CONDITIONS

A. Environmental Limitations: Do not install fire-resistive joint systems when ambient or substrate temperatures are outside limits permitted by fire-resistive joint system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.

B. Install and cure fire-resistive joint systems per manufacturer's written instructions using natural means of ventilation or, where this is inadequate, forced-air circulation.

1.05 COORDINATION

A. Coordinate construction of joints to ensure that fire-resistive joint systems are installed according to specified requirements.

B. Coordinate sizing of joints to accommodate fire-resistive joint systems.

C. Notify Owner's testing agency at least seven days in advance of fire-resistive joint system installations; confirm dates and times on day preceding each series of installations.
PART 2 - PRODUCTS

2.01 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:


2.02 FIRE-RESISTIVE JOINT SYSTEMS

A. Where required, provide fire-resistive joint systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of assemblies in or between which fire-resistive joint systems are installed. Fire-resistive joint systems shall accommodate building movements without impairing their ability to resist the passage of fire and hot gases.

B. Joints in or between Fire-Resistance-Rated Construction: Provide fire-resistive joint systems with ratings determined per ASTM E 1966 or UL 2079:

1. Joints include those installed in or between fire-resistance-rated walls, floor or floor/ceiling assemblies and roofs or roof/ceiling assemblies.
2. Fire-Resistance Rating: Equal to or exceeding the fire-resistance rating of construction they will join.

C. Joints at Exterior Curtain-Wall/Floor Intersections: Provide fire-resistive joint systems with rating determined by ASTM E 119 based on testing at a positive pressure differential of 0.01-inch wg or ASTM E 2307.

1. Fire-Resistance Rating: Equal to or exceeding the fire-resistance rating of the floor assembly.

D. Exposed Fire-Resistive Joint Systems: Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.

E. VOC Content: Provide fire-resistive joint systems that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

1. Architectural Sealants: 250 g/L.
2. Sealant Primers for Nonporous Substrates: 250 g/L.
3. Sealant Primers for Porous Substrates: 775 g/L.

F. Accessories: Provide components of fire-resistive joint systems, including primers and forming materials that are needed to install fill materials and to maintain ratings required. Use only components specified by fire-resistive joint system manufacturer and approved by the qualified testing agency for systems indicated.
PART 3 - EXECUTION

3.01  EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for joint configurations, substrates, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02  PREPARATION

A. Surface Cleaning: Clean joints immediately before installing fire-resistive joint systems to comply with fire-resistive joint system manufacturer's written instructions and the following requirements:
   1. Remove from surfaces of joint substrates foreign materials that could interfere with adhesion of fill materials.
   2. Clean joint substrates to produce clean, sound surfaces capable of developing optimum bond with fill materials. Remove loose particles remaining from cleaning operation.
   3. Remove laitance and form-release agents from concrete.

B. Priming: Prime substrates where recommended in writing by fire-resistive joint system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

C. Masking Tape: Use masking tape to prevent fill materials of fire-resistive joint system from contacting adjoining surfaces that will remain exposed on completion of the Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove stains. Remove tape as soon as possible without disturbing fire-resistive joint system's seal with substrates.

3.03  INSTALLATION

A. General: Install fire-resistive joint systems to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.

B. Install forming materials and other accessories of types required to support fill materials during their application and in position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
   1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of fire-resistive joint system.

C. Install fill materials for fire-resistive joint systems by proven techniques to produce the following results:
   1. Fill voids and cavities formed by joints and forming materials as required to achieve fire-resistance ratings indicated.
   2. Apply fill materials so they contact and adhere to substrates formed by joints.
   3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.
3.04 IDENTIFICATION

A. Identify fire-resistive joint systems with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of joint edge so labels will be visible to anyone seeking to remove or penetrate joint system. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:

2. Contractor's name, address, and phone number.
3. Designation of applicable testing agency.
4. Date of installation.
5. Manufacturer's name.
6. Installer's name.

3.05 FIELD QUALITY CONTROL

A. Inspecting Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Where deficiencies are found or fire-resistive joint systems are damaged or removed due to testing, repair or replace fire-resistive joint systems so they comply with requirements.

C. Proceed with enclosing fire-resistive joint systems with other construction only after inspection reports are issued and installations comply with requirements.

3.06 CLEANING AND PROTECTING

A. Clean off excess fill materials adjacent to joints as the Work progresses by methods and with cleaning materials that are approved in writing by fire-resistive joint system manufacturers and that do not damage materials in which joints occur.

B. Provide final protection and maintain conditions during and after installation that ensure fire-resistive joint systems are without damage or deterioration at time of Substantial Completion. If damage or deterioration occurs despite such protection, cut out and remove damaged or deteriorated fire-resistive joint systems immediately and install new materials to produce fire-resistive joint systems complying with specified requirements.

END OF SECTION
SECTION 07 92 00

JOINT SEALANTS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Silicone joint sealants.
   2. Urethane joint sealants.
   3. Latex joint sealants.

B. Joint Applications:
   1. Interior joints in vertical surfaces and horizontal non-traffic surfaces.
   2. Control and expansion joints on exposed interior surfaces of exterior walls.
   3. Perimeter joints of exterior openings where indicated.
   4. Tile control joints.
   5. Vertical control joints on exposed surfaces of interior walls and partitions.
   6. Perimeter joints between interior wall surfaces and frames of interior doors and windows.
   7. Joints between plumbing fixtures and adjoining walls, floors, and counters.
   8. Other joints as indicated.

C. Related Sections:
   1. Division 04 Section "Unit Masonry" for masonry control and expansion joint fillers and gaskets.
   2. Division 07 Section "Expansion Control" for building expansion joints.
   3. Division 07 Section "Fire-Resistive Joint Systems" for sealing joints in fire-resistance-rated construction.
   4. Division 08 Section "Glazing" for glazing sealants.
   5. Division 09 Section "Gypsum Board" for sealing perimeter joints.
   6. Division 09 Section "Tiling" for sealing joints in tile.
   7. Division 32 Section "Concrete Paving" for sealing joints in concrete pavements, walkways, and curbing.

1.02 PRECONSTRUCTION TESTING

A. Preconstruction Compatibility and Adhesion Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.
   1. Use manufacturer's standard test method to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
   2. Submit not fewer than eight pieces of each kind of material, including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.
   3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
   4. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures including use of specially formulated primers.
5. Testing will not be required if joint-sealant manufacturers submit joint preparation data that are based on previous testing, not older than 24 months, of sealant products for adhesion to, and compatibility with, joint substrates and other materials matching those submitted.

B. Preconstruction Field-Adhesion Testing: Before installing sealants, field test their adhesion to Project joint substrates as follows:
   1. Locate test joints where indicated on Project or, if not indicated, as directed by Architect.
   2. Conduct field tests for each application indicated below:
      a. Each kind of sealant and joint substrate indicated.
   3. Notify Architect seven days in advance of dates and times when test joints will be erected.
   4. Arrange for tests to take place with joint-sealant manufacturer's technical representative present.
         1) For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.

   5. Report whether sealant failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. For sealants that fail adhesively, retest until satisfactory adhesion is obtained.
   6. Evaluation of Preconstruction Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint substrates during testing.

1.03 SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

B. LEED Submittal:
   1. Product Data for Credit EQ 4.1: For sealants and sealant primers used inside the weatherproofing system, including printed statement of VOC content.

C. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

D. Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2-inch- wide joints formed between two 6-inch- long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
E. Joint-Sealant Schedule: Include the following information:
   1. Joint-sealant application, joint location, and designation.
   2. Joint-sealant manufacturer and product name.

F. Qualification Data: For qualified Installer.

G. Product Certificates: For each kind of joint sealant and accessory, from manufacturer.

H. Sealant, Waterproofing, and Restoration Institute (SWRI) Validation Certificate: For each
   sealant specified to be validated by SWRI's Sealant Validation Program.

I. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified
   testing agency, indicating that sealants comply with requirements.

J. Preconstruction Compatibility and Adhesion Test Reports: From sealant manufacturer,
   indicating the following:
   1. Materials forming joint substrates and joint-sealant backings have been tested for
      compatibility and adhesion with joint sealants.
   2. Interpretation of test results and written recommendations for primers and substrate
      preparation needed for adhesion.

K. Preconstruction Field-Adhesion Test Reports: Indicate which sealants and joint preparation
   methods resulted in optimum adhesion to joint substrates based on testing specified in
   "Preconstruction Testing" Article.

L. Field-Adhesion Test Reports: For each sealant application tested.

M. Warranties: Sample of special warranties.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and
   approved for installation of units required for this Project.

B. Source Limitations: Obtain each kind of joint sealant from single source from single
   manufacturer.

C. Product Testing: Test joint sealants using a qualified testing agency.
   1. Testing Agency Qualifications: An independent testing agency qualified according to
      ASTM C 1021 to conduct the testing indicated.
   2. Test according to SWRI's Sealant Validation Program for compliance with requirements
      specified by reference to ASTM C 920 for adhesion and cohesion under cyclic
      movement, adhesion-in-peel, and indentation hardness.
D. Mockups: Install sealant in mockups of assemblies specified in other Sections that are indicated to receive joint sealants specified in this Section. Use materials and installation methods specified in this Section.
   1. Mockups to include existing precast concrete with new joints.

E. Preinstallation Conference: Conduct conference at Project site.

1.05 PROJECT CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:
   1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
   2. When joint substrates are wet.
   3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
   4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.06 WARRANTY

A. Special Installer's Warranty: Manufacturer's standard form in which Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
   1. Warranty Period: Two years from date of Substantial Completion.

B. Special Manufacturer's Warranty: Manufacturer's standard form in which joint-sealant manufacturer agrees to furnish joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.
   1. Warranty Period: 10 years from date of Substantial Completion (for exterior precast joints).

C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:
   1. Movement of the structure caused by structural settlement or errors attributable to design or construction resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
   2. Disintegration of joint substrates from natural causes exceeding design specifications.
   3. Mechanical damage caused by individuals, tools, or other outside agents.
   4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.
PART 2 - PRODUCTS

2.01 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

B. VOC Content of Interior Sealants: Provide sealants and sealant primers for use inside the weatherproofing system that comply with the following limits for VOC content when calculated according to 40 CFR 59, Part 59, Subpart D (EPA Method 24):
   1. Architectural Sealants: 250 g/L.
   2. Sealant Primers for Nonporous Substrates: 250 g/L.
   3. Sealant Primers for Porous Substrates: 775 g/L.

C. Liquid-Applied Joint Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied joint sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.

D. Stain-Test-Response Characteristics: Where sealants are specified to be non-staining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.

E. Suitability for Contact with Food: Where sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.

2.02 SILICONE JOINT SEALANTS

A. Bacteria and Mildew-Resistant, Moisture-Curing Acetoxy Silicone Joint Sealant; ASTM C, Type S, Grade NS, Class 25, for Use NT.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      e. Sika Corporation; Construction Products Division: www.sikaconstruction.com.

   2. Application: Mildew-resistant interior joints in vertical surfaces and horizontal non-traffic surfaces, including:
      a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
      b. Tile control and expansion joints where indicated.
      c. Other joints as indicated.

   3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
2.03 URETHANE JOINT SEALANTS

A. Multi-component, Non-sag, Urethane Joint Sealant: ASTM C 920, Type M, Grade NS, Class 25, for Use NT.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      d. Sika Corporation; Construction Products Division: [www.sikaconstruction.com](http://www.sikaconstruction.com).
      e. Tremco Incorporated: [www.tremcosealants.com](http://www.tremcosealants.com).

2. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal non-traffic surfaces, including:
   b. Joints between plant-precast architectural concrete units.
   c. Control and expansion joints in unit masonry.
   d. Joints between metal panels.
   e. Joints between different materials listed above.
   f. Perimeter joints between materials listed above and frames of doors, windows and louvers.
   g. Control and expansion joints in ceilings and other overhead surfaces.
      1) Other joints as indicated.

3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

A. Multicomponent, Nonsag, Traffic-Grade, Urethane Joint Sealant: ASTM C 920, Type M, Grade NS, Class 25, for Use T.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      d. Sika Corporation; Construction Products Division: [www.sikaconstruction.com](http://www.sikaconstruction.com).
      e. Tremco Incorporated: [www.tremcosealants.com](http://www.tremcosealants.com).

2. Applications: Exterior joints in horizontal traffic surfaces, including:
   a. Control and expansion joints in paving.
   b. Isolation and contraction joints in cast-in-place concrete slabs.
   c. Joints between different materials listed above.
   d. Other joints as indicated.

3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
1.02 LATEX JOINT SEALANTS

A. Latex Joint Sealant: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      d. Tremco Incorporated: [www.tremcoisalants.com](http://www.tremcoisalants.com).

   2. Applications: Interior joints in vertical surfaces and horizontal non-traffic surfaces, including:
      a. Control and expansion joints on exposed interior surfaces of exterior walls.
      b. Perimeter joints of exterior openings where indicated.
      c. Tile control and expansion joints.
      d. Vertical joints on exposed surfaces of interior unit masonry and concrete walls and partitions.
      e. Perimeter joints between interior wall surfaces and frames of interior doors, windows and elevator entrances.
      f. Other joints as indicated.

   3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

1.03 JOINT SEALANT BACKING

A. General: Provide sealant backings of material that are non-staining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

1.04 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.
C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 2 - EXECUTION

2.01 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

2.02 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.

2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
   a. Concrete.
   b. Masonry.
   c. Unglazed surfaces of ceramic tile.

3. Remove laitance and form-release agents from concrete.

4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
   a. Metal.
   b. Glass.
   c. Glazed surfaces of ceramic tile.

B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.
2.03 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
   1. Do not leave gaps between ends of sealant backings.
   2. Do not stretch, twist, puncture, or tear sealant backings.
   3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.

D. Install joint backing to maintain the following joint ratios:
   1. Joints up to 1/2 inch wide: 1:1 width to depth ratio.
   2. Joints greater than 1/2 inch wide: 2:1 width to depth ratio, maximum 1/2 inch joint depth.

E. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

F. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
   1. Place sealants so they directly contact and fully wet joint substrates.
   2. Completely fill recesses in each joint configuration.
   3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

G. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
   1. Remove excess sealant from surfaces adjacent to joints.
   2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
   3. Provide concave joint profile per Figure 8A in ASTM C 1193, unless otherwise indicated.
   4. Provide flush joint profile where indicated per Figure 8B in ASTM C 1193.
   5. Provide recessed joint configuration of recess depth and at locations indicated per Figure 8C in ASTM C 1193.
      a. Use masking tape to protect surfaces adjacent to recessed tooled joints.
2.04 FIELD QUALITY CONTROL

A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:
   1. Extent of Testing: Test completed and cured sealant joints as follows:
      a. Perform 10 tests for the first 1000 feet of joint length for each kind of sealant and
         joint substrate.
      b. Perform 1 test for each 1000 feet of joint length thereafter or 1 test per each
         floor per elevation.
   2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint
      Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in
      ASTM C 1521.
      a. For joints with dissimilar substrates, verify adhesion to each substrate separately;
         extend cut along one side, verifying adhesion to opposite side. Repeat procedure
         for opposite side.
   3. Inspect tested joints and report on the following:
      a. Whether sealants filled joint cavities and are free of voids.
      b. Whether sealant dimensions and configurations comply with specified
         requirements.
      c. Whether sealants in joints connected to pulled-out portion failed to adhere to
         joint substrates or tore cohesively. Include data on pull distance used to test each
         kind of product and joint substrate. Compare these results to determine if
         adhesion passes sealant manufacturer’s field-adhesion hand-pull test criteria.
   4. Record test results in a field-adhesion-test log. Include dates when sealants were
      installed, names of persons who installed sealants, test dates, test locations, whether
      joints were primed, adhesion results and percent elongations, sealant fill, sealant
      configuration, and sealant dimensions.
   5. Repair sealants pulled from test area by applying new sealants following same
      procedures used originally to seal joints. Ensure that original sealant surfaces are clean
      and that new sealant contacts original sealant.

B. Evaluation of Field-Adhesion Test Results: Sealants not evidencing adhesive failure from
   testing or noncompliance with other indicated requirements will be considered satisfactory.
   Remove sealants that fail to adhere to joint substrates during testing or to comply with other
   requirements. Retest failed applications until test results prove sealants comply with indicated
   requirements.

2.05 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by
   methods and with cleaning materials approved in writing by manufacturers of joint sealants
   and of products in which joints occur.
2.06 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes the following:
   1. Architectural joint systems for building interiors:
      a. Floor-to-floor.
      b. Floor-to-wall.
      c. Wall-to-wall.
      d. Wall corner.
      e. Wall-to-ceiling.
      f. Ceiling-to-ceiling.

   2. Architectural joint systems for building exteriors:
      a. Wall and soffit.

B. Related Sections include the following:
   1. Division 03 Section "Cast-in-Place Concrete" for cast-in architectural-joint-system frames furnished, but not installed, in this Section.
   2. Division 07 Section "Sheet Metal Flashing and Trim" for sheet metal wall joint systems.
   3. Division 07 Section "Manufactured Roof Expansion Joints" for factory-fabricated roof joint systems.
   5. Division 07 Section "Joint Sealants" for liquid-applied joint sealants.

1.02 DEFINITIONS

A. **Maximum Joint Width**: Widest linear gap a joint system tolerates and in which it performs its designed function without damaging its functional capabilities.

B. **Minimum Joint Width**: Narrowest linear gap a joint system tolerates and in which it performs its designed function without damaging its functional capabilities.

C. **Movement Capability**: Value obtained from the difference between widest and narrowest widths of a joint opening typically expressed in numerical values (mm or inches) or a percentage (plus or minus) of nominal value of joint width.

D. **Nominal Joint Width**: The width of the linear opening specified in practice and in which the joint system is installed.
1.03 SUBMITTALS

A. Shop Drawings: Provide the following for each joint system specified:
   1. Placement Drawings: Include line diagrams showing plans, elevations, sections, details, splices, blockout requirement, entire route of each joint system, and attachments to other work. Where joint systems change planes, provide isometric or clearly detailed drawing depicting how components interconnect.
   2. Architectural Joint System Schedule: Prepared by or under the supervision of the supplier. Include the following information in tabular form:
      a. Manufacturer and model number for each joint system.
      b. Joint system location cross-referenced to Drawings.
      c. Nominal joint width.
      d. Movement capability.
      e. Classification as thermal or seismic.
      f. Materials, colors, and finishes.
      g. Product options.
      h. Fire-resistance ratings.

B. Samples for Initial Selection: For each type of joint system indicated.
   1. Include manufacturer’s color charts showing the full range of colors and finishes available for each exposed metal and elastomeric seal material.

C. Samples for Verification: For each type of architectural joint system indicated.
   1. Full width by 6 inches long, for each system required.

D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for current products.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by manufacturer.

B. Source Limitations: Obtain interior architectural joint systems through one source from a single manufacturer.

C. Product Options: Drawings indicate size, profiles, and dimensional requirements of architectural joint systems and are based on the specific systems indicated. Refer to Division 01 Section "Product Requirements."
   1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect’s approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

D. Accessibility Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board’s "Americans with Disabilities Act (ADA), Accessibility Guidelines (ADAAG)" and ICC A117.1.
E. **Fire-Test-Response Characteristics:** Where indicated, provide architectural joint system and fire-barrier assemblies identical to those of assemblies tested for fire resistance per UL 2079 or ASTM E 1966 by a testing and inspecting agency acceptable to authorities having jurisdiction.  
   1. **Hose Stream Test:** Wall-to-wall and wall-to-ceiling assemblies shall be subjected to hose stream testing.

1.05 **COORDINATION**

A. Coordinate installation of exterior wall and soffit joint systems with roof expansion assemblies to ensure that wall transitions are watertight. Roof expansion assemblies are specified in Division 07.

PART 2 - PRODUCTS

2.01 **MATERIALS**

A. **Aluminum:** ASTM B 221, Alloy 6063-T5 for extrusions; ASTM B 209, Alloy 6061-T6 for sheet and plate.  
   1. Apply manufacturer’s standard protective coating on aluminum surfaces to be placed in contact with cementitious materials.  
   2. **Mill Finish:** AA-M10 (Mechanical Finish: as fabricated, unspecified).  
   3. **Class I, Clear Anodic Finish:** AA-M12C22A41 (Mechanical Finish: non-specular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.

B. **Elastomeric Seals:** Preformed elastomeric membranes or extrusions to be installed in metal frames.

C. **Compression Seals:** ASTM E 1612; preformed rectangular elastomeric extrusions having internal baffle system and designed to function under compression.

D. **Strip Seals:** ASTM E 1783; preformed elastomeric membrane or tubular extrusions having an internal baffle system and secured in or over a joint by a metal locking rail.

E. **Cellular Foam Seals:** Extruded, compressible foam designed to function under compression.

F. **Elastomeric Concrete:** Modified epoxy or polyurethane extended into a prepackaged aggregate blend, specifically designed for bonding to concrete substrates.

G. **Fire Barriers:** Any material or material combination, when fire tested after cycling, designated to resist the passage of flame and hot gases through a movement joint and to meet performance criteria for required rating period.

H. **Moisture Barrier:** Flexible elastomeric material; Manufacturer’s standard as compatible with adjacent materials.
I. Accessories: Manufacturer's standard anchors, clips, fasteners, set screws, spacers, and other accessories compatible with material in contact, as indicated or required for complete installations.

2.02 ARCHITECTURAL JOINT SYSTEMS, GENERAL

A. General: Provide architectural joint systems of design, basic profile, materials, and operation indicated. Provide units with capability to accommodate variations in adjacent surfaces.
1. Furnish units in longest practicable lengths to minimize field splicing. Install with hairline mitered corners where joint changes direction or abuts other materials.
2. Include factory-fabricated closure materials and transition pieces, tee-joints, corners, curbs, cross-connections, and other accessories as required to provide continuous joint systems.

B. Design architectural joint systems for the following size and movement characteristics:
1. Nominal Joint Width: As indicated on Drawings.
2. Maximum Joint Width: As indicated on Drawings.
3. Minimum Joint Width: As indicated on Drawings.
4. Movement Capability: Plus or minus 50%.
5. Type of Movement: Movement in 2 axis

2.03 ARCHITECTURAL JOINT SYSTEMS FOR BUILDING INTERIORS

A. Basis-of-Design Products: Subject to compliance with requirements, provide products specified in individual subparagraphs below as manufactured by Construction Specialties, Inc. (C/S Group), www.c-sgroup.com, or comparable products by one of the following:

B. Floor-to-Floor Joint Systems:
2. Type: Cover plate.
   a. Exposed Metal: Aluminum.
      1) Finish: Mill or Class I, clear anodic.
   b. Seal Material: MFX-6F fire barrier
3. Cover-Plate Design: Recessed to accept field-applied finish materials.
   a. Recess Depth: As required to accommodate adjacent flooring.
5. Load Capacity: Heavy duty.
   a. Uniform Load: 150 lb/sq. ft.
   c. Maximum Deflection: 0.5 inch.

6. Fire-Resistance Rating: Provide joint system and fire-barrier assembly with a rating not less than that of adjacent construction.
7. Moisture Barrier: Manufacturer's standard.

C. Wall-to-Wall Joint Systems:
1. Basis-of-Design Product at Curtain Wall:
2. Type: Vertical gasketed/accordion.
3. Exposed Metal: Aluminum.
   1) Finish: Mill or Class I, clear anodic.
   b. Seal Material: Santoprene.
   1) Color: As selected by Architect from manufacturer's full range.
   c. Secondary Seal: No secondary seal required at back-to-back seal locations.
4. Fire-Resistance Rating: Provide joint system and fire-barrier assembly with a rating not less than that of adjacent construction.
5. Moisture Barrier: Manufacturer's standard.

D. Wall Corner Joint Systems:
1. Basis-of-Design Product: "LAFC" as manufactured by C/S Group, size as required.
2. Type: Vertical cover plate.
   a. Exposed Metal: Aluminum.
      1) Finish: Manufacturer's standard prime for field paint.
3. Fire-Resistance Rating: Provide joint system and fire-barrier assembly with a rating not less than that of adjacent construction.
E. Ceiling-to-Ceiling Joint Systems:
2. Type: Flush GasketedAccordion
   a. Exposed Metal: Aluminum.
      1) Finish: Mill or Class I, clear anodic.
3. Fire-Resistance Rating: Provide joint system and fire-barrier assembly with a rating not less than that of adjacent construction.

2.04 ARCHITECTURAL JOINT SYSTEMS FOR BUILDING EXTERIORS

A. Basis-of-Design Products: Subject to compliance with requirements, provide products specified in individual subparagraphs below as manufactured by Construction Specialties, Inc. (C/S Group), www.c-sgroup.com, or comparable products by one of the following:

B. Architectural Joint Systems for Exterior Walls and Soffits:
2. Type: Flat Seal.
      1) Color: As selected by Architect from manufacturer's full range.
3. Fire-Resistance Rating: Provide joint system and fire-barrier assembly with a rating not less than that of adjacent construction.

C. Architectural Joint Systems at Exterior Glazing:
2. Type: vertical gasketed/accordion.
   a. Exposed Metal: Aluminum.
      1) Finish: Mill or Class I, clear anodic.
   b. Seal Material: Santoprene.
      1) Color: As selected by Architect from manufacturer's full range.

3. Fire-Resistance Rating: Provide joint system and fire-barrier assembly with a rating not less than that of adjacent construction.

2.05 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine surfaces and blockouts where architectural joint systems will be installed for installation tolerances and other conditions affecting performance of work.
   1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Prepare substrates according to architectural joint system manufacturer's written instructions.

B. Repair concrete slabs and blockouts using manufacturer's recommended repair grout of compressive strength adequate for anticipated structural loadings.

C. Coordinate and furnish anchorages, setting drawings, and instructions for installing joint systems. Provide fasteners of metal, type, and size to suit type of construction indicated and to provide for secure attachment of joint systems.

D. Cast-In Frames: Coordinate and furnish frames to be cast into concrete.

3.03 INSTALLATION

A. Comply with manufacturer's written instructions for storing, handling, and installing architectural joint assemblies and materials unless more stringent requirements are indicated.

B. Metal Frames: Perform cutting, drilling, and fitting required to install joint systems.
   1. Install in true alignment and proper relationship to joints and adjoining finished surfaces measured from established lines and levels.
2. Adjust for differences between actual structural gap and nominal design gap due to ambient temperature at time of installation. Notify Architect where discrepancies occur that will affect proper joint installation and performance.
3. Cut and fit ends to accommodate thermal expansion and contraction of metal without buckling of frames.
4. Locate in continuous contact with adjacent surfaces.
6. Heavy-Duty Systems: Repair or grout blockout as required for continuous frame support and to bring frame to proper level. Shimming is not allowed.
7. Locate anchors at interval recommended by manufacturer, but not less than 3 inches from each end and not more than 24 inches o.c.

C. Seals in Metal Frames: Install elastomeric seals and membranes in frames to comply with manufacturer’s written instructions. Install with minimum number of end joints.
   1. Provide in continuous lengths for straight sections.
   2. Seal transitions according to manufacturer’s written instructions. Vulcanize or heat-weld field-spliced joints as recommended by manufacturer.
   3. Installation: Mechanically lock seals into frames or adhere to frames with adhesive or pressure-sensitive tape as recommended by manufacturer.

D. Compression Seals: Apply adhesive or lubricant adhesive as recommended by manufacturer to both frame interfaces before installing compression seals.

E. Foam Seals: Install with adhesive recommended by manufacturer.

F. Epoxy-Bonded Seals: Pressurize seal for time period and to pressure recommended by manufacturer. Do not over-pressurize.

G. Terminate exposed ends of joint assemblies with field- or factory-fabricated termination devices.

H. Fire-Resistance-Rated Assemblies: Coordinate installation of architectural joint assembly materials and associated work so complete assemblies comply with assembly performance requirements.
   1. Fire Barriers: Install fire barriers to provide continuous, uninterrupted fire resistance throughout length of joint, including transitions and field splices.

I. Water Barrier: Provide water barrier at exterior joints and where called for on Drawings. Provide drainage fittings at a maximum of 50 feet or where indicated.
3.04 PROTECTION

A. Do not remove protective covering until finish work in adjacent areas is complete. When protective covering is removed, clean exposed metal surfaces to comply with manufacturer's written instructions.

B. Protect the installation from damage by work of other Sections. Where necessary due to heavy construction traffic, remove and properly store cover plates or seals and install temporary protection over joints. Reinstall cover plates or seals prior to Substantial Completion of the Work.

END OF SECTION
SECTION 08 11 13

HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
1. Standard hollow metal doors and frames.

B. Related Sections:
1. Division 04 Section "Unit Masonry" for embedding anchors for hollow metal work into masonry construction.
2. Division 08 Section "Flush Wood Doors" for wood doors installed in hollow metal frames.
3. Division 08 Section "Glazing" for glass in glazed openings in doors and frames.
4. Division 08 Section "Door Hardware" for door hardware for hollow metal doors.
5. Division 09 Section "Painting" for field painting hollow metal doors and frames.
6. Division 26 Sections for electrical connections including conduit and wiring for door controls and operators.

1.02 DEFINITIONS

A. Minimum Thickness: Minimum thickness of base metal without coatings.

B. Standard Hollow Metal Work: Hollow metal work fabricated according to ANSI/SDI A250.8.

1.03 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, fire-resistance rating, temperature-rise ratings, and finishes.

B. Shop Drawings: Include the following:
1. Elevations of each door design.
2. Details of doors, including vertical and horizontal edge details and metal thicknesses.
3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
4. Locations of reinforcement and preparations for hardware.
5. Details of each different wall opening condition.
6. Details of anchorages, joints, field splices, and connections.
7. Details of accessories.
8. Details of moldings, removable stops, and glazing.
9. Details of conduit and preparations for power, signal, and control systems.

C. Samples for Initial Selection: For units with factory-applied color finishes.

D. Samples for Verification:
1. For each type of exposed finish required, prepared on Samples of not less than 3 by 5 inches.

2. For the following items, prepared on Samples about 12 by 12 inches to demonstrate compliance with requirements for quality of materials and construction:
   a. Doors: Show vertical-edge, top, and bottom construction; core construction; and hinge and other applied hardware reinforcement. Include separate section showing glazing if applicable.
   b. Frames: Show profile, corner joint, floor and wall anchors, and silencers. Include separate section showing fixed hollow metal panels and glazing if applicable.

E. Other Action Submittals:
   1. Schedule: Provide a schedule of hollow metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with door hardware schedule.

F. Oversize Construction Certification: For assemblies required to be fire rated and exceeding limitations of labeled assemblies.

G. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each type of hollow metal door and frame assembly.

1.04 QUALITY ASSURANCE

A. Source Limitations: Obtain hollow metal work from single source from single manufacturer.

B. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at as close to neutral pressure as possible according to NFPA 252 or UL 10C.
   1. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide certification by a qualified testing agency that doors comply with standard construction requirements for tested and labeled fire-rated door assemblies except for size.
   2. Temperature-Rise Limit: Where indicated, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F above ambient after 30 minutes of standard fire-test exposure.

C. Fire-Rated, Borrowed-Light Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled, by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 257 or UL 9. Label each individual glazed lite.

D. Smoke-Control Door Assemblies: Comply with NFPA 105 or UL 1784.

E. Preinstallation Conference: Conduct conference at Project site.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use non-vented plastic.
1. Remove coverings if they become wet.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch high wood blocking. Do not store in a manner that traps excess humidity.
1. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

1.06 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.07 COORDINATION

A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Amweld Building Products, LLC: www.amweld.com
2. Ceco Door Products; an Assa Abloy Group company: www.cecodoor.com
3. Curries Company; an Assa Abloy Group company: www.curries.com
4. Habersham Metal Products Company: www.habershammetal.com
5. Kewanee Corporation (The) www.federalcorp.com
7. Security Metal Products Corp. www.secmet.com
8. Steelcraft; an Ingersoll-Rand company: www.steelcraft.com

2.02 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 or A60 metallic coating.
D. Frame Anchors: ASTM A 591/A 591M, Commercial Steel (CS), 40Z coating designation; mill phosphatized.
   1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.

E. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.

F. Powder-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow metal frames of type indicated.

G. Grout: ASTM C 476, except with a maximum slump of 4 inches, as measured according to ASTM C 143/C 143M.

H. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool with 6- to 12-lb/cu. ft. density; with maximum flame-spread and smoke-development indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.

I. Glazing: Comply with requirements in Division 08 Section "Glazing."

J. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.03 STANDARD HOLLOW METAL DOORS

A. General: Provide doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI/SDI A250.8.
   1. Design: Flush panel or as indicated.
   2. Core Construction: Manufacturer’s standard kraft-paper honeycomb, polystyrene, polyurethane, polyisocyanurate, mineral-board, or vertical steel-stiffener core.
      a. Fire Door Core: As required to provide fire-protection and temperature-rise ratings indicated.
      b. Thermal-Rated (Insulated) Doors: Where indicated, provide doors fabricated with thermal-resistance value (R-value) of not less than 6.0 deg F x h x sq. ft./Btu when tested according to ASTM C 1363.
         1) Locations: Exterior doors.
   4. Top and Bottom Edges: Closed with flush or inverted 0.042-inch-thick, end closures or channels of same material as face sheets.
B. Exterior Doors: Face sheets fabricated from metallic-coated steel sheet. Provide doors complyng with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:
1. Level 3 and Physical Performance Level A (Extra Heavy Duty), Model 1 (Full Flush).

C. Interior Doors: Face sheets fabricated from cold-rolled steel sheet unless metallic-coated sheet is indicated. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:
1. Level 3 and Physical Performance Level A (Extra Heavy Duty), Model 1 (Full Flush).

D. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

E. Fabricate concealed stiffeners and hardware reinforcement from either cold- or hot-rolled steel sheet.

2.04 STANDARD HOLLOW METAL FRAMES

A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.

1. Fabricate frames with mitered or coped corners.
2. Fabricate frames as face welded unless otherwise indicated.
3. Frames for Level 3 Steel Doors: 0.053-inch-thick steel sheet.

C. Interior Frames: Fabricated from cold-rolled steel sheet unless metallic-coated sheet is indicated.
1. Fabricate frames with mitered or coped corners.
2. Fabricate frames as face welded unless otherwise indicated.
3. Frames for Level 3 Steel Doors: 0.053-inch-thick steel sheet.
5. Frames for Borrowed Lights: Same as adjacent door frame.

D. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcement plates from same material as frames.

2.05 FRAME ANCHORS

A. Jamb Anchors:
1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
2. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.
3. Postinstalled Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch-diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.
B. Floor Anchors: Formed from same material as frames, not less than 0.042 inch thick, and as follows:
   1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.

2.06 HOLLOW METAL PANELS

A. Provide hollow metal panels of same materials, construction, and finish as specified for adjoining hollow metal work.

2.07 STOPS AND MOLDINGS

A. Moldings for Glazed Lites in Doors: Minimum 0.032 inch thick, fabricated from same material as door face sheet in which they are installed.

B. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch high unless otherwise indicated.

C. Loose Stops for Glazed Lites in Frames: Minimum 0.032 inch thick, fabricated from same material as frames in which they are installed.

2.08 ACCESSORIES

A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.

B. Grout Guards: Formed from same material as frames, not less than 0.016 inch thick.

2.09 FABRICATION

A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.

B. Tolerances: Fabricate hollow metal work to tolerances indicated in SDI 117.

C. Hollow Metal Doors:
   1. Exterior Doors: Provide weep-hole openings in bottom of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.
   2. Glazed Lites: Factory cut openings in doors.
   3. Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted.

D. Hollow Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
   1. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
2. Sidelight Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.

3. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.

4. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.

5. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.

6. Jamb Anchors: Provide number and spacing of anchors as follows:
   a. Masonry Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
      1) Two anchors per jamb up to 60 inches high.
      2) Three anchors per jamb from 60 to 90 inches high.
      3) Four anchors per jamb from 90 to 120 inches high.
      4) Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.

   b. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
      1) Three anchors per jamb up to 60 inches high.
      2) Four anchors per jamb from 60 to 90 inches high.
      3) Five anchors per jamb from 90 to 96 inches high.
      4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
      5) Two anchors per head for frames above 42 inches wide and mounted in metal-stud partitions.

   c. Compression Type: Not less than two anchors in each jamb.
   d. Postinstalled Expansion Type: Locate anchors not more than 6 inches from top and bottom of frame. Space anchors not more than 26 inches o.c.

7. Door Silencers: Except on weather-stripped doors, drill stops to receive door silencers as follows. Keep holes clear during construction.
   a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
   b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.

E. Fabricate concealed stiffeners, edge channels, and hardware reinforcement from either cold- or hot-rolled steel sheet.

F. Hardware Preparation: Factory prepare hollow metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."
   1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
   2. Reinforce doors and frames to receive non-templated, mortised and surface-mounted door hardware.
3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 Sections.

G. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints.
1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow metal work.
2. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
3. Provide loose stops and moldings on inside of hollow metal work.
4. Coordinate rabbet width between fixed and removable stops with type of glazing and type of installation indicated.

2.10 STEEL FINISHES
A. Prime Finish: Apply manufacturer’s standard primer immediately after cleaning and pretreating.
   1. Shop Primer: Manufacturer’s standard, fast-curing, lead- and chromate-free primer complying with ANSI/SDI A250.10.

PART 3 - EXECUTION
3.01 EXAMINATION
A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.
C. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION
A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.
B. Prior to installation, adjust and securely brace welded hollow metal frames for squareness, alignment, twist, and plumbness to the following tolerances:
   1. Squarenness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
2. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
3. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
4. Plumbness: Plus or minus 1/16 inch, measured at jambs on a perpendicular line from head to floor.

C. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.03 INSTALLATION

A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.

B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11.
1. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
   a. At fire-protection-rated openings, install frames according to NFPA 80.
   b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
   c. Install frames with removable glazing stops located on secure side of opening.
   d. Install door silencers in frames before grouting.
   e. Remove temporary braces necessary for installation only after frames have been properly set and secured.
   f. Check plumbness, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
   g. Field apply bituminous coating to backs of frames that are filled with grout containing antifreezing agents.

2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.
   a. Floor anchors may be set with powder-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.


4. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.

5. Concrete Walls: Solidly fill space between frames and concrete with grout. Take precautions, including bracing frames, to ensure that frames are not deformed or damaged by grout forces.

6. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
7. Installation Tolerances: Adjust hollow metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
   a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
   b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
   c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
   d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.

C. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.
   1. Non-Fire-Rated Standard Steel Doors:
      a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
      b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
      c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.

   2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
   3. Smoke-Control Doors: Install doors according to NFPA 105.

D. Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with hollow metal manufacturer's written instructions.
   1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches o.c. from each corner.

END OF SECTION
SECTION 08 14 16

FLUSH WOOD DOORS

PART 1 - GENERAL

1.01  SUMMARY

A.  Section Includes:
1.  Solid-core doors with wood-veneer faces.
2.  Factory finishing flush wood doors.
3.  Factory fitting flush wood doors to frames and factory machining for hardware.

B.  Related Sections:
1.  Division 08 Section "Glazing" for glass view panels in flush wood doors.
2.  Division 08 Section “Door Hardware” for operating hardware.

1.02  SUBMITTALS

A.  Product Data:  For each type of door indicated.  Include details of core and edge construction and trim for openings.  Include factory-finishing specifications.

B.  LEED Submittals:
1.  Certificates for Credit MR 7:  Chain-of-custody certificates certifying that flush wood doors comply with forest certification requirements.  Include evidence that manufacturer is certified for chain of custody by an FSC-accredited certification body.
   a.  Include statement indicating costs for each certified wood product.

2.  Product Data for Credit EQ 4.4:  For adhesives and composite wood products, submit documentation indicating that product contains no urea formaldehyde.

C.  Shop Drawings:  Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; location and extent of hardware blocking; and other pertinent data.
1.  Indicate dimensions and locations of mortises and holes for hardware.
2.  Indicate dimensions and locations of cutouts.
3.  Indicate requirements for veneer matching.
4.  Indicate doors to be factory finished and finish requirements.
5.  Indicate fire-protection ratings for fire-rated doors.

D.  Samples:  Submit the following:
1.  Corner sections of doors, approximately 8 by 10 inches, with door faces and edges representing actual materials to be used.
2.  Finish veneer-faced door samples with same materials proposed for factory-finished doors.
3.  Frames for light openings, 6 inches long, for each material, type, and finish required.

E.  Warranty:  Sample of special warranty.
1.03 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body.

B. Source Limitations: Obtain flush wood doors from single manufacturer.

C. Quality Standard: In addition to requirements specified, comply with AWI's "Architectural Woodwork Quality Standards Illustrated."
   1. Provide AWI Quality Certification Labels or an AWI letter of licensing for Project indicating that doors comply with requirements of grades specified.

D. Forest Certification: Provide doors made with not less than 70 percent of wood products obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."

E. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at as close to neutral pressure as possible according to NFPA 252 or UL 10C.
   1. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide certification by a qualified testing agency that doors comply with standard construction requirements for tested and labeled fire-rated door assemblies except for size.

F. Preinstallation Conference: Conduct conference at Project site.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of referenced standard and manufacturer’s written instructions.

B. Protect doors during transit, storage, and handling to prevent damage, soiling, and deterioration. Doors are to be shipped from manufacturer in individual polybags, and shall be inspected immediately upon arrival at jobsite for any damage of defects.

C. Identify each door with individual opening numbers that correlate with designation system used on shop drawings and contract drawings for door, frames and hardware. Use only temporary, removable, or concealed markings.

D. Do not deliver or install doors until building is enclosed and weather tight, wet-work is complete and dry, and HVAC system is operating and maintaining ambient temperature and relative humidity at occupancy level in storage and installation areas.

E. Mark each door on bottom rail with opening number used on Shop Drawings.
1.05  WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Warping (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section.
      b. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span.


PART 2 - PRODUCTS

2.01  LOCAL/REGIONAL MATERIALS

A. Preference shall be given to supplier whose facilities are within a 500 mile radius of the project site.

B. Preference shall also be given to materials that are harvested, extracted, mined, quarried, etc. within a 500 mile radius of the project site.

2.02  MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Algoma Hardwoods, Inc.: www.algomahardwoods.com
   2. Eggers Industries: www.eggersindustries.com
   3. Graham; an Assa Abloy Group company: www.grahamdoors.com
   5. Oshkosh Architectural Door Company: www.oshkoshdoor.com
   6. VT Industries Inc. www.vtindustries.com

2.03  DOOR CONSTRUCTION, GENERAL

A. Low-Emitting Materials: Provide doors made with adhesives and composite wood products that do not contain urea formaldehyde.

B. WDMA I.S.1-A Performance Grade:
   1. Heavy Duty unless otherwise indicated.
   2. Extra Heavy Duty: Classrooms, public toilets, janitor's closets, assembly spaces, exits, and where indicated.
   3. Standard Duty: Closets (not including janitor's closets) and where indicated.
C. Particleboard-Core Doors:
   1. Particleboard: ANSI A208.1, Grade LD-1, made with binder containing no urea-formaldehyde resin.
   2. Particleboard: Straw-based particleboard complying with ANSI A208.1, Grade LD-2 or M-2, except for density.
   3. Blocking: Provide wood blocking in particleboard-core doors as needed to eliminate through-bolting hardware.
   4. Provide doors with either glued-wood-stave or structural-composite-lumber cores instead of particleboard cores for doors indicated to receive exit devices.

D. Structural-Composite-Lumber-Core Doors:
      a. Screw Withdrawal, Face: 700 lbf.
      b. Screw Withdrawal, Edge: 400 lbf.

E. Fire-Protection-Rated Doors: Provide core specified or mineral core as needed to provide fire-protection rating indicated.
   1. Edge Construction: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed edges.
   2. Pairs: Provide fire-retardant stiles that are listed and labeled for applications indicated without formed-steel edges and astragals. Provide stiles with concealed intumescent seals. Comply with specified requirements for exposed edges.

F. Mineral-Core Doors:
   1. Core: Noncombustible mineral product complying with requirements of referenced quality standard and testing and inspecting agency for fire-protection rating indicated.
   2. Blocking: Provide composite blocking with improved screw-holding capability approved for use in doors of fire-protection ratings indicated as needed to eliminate through-bolting hardware.
   3. Edge Construction: At hinge stiles, provide laminated-edge construction with improved screw-holding capability and split resistance. Comply with specified requirements for exposed edges.

2.04 VENEERED-FACED DOORS FOR TRANSPARENT FINISH

A. Interior Solid-Core Doors:
   1. Grade: Premium, with Grade AA faces.
   2. Species: White oak.
   5. Assembly of Veneer Leaves on Door Faces: Center-balance match.
   6. Pair and Set Match: Provide for doors hung in same opening or separated only by mullions.
   7. Exposed Vertical and Top Edges: Same species as faces.
   8. Core: Either glued wood stave or structural composite lumber.
   9. Construction: Five or seven plies. Stiles and rails are bonded to core, then entire unit abrasive planed before veneering.
2.05 LIGHT FRAMES

A. Wood-Veneered Beads for Light Openings in Fire-Rated Doors: Manufacturer's standard wood-veneered noncombustible beads matching veneer species of door faces and approved for use in doors of fire-protection rating indicated. Include concealed metal glazing clips where required for opening size and fire-protection rating indicated.

B. Metal Frames for Light Openings in Fire-Rated Doors: Manufacturer's standard frame formed of 0.048-inch-thick, cold-rolled steel sheet; factory primed for paint finish and approved for use in doors of fire-protection rating greater than 20-minutes.

2.06 FABRICATION

A. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.
   1. Comply with requirements in NFPA 80 for fire-rated doors.

B. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, DHI A115-W series standards, and hardware templates.
   1. Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.

C. Openings: Cut and trim openings through doors in factory.
   1. Light Openings: Trim openings with moldings of material and profile indicated.

2.07 FACTORY FINISHING

A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.
   1. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on bottom edges, edges of cutouts, and mortises.

B. Finish doors at factory.

C. Transparent Finish:
   1. Grade: Premium.
   2. Finish: AWI catalyzed polyurethane system.
   3. Effect: Semifilled finish, produced by applying an additional finish coat to partially fill the wood pores.
PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine doors and installed door frames before hanging doors.
   1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
   2. Reject doors with defects.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Hardware: For installation, see Division 08 Section "Door Hardware."

B. Installation Instructions: Install doors to comply with manufacturer's written instructions and the referenced quality standard, and as indicated.
   1. Install fire-rated doors in corresponding fire-rated frames according to NFPA 80.

C. Job-Fitted Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors. Machine doors for hardware. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.
   1. Clearances: Provide 1/8 inch at heads, jambs, and between pairs of doors. Provide 1/8 inch from bottom of door to top of decorative floor finish or covering unless otherwise indicated. Where threshold is shown or scheduled, provide 1/4 inch from bottom of door to top of threshold unless otherwise indicated.
      a. Comply with NFPA 80 for fire-rated doors.
   2. Bevel non-fire-rated doors 1/8 inch in 2 inches at lock and hinge edges.
   3. Bevel fire-rated doors 1/8 inch in 2 inches at lock edge; trim stiles and rails only to extent permitted by labeling agency.

D. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

E. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.03 ADJUSTING

A. Operation: Rehang or replace doors that do not swing or operate freely.

B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.
3.04 CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

A. Construction waste shall be managed in accordance with provisions of Division 01 Section “Construction Waste Management and Disposal”. Documentation shall be submitted to satisfy the requirements of that section.

B. Waste Disposal: Comply with the requirements of Division 01 Section “Construction Waste Management and Disposal”, and as follows:
   1. Comply with applicable regulations.
   2. Do not burn scrap on project site.
   3. Do not burn scraps that have been pressure treated.
   4. Do not send materials treated with pentachlorophenol, CCA, or ACA to co-generation facilities or “waste-to-energy” facilities.

C. Do not leave any wood, shavings, sawdust, etc. on the ground or buried in fill.

D. Prevent sawdust and wood shavings from entering the storm drainage system.

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes:
   1. Access doors and frames for walls and ceilings.

B. Related Sections include the following:
   1. Division 03 Section "Cast-in-Place Concrete" for blocking out openings for access doors and frames in concrete.
   2. Division 08 Section "Door Hardware" for rim cylinder locks and master keying.
   3. Division 09 Section "Acoustical Tile Ceilings" for suspended acoustical tile ceilings.
   4. Division 23 Section "Air Duct Accessories" for heating and air-conditioning duct access doors.

C. The intent of this section is to provide a standardized guideline for access doors. Access doors shall be provided by the trade that requires access to their systems.

1.02 SUBMITTALS

A. Product Data: For each type of access door and frame indicated.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

C. Samples: For each door face material in specified finish.

D. Schedule: Types, locations, sizes, latching or locking provisions, and other data pertinent to installation.

E. Ceiling Coordination Drawings: Reflected ceiling plans, drawn to scale, on which ceiling-mounted items including access doors and frames, lighting fixtures, diffusers, grilles, speakers, sprinklers, and special trim are shown and coordinated with each other.

1.03 QUALITY ASSURANCE

A. Fire-Rated Access Doors and Frames: Units complying with NFPA 80 that are identical to assemblies tested for fire-test-response characteristics per the following test method and that are listed and labeled by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
   1. NFPA 252 or UL 10B for vertical access doors and frames.
   2. ASTM E 119 or UL 263 for horizontal access doors and frames.
1.04 COORDINATION

A. Verification: Determine specific locations and sizes for access doors needed to gain access to concealed plumbing, mechanical, or other concealed work, and indicate in the schedule specified in "Submittals" Article.

PART 2 - PRODUCTS

2.01 STEEL MATERIALS

A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
   1. ASTM A 123/A 123M, for galvanizing steel and iron products.
   2. ASTM A 153/A 153M, for galvanizing steel and iron hardware.

B. Steel Sheet: Uncoated or electrolytic zinc-coated, ASTM A 591/A 591M with cold-rolled steel sheet substrate complying with ASTM A 1008/A 1008M, Commercial Steel (CS), exposed.
   1. Provide zinc-coated access doors and frames in high relative humidity areas.
      a. "High Relative Humidity Areas" shall be defined as within all toilet rooms and within 3-feet of sinks.

C. Steel Finishes: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
   1. Factory-Primed Finish: Manufacturer's standard shop primer.

D. Drywall Beads: 0.0299-inch zinc-coated steel sheet to receive joint compound.

2.02 ACCESS DOORS AND FRAMES FOR WALLS AND CEILINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Acudor Products, Inc. www.acudor.com
   2. Babcock-Davis; A Cierra Products Co. www.babcockdavis.com
   5. J. L. Industries, Inc. www.jlindustries.com
   8. MIFAB, Inc. www.mifab.com

B. Flush Access Doors with Exposed Flanges:
   1. Assembly Description: Fabricate door to fit flush to frame. Provide manufacturer’s standard-width exposed flange, proportional to door size.
   2. Locations: Wall and ceiling.
   3. Door Size: As required by trade requiring access.
   4. Uncoated Steel Sheet for Door: Nominal 0.060 inch, 16 gage.
5. **Frame Material**: Same material, thickness, and finish as door.
6. **Hinges**: Manufacturer's standard.
7. **Hardware**: Cam Latch (screwdriver stop). Minimum of 2 per door.

C. **Flush Access Doors with Concealed Flanges**:
   1. **Assembly Description**: Fabricate door to fit flush to frame. Provide frame with gypsum board beads for concealed flange installation.
   2. **Locations**: Wall and ceiling.
   3. **Door Size**: As required by trade requiring access.
   4. **Uncoated Steel Sheet for Door**: Nominal 0.060 inch, 16 gage.
      a. **Finish**: Factory prime.

5. **Frame Material**: Same material and thickness as door.
6. **Hinges**: Manufacturer's standard.
7. **Hardware**: Cam Latch (screwdriver stop). Minimum of 2 per door.

D. **Fire-Rated, Flush Access Doors with Concealed Flanges**:
   1. **Assembly Description**: Fabricate door to fit flush to frame, with a core of mineral-fiber insulation enclosed in sheet metal or uninsulated as required by location. Provide self-latching door with automatic closer and interior latch release. Provide frame with gypsum board beads for concealed flange installation.
   2. **Locations**: Wall and ceiling.
   3. **Fire-Resistance Rating**: Not less than that of adjacent construction.
   4. **Temperature-Rise Rating**: 450 deg F (250 deg C) at the end of 30 minutes.
   5. **Uncoated Steel Sheet for Door**: Nominal 0.036 inch (0.91 mm), 20 gage.
      a. **Finish**: Factory prime.

6. **Frame Material**: Same material, thickness, and finish as door.
7. **Hinges**: Manufacturer's standard.
8. **Hardware**: Cam Latch (screwdriver stop). Minimum of 2 per door.

2.03 **FABRICATION**

A. **General**: Provide access door and frame assemblies manufactured as integral units ready for installation.

B. **Sizes**: To the greatest extent possible, provide manufacturer's standard sizes, except where clearly indicated otherwise. Provide access doors with size appropriate for their intended use. For access doors through which equipment or components must be moved for building maintenance, provide access doors which are large enough to permit easy removal and installation of equipment or component. Provide the following minimum sizes, unless otherwise indicated:
   1. **Hand and Arm Reach-In Only**: Minimum 12 inch square doors.
   2. **Upper Body Reach-In**: Minimum 20 inch square doors.

C. **Metal Surfaces**: For metal surfaces exposed to view, provide materials with smooth, flat surfaces without blemishes.
D. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access panels to types of supports indicated.

E. Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane when closed.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Comply with manufacturer's written instructions for installing access doors and frames.

B. Install doors flush with adjacent finish surfaces or recessed to receive finish material.

3.02 ADJUSTING AND CLEANING

A. Adjust doors and hardware after installation for proper operation.

B. Remove and replace doors and frames that are warped, bowed, or otherwise damaged.

END OF SECTION
SECTION 08 41 13

ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Exterior and interior storefront framing.
   2. Storefront framing for window walls.
   4. Exterior and interior manual-swing entrance doors and door-frame units.
   5. Break metal closures.

B. Related Sections:
   1. Division 08 Section "Glazed Aluminum Curtain Walls" for curtain-wall systems that mechanically retain glazing on four sides.
   2. Division 08 Section "Door Hardware" for storefront door hardware.

1.02 DEFINITIONS

A. ADA/ABA Accessibility Guidelines: U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disability Act (ADA) and Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities."

1.03 PERFORMANCE REQUIREMENTS

A. General Performance: Aluminum-framed systems shall withstand the effects of the following performance requirements without exceeding performance criteria or failure due to defective manufacture, fabrication, installation, or other defects in construction:
   1. Movements of supporting structure indicated on Drawings including, but not limited to, story drift and deflection from uniformly distributed and concentrated live loads.
   2. Dimensional tolerances of building frame and other adjacent construction.
   3. Failure includes the following:
      a. Deflection exceeding specified limits.
      b. Thermal stresses transferring to building structure.
      c. Framing members transferring stresses, including those caused by thermal and structural movements to glazing.
      d. Glazing-to-glazing contact.
      e. Noise or vibration created by wind and by thermal and structural movements.
      f. Loosening or weakening of fasteners, attachments, and other components.
      g. Sealant failure.
      h. Failure of operating units.

B. Delegated Design: Design aluminum-framed systems, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
C. Structural Loads:
   1. Wind Loads: As indicated on Drawings.
   2. Seismic Loads: As indicated on Drawings.

D. Deflection of Framing Members:
   1. Deflection Normal to Wall Plane: Limited to edge of glass in a direction perpendicular to glass plane shall not exceed L/175 of the glass edge length for each individual glazing lite or an amount that restricts edge deflection of individual glazing lites to 3/4 inch, whichever is less.
   2. Deflection Parallel to Glazing Plane: Limited to L/360 of clear span or 1/8 inch, whichever is smaller.

E. Structural-Test Performance: Provide aluminum-framed systems tested according to ASTM E 330 as follows:
   1. When tested at positive and negative wind-load design pressures, systems do not evidence deflection exceeding specified limits.
   2. When tested at 150 percent of positive and negative wind-load design pressures, systems, including anchorage, do not evidence material failures, structural distress, and permanent deformation of main framing members exceeding 0.2 percent of span.
   3. Test Durations: As required by design wind velocity, but not fewer than 10 seconds.

F. Windborne-Debris-Impact-Resistance Performance: Provide aluminum-framed systems that pass missile-impact and cyclic-pressure tests when tested according to ASTM E 1886 and testing information in ASTM E 1996 or AAMA 506.
   1. Large-Missile Impact: For aluminum-framed systems located within 30 feet of grade.
   2. Small-Missile Impact: For aluminum-framed systems located more than 30 feet above grade.

G. Story Drift: Provide aluminum-framed systems that accommodate design displacement of adjacent stories indicated.
   1. Design Displacement: As indicated on Drawings.
   2. Test Performance: Meet criteria for passing, based on building occupancy type, when tested according to AAMA 501.4 at design displacement and 1.5 times design displacement.

H. Air Infiltration: Provide aluminum-framed systems with maximum air leakage through fixed glazing and framing areas of 0.06 cfm/sq. ft. of fixed wall area when tested according to ASTM E 283 at a minimum static-air-pressure difference of 6.24 lbf/sq. ft.

I. Water Penetration under Static Pressure: Provide aluminum-framed systems that do not evidence water penetration through fixed glazing and framing areas when tested according to ASTM E 331 at a minimum static-air-pressure difference of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft.

J. Water Penetration under Dynamic Pressure: Provide aluminum-framed systems that do not evidence water leakage through fixed glazing and framing areas when tested according to AAMA 501.1 under dynamic pressure equal to 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft.
1. Maximum Water Leakage: According to AAMA 501.1. Water leakage does not include water controlled by flashing and gutters that is drained to exterior and water that cannot damage adjacent materials or finishes.

K. Thermal Movements: Provide aluminum-framed systems that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
   1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.
   2. Test Performance: No buckling; stress on glass; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested according to AAMA 501.5.
      a. High Exterior Ambient-Air Temperature: That which produces an exterior metal-surface temperature of 180 deg F.
      b. Low Exterior Ambient-Air Temperature: 0 deg F.

3. Interior Ambient-Air Temperature: 75 deg F.

L. Condensation Resistance: Provide aluminum-framed systems with fixed glazing and framing areas having condensation-resistance factor (CRF) of not less than 53 when tested according to AAMA 1503.

M. Thermal Conductance: Provide aluminum-framed systems with fixed glazing and framing areas having an average U-factor of not more than 0.57 Btu/sq. ft. x h x deg F when tested according to AAMA 1503.

N. Sound Transmission: Provide aluminum-framed systems with fixed glazing and framing areas having the following sound-transmission characteristics:
   1. Sound Transmission Class (STC): Minimum 30 STC when tested for laboratory sound transmission loss according to ASTM E 90 and determined by ASTM E 413.

1.04 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for aluminum-framed systems.

B. LEED Submittal:
   1. Product Data for Credit EQ 4.1: For adhesives and sealants used inside of the weatherproofing system, including printed statement of VOC content.

C. Shop Drawings: For aluminum-framed systems. Include plans, elevations, sections, details, and attachments to other work.
   1. Include details of provisions for system expansion and contraction and for drainage of moisture in the system to the exterior.
2. For entrance doors, include hardware schedule and indicate operating hardware types, functions, quantities, and locations.

D. Samples for Initial Selection: For units with factory-applied color finishes.

E. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.

F. Fabrication Sample: Of each vertical-to-horizontal intersection of aluminum-framed systems, made from 12-inch lengths of full-size components and showing details of the following:
   1. Joinery, including concealed welds.
   2. Anchorage.
   5. Flashing and drainage.

G. Other Action Submittals:
   1. Entrance Door Hardware Schedule: See Division 08 Section “Door Hardware”. Prepared by or under the supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams. Coordinate final entrance door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of entrance door hardware.

H. Delegated-Design Submittal: For aluminum-framed systems 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. Detail fabrication and assembly of aluminum-framed systems.
   2. Include design calculations.

I. Qualification Data: For qualified Installer and testing agency.

J. Seismic Qualification Certificates: For aluminum-framed systems, accessories, and components, from manufacturer.
   1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

K. Welding certificates.

L. Preconstruction Test Reports: For sealant.

M. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for aluminum-framed systems, indicating compliance with performance requirements.

N. Source quality-control reports.


P. Field quality-control reports.
Q. Maintenance Data: For aluminum-framed systems to include in maintenance manuals.

R. Warranties: Sample of special warranties.

### 1.05 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

B. Testing Agency Qualifications: Qualified according to ASTM E 699 for testing indicated.

C. Engineering Responsibility: Prepare data for aluminum-framed systems, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in systems similar to those indicated for this Project.

D. Product Options: Information on Drawings and in Specifications establishes requirements for systems' aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in-service performance.

   1. Do not revise intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If revisions are proposed, submit comprehensive explanatory data to Architect for review.


F. Source Limitations for Aluminum-Framed Systems: Obtain from single source from single manufacturer.


H. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.

   1. Build mockup of typical wall area as shown on Drawings.
   2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
   3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

I. Preinstallation Conference: Conduct conference at Project site.
1.06 PROJECT CONDITIONS

   A. Field Measurements: Verify actual locations of structural supports for aluminum-framed systems by field measurements before fabrication and indicate measurements on Shop Drawings.

1.07 WARRANTY

   A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of aluminum-framed systems that do not comply with requirements or that fail in materials or workmanship within specified warranty period.
      1. Failures include, but are not limited to, the following:
         a. Structural failures including, but not limited to, excessive deflection.
         b. Noise or vibration caused by thermal movements.
         c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
         d. Adhesive or cohesive sealant failures.
         e. Water leakage through fixed glazing and framing areas.
         f. Failure of operating components.
      
   2. Warranty Period: 2 years from date of Substantial Completion.

   B. Special Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components on which finishes do not comply with requirements or that fail in materials or workmanship within specified warranty period. Warranty does not include normal weathering.
      1. Warranty Period: 5 years from date of Substantial Completion.

1.08 MAINTENANCE SERVICE

   A. Entrance Door Hardware:
      1. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of entrance door hardware.
      2. Initial Maintenance Service: Beginning at Substantial Completion, provide six months' full maintenance by skilled employees of entrance door hardware Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper entrance door hardware operation at rated speed and capacity. Provide parts and supplies the same as those used in the manufacture and installation of original equipment.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

   A. Basis-of-Design Product: Subject to compliance with requirements, provide "Trifab 451 (thermally broken at exterior), and Trifab 450 (at interior) Storefront System" as manufactured by Kawneer North America: www.kawneer.com, or comparable product by one of the following:

ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS
08 41 13 - 6

2.02 MATERIALS

A. Aluminum:  Alloy and temper recommended by manufacturer for type of use and finish indicated.
   2. Extruded Bars, Rods, Profiles, and Tubes:  ASTM B 221 (ASTM B 221M).
   4. Structural Profiles:  ASTM B 308/B 308M.
   5. Welding Rods and Bare Electrodes:  AWS A5.10/A5.10M.

B. Steel Reinforcement:  Manufacturer’s standard zinc-rich, corrosion-resistant primer, complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment.  Select surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.
   1. Structural Shapes, Plates, and Bars:  ASTM A 36/A 36M.
   2. Cold-Rolled Sheet and Strip:  ASTM A 1008/A 1008M.
   3. Hot-Rolled Sheet and Strip:  ASTM A 1011/A 1011M.

2.03 FRAMING SYSTEMS

A. Framing Members:  Manufacturer’s standard extruded-aluminum framing members of thickness required and reinforced as required to support imposed loads.
   1. Construction:  Thermally broken at exterior frames.
   2. Glazing System:  Retained mechanically with gaskets on four sides.
B. Brackets and Reinforcements: Manufacturer’s standard high-strength aluminum with non-staining, nonferrous shims for aligning system components, include where indicated and/or recommended by manufacturer:
   1. Compensating channel heads and jambs (+/- 1-inch).
   2. Performance sills (Heavy Duty).

C. Fasteners and Accessories: Manufacturer’s standard corrosion-resistant, non-staining, non-bleeding fasteners and accessories compatible with adjacent materials.
   1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
   2. Reinforce members as required to receive fastener threads.
   3. Use exposed fasteners with countersunk Phillips screw heads, finished to match framing system.

D. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts, complying with ASTM A 123/A 123M or ASTM A 153/A 153M.

E. Concealed Flashing: Manufacturer’s standard corrosion-resistant, non-staining, non-bleeding flashing compatible with adjacent materials.

F. Framing System Gaskets and Sealants: Manufacturer’s standard, recommended by manufacturer for joint type.
   1. Provide sealants for use inside of the weatherproofing system that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.04 GLAZING SYSTEMS

A. Glazing: As specified in Division 08 Section "Glazing."

B. Glazing Gaskets: Manufacturer’s standard compression types; replaceable, molded or extruded, of profile and hardness required to maintain watertight seal.

C. Spacers and Setting Blocks: Manufacturer’s standard elastomeric type.

D. Bond-Breaker Tape: Manufacturer’s standard TFE-fluorocarbon or polyethylene material to which sealants will not develop adhesion.

E. Glazing Sealants: For structural-sealant-glazed systems, as recommended by manufacturer for joint type, and as follows:
   1. Structural Sealant: ASTM C 1184, single-component neutral-curing silicone formulation that is compatible with system components with which it comes in contact, specifically formulated and tested for use as structural sealant and approved by a structural-sealant manufacturer for use in aluminum-framed systems indicated.
      a. Provide sealants for use inside of the weatherproofing system that have a VOC content of 100 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
      b. Color: Black.
2. Weatherseal Sealant: ASTM C 920 for Type S, Grade NS, Class 25, Uses NT, G, A, and O; single-component neutral-curing formulation that is compatible with structural sealant and other system components with which it comes in contact; recommended by structural-sealant, weatherseal-sealant, and aluminum-framed-system manufacturers for this use.
   a. Provide sealants for use inside of the weatherproofing system that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
   b. Color: Matching structural sealant.

2.05 ENTRANCE DOOR SYSTEMS

A. Entrance Doors: Manufacturer’s standard glazed entrance doors for manual-swing operation.
   1. Door Construction: 1-3/4-inch overall thickness, with minimum 0.125-inch thick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and fillet welded or that incorporate concealed tie rods.
      a. Thermal Construction: High-performance plastic connectors separate aluminum members exposed to the exterior from members exposed to the interior.
   2. Door Design: Heavy stile; 5-inch nominal width.
      a. Accessible Doors: Smooth surfaced for width of door in area within 10 inches above floor or ground plane.
      a. Provide non-removable glazing stops on outside of door.

2.06 ENTRANCE DOOR HARDWARE

A. General: Provide entrance door hardware and entrance door hardware sets as specified in Division 08 Section “Door Hardware” for each entrance door and to comply with requirements in this Section.
   1. Entrance Door Hardware Sets: Provide quantity, item, size, finish or color indicated as specified in Division 08 Section “Door Hardware”.

2.07 ACCESSORY MATERIALS

A. Joint Sealants: For installation at perimeter of aluminum-framed systems, as specified in Division 07 Section "Joint Sealants."
   1. Provide sealants for use inside of the weatherproofing system that have a VOC content of 250g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Bituminous Paint: Cold-applied, asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos; formulated for 30-mil thickness per coat.
C. Provide break metal closure wraps, locations as indicated on the drawings.
   1. Material: Aluminum per this section.
   2. Thickness: 0.125-inches
   3. Finish: same as adjacent storefront.

2.08 FABRICATION

A. Form or extrude aluminum shapes before finishing.

B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

C. Framing Members, General: Fabricate components that, when assembled, have the following characteristics:
   1. Profiles that are sharp, straight, and free of defects or deformations.
   2. Accurately fitted joints with ends coped or mitered.
   3. Means to drain water passing joints, condensation within framing members, and moisture migrating within the system to exterior.
   4. Physical and thermal isolation of glazing from framing members.
   5. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
   7. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

D. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.

E. Storefront Framing: Fabricate components for assembly using head-and-sill-receptor system with shear blocks at intermediate horizontal members.
   1. Screw Shear block acceptable at single punched windows.

F. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.
   1. At exterior doors, provide compression weather stripping at fixed stops.
   2. At interior doors, provide silencers at stops to prevent metal-to-metal contact. Install three silencers on strike jamb of single-door frames and two silencers on head of frames for pairs of doors.

G. Entrance Doors: Reinforce doors as required for installing entrance door hardware.
   1. At pairs of exterior doors, provide sliding-type weather stripping retained in adjustable strip and mortised into door edge.
   2. At exterior doors, provide weather sweeps applied to door bottoms.

H. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.
I. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.09 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

2.10 SOURCE QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to evaluate structural-sealant-glazed systems.

B. Prepare test and inspection reports.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. General:
   1. Comply with manufacturer’s written instructions.
   2. Do not install damaged components.
   3. Fit joints to produce hairline joints free of burrs and distortion.
   4. Rigidly secure non-movement joints.
   5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration.
   6. Seal joints watertight unless otherwise indicated.

B. Metal Protection:
   1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or applying sealant or tape, or by installing nonconductive spacers as recommended by manufacturer for this purpose.
   2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.

D. Set continuous sill members and flashing in full sealant bed as specified in Division 07 Section "Joint Sealants" to produce weathertight installation.
E. Install components plumb and true in alignment with established lines and grades, and without warp or rack.

F. Install glazing as specified in Division 08 Section "Glazing."

G. Entrance Doors: Install doors to produce smooth operation and tight fit at contact points.
   1. Exterior Doors: Install to produce weathertight enclosure and tight fit at weather stripping.
   2. Field-Installed Entrance Door Hardware: Install surface-mounted entrance door hardware according to entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

H. Install perimeter joint sealants as specified in Division 07 Section "Joint Sealants" to produce weathertight installation.

3.03 ERECTION TOLERANCES

A. Install aluminum-framed systems to comply with the following maximum erection tolerances:
   1. Location and Plane: Limit variation from true location and plane to 1/8 inch in 12 feet; 1/4 inch over total length.
   2. Alignment:
      a. Where surfaces abut in line, limit offset from true alignment to 1/16 inch.
      b. Where surfaces meet at corners, limit offset from true alignment to 1/32 inch.

B. Diagonal Measurements: Limit difference between diagonal measurements to 1/8 inch.

3.04 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections.

B. Testing Services: Testing and inspecting of representative areas to determine compliance of installed systems with specified requirements shall take place as follows and in successive phases as indicated on Drawings. Do not proceed with installation of the next area until test results for previously completed areas show compliance with requirements.
   1. Air Infiltration: Areas shall be tested for air leakage of 1.5 times the rate specified for laboratory testing under "Performance Requirements" Article, but not more than 0.09 cfm/sq. ft., of fixed wall area when tested according to ASTM E 783 at a minimum static-air-pressure difference of 6.24 lbf/sq. ft.
   2. Water Penetration: Areas shall be tested according to ASTM E 1105 at a minimum uniform and cyclic static-air-pressure difference of [0.67 times the static-air-pressure difference specified for laboratory testing under "Performance Requirements" Article, but not less than 4.18 lbf/sq. ft. (200 Pa)] <Insert pressure>, and shall not evidence water penetration.
   3. Water Spray Test: Before installation of interior finishes has begun, a minimum area of 75 feet by 1 story of aluminum-framed systems designated by Architect shall be tested according to AAMA 501.2 and shall not evidence water penetration.
C. Repair or remove work if test results and inspections indicate that it does not comply with specified requirements.

D. Additional testing and inspecting, at Contractor’s expense, will be performed to determine compliance of replaced or additional work with specified requirements.

E. Aluminum-framed assemblies will be considered defective if they do not pass tests and inspections.

F. Prepare test and inspection reports.

3.05 ADJUSTING

A. Adjust operating entrance door hardware to function smoothly as recommended by manufacturer.
   1. For entrance doors accessible to people with disabilities, adjust closers to provide a 3-second closer sweep period for doors to move from a 70-degree open position to 3 inches from the latch, measured to the leading door edge.

3.06 ENTRANCE DOOR HARDWARE SETS

A. As specified in Division 08 Section "Door Hardware."

END OF SECTION
SECTION 08 41 26

ALL-GLASS ENTRANCES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Interior manual-swinging all-glass entrance doors.

B. Related Sections:
   1. Division 06 Section “Interior Architectural Woodwork” for wood door frames supporting all glass doors.
   2. Division 08 Section "Glazing" for general glass requirements.

1.02 DEFINITIONS

A. ADA/ABA Accessibility Guidelines: U.S. Architectural & Transportation Barriers Compliance Board’s "Americans with Disability Act (ADA) and Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities."

1.03 PERFORMANCE REQUIREMENTS

A. General Performance: All-glass systems shall withstand the effects of the following performance requirements without exceeding performance criteria or failure due to defective manufacture, fabrication, installation, or other defects in construction.

B. Structural Performance: All-glass systems shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated according to SEI/ASCE 7.
   1. Seismic Loads: As indicated on Drawings.
   2. Deflection Limits: Deflection normal to glazing plane is limited to 1 inch.

C. Thermal Movements: Allow for thermal movements resulting from the following ambient and surface temperature changes.
   1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

1.04 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for all-glass system.

B. Shop Drawings: Show fabrication and installation details, including the following:
   1. Plans, elevations, and sections.
   2. Details of fittings and glazing, including isometric drawings of patch fittings.
   3. Door hardware locations, mounting heights, and installation requirements.
C. Samples for Initial Selection: For each type of exposed finish indicated.

D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.
   1. Metal Finishes: 6-inch-long sections of patch fittings, accessory fittings, and other items.
   2. Glass: 6 inches square, showing exposed-edge finish.
   3. Door Hardware: For exposed door hardware of each type, in specified finish, full size.

E. Other Action Submittals:
   1. Entrance Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams. Coordinate final entrance door hardware schedule with doors and related work to ensure proper size, thickness, hand, function, and finish of entrance door hardware.

F. Qualification Data: For qualified Installer.

G. Seismic Qualification Certificates: For all-glass systems, accessories, and components, from manufacturer.

H. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for all-glass systems.

I. Field quality-control reports.

J. Maintenance Data: For all-glass systems to include in maintenance manuals.

K. Warranty: Sample of special warranty.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

B. Engineering Responsibility: Prepare data for all-glass systems, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in systems similar to those indicated for this Project.

C. Source Limitations: Obtain all-glass systems from single source from single manufacturer.

D. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
   1. Build mockup of all-glass systems as shown on Drawings.
   2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
   3. Following review and approval by Architect, approved mockups may become part of the completed Work.

F. Preinstallation Conference: Conduct conference at Project site.

1.06 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with all-glass systems by field measurements before fabrication and indicate measurements on Shop Drawings.

1.07 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of all-glass systems that do not comply with requirements or that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
   a. Structural failures including excessive deflection.
   b. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
   c. Failure of operating components.

2. Warranty Period: Two years from date of Substantial Completion, except as follows:
   a. Concealed Floor Closers: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:


2.02 MATERIALS

A. Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated surfaces), Type I (transparent), tested for surface and edge compression per ASTM C 1048 and for impact strength per 16 CFR 1201 for Category II materials.

1. Class 1: Clear monolithic.
   b. Locations: As indicated.
2. Exposed Edges: Machine ground and flat polished.

2.03 METAL COMPONENTS

A. Fitting Configuration:
   1. Manual-Swinging, All-Glass Entrance Doors: Patch fittings at head and sill on pivot side, and for lock at sill of swing side.

B. Patch Fittings: Stainless-steel-or stainless steel clad aluminum.

C. Accessory Fittings: Match patch-fitting metal and finish for the following:
   1. Overhead doorstop.
   2. Recessed dust-proof strike.

D. Anchors and Fastenings: Concealed.

2.04 ENTRANCE DOOR HARDWARE

A. General: Heavy-duty entrance door hardware units in sizes, quantities, and types recommended by manufacturer for all-glass entrance systems indicated. For exposed parts, match metal and finish of patch fittings.

B. Concealed Floor Closers and Top Pivots: Center hung; BHMA A156.4, Grade 1; including cases, bottom arms, top walking beam pivots, plates, and accessories required for complete installation.
      a. Positive Dead Stop: Coordinated with hold-open angle if any, or at angle selected.


   3. Opening-Force Requirements:
      a. Accessible Interior Swinging Doors: Not more than 5 lbf to fully open door.

C. Concealed Overhead Holder: BHMA A156.8, Grade 1, with dead-stop setting coordinated with concealed floor closer.

D. Push-Pull Set: As selected from manufacturer's full range, type as indicated on Drawings.

E. Single-Door and Active-Leaf Locksets: Bottom-fitting or bottom-rail deadbolt.
   1. Deadbolt operated by key outside and thumb turn inside.

   2. See Division 06 Section “Interior Architectural Woodwork” for sliding glass doors requiring locksets furnished under this section.

F. Inactive-Leaf Locksets: Bottom-fitting or bottom-rail deadbolt.
   1. Deadbolt operated by key outside and thumb turn inside.

   2. Provide matching recessed dust-proof floor strike.

G. Cylinders: As specified in Division 08 Section "Door Hardware."
2.05  FABRICATION

A.  Provide holes and cutouts in glass to receive hardware, fittings, and accessory fittings before tempering glass. Do not cut, drill, or make other alterations to glass after tempering.
   1.  Fully temper glass using horizontal (roller-hearth) process, and fabricate so that when glass is installed, roll-wave distortion is parallel with bottom edge of door or lite.

B.  Factory assemble components and factory install hardware and fittings to greatest extent possible.

2.06  STAINLESS-STEEL FINISHES

A.  Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.

B.  Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
   1.  Run grain of directional finishes with long dimension of each piece.
   2.  When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
   3.  Directional Satin Finish: No. 4.

PART 3 - EXECUTION

3.01  EXAMINATION

A.  Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B.  Proceed with installation only after unsatisfactory conditions have been corrected.

3.02  INSTALLATION

A.  Install all-glass systems and associated components according to manufacturer's written instructions.

B.  Set units level, plumb, and true to line, with uniform joints.

C.  Maintain uniform clearances between adjacent components.

D.  Lubricate hardware and other moving parts according to manufacturer's written instructions.

E.  Set, seal, and grout floor closer cases as required to suit hardware and substrate indicated.
3.03 ADJUSTING AND CLEANING

A. Adjust all-glass entrance doors and hardware to produce smooth operation and tight fit at contact points and weather stripping.
   1. For all-glass entrance doors accessible to people with disabilities, adjust closers to provide a 3-second closer sweep period for doors to move from a 70-degree open position to 3 inches from the latch measured to the leading door edge.

B. Remove excess sealant and glazing compounds and dirt from surfaces.

END OF SECTION
SECTION 08 44 13

GLAZED ALUMINUM CURTAIN WALLS

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes:
   1. Conventionally glazed aluminum curtain walls installed as stick or unitized assemblies.
   2. Break metal enclosures and copings.

B. Related Sections:
   1. Division 07 Section "Joint Sealants" for installation of joint sealants installed with glazed
      aluminum curtain walls and for sealants to the extent not specified in this Section.

1.02 PERFORMANCE REQUIREMENTS

A. General Performance: Comply with performance requirements specified, as determined by
   preconstruction testing of manufacturer’s standard glazed aluminum curtain walls
   representing those indicated for this Project without failure due to defective manufacture,
   fabrication, installation, or other defects in construction.
   1. Glazed aluminum curtain walls shall withstand opening and closing movements of
      supporting structure equal to 1/360 of span unless noted otherwise on Drawings,
      including, but not limited to, story drift, twist, column shortening, long-term creep, and
      deflection from uniformly distributed and concentrated live loads.
   2. Failure also includes the following:
      a. Thermal stresses transferring to building structure.
      b. Glass breakage.
      c. Noise or vibration created by wind and thermal and structural movements.
      d. Loosening or weakening of fasteners, attachments, and other components.
      e. Failure of operating units.

B. Delegated Design: Design glazed aluminum curtain walls, including comprehensive
   engineering analysis by a qualified professional engineer, using performance requirements and
   design criteria indicated.

C. Structural Loads:
   1. Wind Loads: As indicated on Drawings.
   2. Seismic Loads: As indicated on Drawings.
   4. Building Super-Structure: Framing members have been designed to accept gravity loads
      from curtainwall assemblies only at locations indicated on the Drawings. Support no
      more than 2 stories (26'-0" maximum height) of curtainwall per location. Notify
      Architect if design imposes gravity loads at other locations or of larger magnitude than
      indicated on the Drawings.

D. Structural-Test Performance: Test according to ASTM E 330 as follows:
1. When tested at positive and negative wind-load design pressures of 40psf, assemblies do not evidence deflection exceeding specified limits.

2. When tested at 150 percent of positive and negative wind-load design pressures, assemblies, including anchorage, do not evidence material failures, structural distress, and permanent deformation of main framing members exceeding 0.2 percent of span.

3. Test Durations: As required by design wind velocity, but not less than 10 seconds.

E. Deflection of Framing Members: At design wind pressure, as follows:
   1. Deflection Normal to Wall Plane: Limited to edge of glass in a direction perpendicular to glass plane not exceeding L/175 of the glass edge length for each individual glazing lite or an amount that restricts edge deflection of individual glazing lites to 3/4 inch, whichever is less.
   2. Deflection Parallel to Glazing Plane: Limited to L/360 of clear span or 1/8 inch, whichever is smaller.

F. Windborne-Debris-Impact-Resistance Performance: Pass missile-impact and cyclic-pressure tests when tested according to ASTM E 1886 and testing information in ASTM E 1996 for Wind Zone per project location.
   1. Large-Missile Test: For glazed openings located within 30 feet of grade.
   2. Small-Missile Test: For glazed openings located more than 30 feet above grade.

G. Seismic Performance: Glazed aluminum curtain walls shall withstand the effects of earthquake motions determined according to SEI/ASCE 7 and as indicated on Drawings.
   1. Component Importance Factor: As indicated on Drawings.

H. Story Drift: Accommodate design displacement of adjacent stories indicated.
   1. Design Displacement: 0.010x the story height.
   2. Test Performance: Meeting criteria for passing based on building occupancy type when tested according to AAMA 501.4 at design displacement and 1.5 times the design displacement.

I. Water Penetration under Static Pressure: No evidence of water penetration through fixed glazing and framing areas when tested according to ASTM E 331 at a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 12 lbf/sq. ft. as defined in AAMA 501.

J. Water Penetration under Dynamic Pressure: No evidence of water penetration through fixed glazing and framing areas when tested according to AAMA 501.1 at dynamic pressure equal to 20 percent of positive wind-load design pressure, but not less than 12 lbf/sq. ft. as defined in AAMA 501.
   1. Maximum Water Leakage: No uncontrolled water penetrating assemblies or water appearing on assemblies' normally exposed interior surfaces from sources other than condensation. Water leakage does not include water controlled by flashing and gutters that is drained to exterior.
K. Thermal Movements: Allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures:
1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.
2. Test Interior Ambient-Air Temperature: 75 deg F.
3. Test Performance: No buckling; stress on glass; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested according to AAMA 501.5.

L. Energy Performance: Glazed aluminum curtain walls shall have certified and labeled energy performance ratings in accordance with NFRC.
1. Thermal Transmittance (U-factor): When tested to AAMA Specification 1503, as determined according to NFRC 100, fixed glazing and framing areas shall have U-factor of not more than:
   a. 0.66 Btu/sq. ft.x h x deg F (clear glazing)
   b. 0.43 Btu/sq/ ft.x h x deg F (low e glazing)

2. Air Infiltration: Maximum air leakage through fixed glazing and framing areas of 0.06 cfm/sq. ft. of fixed wall area as determined according to ASTM E 283 at a minimum static-air-pressure differential of 6.24 lbf/sq. ft.
3. Condensation Resistance: When tested to AAMA Specification 1503, the condensation resistance factor for NFRC 500-certified condensation resistance rating shall not be less than:
   a. 71 for framing
   b. 71 for glazing

M. Sound Transmission: Provide glazed aluminum curtain walls with fixed glazing and framing areas having the following sound-transmission characteristics:
1. Outdoor-Indoor Transmission Class: Minimum 30 when tested for laboratory sound transmission loss according to ASTM E 90 and determined by ASTM E 1332.

1.03 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Provide glazed aluminum curtain walls that comply with test-performance requirements indicated, as evidenced by reports based on Project-specific preconstruction testing by a qualified testing agency.
1. Owner will engage a qualified testing agency to perform preconstruction testing on laboratory mockups.
2. Build laboratory mockups at testing agency facility using personnel, materials, and methods of construction that will be used at Project site.
3. Notify Architect seven days in advance of the dates and times when laboratory mockups will be constructed.
4. Preconstruction Testing Program: Perform tests specified in "Performance Requirements" Article on laboratory mockups in the following order:
   a. Structural-performance preloading at 50 percent of the specified wind-load design pressure when tested according to ASTM E 330.
   b. Air infiltration when tested according to ASTM E 283.
   c. Water penetration under static pressure when tested according to ASTM E 331.
d. Water penetration under dynamic pressure when tested according to AAMA 501.1.

e. Structural performance at design load when tested according to ASTM E 330.

f. Repeat air filtration when tested according to ASTM E 283.

g. Repeat water penetration under static pressure when tested according to ASTM E 331.

h. Structural performance at maximum 150 percent of positive and negative wind-load design pressures when tested according to ASTM E 330.

1.04 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. LEED Submittal:
   1. Product Data for Credit EQ 4.1: For glazing sealants used inside of the weatherproofing system, including printed statement of VOC content.

C. Shop Drawings: For glazed aluminum curtain walls. Include plans, elevations, sections, full-size details, and attachments to other work.
   1. Include details of provisions for assembly expansion and contraction and for draining moisture occurring within the assembly to the exterior.
   2. Include full-size isometric details of each vertical-to-horizontal intersection of glazed aluminum curtain walls, showing the following:
      a. Joinery, including concealed welds.
      b. Anchorage.
      c. Expansion provisions.
      d. Glazing.
      e. Flashing and drainage.
   3. Include laboratory mockup Shop Drawings, prepared by a qualified preconstruction testing agency, showing details of laboratory mockup.
      a. Resubmit Shop Drawings with changes made to glazed aluminum curtain walls to successfully complete preconstruction testing.

D. Samples for Initial Selection: For units with factory-applied color finishes.

E. Samples for Verification: For each type of exposed finish required, in manufacturer’s standard sizes.

F. Fabrication Sample: Of each vertical-to-horizontal intersection of assemblies, made from 12-inch lengths of full-size components and showing details of the following:
   1. Joinery, including concealed welds.
   2. Anchorage.
   5. Flashing and drainage.
G. Delegated-Design Submittal: For glazed aluminum curtain walls indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

H. Preconstruction Mockup Submittals:
   1. Preconstruction Testing Program: Developed specifically for Project.
   2. Preconstruction Test Reports: Prepared by a qualified preconstruction testing agency for each mockup test.
   3. Photographs:
      a. Take a minimum of 10 photographs at locations and intervals as required by Architect.
      b. Submit digital color images on CD-R of mockup before, during, and after preconstruction testing.
   4. Record Drawings: Submit record drawings of preconstruction mockups prepared by preconstruction testing agency.

I. Qualification Data: For qualified Installer and preconstruction testing agency.

J. Seismic Qualification Certificates: For glazed aluminum curtain walls, accessories, and components, from manufacturer.
   1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

K. Welding certificates.

L. Energy Performance Certificates: For glazed aluminum curtain walls, accessories, and components, from manufacturer.
   1. Basis for Certification: NFRC-certified energy performance values for each glazed aluminum curtain wall.

M. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified preconstruction testing agency, for glazed aluminum curtain walls, indicating compliance with performance requirements.

N. Field quality-control reports.

O. Maintenance Data: For glazed aluminum curtain walls to include in maintenance manuals.

P. Warranties: Sample of special warranties.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: A manufacturer capable of fabricating glazed aluminum curtain walls that meet or exceed energy performance requirements indicated and of documenting this performance by certification, labeling, and inclusion in lists.

B. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
C. Preconstruction Testing Agency Qualifications: Qualified according to ISO/IEC 17025 and accredited by ICC-ES for preconstruction testing indicated.

D. Testing Agency Qualifications: Qualified according to ASTM E 699 for testing indicated.

E. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.
   1. Do not revise intended aesthetic effects, as judged solely by Architect, except with Architect’s approval. If revisions are proposed, submit comprehensive explanatory data to Architect for review.

F. Welding Qualifications: Qualify procedures and personnel according to the following:
   1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
   2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."

G. Energy Performance Standards: Comply with NFRC for minimum standards of energy performance, materials, components, accessories, and fabrication. Comply with more stringent requirements if indicated.
   1. Provide NFRC-certified glazed aluminum curtain walls with an attached label.

H. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
   1. Build mockup of typical outside corner area as shown on Drawings or as directed by Architect.
   2. Field testing shall be performed on mockups according to requirements in "Field Quality Control" Article.
   3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
   4. Following review and approval by Architect, approved mockups may become part of the completed Work.

I. Preinstallation Conference: Conduct conference at Project site.

1.06 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of structural supports for glazed aluminum curtain walls by field measurements before fabrication and indicate measurements on Shop Drawings.

1.07 WARRANTY

A. Special Assembly Warranty: Standard form in which Installer agrees to repair or replace components of glazed aluminum curtain walls that do not comply with requirements or that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Structural failures including, but not limited to, excessive deflection.
b. Noise or vibration created by wind and thermal and structural movements.

c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

d. Water penetration through fixed glazing and framing areas.

2. Warranty Period: 2 years from date of Substantial Completion.

B. Special Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of factory-applied finishes within specified warranty period.

1. Deterioration includes, but is not limited to, the following:
   a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
   b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
   c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Warranty Period: 5 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide "1600 System 1, 6- and 7-1/2-Inch System" as manufactured by Kawneer North America: [www.kawneer.com](http://www.kawneer.com) or comparable product by one of the following:

4. EFCO Corporation: [www.efcocorp.com](http://www.efcocorp.com).
6. TRACO: [www.traco.com](http://www.traco.com).
10. YKK AP America Inc. [www.ykkap.com](http://www.ykkap.com).

2.02 MATERIALS

A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.

2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
4. Structural Profiles: ASTM B 308/B 308M.
5. Welding Rods and Bare Electrodes: AWS A5.10/A5.10M.

B. Steel Reinforcement: Manufacturer's standard zinc-rich, corrosion-resistant primer complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and
pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.

1. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
2. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
3. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.

2.03 FRAMING

A. Framing Members: Manufacturer’s standard extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.
1. “1600 System 1”: 6- and 7-1/2-Inch System with 4-inch and 5-inch nominal inside mullion depths.
2. Construction: Thermally broken.
5. Snap Covers/Mullions: Multiple depths as indicated on the drawings.

B. Brackets and Reinforcements: Manufacturer’s standard high-strength aluminum with non-staining, nonferrous shims for aligning system components.
1. Compensating channel heads and jambs (+/- 1-inch).
2. Performance sills (Heavy Duty).

C. Fasteners and Accessories: Manufacturer’s standard corrosion-resistant, non-staining, non-bleeding fasteners and accessories compatible with adjacent materials.
1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
2. Reinforce members as required to receive fastener threads.
3. Use exposed fasteners with countersunk Phillips screw heads, finished to match framing system.

D. Anchors: Three-way adjustable anchors with minimum adjustment of 1 inch that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.
1. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123/A 123M or ASTM A 153/A 153M requirements.

E. Concealed Flashing: Manufacturer’s standard corrosion-resistant, non-staining, non-bleeding flashing compatible with adjacent materials.

F. Framing Sealants: Manufacturer’s standard sealants.
2.04 GLAZING

A. Glazing: Comply with Division 08 Section "Glazing."

B. Glazing Gaskets: Manufacturer’s standard sealed-corner pressure-glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers.

C. Glazing Sealants: As recommended by manufacturer.
   1. Provide sealants for use inside of the weatherproofing system that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.05 ACCESSORY MATERIALS

A. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30-mil thickness per coat.

B. Provide break metal closure wraps, locations as indicated on the drawings.
   1. Material: Aluminum per this section.
   2. Thickness: 0.125-inches
   3. Finish: same as adjacent storefront.

2.06 FABRICATION

A. Form or extrude aluminum shapes before finishing.

B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

C. Fabricate components that, when assembled, have the following characteristics:
   1. Profiles that are sharp, straight, and free of defects or deformations.
   2. Accurately fitted joints with ends coped or mitered.
   3. Physical and thermal isolation of glazing from framing members.
   4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
   5. Provisions for field replacement of glazing from exterior.
   6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
   7. Components curved to indicated radii.

D. Fabricate components that, when assembled, have the following characteristics:
   1. Internal guttering system or other means to drain water passing joints, condensation occurring within framing members, and moisture migrating within glazed aluminum curtain wall to exterior.
   2. Pressure-equalized system or double barrier design with primary air and vapor barrier at interior side of glazed aluminum curtain wall and secondary seal weeped and vented to exterior.
E. Curtain-Wall Framing: Fabricate components for assembly using shear-block system.

F. Factory-Assembled Frame Units:
   1. Rigidly secure non-movement joints.
   2. Seal joints watertight unless otherwise indicated.
   3. Install glazing to comply with requirements in Division 08 Section "Glazing."

G. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.07 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. General:
   1. Comply with manufacturer's written instructions.
   2. Do not install damaged components.
   3. Fit joints to produce hairline joints free of burrs and distortion.
   4. Rigidly secure non-movement joints.
   5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
   6. Weld components in concealed locations to minimize distortion or discoloration of finish. Protect glazing surfaces from welding.
   7. Seal joints watertight unless otherwise indicated.

B. Metal Protection:
   1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape or installing nonconductive spacers as recommended by manufacturer for this purpose.
   2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within glazed aluminum curtain wall to exterior.

D. Install components plumb and true in alignment with established lines and grades.
E. Install operable units level and plumb, securely anchored, and without distortion. Adjust weather-stripping contact and hardware movement to produce proper operation.

F. Install glazing as specified in Division 08 Section "Glazing."

3.03 ERECTION TOLERANCES

A. Erection Tolerances: Install glazed aluminum curtain walls to comply with the following maximum tolerances:

1. Plumb: 1/8 inch in 10 feet; 1/4 inch in 40 feet.
2. Level: 1/8 inch in 20 feet; 1/4 inch in 40 feet.
3. Alignment:
   a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch wide, limit offset from true alignment to 1/16 inch.
   b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch wide, limit offset from true alignment to 1/8 inch.
   c. Where surfaces are separated by reveal or protruding element of 1 inch wide or more, limit offset from true alignment to 1/4 inch.

4. Location: Limit variation from plane to 1/8 inch in 12 feet; 1/2 inch over total length.

3.04 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Testing Services: Testing and inspecting of representative areas of glazed aluminum curtain walls shall take place as installation proceeds to determine compliance of installed assemblies with specified requirements.

1. Air Infiltration: Areas shall be tested for air leakage of 1.5 times the rate specified for laboratory testing in "Performance Requirements" Article, but not more than 0.06 cfm/sq. ft., of fixed wall area when tested according to ASTM E 783 at a minimum static-air-pressure differential of 6.24 lbf/sq. ft.
   a. Test Area: One bay wide, but not less than 30 feet, by one story of glazed aluminum curtain wall.
   b. Perform a minimum of two tests in areas as directed by Architect.

2. Water Penetration: Areas shall be tested according to ASTM E 1105 at a minimum uniform and cyclic static-air-pressure differential of 0.67 times the static-air-pressure differential specified for laboratory testing in "Performance Requirements" Article, but not less than 6.24 lbf/sq. ft., and shall not evidence water penetration.
   a. Test Area: One bay wide, but not less than 30 feet, by one story of glazed aluminum curtain wall.
   b. Perform a minimum of two tests in areas as directed by Architect.

3. Water Spray Test: Before installation of interior finishes has begun, areas designated by Architect shall be tested according to AAMA 501.2 and shall not evidence water penetration.
a. Test Area: A minimum area of 75 feet by one story of glazed aluminum curtain wall.

C. Glazed aluminum curtain walls will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports.

END OF SECTION
SECTION 08 71 00

DOOR HARDWARE

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes the following:
   1. Commercial door hardware for the following:
      a. Swinging doors.
      b. Non-fire-rated sliding doors.
      c. Non-fire-rated folding doors.
      d. Other doors to the extent indicated.
   2. Aluminum door hardware.
   3. Cylinders for doors specified in other Sections.
   4. Electrified door hardware.
   5. Automatic operators.

B. Related Sections include the following:
   1. Division 08 Section "Hollow Metal Doors and Frames" for astragals provided as part of fire-rated labeled assemblies and for door silencers provided as part of hollow-metal frames.
   2. Division 08 Section "Flush Wood Doors" for astragals and integral intumescent seals provided as part of fire-rated labeled assemblies.
   3. Division 08 Section "Aluminum-Framed Entrances and Storefronts" for entrance doors.
   4. Division 08 Section "All-Glass Entrances" for entrance door hardware, excluding cylinders.
   5. Division 26 Sections for connections to electrical power system and for low-voltage wiring work.
   6. Division 28 Section "Access Control" for access control devices installed at door openings and provided as part of a security access system.
   7. Division 28 Section "Intrusion Detection" for detection devices installed at door openings and provided as part of an intrusion detection system.
   8. Division 28 Section "Fire Detection and Alarm" for connections to building fire alarm system.

C. Products furnished, but not installed, under this Section include the following. Coordinating, purchasing, delivering, and scheduling remain requirements of this Section.
   1. Aluminum door hardware.
   2. Access Control system.
   3. Cylinders for locks specified in other Sections.
D. Access Control System: Access control hardware, including all readers, REX, DPS, Squadron Panel, reader panel, and wiring, including wiring to the auto operators will be provided by CBORD. All Bidders are required to contact CBORD for quote to include with their bid.

Ryan Wagner  
Account Manager  
The CBORD Group, Inc.  
8647 New Heritage Dr  
Indianapolis, IN 46239  
Tel: (317) 527-9475  
Fax: (317) 536-3036  
rpw@cbord.com  
www.cbord.com

1.02 SUBMITTALS

A. Product Data: Include construction and installation details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: Details of electrified door hardware, indicating the following:
   1. Wiring Diagrams: Power, signal, and control wiring. Include the following:
      a. System schematic.
      b. Point-to-point wiring diagram.
      c. Riser diagram.
      d. Elevation of each door.
   2. Detail interface between electrified door hardware and access control security building control system.
   3. Operation Narrative: Describe the operation of doors controlled by electrified door hardware.

C. Qualification Data: For Installer and Architectural Hardware Consultant.

D. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for locks latches and closers.

E. Maintenance Data: For each type of door hardware to include in maintenance manuals. Include final hardware and keying schedule.

F. Warranty: Special warranty specified in this Section.
G. Other Action Submittals:

1. Door Hardware Sets: Prepared by or under the supervision of Architectural Hardware Consultant, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final door hardware sets with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
   a. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule." Double space entries, and number and date each page.
   b. Format: Use same scheduling sequence and format and use same door numbers as in the Contract Documents.
   c. Content: Include the following information:
      1) Identification number, location, hand, fire rating and material of each door and frame.
      2) Type, style, function, size, quantity, and finish of each door hardware item. Include description and function of each lockset and exit device.
      3) Complete designations of every item required for each door or opening including name and manufacturer.
      4) Fastenings and other pertinent information.
      5) Location of each door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
      6) Explanation of abbreviations, symbols, and codes contained in schedule.
      7) Mounting locations for door hardware.
      8) Door and frame sizes and materials.
      9) Description of each electrified door hardware function, including location, sequence of operation, and interface with other building control systems. 
         a) Sequence of Operation: Include description of component functions that occur in the following situations: authorized person wants to enter; authorized person wants to exit; unauthorized person wants to enter; unauthorized person wants to exit.
      10) List of related door devices specified in other Sections for each door and frame.

d. Submittal Sequence: Submit the final door hardware sets at earliest possible date, particularly where approval of the door hardware sets must precede fabrication of other work that is critical in Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the door hardware sets.

2. Keying Schedule: Prepared by or under the supervision of Architectural Hardware Consultant, detailing Owner’s final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations.
1.03 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by lock manufacturer.
   1. Installer’s responsibilities include supplying and installing door hardware and providing a qualified Architectural Hardware Consultant available during the course of the Work to consult with Contractor, Architect, and Owner about door hardware and keying.
   2. Installer shall have warehousing facilities in Project's vicinity.
   4. Engineering Responsibility: Preparation of data for electrified door hardware, including Shop Drawings, based on testing and engineering analysis of manufacturer’s standard units in assemblies similar to those indicated for this Project.

B. Architectural Hardware Consultant Qualifications: A person who is currently certified by DHI as an Architectural Hardware Consultant and who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project.
   1. Electrified Door Hardware Consultant Qualifications: A qualified Architectural Hardware Consultant who is experienced in providing consulting services for electrified door hardware installations.

C. Source Limitations: Obtain each type and variety of door hardware from a single manufacturer, unless otherwise indicated.
   1. Provide electrified door hardware from same manufacturer as mechanical door hardware, unless otherwise indicated. Manufacturers that perform electrical modifications and that are listed by a testing and inspecting agency acceptable to authorities having jurisdiction are acceptable.

D. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252.

E. Electrified Door Hardware: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

F. Keying Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination". In addition to Owner, Construction Manager, Contractor, and Architect, conference participants shall also include Installer's Architectural Hardware Consultant and Owner’s security consultant. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including, but not limited to, the following:
   1. Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
   2. Preliminary key system schematic diagram.
   3. Requirements for key control system.
   4. Address for delivery of keys.

G. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."
H. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to electrified door hardware including, but not limited to, the following:
   1. Inspect and discuss electrical roughing-in and other preparatory work performed by other trades.
   2. Review sequence of operation for each type of electrified door hardware.
   3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
   4. Review required testing, inspecting, and certifying procedures.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site.

B. Tag each item or package separately with identification related to the final door hardware sets, and include basic installation instructions, templates, and necessary fasteners with each item or package.

C. Deliver keys and permanent cores to Owner by registered mail or overnight package service.
   1. <Insert name and address of Owner's representative.>

1.05 COORDINATION

A. Templates: Distribute door hardware templates for doors, frames, and other work specified to be factory prepared for installing door hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

B. Electrical System Roughing-in: Coordinate layout and installation of electrified door hardware with connections to power supplies access control system.

C. Existing Openings: Where new hardware components are scheduled for application to existing construction or where modifications to existing door hardware are required, field verify existing conditions and coordinate installation of door hardware to suit opening conditions and to provide for proper operation.

1.06 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Structural failures including excessive deflection, cracking, or breakage.
      b. Faulty operation of operators and door hardware.
      c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.
2. **Warranty Period:** Three years from date of Substantial Completion, except as follows:
   a. **Exit Devices:** 3 years from date of Substantial Completion.
   b. **Manual Closers:** 10 years from date of Substantial Completion.
   c. **Mechanical Locksets:** 7 years from date of Substantial Completion.

1.07 **MAINTENANCE SERVICE**

A. **Maintenance Tools and Instructions:** Furnish a complete set of specialized tools and maintenance instructions as needed for Owner’s continued adjustment, maintenance, and removal and replacement of door hardware.

B. **Maintenance Service:** Beginning at Substantial Completion, provide six months' full maintenance by skilled employees of door hardware Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door hardware operation. Provide parts and supplies same as those used in the manufacture and installation of original products.

**PART 2 - PRODUCTS**

2.01 **SCHEDULED DOOR HARDWARE**

A. **General:** Provide door hardware for each door to comply with requirements in this Section and door hardware sets indicated in door and frame schedule and door hardware sets indicated in Part 3 "Door Hardware Sets" Article.
   1. **Door Hardware Sets:** Provide quantity, item, size, finish or color indicated, and named manufacturers’ products as listed.
   2. **Sequence of Operation:** Provide electrified door hardware function, sequence of operation, and interface with other building control systems indicated.

B. **Designations:** Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of door hardware are indicated in Part 3 "Door Hardware Sets" Article. Products are identified by using door hardware designations, as follows:

C. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
   1. **Manufacturers:** Subject to compliance with requirements, provide products by the manufacturers specified.

2.02 **HINGES, GENERAL**

A. **Quantity:** Provide the following, unless otherwise indicated:
   1. **Two Hinges:** For doors with heights up to 60 inches.
   2. **Three Hinges:** For doors with heights 61 to 90 inches.
   3. **Four Hinges:** For doors with heights 91 to 120 inches.
   4. **For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.**
B. Template Requirements: Except for hinges and pivots to be installed entirely (both leaves) into wood doors and frames, provide only template-produced units.

C. Hinge Base Metal: Unless otherwise indicated, provide the following:
2. Interior Hinges: Steel, with steel pin.
3. Hinges for Fire-Rated Assemblies: Steel, with steel pin.

D. Hinge Options: Where indicated in door hardware sets or on Drawings:
1. Non-removable Pins: Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for out swinging exterior doors and out swinging corridor doors with locks.
2. Corners: Square.

E. Fasteners: Comply with the following:
2. Wood Screws: For wood doors and frames.
3. Threaded-to-the-Head Wood Screws: For fire-rated wood doors.
4. Screws: Phillips flat-head; machine screws (drilled and tapped holes) for metal doors] wood screws for wood doors and frames. Finish screw heads to match surface of hinges.

2.03 HINGES

A. Hinges shall be 3-knuckle, concealed, Nylatron self-lubricating, vertical and lateral thrust bearings and shall be certified to exceed 2,500,000, full load-operating cycles by a recognized independent testing laboratory. Templates: Except for hinges to be installed entirely (both leaves) into wood doors and frames provide only template-produced units.

B. Available Manufacturers:
1. Ives Hinges: 3CB1 3CB1HW.

2.04 LOCKS AND LATCHES, GENERAL

A. Accessibility Requirements: Where indicated to comply with accessibility requirements, comply with [the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG), ANSI A117.1.
1. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf.

B. Latches and Locks for Means of Egress Doors: Comply with NFPA 101. Latches shall not require more than 15 lbf to release the latch. Locks shall not require use of a key, tool, or special knowledge for operation.
2.05 MECHANICAL LOCKS AND LATCHES

A. Lock Functions: Function numbers and descriptions indicated in door hardware sets comply with the following:

B. An approved (BHMA) Builder’s Hardware Manufacturers Association testing laboratory shall certify locksets to exceed 3,000,000, full load operating cycles.

C. Locksets and latchsets shall be non-handed, heavy-duty cylindrical type, with 2-3/4 inch backset or greater, as specified, with ½ inch throw latchbolt. Manufacturer lock chassis from cold rolled steel, with locking spindles of deep drawn cold rolled steel. Spindles to resist deforming under sever torque.

D. Lever trim shall be designed to increase resistance against vandalism and forced entry by over torquing of lock chassis. Disablement of secured levers shall not permit latchbolt retraction from secure side while allowing emergency egress.

E. Furnish units with concealed through-bolts and threaded chassis hubs to prevent lever torque from rotating lock chassis and maintain correct alignment. Equip units with cast auxiliary spring cages with studs to prevent rotation attached directly to the lock chassis to assist in support of levers. Spring cage units shall contain coil compression springs to maintain life safety and provide extended service.

F. Provide manufacturer’s standard wrought box strike for each latch or lock bolt, with curved lip extended to protect frame. Comply with UL requirements for throw of bolts and latch bolts on rated fire openings.

G. Interface Owner’s existing keying system with specified locksets. Furnish complete and fully operational locksets and cylinders.

H. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include:

2.06 EXIT LOCKS AND EXIT ALARMS

A. Provide exit devices of single manufacturer with specified functions, which can accept exterior and interior cylinders of specified cylinders. An approved (BHMA) Builder’s Hardware Manufacturers Association testing laboratory shall certify exit devices to exceed 3,000,000, full load-operating cycles.

B. Provide exit devices with specified functions, which can accept specified cylinders. Exit devices shall have ribbed interior body to discourage vandalism and graffiti. Releasable with 15 lb. maximum pressure under 250-lb. load to the door.

C. Equip devices with dead locking latchbolts. Furnish through bolted fasteners for all devices. Where required, provide projecting glass bead stop kits to provide clearance when used with projecting glass stops. Furnish glass bead stop kits at locations using both exit devices and electric strikes.
D. Lever handle trim shall have a mechanism to disengage lever from operating should excessive force be applied, and allow lever to be re-set to its operating position. Lever design to match lock manufacturer’s lever design. Provide keyed security removable mullions, which will accept security cylinders of specified cylinder manufacturer, to allow removal by use of the cylinder. Mullions to be furnished with a self-locking mechanism for re-installation without the use of the cylinder. Equip each mullion with mullion stabilizers to maintain integrity between door and mullion to prevent vandalism.

E. Electrically actuated devices shall retract latchbolts instantly without delay for momentary unlocking or for extended periods of time. Solenoids shall be continuous duty, 24 volt, direct current, and 16.0-amp inrush. Devices shall be UL approved for Class II circuit applications.

F. Alarmed Exit Devices: surface mounted, battery powered, housed in metal case; with red-and-white lettering reading "EMERGENCY EXIT PUSH TO OPEN--ALARM WILL SOUND," Include the following features:
   1. Low-battery alert.
   2. Outside key control.
   3. Audible alarm that sounds when unauthorized use of door occurs.
   4. Silent alarm with remote signal capability for connection to remote indicating panel.

G. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include:

2.07 DOOR BOLTS

A. Bolt Throw: Comply with testing requirements for length of bolts required for labeled fire doors, and as follows:
   1. Fire-Rated Surface Bolts: Minimum 1-inch throw; listed and labeled for fire-rated doors.

B. An approved (BHMA) Builder’s Hardware Manufacturers Association testing laboratory shall certify auto flush bolts to exceed 100,000, full load-operating cycles.

C. Provide units UL listed up to 1-1/2 hours for use on wood or metal doors and 3 hours on metal fire rated doors. Furnish in investment cast steel, brass, bronze or stainless steel base material. Wrought materials will not be permitted.

D. Units shall be non-handed, and feature adjustable rods to accommodate door and frame variations. Automatic flush bolts shall latch the inactive leaf of pair of doors, when the active door is closed. When the active door is opened, bolts will automatically retract, releasing the inactive door.

E. Coordinators shall be certified to exceed 100 hundred thousand, 100,000, full load operating cycles by a recognized independent testing laboratory.

F. Coordinators shall be UL Listed for use and applications on pair of doors. Mount coordinators on the stop strip of the frame. Furnish filler bars of necessary length to cover the remaining portion of the stop strip. Where required, provide cast aluminum mounting brackets to allow...
stop-mounted hardware. Units shall be of structural steel components, housed in an aluminum channel.

G. Provide spring loaded type dust proof strikes where manual or automatic operated flush bolts are applied. Provide units for applications in floor or threshold conditions.

H. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include:
   1. Ives: FB31P FB41P FB458 COR-BX-FB.
   3. Trimco: 3810 3815 3917 3094-3095/96

2.08 LOCK CYLINDERS

A. Integrate locks and cylinders with Owner’s existing Everest/Primus D patent protected keying system with specifically assigned milled side bar. Cylinders must allow for applications of multiplex keying capabilities and multiple keyways. Key bittings shall be registered by the lock manufacturer. Keying services shall be performed by lock factory, where permanent records are maintained.
   1. Furnish cylinders with temporary small format, interchangeable core construction keying system during construction period. Temporary cores and keys remain property of hardware supplier.
   2. General Contractor shall remove temporary construction cores and install permanent small format, keyed cores into locksets and cylinders. Return temporary construction cores to hardware supplier.
   3. General Contractor shall receive permanent cores and cylinders from Owner. Inventory cores and cylinders prior to installation and submit written confirmation that permanent keys and cylinders operate locksets as required by Owner’s keying instructions

B. Keys and Key Blanks: Furnish of nickel silver to maintain security and safety of keying system and accuracy in keys and long cylinder wear. Key blanks shall be available only from factory-direct sources, not available from after-market key blank manufacturers.

C. Do not package permanent keys with locks. Package key separately from locksets and cores. Deliver all keys, key blanks and other security keys direct to Owner from lock manufacturer by secure courier, return receipt requested.

D. Failure to properly comply with these requirements may be cause to require replacement of all or any part of the keying system, cores, cylinders and keys involved as deemed necessary at no additional cost to the Owner.

E. Key Quantity: Furnish keys in the following quantities:
   1. 25 each Temporary construction keys to General Contractor.
   2. 6 each Temporary construction control keys General Contractor.
   3. 10 each Permanent Core Control keys, to Owner.
   4. 3 each Change keys per cylinder to Owner.
   5. 10 each Emergency keys per cylinder to Owner.
   6. 500 each Key blanks each type used to Owner.
   7. 1 each Lock service kit to Owner.
F. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the Work include:
   1. Owner’s standard: Schlage SFIC, patented, Everest/Primus as directed by Owner.

2.09 KEY CONTROL SYSTEM

A. Key Control Cabinet: metal cabinet with baked-enamel finish; containing key-holding hooks, labels, 2 sets of key tags with self-locking key holders, key-gathering envelopes, and temporary and permanent markers; with key capacity of 150 percent of the number of locks.

B. Cross-Index System: Single-index system for recording key information. Include three receipt forms for each key-holding hook. Set up by Owner.
   1. Available Manufacturers:
      b. Lund Equipment Co., Inc. (LUN).
      c. MMF Industries (MMF).
      d. Sunroc Corporation (SUN).

C. Key Control System Software: multiple-index system for recording and reporting key-holder listings, tracking keys and lock and key history, and printing receipts for transactions. Include instruction manual.

D. Supplier shall furnish to the owner Sitemaster program, complete with door numbers, room names, key symbols and bittings. Manufacture shall provide two, on site, 8-hour training sessions for Owner’s personnel.
   1. Available Manufacturers:

2.10 ELECTRONIC SECURITY HARDWARE

A. Electrified Door Hardware: Listed and labeled as defined in NFPA 70, Article 100, by testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Electric Power Transfer: Power transfers shall be certified to exceed 3,000,000 full load-operating cycles by a recognized independent testing laboratory. Provide fully concealed; tamper proof, when door is in closed position. Units shall provide continuous protection for the enclosed wires, when doors are in the open position. Provide UL rated units for use in fire door and frame applications. Power transfers to be UL listed, rated Class 1, low voltage, at 24VDC, 2 amperes, 16/20 amperes maximum surge, two 18 gauge wire or ten 24 gauge wire leads, as required. Coordinate where openings exceed 180-degree door swing with other hardware items. Units shall be approximately 9 inches x 1-7/16 inches x 1-1/2 inches, with housings and fittings pressure cast, zinc dichromate steel. Exposed door loop and electric power hinge transfers will not be permitted. Furnish mortar guards at grout filled frames.
   1. Door and frame manufacturer shall provide a concealed channel within the door between the electrified hinge and the locking mechanism.
   2. Available Manufacturers:
C. Electrical Exit Devices: Manufacturer units in accordance with U.S. domestic and international standards for NFPA 101, Special Locking Arrangement. Provide only UL listed “A” Controlled Exit Panic Device for use on Accident Hazard or Fire Exit Hardware applications. Electrically actuated devices shall retract latchbolts instantly without delay for momentary unlocking or for extended periods of time. Solenoids shall be continuous duty, 24 volt, direct current, 16.0 amp inrush. Devices shall be UL listed for Class II circuit applications.

D. Electric exit devices shall be operated by continuous duty solenoid activated latchbolts, which can be opened momentary, or for prolonged periods of time. Fail safe design, interruption of power, device returns latch bolt to the locked position. Devices to be connected direct to security consoles or may be used as a stand-alone alarm station. Devices shall be equipped with a "request to exit switch" (RX) to detect attempts to exit. Devices shall be equipped with “latchbolt monitor” switch (LX); SPDT switch which monitor the latch bolt.
1. Available Manufacturers:

E. Electric Strikes: Provide electric strikes which are certified to exceed 250,000 full load operation cycles, at 1,500-pounds static load, at strike lip, and 750-pounds dynamic load impact test by an recognized independent testing laboratory.
1. Provide investment cast stainless steel construction, non-handed, UL Listed for burglary and fire rated conditions. Equip units with adjustable strike boxes to compensate for any misalignment for door and frame. Operating voltage to be 24VDC with fail secure, (FSE) standard, or unless specified, fail safe, (FS). Strikes to be furnished with two-piece plug connectors.
2. Where required furnish dual switch (DS) with low current (LC) gold contacts for use on applications associated with computer control and monitoring, rated 24V, operating range 50-milliampere or below.
3. Available Manufacturers:
   a. Von Duprin: 6111  6211 Series.

F. Regulated Power Supply: Provide only UL listed, class 2-power supply, regulated and rectified to meet electrical security hardware current requirements. Install in a secured location adjacent to the security device. Equip with hinged panel, keyed lock. Enclosure shall be constructed of 19-gauge, prime coat gray steel, approximately 10-inches high, 12-1/2-inches wide, 5-inches deep, with five 1/2 by 3/4-inch knockout holes for conduit connection. Provide units with terminal blocks to accept up to 14-gauge wire. Regulated power output to be field selectable for either 24VDC at 2-ampere continuous, 16.0 amperes surge for 300 milliseconds or 12VDC at 4-ampere with power input 240VAC at 0.5-ampere, capable of providing power to two security devices.
1. Door and frame manufacturer shall provide a concealed channel within the door between the electrified hinge and the locking mechanism.
2. Available Manufacturers:

G. Key Switches: provide keyed cylinder switch, capable of accepting specified security cylinders, to provide means of arming, disarming or resetting devices. Switches shall allow key removal when either in the armed or disarmed position. Provide indicator lamps to allow visual status of security device. Security key switch shall be equipped with 24VDC solid state (SCR) alarm
circuit containing a monitored NO contact input and NO alarm output, reset by activation of the key switch. Furnish 2-3/4 inches x 4-1/2 inches; tamper resistant back box with ½ inch knockouts for access to switch assemblies.

H. Door position indicator switches (DPIS) shall be recessed, UL listed for wood or metal fire door applications. Switches shall be recessed types for wood or metal door applications. Furnish magnetic housings, which can to accommodate a variety of doors with channel widths.
1. Doors with grouted frames provide a 1-1/4-inch deep back-box in the frame above the switch hole.

I. Junction box: Provide surface mounted, hinged door with keyed lock, junction box with 24 position terminal strip to accept 12 to 24-gauge wires. Units are to be approximately 10-inches high, 10-inches wide and 6-inches deep, with 6 heavy gauge steel, 3/4-inch knock outs, top, bottom, right and left side panels and back.
1. Key locks for power supplies and junction boxes shall be keyed alike.

J. Wiring and Riser Diagrams: Electronic security hardware supplier shall furnish to the General Contractor, electrical wiring and riser diagrams for low voltage security equipment specified in this Section. Provide elevation drawings indicating door numbers, associated electronic security equipment such as power supplies and interconnections between door system components, control wiring for electric locks, indicator signal lights and sounding devices which are contained in the approved hardware Submittals. Elevations shall indicate standard electrical enclosures detailing the manufacturer’s space and attaching requirements.

K. Wire and Cable: Refer to Division 28.


2.11 CLOSERS

A. Accessibility Requirements: Where handles, pulls, latches, locks, and other operating devices are indicated to comply with accessibility requirements, comply with the U.S. Architectural & Transportation Barriers Compliance Board’s "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)." ANSI A117.1. FED-STD-795, "Uniform Federal Accessibility Standards."
1. Comply with the following maximum opening-force requirements:
   a. Interior, Non-Fire-Rated Hinged Doors: 5 lbf (22.2 N) applied perpendicular to door.
   b. Fire Doors: Minimum opening force allowable by authorities having jurisdiction.

B. Door Closers for Means of Egress Doors: Comply with NFPA 101. Door closers shall not require more than 30 lbf (133 N) to set door in motion and not more than 15 lbf (67 N) to open door to minimum required width.

C. Closers shall be certified to exceed ten million full load-operating cycles by a recognized independent testing laboratory.
D. Closers shall be constructed with forged lever arms, independent adjusting valves for closing, latching and back check. Hydraulic regulation controlled by tamper-proof, non-critical screw valves. All closer adjustments shall be shielded by full sized high impact plastic cover after installation.

E. Furnish drop brackets and spacers where required for aluminum, metal and wood doors. Provide special templated arms or brackets to allow clearance and applications of overhead stops and holders. Furnish closers with non-flaming fluid that will not fuel door or floor covering fires.

F. Provide combination door closer and electromagnetic holder designed to hold door in open position. Under normal usage and to release and automatically close door under fire conditions. Incorporate an integral electromagnetic holder mechanism designed for use with UL listed fire detectors, provided with normally closed switching contacts. Provide integral smoke detector device in combination door closers and holders complying with UL 228.

1. Install closers to allow maximum degree of opening, position back check to activate well in advance of the stop position to cushion the opening swing and prevent door and frame damage. Do not use door closer to stop door travel. Install closers with through bolt mounting method on metal and wood doors. Install door closers on room side, away from public view, unless otherwise noted.

G. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include:


2.12 PNEUMATIC POWER DOOR OPERATORS

A. Closer body shall be certified to exceed ten million, 10,000,000, full load-operating cycles by a recognized independent testing laboratory. Shall conform to ANSI A156.19; ADA law, section 4.13.12; ANSI A117.1.

B. System shall be a pneumatically and electrically powered, surface; door mounted overhead operator to provide easy access for physically handicapped persons. Opening force and time to close standards shall be in compliance with ADA requirements. Full closing force shall be provided when power cycle ends.

1. Interface ADA operators with CBORD access systems.

2. Power door operator system shall include features and functions as follows:

   a. Provisions for separate conduits to carry high and low voltage wiring in compliance with applicable National Electrical Code requirements.

   b. Provide building emergency electrical operating power to control box. Operator shall be designed to prevent damage to mechanism if system is actuated while door is latched or if door is forced closed during opening cycle.

   c. Provisions in control box or module shall provide control (inputs and outputs) for electric strike delay, auxiliary contacts, sequential operation, fire alarm systems, actuators, swing side sensors, and stop side sensors. Coordinate installation of control box and hardwired actuators with Electrical Contractor.
C. Door operator (closer) shall be fabricated using high strength cast iron cylinder and one-piece forged steel piston with forged steel main arm. Units shall be sealed and filled with all-weather fluid.

D. Furnish and provide complete system with components necessary for proper installation, including door closer (operator), actuators at each side of door, connectors, wiring, compressors, tubing and other components as needed.

E. Actuators shall be wireless, short range radio frequency (RF), transmitters, powered by 9-volt battery, as indicated on drawings. Locate RF actuators and RF receivers so maximum line of sight does not exceed 50-feet. Provide two actuators per opening one on each side of door for access from either direction.

F. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the Work include:
   1. Owner’s standard: LCN 4822 Series.

2.13 PROTECTIVE TRIM UNITS

A. Provide manufacturers standard exposed fasteners for door trim units, Kick plates, edge trim, push/pull plates and similar units; either machine screws of self-tapping screws.

B. Fabricate protection plates, armor, kick or mop, not more than 2 inches less than door width on stop side and not more than 1 inch less than door width on pull side, and 1 inch less than the door width on double doors, by the height indicated. Size plates to provide clearance for grills, louvers and door lites.

C. Metal Plates: Stainless steel plates 0.050, US 18 Ga.

D. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include:
   1. Ives 8400, 18 gage, (0.050 inches), B3E.
   2. Rockwood K1050, 18 gage, (0.050 inches), B3E.
   3. Triangle Brass KOO50, 18 gage, (0.050 inches), B3E.

2.14 STOPS AND HOLDERS

A. Furnish heavy duty wrought stainless steel base material, concave or convex wall stops, coincide with lock function, wherever door strikes wall unless otherwise noted in hardware sets, provide wall type with appropriate fasteners.

B. Silencers for Metal Door Frames: neoprene or rubber, minimum diameter 1/2 inch (13 mm); fabricated for drilled-in application to frame.

C. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include:
   1. Ives WS406 470 436/438.
   2. Rockwood 407/408 455 440/441.
2.15 DOOR PULLS

A. Furnish solid stainless steel, 1-inch diameter, with 2-1/2-inch projection and 1-1/2-inches clearance. Pulls to be mounted vertically on doors using decorative blind-through bolts plated to match. Door pulls shall be approximately 72-inch in height. Final selection and approval by Architect.

B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include:
   1. Ives 9100-72”-CTC.
   2. Rockwood 47-72”-CTC.
   3. Triangle Brass 1741-72”-CTC.

2.16 DOOR GASKETING

A. General: Provide continuous weather-strip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated or scheduled. Provide noncorrosive fasteners for exterior applications and elsewhere as indicated.
   1. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
   2. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.
   3. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.

B. Air Leakage: Not to exceed 0.50 cfm per foot (0.000774 cu. m/s per m) of crack length for gasketing other than for smoke control, as tested according to ASTM E283.

C. Smoke-Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke-control ratings indicated, based on testing according to UL 1784.
   1. Provide smoke-labeled gasketing on 20-minute-rated doors and on smoke-labeled doors.

D. Thresholds for Means of Egress Doors: Comply with NFPA 101. Maximum 1/2 inch (13 mm) high.

E. Fire-Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252, UBC Standard 7-2.

F. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated, based on testing according to ASTM E 1408.

G. Replaceable Seal Strips: Provide only those units where resilient or brush seal strips are easily replaceable and readily available from stocks maintained by manufacturer.

H. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include:
   1. Pemko: 272A 45041CP 3452CP S88D S77D.
   2. National Guard: 613A A626A C627A 2525B 5060B.
2.17 FABRICATION

A. Manufacturer's Nameplate: Do not provide products that have manufacturer's name or trade name displayed in a visible location except in conjunction with required fire-rated labels and as otherwise approved by Architect.
   1. Manufacturer's identification is permitted on rim of lock cylinders only.

B. Base Metals: Produce door hardware units of base metal, fabricated by forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness. Furnish metals of a quality equal to or greater than that of specified door hardware units and BHMA A156.18. Do not furnish manufacturer's standard materials or forming methods if different from specified standard.

C. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to commercially recognized industry standards for application intended, except aluminum fasteners are not permitted. Provide Phillips flat-head screws with finished heads to match surface of door hardware, unless otherwise indicated.
   1. Steel Machine or Wood Screws: For the following fire-rated applications:
      a. Mortise hinges to doors.
      b. Strike plates to frames.
      c. Closers to doors and frames.
   2. Steel Through Bolts: For the following fire-rated applications unless door blocking is provided:
      a. Surface hinges to doors.
      b. Closers to doors and frames.
      c. Surface-mounted exit devices.
   3. Spacers or Sex Bolts: For through bolting of hollow-metal doors.
   4. Fasteners for Wood Doors: Comply with requirements in DHI WDHS.2, "Recommended Fasteners for Wood Doors."

2.18 FINISHES

A. Standard: BHMA A156.18, as indicated in door hardware sets.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.

B. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Steel Doors and Frames: Comply with DHI A115 Series.
   1. Surface-Applied Door Hardware: Drill and tap doors and frames according to ANSI A250.6.

B. Wood Doors: Comply with DHI A115-W Series.

3.03 INSTALLATION

A. Mounting Heights: Mount door hardware units at heights indicated [on Drawings] [as follows] unless otherwise indicated or required to comply with governing regulations.
   2. Custom Steel Doors and Frames: DHI's "Recommended Locations for Builders' Hardware for Custom Steel Doors and Frames."

B. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 09 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.
   1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
   2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
C. Pneumatic Operator Installation:
   1. Manufacturer’s factory representative shall provide and demonstrate installation instructions, techniques and best practices prior to installation of pneumatic operated low energy automatic operators, pneumatic tubing, electro/pneumatic control boxes and electronic or radio frequency activated actuators in accordance with manufacturers suggested installation instructions. Interface with Division 28, Fire/Life Safety Systems and Security Access Systems.

D. Electronic Security Hardware Installation:
   1. Manufacturer’s factory representative shall provide and demonstrate installation instructions, techniques and best practices prior to installation of electromechanical security exit devices, electric strikes, key switches, power transfers, power supplies, junction boxes, door position switches, request for exit detectors in accordance with manufacturers suggested installation instructions and practices. Interface with Division 286, Fire/Life Safety Systems and Security Access Systems.

E. Boxed Power Supplies: Locate power supplies as indicated or, if not indicated, above accessible ceilings or in equipment room. Verify location with Architect.
   1. Configuration: Provide the least number of power supplies required to adequately serve doors with electrified door hardware.

F. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 07 Section "Joint Sealants."

3.04 FIELD QUALITY CONTROL

A. An Architectural Hardware Consultant: Owner will engage a qualified Architectural Hardware Consultant to perform inspections and to prepare inspection reports.
   1. Architectural Hardware Consultant will inspect door hardware and state in each report whether installed work complies with or deviates from requirements, including whether door hardware is properly installed and adjusted.

3.05 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.
   1. Adjust to achieve positive latching when door is allowed to close freely from an open position of 30 degrees.
   2. Electric Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.
   3. Door Closers: Unless otherwise required by authorities having jurisdiction, adjust sweep period so that, from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches (75 mm) from the latch, measured to the leading edge of the door.
B. Occupancy Adjustment: Approximately three months after date of Substantial Completion, Manufacturer's representatives of locksets, exit devices and door closers, shall examine and readjust, including adjusting operating forces, each item of door hardware as necessary to ensure function of doors, door hardware, and electrified door hardware.

3.06 CLEANING AND PROTECTION

A. Clean adjacent surfaces soiled by door hardware installation.

B. Clean operating items as necessary to restore proper function and finish.

C. Provide final protection and maintain conditions that ensure that door hardware is without damage or deterioration at time of Substantial Completion.

3.07 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain door hardware and door hardware finishes. Refer to Division 01 Section "Demonstration and Training."
## DOOR HARDWARE SETS

### HW SET: 100

**Each To Have:**

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Item Description</th>
<th>Manufacturer</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Power Transfer Door/Frame MFG EPT-10</td>
<td></td>
<td>689</td>
</tr>
<tr>
<td>2</td>
<td>Continuous Hinge Door/Frame MFG CONTINUOUS HINGE</td>
<td></td>
<td>B/O</td>
</tr>
<tr>
<td>2</td>
<td>Mullion Stabilizer Door/Frame MFG 154</td>
<td></td>
<td>689</td>
</tr>
<tr>
<td>1</td>
<td>Mullion Door/Frame MFG KR4954</td>
<td></td>
<td>689</td>
</tr>
<tr>
<td>1</td>
<td>Top Mullion Fitting Door/Frame MFG MULLION FITTING</td>
<td></td>
<td>628</td>
</tr>
<tr>
<td>1</td>
<td>Panic Hardware Door/Frame MFG EL-RX-LX-99EO</td>
<td></td>
<td>626</td>
</tr>
<tr>
<td>1</td>
<td>Panic Hardware Door/Frame MFG EL-RX-LX-99NL-OP</td>
<td></td>
<td>626</td>
</tr>
<tr>
<td>2</td>
<td>SFIC Permanent Core Door/Frame MFG 80-037</td>
<td>SCH</td>
<td>626</td>
</tr>
<tr>
<td>1</td>
<td>SFIC Mort Cyl 80-135 X 80-035 X 50-231 (Mullion)</td>
<td></td>
<td>626</td>
</tr>
<tr>
<td>1</td>
<td>SFIC Rim Cylinder 80-159 X 80-035 X 50-231 (Exit Device)</td>
<td></td>
<td>626</td>
</tr>
<tr>
<td>2</td>
<td>Vertical Pull Bar Door/Frame MFG 9100-NO (72-INCHES CTC)</td>
<td></td>
<td>630</td>
</tr>
<tr>
<td>1</td>
<td>Top Jamb Closer Door/Frame MFG 4041 TJ</td>
<td></td>
<td>689</td>
</tr>
<tr>
<td>1</td>
<td>Top Jamb Bracket Door/Frame MFG 4040TJ</td>
<td></td>
<td>689</td>
</tr>
<tr>
<td>2</td>
<td>Overhead Stop Door/Frame MFG 900S</td>
<td></td>
<td>630</td>
</tr>
<tr>
<td>1</td>
<td>Threshold Door/Frame MFG Threshold</td>
<td></td>
<td>B/O</td>
</tr>
<tr>
<td>1</td>
<td>Weatherstrip Door/Frame MFG Weatherstrip</td>
<td></td>
<td>B/O</td>
</tr>
<tr>
<td>2</td>
<td>Door Sweep Door/Frame MFG Door Sweep</td>
<td></td>
<td>B/O</td>
</tr>
<tr>
<td>1</td>
<td>Mullion Gasket Door/Frame MFG 5100S</td>
<td>BLK</td>
<td>NGP</td>
</tr>
<tr>
<td>1</td>
<td>Control Box Door/Frame MFG 7982ES</td>
<td></td>
<td>GRY</td>
</tr>
<tr>
<td>1</td>
<td>Interface Box Door/Frame MFG JB7-R1</td>
<td></td>
<td>GRY</td>
</tr>
<tr>
<td>1</td>
<td>Power Supply Door/Frame MFG PS873-2-BB</td>
<td></td>
<td>GRY</td>
</tr>
<tr>
<td>1</td>
<td>Pneumatic Tubing Door/Frame MFG 925 (50'-FEET)</td>
<td></td>
<td>CLR</td>
</tr>
<tr>
<td>1</td>
<td>Card Swipe CBORD CARD SWIPE ACCESS SYSTEM</td>
<td></td>
<td>DLR</td>
</tr>
<tr>
<td>2</td>
<td>Door Position Door/Frame MFG 679-05</td>
<td>BLK</td>
<td>SCE</td>
</tr>
<tr>
<td>1</td>
<td>Set Riser/Wiring Diagram Door/Frame MFG 7988 RISER/WIRING DIAGRAM</td>
<td></td>
<td>VON</td>
</tr>
<tr>
<td>1</td>
<td>RF Actuator, Jamb Door/Frame MFG 8310-3818TWF</td>
<td></td>
<td>LCN</td>
</tr>
<tr>
<td>1</td>
<td>RF Actuator, Wall Door/Frame MFG 8310-3856TWF</td>
<td></td>
<td>LCN</td>
</tr>
<tr>
<td>1</td>
<td>RF Receiver Door/Frame MFG 8310-865</td>
<td></td>
<td>LCN</td>
</tr>
</tbody>
</table>
## HW SET: 110

**EACH TO HAVE:**

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Item Description</th>
<th>Manufacturer</th>
<th>Model/Part No.</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>CONTINUOUS HINGE</td>
<td>DOOR/FRAME MFG</td>
<td>CONTINUOUS HINGE</td>
<td>B/O</td>
</tr>
<tr>
<td>2</td>
<td>VERTICAL PULL BAR</td>
<td>DOOR/FRAME MFG</td>
<td>9100-NO (72-INCHES)</td>
<td>630 IVE CTC</td>
</tr>
<tr>
<td>1</td>
<td>SURFACE CLOSER</td>
<td>DOOR/FRAME MFG</td>
<td>4041 ST2731</td>
<td>689 LCN</td>
</tr>
<tr>
<td>1</td>
<td>MOUNTING PLATE</td>
<td>DOOR/FRAME MFG</td>
<td>4040-18PA</td>
<td>689 LCN</td>
</tr>
<tr>
<td>1</td>
<td>ADA OPERATOR</td>
<td>DOOR/FRAME MFG</td>
<td>4822</td>
<td>689 LCN</td>
</tr>
<tr>
<td>2</td>
<td>OVERHEAD STOP</td>
<td>DOOR/FRAME MFG</td>
<td>900S</td>
<td>630 GLY</td>
</tr>
<tr>
<td>1</td>
<td>THRESHOLD</td>
<td>DOOR/FRAME MFG</td>
<td>9100-NO (72-INCHES)</td>
<td>B/O</td>
</tr>
<tr>
<td>1</td>
<td>WEATHERSTRIP</td>
<td>DOOR/FRAME MFG</td>
<td>WEATHERSTRIP</td>
<td>B/O</td>
</tr>
<tr>
<td>2</td>
<td>DOOR SWEEP</td>
<td>DOOR/FRAME MFG</td>
<td>900S</td>
<td>630 GLY</td>
</tr>
<tr>
<td>1</td>
<td>ASTRAGAL</td>
<td>DOOR/FRAME MFG</td>
<td>ASTRAGAL</td>
<td>B/O</td>
</tr>
<tr>
<td>1</td>
<td>SHARED CONTROL BOX</td>
<td>DOOR/FRAME MFG</td>
<td>SHARED CONTROL BOX</td>
<td>LCN</td>
</tr>
<tr>
<td>1</td>
<td>PNEUMATIC TUBING</td>
<td>DOOR/FRAME MFG</td>
<td>925 (50'-FEET)</td>
<td>CLR LCN</td>
</tr>
<tr>
<td>1</td>
<td>RF ACTUATOR, JAMB</td>
<td>DOOR/FRAME MFG</td>
<td>8310-3818TWF</td>
<td>LCN</td>
</tr>
<tr>
<td></td>
<td>(VESTIBULE SIDE)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## HW SET: 115

**EACH TO HAVE:**

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Item Description</th>
<th>Manufacturer</th>
<th>Model/Part No.</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>POWER TRANSFER</td>
<td>DOOR/FRAME MFG</td>
<td>EPT-10</td>
<td>689 VON</td>
</tr>
<tr>
<td>1</td>
<td>CONTINUOUS HINGE</td>
<td>DOOR/FRAME MFG</td>
<td>CONTINUOUS HINGE</td>
<td>B/O</td>
</tr>
<tr>
<td>1</td>
<td>PANIC HARDWARE</td>
<td>DOOR/FRAME MFG</td>
<td>EL-RX-LX-99NL-OP</td>
<td>626 VON</td>
</tr>
<tr>
<td>1</td>
<td>SFIC PERMANENT CORE</td>
<td>80-037 (PERMANENT CORE)</td>
<td>626 SCH</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>SFIC RIM CYLINDER</td>
<td>80-159 X 80-035 X 50-231 (EXIT DEVICE)</td>
<td>626 SCH</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>VERTICAL PULL BAR</td>
<td>DOOR/FRAME MFG</td>
<td>9100-NO (72-INCHES)</td>
<td>630 IVE CTC</td>
</tr>
<tr>
<td>1</td>
<td>SURFACE CLOSER</td>
<td>DOOR/FRAME MFG</td>
<td>4041 DEL ST2731</td>
<td>(DELAYED ACTION)</td>
</tr>
<tr>
<td>1</td>
<td>MOUNTING PLATE</td>
<td>DOOR/FRAME MFG</td>
<td>4040-18PA</td>
<td>689 LCN</td>
</tr>
<tr>
<td>1</td>
<td>OVERHEAD STOP</td>
<td>900S</td>
<td>630 GLY</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>THRESHOLD</td>
<td>DOOR/FRAME MFG</td>
<td>THRESHOLD</td>
<td>B/O</td>
</tr>
<tr>
<td>1</td>
<td>WEATHERSTRIP</td>
<td>DOOR/FRAME MFG</td>
<td>WEATHERSTRIP</td>
<td>B/O</td>
</tr>
<tr>
<td>1</td>
<td>DOOR SWEEP</td>
<td>DOOR/FRAME MFG</td>
<td>DOOR SWEEP</td>
<td>B/O</td>
</tr>
<tr>
<td>1</td>
<td>INTERFACE BOX</td>
<td>DOOR/FRAME MFG</td>
<td>JB7-R1</td>
<td>GRY VON</td>
</tr>
<tr>
<td>1</td>
<td>POWER SUPPLY</td>
<td>DOOR/FRAME MFG</td>
<td>PS873-2-BB</td>
<td>GRY VON</td>
</tr>
<tr>
<td>1</td>
<td>CARD SWIPE</td>
<td>CBORD CARD SWIPE ACCESS SYSTEM</td>
<td>DLR</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>DOOR POSITION SWITCH</td>
<td>DOOR/FRAME MFG</td>
<td>679-05 BLK SCE</td>
<td>DLR</td>
</tr>
<tr>
<td>1</td>
<td>RISER/WIRING DIAGRAM</td>
<td>DOOR/FRAME MFG</td>
<td>7988 RISER/WIRING DIAGRAM</td>
<td>VON</td>
</tr>
</tbody>
</table>

---

**DOOR HARDWARE**

08 71 00 - 22
## HW SET: 120

### EACH TO HAVE:

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Item Description</th>
<th>Part Number</th>
<th>Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Power Transfer Door/Frame MFG EPT-10</td>
<td>689 VON</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Continuous Hinge Door/Frame MFG CONTINUOUS HINGE</td>
<td>B/O</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Mullion Stabilizer Door/Frame MFG 154</td>
<td>689 VON</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Mullion Door/Frame MFG KR4954</td>
<td>689 VON</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Top Mullion Fitting Door/Frame MFG MULLION FITTING</td>
<td>628 B/O</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Panic Hardware Door/Frame MFG EL-RX-LX-99EO</td>
<td>626 VON</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Panic Hardware Door/Frame MFG EL-RX-LX-99NL-OP</td>
<td>626 VON</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Vertical Pull Bar Door/Frame MFG 9100-NO (72-INCHES CTC)</td>
<td>630 IVE</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Top Jamb Closer Door/Frame MFG 4041 TJ</td>
<td>689 LCN</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Top Jamb Bracket Door/Frame MFG 4040TJ</td>
<td>689 LCN</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>ADA Operator Door/Frame MFG 4822</td>
<td>689 LCN</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Threshold Door/Frame MFG Threshold</td>
<td>B/O</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Weatherstrip Door/Frame MFG Weatherstrip</td>
<td>B/O</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Door Sweep Door/Frame MFG Door Sweep</td>
<td>B/O</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Mullion Gasket Door/Frame MFG 5100S</td>
<td>BLK NGP</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Control Box Door/Frame MFG 7982ES</td>
<td>GRY LCN</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Interface Box Door/Frame MFG JB7-R1</td>
<td>GRY VON</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Power Supply Door/Frame MFG PS873-2-BB</td>
<td>GRY VON</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Pneumatic Tubing Door/Frame MFG 925 (50'-FEET)</td>
<td>CLR LCN</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Card Swipe CBORD Card Swipe Access System</td>
<td>DLR</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Door Position Door/Frame MFG 679-05</td>
<td>BLK SCE</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Riser/Wiring Diagram Door/Frame MFG 7988</td>
<td>VON</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>RF Actuator, Jamb MT Door/Frame MFG 8310-3818TWF (VESTIBULE SIDE)</td>
<td>LCN</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>RF Actuator, Wall MT Door/Frame MFG 8310-3856TWF (PEDESTAL MOUNT)</td>
<td>LCN</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>RF Receiver Door/Frame MFG 8310-865</td>
<td>LCN</td>
<td></td>
</tr>
</tbody>
</table>
**HW SET: 130**

**EACH TO HAVE:**

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Item Description</th>
<th>Manufacturer</th>
<th>Model</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>POWER TRANSFER</td>
<td>DOOR/FRAME</td>
<td>EPT-10</td>
<td>689</td>
</tr>
<tr>
<td>2</td>
<td>CONTINUOUS HINGE</td>
<td>DOOR/FRAME</td>
<td>CONTINUOUS HINGE</td>
<td>B/O</td>
</tr>
<tr>
<td>2</td>
<td>MULLION STABILIZER</td>
<td>DOOR/FRAME</td>
<td>MFG 154</td>
<td>689</td>
</tr>
<tr>
<td>1</td>
<td>MULLION</td>
<td>DOOR/FRAME</td>
<td>MFG KR4954</td>
<td>689</td>
</tr>
<tr>
<td>1</td>
<td>TOP MULLION FITTING</td>
<td>DOOR/FRAME</td>
<td>MFG MULLION FITTING</td>
<td>628 B/O</td>
</tr>
<tr>
<td>2</td>
<td>ALARmed PAnic HDW</td>
<td>DOOR/FRAME</td>
<td>MFG ALK-RX-LX-99EO</td>
<td>626</td>
</tr>
<tr>
<td>3</td>
<td>SFIC PERMANENT</td>
<td>80-037</td>
<td>(PERMANENT CORE)</td>
<td>626</td>
</tr>
<tr>
<td>2</td>
<td>SFIC MORT CYL</td>
<td>80-135 X 80-035 X 50-231</td>
<td>(ALARM ON/OFF)</td>
<td>626</td>
</tr>
<tr>
<td>1</td>
<td>SFIC MORT CYL</td>
<td>80-135 X 80-035 X 50-231</td>
<td>(MULLION)</td>
<td>626</td>
</tr>
<tr>
<td>2</td>
<td>VERTICAL PULL BAR</td>
<td>DOOR/FRAME</td>
<td>MFG 9100-NO (72-INCHES CTC)</td>
<td>630</td>
</tr>
<tr>
<td>2</td>
<td>TOP JAMB CLOSER</td>
<td>DOOR/FRAME</td>
<td>MFG 4041 TJ</td>
<td>689</td>
</tr>
<tr>
<td>2</td>
<td>TOP JAMB BRACKET</td>
<td>DOOR/FRAME</td>
<td>MFG 4040TJ</td>
<td>689</td>
</tr>
<tr>
<td>2</td>
<td>OVERHEAD STOP</td>
<td>DOOR/FRAME</td>
<td>MFG 900S</td>
<td>630</td>
</tr>
<tr>
<td>1</td>
<td>THRESHOLD</td>
<td>DOOR/FRAME</td>
<td>MFG THRESHOLD</td>
<td>B/O</td>
</tr>
<tr>
<td>1</td>
<td>WEATHERSTRIP</td>
<td>DOOR/FRAME</td>
<td>MFG WEATHERSTRIP</td>
<td>B/O</td>
</tr>
<tr>
<td>2</td>
<td>DOOR SWEEP</td>
<td>DOOR/FRAME</td>
<td>MFG DOOR SWEEP</td>
<td>B/O</td>
</tr>
<tr>
<td>1</td>
<td>MULLION GASKET</td>
<td>DOOR/FRAME</td>
<td>MFG 5100S</td>
<td>BLK NGP</td>
</tr>
<tr>
<td>1</td>
<td>INTERFACE BOX</td>
<td>DOOR/FRAME</td>
<td>MFG JB7-R1</td>
<td>GRY VON</td>
</tr>
<tr>
<td>1</td>
<td>POWER SUPPLY</td>
<td>DOOR/FRAME</td>
<td>MFG PS9-K</td>
<td>600 VON</td>
</tr>
<tr>
<td>2</td>
<td>DOOR POSITION</td>
<td>DOOR/FRAME</td>
<td>MFG 679-05</td>
<td>BLK SCE</td>
</tr>
<tr>
<td>1</td>
<td>RISER/WIRING</td>
<td>DOOR/FRAME</td>
<td>MFG 7988 RISER/WIRING</td>
<td>VON</td>
</tr>
</tbody>
</table>

**Diagram:**

- WEATHERSTRIP
- RISER/WIRING
**HW SET: 135**

**EACH TO HAVE:**

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Description</th>
<th>Manufacturer</th>
<th>Model/Part</th>
<th>Color/Cert</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>POWER TRANSFER</td>
<td>DOOR/FRAME MFG</td>
<td>EPT-10</td>
<td>689 VON</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>CONTINUOUS HINGE</td>
<td>DOOR/FRAME MFG</td>
<td>CONTINUOUS HINGE</td>
<td>B/O</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>MULLION STABILIZER</td>
<td>DOOR/FRAME MFG</td>
<td>154</td>
<td>689 VON</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>MULLION</td>
<td>DOOR/FRAME MFG</td>
<td>KR4954</td>
<td>689 VON</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>MULLION STORAGE KIT</td>
<td>DOOR/FRAME MFG</td>
<td>MT54</td>
<td>689 VON</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>TOP MULLION FITTING</td>
<td>DOOR/FRAME MFG</td>
<td>MULLION FITTING</td>
<td>628 B/O</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>PANIC HARDWARE</td>
<td>DOOR/FRAME MFG</td>
<td>EL-RX-LX-99EO</td>
<td>626 VON</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>PANIC HARDWARE</td>
<td>DOOR/FRAME MFG</td>
<td>EL-RX-LX-99NL-OP</td>
<td>626 VON</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>SFIC PERMANENT</td>
<td>80-037</td>
<td>(PERMANENT CORE)</td>
<td>626 SCH</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>SFIC MORT CYL</td>
<td>80-135 X 80-035 X 50-231</td>
<td>(MULLION)</td>
<td>626 SCH</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>SFIC RIM CYLIAN</td>
<td>80-159 X 80-035 X 50-231</td>
<td>(EXIT DEVICE)</td>
<td>626 SCH</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>VERTICAL PULL BAR</td>
<td>DOOR/FRAME MFG</td>
<td>9100-NO (72-INCHES CTC)</td>
<td>630 IVE</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>SURFACE CLOSER</td>
<td>DOOR/FRAME MFG</td>
<td>4041 DEL ST2731</td>
<td>689 LCN</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>MOUNTING PLATE</td>
<td>DOOR/FRAME MFG</td>
<td>4040-18PA</td>
<td>689 LCN</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>THRESHOLD</td>
<td>DOOR/FRAME MFG</td>
<td>MULLION DOOR</td>
<td>B/O</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>WEATHERSTRIP</td>
<td>DOOR/FRAME MFG</td>
<td>WEATHERSTRIP</td>
<td>B/O</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>DOOR SWEEP</td>
<td>DOOR/FRAME MFG</td>
<td>MULLION SWEEP</td>
<td>B/O</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>MULLION GASKET</td>
<td>DOOR/FRAME MFG</td>
<td>5100S</td>
<td>BLK NGP</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>INTERFACE BOX</td>
<td>DOOR/FRAME MFG</td>
<td>JB7-R1</td>
<td>GRY VON</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>POWER SUPPLY</td>
<td>DOOR/FRAME MFG</td>
<td>PS873-2-BB</td>
<td>GRY VON</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>ANNUNCIATOR SYSTEM BY ELECTRICAL SYSTEM</td>
<td></td>
<td></td>
<td>B/O</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>CARD SWIPE</td>
<td>CBORD CARD SWIPE ACCESS SYSTEM</td>
<td>DLR</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>DOOR POSITION</td>
<td>DOOR/FRAME MFG</td>
<td>679-05 BLK SCE</td>
<td>689 LCN</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>SET RISER/WIRING</td>
<td>DOOR/FRAME MFG</td>
<td>7988 RISER/WIRING</td>
<td>VON</td>
<td></td>
</tr>
<tr>
<td>HW SET: 140</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>----------------------------------</td>
<td>---</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>EACH TO HAVE:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 EA CONTINUOUS HINGE</td>
<td>1 EA PANIC HARDWARE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Door/Frame MFG CONTINUOUS HINGE</td>
<td>99EO</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B/O</td>
<td>626 VON</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 EA TOP JAMB CLOSER</td>
<td>1 EA TOP JAMB BRACKET</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Door/Frame MFG 4041 TJ</td>
<td>4040TJ</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>689 LCN</td>
<td>689 LCN</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 EA OVERHEAD STOP</td>
<td>1 EA OVERHEAD STOP</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Door/Frame MFG 900S</td>
<td>900S</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>630 GLY</td>
<td>630 GLY</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 EA THRESHOLD</td>
<td>1 SET WEATHERSTRIP</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Door/Frame MFG THRESHOLD</td>
<td>Door/Frame MFG WEATHERSTRIP</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B/O</td>
<td>B/O</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 EA DOOR SWEEP</td>
<td>1 EA DOOR SWEEP</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Door/Frame MFG DOOR SWEEP</td>
<td>679-05</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B/O</td>
<td>BLK SCE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 EA WEATHERSTRIP</td>
<td>1 EA DOOR POSITION</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Door/Frame MFG WEATHERSTRIP</td>
<td>Door/Frame MFG 679-05</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B/O</td>
<td>BLK SCE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 EA POWER TRANSFER</td>
<td>1 EA POWER TRANSFER</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Door/Frame MFG EPT-10</td>
<td>Door/Frame MFG EPT-10</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>689 VON</td>
<td>689 VON</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 EA CONTINUOUS HINGE</td>
<td>1 EA CONTINUOUS HINGE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Door/Frame MFG CONTINUOUS HINGE</td>
<td>Door/Frame MFG CONTINUOUS HINGE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B/O</td>
<td>B/O</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 EA ALARMED PANIC HDW</td>
<td>1 EA SFIC PERMANENT</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Door/Frame MFG ALK-RX-LX-99EO</td>
<td>80-037 (PERMANENT CORE)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>626 VON</td>
<td>626 SCH</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 EA TOP JAMB BRACKET</td>
<td>1 EA TOP JAMB BRACKET</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Door/Frame MFG 4040TJ</td>
<td>Door/Frame MFG 4040TJ</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>689 LCN</td>
<td>689 LCN</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 EA OVERHEAD STOP</td>
<td>1 EA OVERHEAD STOP</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Door/Frame MFG 900S</td>
<td>900S</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>630 GLY</td>
<td>630 GLY</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 EA THRESHOLD</td>
<td>1 SET WEATHERSTRIP</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Door/Frame MFG THRESHOLD</td>
<td>Door/Frame MFG WEATHERSTRIP</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B/O</td>
<td>B/O</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 EA DOOR SWEEP</td>
<td>1 EA DOOR SWEEP</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Door/Frame MFG DOOR SWEEP</td>
<td>Door/Frame MFG 679-05</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B/O</td>
<td>BLK SCE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 EA SFIC MORT CYL</td>
<td>1 EA SFIC MORT CYL</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>80-135 X 80-035 X 50-231 (ALARM</td>
<td>80-135 X 80-035 X 50-231 (ALARM</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ON/OFF) 626</td>
<td>ON/OFF) 626</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>689 VON</td>
<td>626 SCH</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 EA TOP JAMB BRACKET</td>
<td>1 EA TOP JAMB BRACKET</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Door/Frame MFG 4040TJ</td>
<td>Door/Frame MFG 4040TJ</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>689 LCN</td>
<td>689 LCN</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 EA OVERHEAD STOP</td>
<td>1 EA OVERHEAD STOP</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Door/Frame MFG 900S</td>
<td>900S</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>630 GLY</td>
<td>630 GLY</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 EA THRESHOLD</td>
<td>1 SET WEATHERSTRIP</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Door/Frame MFG THRESHOLD</td>
<td>Door/Frame MFG WEATHERSTRIP</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B/O</td>
<td>B/O</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 EA DOOR SWEEP</td>
<td>1 EA DOOR SWEEP</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Door/Frame MFG DOOR SWEEP</td>
<td>Door/Frame MFG 679-05</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B/O</td>
<td>BLK SCE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 EA POWER SUPPLY</td>
<td>1 EA POWER SUPPLY</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Door/Frame MFG PS9-K</td>
<td>Door/Frame MFG PS9-K</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>600 VON</td>
<td>600 VON</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 EA INTERFACE BOX</td>
<td>1 EA INTERFACE BOX</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>JB7-R1</td>
<td>JB7-R1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GRY VON</td>
<td>GRY VON</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 EA DOOR POSITION</td>
<td>1 EA DOOR POSITION</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Door/Frame MFG 679-05</td>
<td>Door/Frame MFG 679-05</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BLK SCE</td>
<td>BLK SCE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 SET RISER/WIRING</td>
<td>1 SET RISER/WIRING</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Door/Frame MFG 7988 RISER/WIRING</td>
<td>Door/Frame MFG 7988 RISER/WIRING</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VON</td>
<td>VON</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DIAGRAM</td>
<td>DIAGRAM</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>HW SET: 150</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>EACH TO HAVE:</strong></td>
<td></td>
</tr>
<tr>
<td>1 EA CONTINUOUS HINGE</td>
<td>1 EA CLASSROOM LOCK</td>
</tr>
<tr>
<td>Door/Frame MFG CONTINUOUS HINGE</td>
<td>ND94HD RHO</td>
</tr>
<tr>
<td>B/O</td>
<td>626 SCH</td>
</tr>
<tr>
<td>1 EA SFIC PERMANENT</td>
<td>1 EA SFIC PERMANENT</td>
</tr>
<tr>
<td>80-037 (PERMANENT CORE)</td>
<td>80-037 (PERMANENT CORE)</td>
</tr>
<tr>
<td>626 SCH</td>
<td>626 SCH</td>
</tr>
<tr>
<td>1 EA SURFACE CLOSER</td>
<td>1 EA MOUNTING PLATE</td>
</tr>
<tr>
<td>Door/Frame MFG 4041 H</td>
<td>Door/Frame MFG 4040-18</td>
</tr>
<tr>
<td>689 LCN</td>
<td>689 LCN</td>
</tr>
<tr>
<td>1 EA WALL STOP</td>
<td>1 EA WALL STOP</td>
</tr>
<tr>
<td>Door/Frame MFG WS406CCV</td>
<td>Door/Frame MFG WS406CCV</td>
</tr>
<tr>
<td>630 IVE</td>
<td>630 IVE</td>
</tr>
<tr>
<td>1 SET WEATHERSTRIP</td>
<td>1 SET WEATHERSTRIP</td>
</tr>
<tr>
<td>Door/Frame MFG WEATHERSTRIP</td>
<td>Door/Frame MFG WEATHERSTRIP</td>
</tr>
<tr>
<td>B/O</td>
<td>B/O</td>
</tr>
</tbody>
</table>
### HW SET: 155

**EACH TO HAVE:**

<table>
<thead>
<tr>
<th>Qty</th>
<th>Description</th>
<th>Model</th>
<th>Quantity</th>
<th>Supplier</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>SFIC PERMANENT CORE</td>
<td>80-037</td>
<td>626 SCH</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>SFIC MORT CYL BY DOOR MFG</td>
<td>80-135 X 80-035 X 50-231</td>
<td>626 SCH</td>
<td>B/O MANUFACTURER</td>
</tr>
</tbody>
</table>

### HW SET: 200

**EACH TO HAVE:**

<table>
<thead>
<tr>
<th>Qty</th>
<th>Description</th>
<th>Model</th>
<th>Quantity</th>
<th>Supplier</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>HINGE</td>
<td>3CB1HW 4.5 X 4.5</td>
<td>630 IVE</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>STOREROOM LOCK</td>
<td>ND96HD RHO</td>
<td>626 SCH</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>SFIC PERMANENT CORE</td>
<td>80-037</td>
<td>626 SCH</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>SURFACE CLOSER</td>
<td>4041 CUSH</td>
<td>689 LCN</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>SET SEALS</td>
<td>A626A</td>
<td>AL NGP</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>DOOR SWEEP</td>
<td>C627A</td>
<td>AL NGP</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>THRESHOLD</td>
<td>896-S MS/LA</td>
<td>AL NGP</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>LOCK GUARD</td>
<td>LG12</td>
<td>630 IVE</td>
<td></td>
</tr>
</tbody>
</table>

### HW SET: 205

**EACH TO HAVE:**

<table>
<thead>
<tr>
<th>Qty</th>
<th>Description</th>
<th>Model</th>
<th>Quantity</th>
<th>Supplier</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>HINGE</td>
<td>3CB1HW 4.5 X 4.5</td>
<td>630 IVE</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>INSTITUTION LOCK</td>
<td>ND82HD RHO</td>
<td>626 SCH</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>SFIC PERMANENT CORE</td>
<td>80-037</td>
<td>626 SCH</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>SURFACE CLOSER</td>
<td>4041 CUSH</td>
<td>689 LCN</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>SET SEALS</td>
<td>A626A</td>
<td>AL NGP</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>DOOR SWEEP</td>
<td>C627A</td>
<td>AL NGP</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>THRESHOLD</td>
<td>896-S MS/LA</td>
<td>AL NGP</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>LOCK GUARD</td>
<td>LG12</td>
<td>630 IVE</td>
<td></td>
</tr>
</tbody>
</table>

### HW SET: 210

**EACH TO HAVE:**

<table>
<thead>
<tr>
<th>Qty</th>
<th>Description</th>
<th>Model</th>
<th>Quantity</th>
<th>Supplier</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>HINGE</td>
<td>3CB1 4.5 X 4.5</td>
<td>652 IVE</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>STOREROOM LOCK</td>
<td>ND96HD RHO</td>
<td>626 SCH</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>SFIC PERMANENT CORE</td>
<td>80-037</td>
<td>626 SCH</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>SURFACE CLOSER</td>
<td>4041</td>
<td>689 LCN</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>WALL STOP</td>
<td>WS406CCV</td>
<td>630 IVE</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>SET SEALS</td>
<td>2525B</td>
<td>BRN NGP</td>
<td></td>
</tr>
</tbody>
</table>

DOOR HARDWARE
087100 - 27
HW SET: 300

EACH TO HAVE:

6 EA HINGE 3CB1HW 4.5 X 4.5 652 IVE
1 EA POWER TRANSFER DOOR/FRAME MFG EPT-10 689 VON
1 EA ELECT MULLION KR9854 (PREP FOR 6111 ELECT STRIKE) 689 VON
1 EA FIRE EXIT HARDWARE 99L-F BE996L (PASSAGE-NON-LOCKING) 626 VON
1 EA FIRE EXIT HARDWARE EL99L-F BE996L 626 VON
1 EA SFIC PERMANENT 80-037 (PERMANENT CORE) 626 SCH
    CORE
1 EA SFIC MORT CYL 80-135 X 80-035 X 50-231 (MULLION) 626 SCH
1 EA ELECTRIC STRIKE 6111 FSE 24VDC 630 VON
1 EA TOP JAMB CLOSER 4041 TJ 689 LCN
1 EA ADA OPERATOR 4822 689 LCN
2 EA OVERHEAD STOP 900S 630 GLY
1 EA MULLION GASKET 5100S BLK NGP
1 EA INTERFACE BOX JB7-R1 GRY VON
1 EA SHARED CONTROL BOX SHARED CONTROL BOX LCN
1 FT PNEUMATIC TUBING 925 (50'-FEET) CLR LCN
1 SET RISER/WIRING 7988 RISER/WIRING DIAGRAM VON DIAGRAM
2 EA ACTUATOR, WALL 8310-3856TWF LCN MOUNT
1 EA RECEIVER 8310-865 LCN

HW SET: 305

EACH TO HAVE:

6 EA HINGE 3CB1HW 5 X 4.5 652 IVE
2 EA FIRE EXIT HARDWARE 9927EO-F-LBR 626 VON
2 EA SURFACE CLOSER 4041 EDA 689 LCN
2 EA TRANSFORMER 4040SE-3210 LCN
2 EA KICK PLATE 8400 10" X 1" LDW 630 IVE
2 EA MAGNETIC HOLD-SEM 1980 AL LCN OPEN
1 SET SEALS 2525B BRN NGP
1 EA ASTRAGAL 5060B (MEETING STILES) BRN NGP

01. INTERFACE MAGNETIC HOLDERS WITH FIRE/LIFE SAFETY SYSTEMS.
## DOOR HARDWARE

### HW SET: 310

**EACH TO HAVE:**

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
<th>Description</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>HINGE</td>
<td>6</td>
<td>3CB1HW 4.5 X 4.5</td>
<td>652</td>
</tr>
<tr>
<td>FIRE EXIT HARDWARE</td>
<td>2</td>
<td>9927EO-F-LBR</td>
<td>626</td>
</tr>
<tr>
<td>SURFACE CLOSER</td>
<td>2</td>
<td>4041 EDA</td>
<td>689</td>
</tr>
<tr>
<td>TRANSFORMER</td>
<td>2</td>
<td>4040SE-3210</td>
<td>LCN</td>
</tr>
<tr>
<td>KICK PLATE</td>
<td>2</td>
<td>8400 10&quot; X 1&quot; LDW</td>
<td>630</td>
</tr>
<tr>
<td>MAGNETIC HOLD-OPEN</td>
<td>2</td>
<td>SEM 1980</td>
<td>LCN</td>
</tr>
<tr>
<td>SEALS</td>
<td>1</td>
<td>2525B</td>
<td>BRN</td>
</tr>
<tr>
<td>ASTRAGAL</td>
<td>1</td>
<td>5060B (MEETING STILES)</td>
<td>BRN</td>
</tr>
</tbody>
</table>

01. INTERFACE MAGNETIC HOLDERS WITH FIRE/LIFE SAFETY SYSTEMS.

### HW SET: 315

**EACH TO HAVE:**

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
<th>Description</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>HINGE</td>
<td>3</td>
<td>3CB1 4.5 X 4.5</td>
<td>652</td>
</tr>
<tr>
<td>CLASSROOM LOCK</td>
<td>1</td>
<td>ND94HD RHO</td>
<td>626</td>
</tr>
<tr>
<td>SFIC PERMANENT CORE</td>
<td>1</td>
<td>80-037 (PERMANENT CORE)</td>
<td>626</td>
</tr>
<tr>
<td>SURFACE CLOSER</td>
<td>1</td>
<td>4041</td>
<td>689</td>
</tr>
<tr>
<td>KICK PLATE</td>
<td>1</td>
<td>8400 10&quot; X 2&quot; LDW</td>
<td>630</td>
</tr>
<tr>
<td>FLOOR STOP</td>
<td>1</td>
<td>FS438</td>
<td>626</td>
</tr>
<tr>
<td>SET SEALS</td>
<td>1</td>
<td>2525B</td>
<td>BRN</td>
</tr>
</tbody>
</table>

### HW SET: 320

**EACH TO HAVE:**

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
<th>Description</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>HINGE</td>
<td>3</td>
<td>3CB1HW 4.5 X 4.5</td>
<td>652</td>
</tr>
<tr>
<td>CLASSROOM LOCK</td>
<td>1</td>
<td>ND94HD RHO</td>
<td>626</td>
</tr>
<tr>
<td>SFIC PERMANENT CORE</td>
<td>1</td>
<td>80-037 (PERMANENT CORE)</td>
<td>626</td>
</tr>
<tr>
<td>SURFACE CLOSER</td>
<td>1</td>
<td>4041 EDA</td>
<td>689</td>
</tr>
<tr>
<td>KICK PLATE</td>
<td>1</td>
<td>8400 10&quot; X 2&quot; LDW</td>
<td>630</td>
</tr>
<tr>
<td>WALL STOP</td>
<td>1</td>
<td>WS406CCV</td>
<td>630</td>
</tr>
<tr>
<td>SET SEALS</td>
<td>1</td>
<td>2525B</td>
<td>BRN</td>
</tr>
<tr>
<td>Item Number</td>
<td>Description</td>
<td>Model/Number</td>
<td>Vendor</td>
</tr>
<tr>
<td>-------------</td>
<td>--------------------------------------------------</td>
<td>--------------</td>
<td>--------</td>
</tr>
<tr>
<td>3</td>
<td>Hinge</td>
<td>3CB1HW 4.5 X 4.5</td>
<td>652 IVE</td>
</tr>
<tr>
<td>1</td>
<td>Storeroom Lock</td>
<td>ND96HD RHO</td>
<td>626 SCH</td>
</tr>
<tr>
<td>1</td>
<td>SFIC Permanent Core</td>
<td>80-037 (PERMANENT CORE)</td>
<td>626 SCH</td>
</tr>
<tr>
<td>1</td>
<td>Electric Strike</td>
<td>6211 FSE 24VDC</td>
<td>630 VON</td>
</tr>
<tr>
<td>1</td>
<td>Surface Closer</td>
<td>4041</td>
<td>689 LCN</td>
</tr>
<tr>
<td>1</td>
<td>Kick Plate</td>
<td>8400 10&quot; X 2&quot; LDW</td>
<td>630 IVE</td>
</tr>
<tr>
<td>1</td>
<td>Wall Stop</td>
<td>WS406CCV</td>
<td>630 IVE</td>
</tr>
<tr>
<td>1 SET</td>
<td>Seals</td>
<td>2525B</td>
<td>BRN NGP</td>
</tr>
<tr>
<td>1</td>
<td>Lock Guard</td>
<td>LG14</td>
<td>630 IVE</td>
</tr>
<tr>
<td>1</td>
<td>Interface Box</td>
<td>JB7-R1</td>
<td>GRY VON</td>
</tr>
<tr>
<td>1</td>
<td>Door Position Switch</td>
<td>679-05</td>
<td>BLK SCE</td>
</tr>
<tr>
<td>1 SET</td>
<td>Riser/Wiring Diagram</td>
<td>7988</td>
<td>VON</td>
</tr>
<tr>
<td>1</td>
<td>Card Swipe</td>
<td>CBORD CARD SWIPE ACCESS SYSTEM</td>
<td>DLR</td>
</tr>
</tbody>
</table>

**HW SET: 330**

<table>
<thead>
<tr>
<th>Item Number</th>
<th>Description</th>
<th>Model/Number</th>
<th>Vendor</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Hinge</td>
<td>3CB1HW 4.5 X 4.5</td>
<td>652 IVE</td>
</tr>
<tr>
<td>1</td>
<td>Power Transfer</td>
<td>EPT-10</td>
<td>689 VON</td>
</tr>
<tr>
<td>1</td>
<td>Fire Exit Hardware</td>
<td>ALK-99L-F E996L 499F FSE 24VDC</td>
<td>626 VON</td>
</tr>
<tr>
<td>2</td>
<td>SFIC Permanent Core</td>
<td>80-037 (PERMANENT CORE)</td>
<td>626 SCH</td>
</tr>
<tr>
<td>1</td>
<td>SFIC Mort Cylinder</td>
<td>80-135 X 80-035 X 50-231 (ALARM ON/OFF)</td>
<td>626 SCH</td>
</tr>
<tr>
<td>1</td>
<td>SFIC Rim Cylinder</td>
<td>80-159 X 80-035 X 50-231 (EXIT DEVICE)</td>
<td>626 SCH</td>
</tr>
<tr>
<td>1</td>
<td>Surface Closer</td>
<td>4041 EDA</td>
<td>689 LCN</td>
</tr>
<tr>
<td>1</td>
<td>Kick Plate</td>
<td>8400 10&quot; X 2&quot; LDW</td>
<td>630 IVE</td>
</tr>
<tr>
<td>1</td>
<td>Wall Stop</td>
<td>WS406CCV</td>
<td>630 IVE</td>
</tr>
<tr>
<td>1 SET</td>
<td>Seals</td>
<td>2525B</td>
<td>BRN NGP</td>
</tr>
<tr>
<td>1</td>
<td>Door Sweep</td>
<td>600A</td>
<td>AL NGP</td>
</tr>
<tr>
<td>1</td>
<td>Threshold</td>
<td>513 MS/LA</td>
<td>AL NGP</td>
</tr>
<tr>
<td>1</td>
<td>Interface Box</td>
<td>JB7-R1</td>
<td>GRY VON</td>
</tr>
<tr>
<td>1</td>
<td>Power Supply</td>
<td>PS861BK</td>
<td>GRY VON</td>
</tr>
<tr>
<td>1</td>
<td>Door Position Switch</td>
<td>679-05</td>
<td>BLK SCE</td>
</tr>
<tr>
<td>1 SET</td>
<td>Riser/Wiring Diagram</td>
<td>7988</td>
<td>VON</td>
</tr>
<tr>
<td>1</td>
<td>Card Swipe</td>
<td>CBORD CARD SWIPE ACCESS SYSTEM</td>
<td>DLR</td>
</tr>
</tbody>
</table>
### HW SET: 335

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Description</th>
<th>Model/Type</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Hinge</td>
<td>3CB1HW 4.5 X 4.5</td>
<td>652 IVE</td>
</tr>
<tr>
<td>1</td>
<td>Power Transfer</td>
<td>EPT-10</td>
<td>689 VON</td>
</tr>
<tr>
<td>1</td>
<td>Fire Exit Hardware</td>
<td>99L-F E996L 499F FSE 24VDC</td>
<td>626 VON</td>
</tr>
<tr>
<td>2</td>
<td>SFIC Permanent</td>
<td>80-037 (PERMANENT CORE)</td>
<td>626 SCH</td>
</tr>
<tr>
<td>1</td>
<td>SFIC Rim Cylinder</td>
<td>80-159 X 80-035 X 50-231 (EXIT DEVICE)</td>
<td>626 SCH</td>
</tr>
<tr>
<td>1</td>
<td>Surface Closer</td>
<td>4041 CUSH</td>
<td>689 LCN</td>
</tr>
<tr>
<td>1</td>
<td>Kick Plate</td>
<td>8400 10&quot; X 2&quot; LDW</td>
<td>630 IVE</td>
</tr>
<tr>
<td>1</td>
<td>Seals</td>
<td>2525B</td>
<td>BRN NGP</td>
</tr>
<tr>
<td>1</td>
<td>Door Sweep</td>
<td>600A</td>
<td>AL NGP</td>
</tr>
<tr>
<td>1</td>
<td>Threshold</td>
<td>513 MS/LA</td>
<td>AL NGP</td>
</tr>
<tr>
<td>1</td>
<td>Interface Box</td>
<td>JB7-R1</td>
<td>GRY VON</td>
</tr>
<tr>
<td>1</td>
<td>Power Supply</td>
<td>PS861BK</td>
<td>GRY VON</td>
</tr>
<tr>
<td>1</td>
<td>Door Position Switch</td>
<td>679-05</td>
<td>BLK SCE</td>
</tr>
<tr>
<td>1</td>
<td>Riser/Wiring Diagram</td>
<td>7988</td>
<td>VON</td>
</tr>
<tr>
<td>1</td>
<td>Card Swipe</td>
<td>CBORD CARD SWIPE ACCESS SYSTEM</td>
<td>DLR</td>
</tr>
</tbody>
</table>

### HW SET: 340

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Description</th>
<th>Model/Type</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Hinge</td>
<td>3CB1HW 4.5 X 4.5</td>
<td>652 IVE</td>
</tr>
<tr>
<td>1</td>
<td>Power Transfer</td>
<td>EPT-10</td>
<td>689 VON</td>
</tr>
<tr>
<td>1</td>
<td>Fire Exit Hardware</td>
<td>99L-F E996L 499F FSE 24VDC</td>
<td>626 VON</td>
</tr>
<tr>
<td>2</td>
<td>SFIC Permanent</td>
<td>80-037 (PERMANENT CORE)</td>
<td>626 SCH</td>
</tr>
<tr>
<td>1</td>
<td>SFIC Rim Cylinder</td>
<td>80-159 X 80-035 X 50-231 (EXIT DEVICE)</td>
<td>626 SCH</td>
</tr>
<tr>
<td>1</td>
<td>Surface Closer</td>
<td>4041 EDA</td>
<td>689 LCN</td>
</tr>
<tr>
<td>1</td>
<td>Kick Plate</td>
<td>8400 10&quot; X 2&quot; LDW</td>
<td>630 IVE</td>
</tr>
<tr>
<td>1</td>
<td>Wall Stop</td>
<td>WS406CCV</td>
<td>630 IVE</td>
</tr>
<tr>
<td>1</td>
<td>Seals</td>
<td>2525B</td>
<td>BRN NGP</td>
</tr>
<tr>
<td>1</td>
<td>Door Sweep</td>
<td>600A</td>
<td>AL NGP</td>
</tr>
<tr>
<td>1</td>
<td>Threshold</td>
<td>513 MS/LA</td>
<td>AL NGP</td>
</tr>
<tr>
<td>1</td>
<td>Interface Box</td>
<td>JB7-R1</td>
<td>GRY VON</td>
</tr>
<tr>
<td>1</td>
<td>Power Supply</td>
<td>PS861BK</td>
<td>GRY VON</td>
</tr>
<tr>
<td>1</td>
<td>Door Position Switch</td>
<td>679-05</td>
<td>BLK SCE</td>
</tr>
<tr>
<td>1</td>
<td>Riser/Wiring Diagram</td>
<td>7988</td>
<td>VON</td>
</tr>
<tr>
<td>1</td>
<td>Card Swipe</td>
<td>CBORD CARD SWIPE ACCESS SYSTEM</td>
<td>DLR</td>
</tr>
</tbody>
</table>
### HW SET: 345

**EACH TO HAVE:**

<table>
<thead>
<tr>
<th>Item Description</th>
<th>Quantity</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 EA HINGE</td>
<td></td>
<td>3CB1HW 5 X 4.5</td>
</tr>
<tr>
<td>1 EA POWER TRANSFER</td>
<td></td>
<td>EPT-10</td>
</tr>
<tr>
<td>1 EA FIRE EXIT HARDWARE</td>
<td></td>
<td>99L-F  E996L 499F  FSE 24VDC</td>
</tr>
<tr>
<td>2 EA SFIC PERMANENT</td>
<td></td>
<td>80-037 (PERMANENT CORE)</td>
</tr>
<tr>
<td>1 EA SFIC RIM CYLINDER</td>
<td></td>
<td>80-159 X 80-035 X 50-231 (EXIT DEVICE)</td>
</tr>
<tr>
<td>1 EA SURFACE CLOSER</td>
<td></td>
<td>4041 EDA</td>
</tr>
<tr>
<td>1 EA TRANSFORMER</td>
<td></td>
<td>4040SE-3210</td>
</tr>
<tr>
<td>1 EA KICK PLATE</td>
<td></td>
<td>8400 10&quot; X 2&quot; LDW</td>
</tr>
<tr>
<td>1 EA MAGNETIC HOLD-OPEN</td>
<td></td>
<td>SEM 1980</td>
</tr>
<tr>
<td>1 SET SEALS</td>
<td></td>
<td>2525B</td>
</tr>
<tr>
<td>1 EA DOOR SWEEP</td>
<td></td>
<td>600A</td>
</tr>
<tr>
<td>1 EA THRESHOLD</td>
<td></td>
<td>513 MS/LA</td>
</tr>
<tr>
<td>1 EA INTERFACE BOX</td>
<td></td>
<td>JB7-R1</td>
</tr>
<tr>
<td>1 EA POWER SUPPLY</td>
<td></td>
<td>PS861BK</td>
</tr>
<tr>
<td>1 EA DOOR POSITION</td>
<td></td>
<td>679-05</td>
</tr>
<tr>
<td>1 SET RISER/WIRING DIAGRAM</td>
<td></td>
<td>7988 RISER/WIRING DIAGRAM</td>
</tr>
<tr>
<td>1 EA CARD SWIPE</td>
<td></td>
<td>CBORD CARD SWIPE ACCESS SYSTEM</td>
</tr>
</tbody>
</table>

### HW SET: 350

**EACH TO HAVE:**

<table>
<thead>
<tr>
<th>Item Description</th>
<th>Quantity</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 EA HINGE</td>
<td></td>
<td>3CB1HW 5 X 4.5</td>
</tr>
<tr>
<td>1 EA POWER TRANSFER</td>
<td></td>
<td>EPT-10</td>
</tr>
<tr>
<td>1 EA FIRE EXIT HARDWARE</td>
<td></td>
<td>99L-F  E996L 499F  FSE 24VDC</td>
</tr>
<tr>
<td>2 EA SFIC PERMANENT</td>
<td></td>
<td>80-037 (PERMANENT CORE)</td>
</tr>
<tr>
<td>1 EA SFIC RIM CYLINDER</td>
<td></td>
<td>80-159 X 80-035 X 50-231 (EXIT DEVICE)</td>
</tr>
<tr>
<td>1 EA SURFACE CLOSER</td>
<td></td>
<td>4041 EDA</td>
</tr>
<tr>
<td>1 EA TRANSFORMER</td>
<td></td>
<td>4040SE-3210</td>
</tr>
<tr>
<td>1 EA KICK PLATE</td>
<td></td>
<td>8400 10&quot; X 2&quot; LDW</td>
</tr>
<tr>
<td>1 EA MAGNETIC HOLD-OPEN</td>
<td></td>
<td>SEM 1980</td>
</tr>
<tr>
<td>1 SET SEALS</td>
<td></td>
<td>2525B</td>
</tr>
<tr>
<td>1 EA DOOR SWEEP</td>
<td></td>
<td>600A</td>
</tr>
<tr>
<td>1 EA THRESHOLD</td>
<td></td>
<td>513 MS/LA</td>
</tr>
<tr>
<td>1 EA INTERFACE BOX</td>
<td></td>
<td>JB7-R1</td>
</tr>
<tr>
<td>1 EA POWER SUPPLY</td>
<td></td>
<td>PS861BK</td>
</tr>
<tr>
<td>1 EA DOOR POSITION</td>
<td></td>
<td>679-05</td>
</tr>
<tr>
<td>1 SET RISER/WIRING DIAGRAM</td>
<td></td>
<td>7988 RISER/WIRING DIAGRAM</td>
</tr>
<tr>
<td>1 EA CARD SWIPE</td>
<td></td>
<td>CBORD CARD SWIPE ACCESS SYSTEM</td>
</tr>
</tbody>
</table>
**HW SET: 355**

**EACH TO HAVE:**

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Quantity</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Hinge</td>
<td>3CB1 4.5 X 4.5</td>
<td>652 IVE</td>
</tr>
<tr>
<td>1</td>
<td>Storeroom lock</td>
<td>ND96HD RHO</td>
<td>626 SCH</td>
</tr>
<tr>
<td>1</td>
<td>SFIC Permanent core</td>
<td>80-037 (PERMANENT CORE)</td>
<td>626 SCH</td>
</tr>
<tr>
<td>1</td>
<td>Surface closer</td>
<td>4041 CUSH</td>
<td>689 LCN</td>
</tr>
<tr>
<td>1</td>
<td>Kick plate</td>
<td>8400 10&quot; X 2&quot; LDW</td>
<td>630 IVE</td>
</tr>
<tr>
<td>1</td>
<td>Surface closer</td>
<td>4041</td>
<td>689 LCN</td>
</tr>
<tr>
<td>1</td>
<td>Kick plate</td>
<td>8400 10&quot; X 2&quot; LDW</td>
<td>630 IVE</td>
</tr>
<tr>
<td>1</td>
<td>Surface closer</td>
<td>WS406CCV</td>
<td>630 IVE</td>
</tr>
<tr>
<td>1</td>
<td>Seals</td>
<td>2525B</td>
<td>BRN NGP</td>
</tr>
<tr>
<td>1</td>
<td>Kick plate</td>
<td>8400 10&quot; X 2&quot; LDW</td>
<td>630 IVE</td>
</tr>
</tbody>
</table>

**HW SET: 360**

**EACH TO HAVE:**

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Quantity</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Hinge</td>
<td>3CB1HW 4.5 X 4.5</td>
<td>652 IVE</td>
</tr>
<tr>
<td>1</td>
<td>Fire exit hardware</td>
<td>99L-F BE996L (PASSAGE-NON-LOCKING)</td>
<td>626 VON</td>
</tr>
<tr>
<td>1</td>
<td>Surface closer</td>
<td>4041</td>
<td>689 LCN</td>
</tr>
<tr>
<td>1</td>
<td>Kick plate</td>
<td>8400 10&quot; X 2&quot; LDW</td>
<td>630 IVE</td>
</tr>
<tr>
<td>1</td>
<td>Surface closer</td>
<td>WS406CCV</td>
<td>630 IVE</td>
</tr>
<tr>
<td>1</td>
<td>Seals</td>
<td>2525B</td>
<td>BRN NGP</td>
</tr>
<tr>
<td>1</td>
<td>Door sweep</td>
<td>600A</td>
<td>AL NGP</td>
</tr>
<tr>
<td>1</td>
<td>Threshold</td>
<td>513 MS/LA</td>
<td>AL NGP</td>
</tr>
</tbody>
</table>

**HW SET: 365**

**EACH TO HAVE:**

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Quantity</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Hinge</td>
<td>3CB1 4.5 X 4.5</td>
<td>652 IVE</td>
</tr>
<tr>
<td>1</td>
<td>Storeroom lock</td>
<td>ND96HD RHO</td>
<td>626 SCH</td>
</tr>
<tr>
<td>1</td>
<td>SFIC Permanent core</td>
<td>80-037 (PERMANENT CORE)</td>
<td>626 SCH</td>
</tr>
<tr>
<td>1</td>
<td>Surface closer</td>
<td>4041</td>
<td>689 LCN</td>
</tr>
<tr>
<td>1</td>
<td>Kick plate</td>
<td>8400 10&quot; X 2&quot; LDW</td>
<td>630 IVE</td>
</tr>
<tr>
<td>1</td>
<td>Wall stop</td>
<td>WS406CCV</td>
<td>630 IVE</td>
</tr>
<tr>
<td>1</td>
<td>Seals</td>
<td>2525B</td>
<td>BRN NGP</td>
</tr>
</tbody>
</table>
**HW SET: 370**

<table>
<thead>
<tr>
<th>Item Description</th>
<th>Manufacturer Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 EA CONTINUOUS HINGE</td>
<td>DOOR/FRAME MFG CONTINUOUS HINGE B/O</td>
</tr>
<tr>
<td>1 EA CLASSROOM LOCK</td>
<td>DOOR/FRAME MFG ND94HD RHO 626 SCH</td>
</tr>
<tr>
<td>1 EA SFIC PERMANENT CORE</td>
<td>80-037 (PERMANENT CORE) 626 SCH</td>
</tr>
<tr>
<td>1 EA TOP JAMB CLOSER</td>
<td>DOOR/FRAME MFG 4041 TJ 689 LCN</td>
</tr>
<tr>
<td>1 EA TOP JAMB BRACKET</td>
<td>DOOR/FRAME MFG 4040TJ 689 LCN</td>
</tr>
<tr>
<td>1 EA WALL STOP</td>
<td>DOOR/FRAME MFG WS406CCV 630 IVE</td>
</tr>
<tr>
<td>1 SET SEALS</td>
<td>DOOR/FRAME MFG 2525B BRN NGP</td>
</tr>
</tbody>
</table>

01. ARCHITECT CONFIRMS THAT ALUMINUM DOOR/FRAME WILL MEET FIRE RATING CONDITIONS.

**HW SET: 375**

<table>
<thead>
<tr>
<th>Item Description</th>
<th>Manufacturer Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 EA HINGE</td>
<td>3CB1HW 5 X 4.5</td>
</tr>
<tr>
<td>1 EA FIRE EXIT HARDWARE</td>
<td>99L-F BE996L (PASSAGE-NON-LOCKING) 626 VON</td>
</tr>
<tr>
<td>1 EA SURFACE CLOSER</td>
<td>4041</td>
</tr>
<tr>
<td>1 EA KICK PLATE</td>
<td>8400 10&quot; X 2&quot; LDW</td>
</tr>
<tr>
<td>1 EA WALL STOP</td>
<td>WS406CCV</td>
</tr>
<tr>
<td>1 SET SEALS</td>
<td>2525B</td>
</tr>
<tr>
<td>1 EA DOOR SWEEP</td>
<td>600A</td>
</tr>
<tr>
<td>1 EA THRESHOLD</td>
<td>513 MS/LA</td>
</tr>
</tbody>
</table>

**HW SET: 380**

<table>
<thead>
<tr>
<th>Item Description</th>
<th>Manufacturer Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 EA HINGE</td>
<td>3CB1HW 5 X 4.5</td>
</tr>
<tr>
<td>1 EA PASSAGE SET</td>
<td>ND10S RHO</td>
</tr>
<tr>
<td>1 EA SURFACE CLOSER</td>
<td>4041 EDA</td>
</tr>
<tr>
<td>1 EA TRANSFORMER</td>
<td>4040SE-3210 LCN</td>
</tr>
<tr>
<td>1 EA KICK PLATE</td>
<td>8400 10&quot; X 2&quot; LDW</td>
</tr>
<tr>
<td>1 EA MAGNETIC HOLD-OPEN</td>
<td>SEM 1980 AL LCN</td>
</tr>
<tr>
<td>1 SET SEALS</td>
<td>2525B BRN NGP</td>
</tr>
</tbody>
</table>

01. INTERFACE MAGNETIC HOLDER WITH FIRE/LIFE SAFETY SYSTEMS.
HW SET: 385

EACH TO HAVE:

- **3 EA HINGE**
  - DOOR/FRAME MFG 3CB1HW 4.5 X 4.5
  - 652 IVE

- **1 EA POWER TRANSFER**
  - DOOR/FRAME MFG EPT-10
  - 689 VON

- **1 EA FIRE EXIT HARDWARE**
  - DOOR/FRAME MFG 99L-F E996L 499F FSE
  - 24VDC
  - 626 VON

- **2 EA SFIC PERMANENT CORE**
  - 80-037 (PERMANENT CORE)
  - 626 SCH

- **1 EA SFIC RIM CYLINDER**
  - 80-159 X 80-035 X 50-231 (EXIT DEVICE)
  - 626 SCH

- **1 EA SURFACE CLOSER**
  - DOOR/FRAME MFG 4041 CUSH
  - 689 LCN

- **1 EA THRESHOLD**
  - DOOR/FRAME MFG THRESHOLD
  - B/O

- **1 SET SEALS**
  - DOOR/FRAME MFG 2525B
  - BRN NGP

- **1 EA DOOR SWEEP**
  - DOOR/FRAME MFG DOOR SWEEP
  - B/O

- **1 EA INTERFACE BOX**
  - DOOR/FRAME MFG JB7-R1
  - GRY VON

- **1 EA POWER SUPPLY**
  - DOOR/FRAME MFG PS861BK
  - GRY VON

- **1 EA CARD SWIPE**
  - CBORD CARD SWIPE ACCESS SYSTEM
  - DLR

- **1 EA DOOR POSITION SWITCH**
  - DOOR/FRAME MFG 679-05
  - BLK SCE

- **1 SET RISER/WIRING DIAGRAM**
  - DOOR/FRAME MFG 7988 RISER/WIRING
  - VON

HW SET: 390

EACH TO HAVE:

- **3 EA HINGE**
  - 3CB1HW 4.5 X 4.5
  - 652 IVE

- **1 EA FIRE EXIT HARDWARE**
  - 99L-F 996L
  - 626 VON

- **1 EA SFIC PERMANENT CORE**
  - 80-037 (PERMANENT CORE)
  - 626 SCH

- **1 EA SFIC RIM CYLINDER**
  - 80-159 X 80-035 X 50-231 (EXIT DEVICE)
  - 626 SCH

- **1 EA SURFACE CLOSER**
  - 4041 EDA
  - 689 LCN

- **1 EA WALL STOP**
  - WS406CCV
  - 630 IVE

- **1 SET SEALS**
  - 2525B
  - BRN NGP

HW SET: 400

EACH TO HAVE:

- **3 EA HINGE**
  - 3CB1HW 4.5 X 4.5
  - 652 IVE

- **1 EA PANIC HARDWARE**
  - 99L 996L
  - 626 VON

- **1 EA SFIC PERMANENT CORE**
  - 80-037 (PERMANENT CORE)
  - 626 SCH

- **1 EA SFIC RIM CYLINDER**
  - 80-159 X 80-035 X 50-231 (EXIT DEVICE)
  - 626 SCH

- **1 EA SURFACE CLOSER**
  - 4041 HEDA
  - 689 LCN

- **1 EA KICK PLATE**
  - 8400 10" X 2" LDW
  - 630 IVE

- **1 EA WALL STOP**
  - WS406CCV
  - 630 IVE

- **3 EA SILENCER**
  - SR64
  - GRY IVE
HW SET: 405

EACH TO HAVE:

3 EA HINGE 3CB1HW 5 X 4.5 652 IVE
1 EA CLASSROOM LOCK ND94HD RHO 626 SCH
1 EA SFIC PERMANENT 80-037 (PERMANENT CORE) 626 SCH
1 EA SURFACE CLOSER 4041 H 689 LCN
1 EA KICK PLATE 8400 10" X 2" LDW 630 IVE
1 EA WALL STOP WS406CCV 630 IVE
1 SET SEALS 2525B BRN NGP

HW SET: 410

EACH TO HAVE:

6 EA HINGE 3CB1HW 4.5 X 4.5 652 IVE
1 SET AUTO FLUSH BOLT FB41P 630 IVE
1 EA DUST PROOF STRIKE DP1 (SET IN EPOXY) 626 IVE
1 EA CLASSROOM LOCK ND94HD RHO 626 IVE
1 EA SFIC PERMANENT 80-037 (PERMANENT CORE) 626 SCH
1 EA COORDINATOR COR X FB X BX 628 IVE
1 EA ASTRAGAL 148NA AL NGP
2 EA SURFACE CLOSER 4041 HEDA 689 LCN
2 EA KICK PLATE 8400 10" X 1" LDW 630 IVE
2 EA FLOOR STOP FS438 626 IVE
2 EA SILENCER SR64 GRY IVE

HW SET: 500

EACH TO HAVE:

3 EA HINGE 3CB1 4.5 X 4.5 652 IVE
1 EA ENTRANCE LOCK ND92HD RHO 626 SCH
1 EA SFIC PERMANENT 80-037 (PERMANENT CORE) 626 SCH
1 EA KICK PLATE 8400 10" X 2" LDW 630 IVE
1 EA WALL STOP WS406CCV 630 IVE
3 EA SILENCER SR64 GRY IVE

DOOR HARDWARE
08 71 00 - 36
DOOR HARDWARE

HW SET: 505

EACH TO HAVE:

3 EA HINGE 3CB1 4.5 X 4.5 652 IVE
1 EA CLASSROOM LOCK ND94HD RHO 626 SCH
1 EA SFIC PERMANENT 80-037 (PERMANENT CORE) 626 SCH
1 EA SURFACE CLOSER 4041 689 LCN
1 EA KICK PLATE 8400 10" X 2" LDW 630 IVE
1 EA WALL STOP WS406CCV 630 IVE
3 EA SILENCER SR64 GRY IVE

HW SET: 510

EACH TO HAVE:

3 EA HINGE 3CB1 4.5 X 4.5 652 IVE
1 EA CLASSROOM LOCK ND94HD RHO 626 SCH
1 EA SFIC PERMANENT 80-037 (PERMANENT CORE) 626 SCH
1 EA KICK PLATE 8400 10" X 2" LDW 630 IVE
1 EA WALL STOP WS406CCV 630 IVE
3 EA SILENCER SR64 GRY IVE

HW SET: 515

EACH TO HAVE:

1 EA CONTINUOUS HINGE DOOR/FRAME MFG CONTINUOUS HINGE B/O
1 EA CLASSROOM LOCK DOOR/FRAME MFG ND94HD RHO 626 SCH
1 EA SFIC PERMANENT 80-037 (PERMANENT CORE) 626 SCH
1 EA TOP JAMB CLOSER DOOR/FRAME MFG 4041 TJ 689 LCN
1 EA TOP JAMB BRACKET DOOR/FRAME MFG 4040TJ 689 LCN
1 EA WALL STOP DOOR/FRAME MFG WS406CCV 630 IVE
1 SET WEATHERSTRIP DOOR/FRAME MFG WEATHERSTRIP B/O

HW SET: 520

EACH TO HAVE:

3 EA HINGE 3CB1 4.5 X 4.5 652 IVE
1 EA CLASSROOM LOCK ND94HD RHO 626 SCH
1 EA SFIC PERMANENT 80-037 (PERMANENT CORE) 626 SCH
1 EA SURFACE CLOSER 4041 H 689 LCN
1 EA OVERHEAD STOP 900S 630 GLY
1 EA KICK PLATE 8400 10" X 2" LDW 630 IVE
1 EA WALL STOP WS406CCV 630 IVE
3 EA SILENCER SR64 GRY IVE
**HW SET: 525**

**EACH TO HAVE:**
- 3 EA HINGE 3CB1HW 4.5 X 4.5
- 1 EA CLASSROOM LOCK ND94HD RHO
- 1 EA SFIC PERMANENT 80-037 (PERMANENT CORE)
- 1 EA SURFACE CLOSER 4041
- 1 EA KICK PLATE 8400 10" X 2" LDW
- 1 EA WALL STOP WS406CCV
- 3 EA SILENCER SR64

**HW SET: 530**

**EACH TO HAVE:**
- 3 EA HINGE 3CB1HW 4.5 X 4.5
- 1 EA CLASSROOM LOCK ND94HD RHO
- 1 EA SFIC PERMANENT 80-037 (PERMANENT CORE)
- 1 EA SURFACE CLOSER 4041 CUSH
- 1 EA KICK PLATE 8400 10" X 2" LDW
- 3 EA SILENCER SR64

**HW SET: 600**

**EACH TO HAVE:**
- 3 EA HINGE 3CB1 4.5 X 4.5
- 1 EA STOREROOM LOCK ND96HD RHO
- 1 EA SFIC PERMANENT 80-037 (PERMANENT CORE)
- 1 EA SURFACE CLOSER 4041
- 1 EA KICK PLATE 8400 10" X 2" LDW
- 1 EA WALL STOP WS406CCV
- 1 EA LOCK GUARD LG14
- 3 EA SILENCER SR64

**HW SET: 605**

**EACH TO HAVE:**
- 3 EA HINGE 3CB1 4.5 X 4.5
- 1 EA STOREROOM LOCK ND96HD RHO
- 1 EA SFIC PERMANENT 80-037 (PERMANENT CORE)
- 1 EA WALL STOP WS406CCV
- 3 EA SILENCER SR64
### HW SET: 610

**EACH TO HAVE:**

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
<th>Description</th>
<th>Code</th>
<th>Brand</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hinge</td>
<td>3</td>
<td>3CB1 4.5 X 4.5</td>
<td>652</td>
<td>IVE</td>
</tr>
<tr>
<td>Storeroom Lock</td>
<td>1</td>
<td>ND96HD RHO</td>
<td>626</td>
<td>SCH</td>
</tr>
<tr>
<td>SFIC Permanent Core</td>
<td>1</td>
<td>80-037 (PERMANENT CORE)</td>
<td>626</td>
<td>SCH</td>
</tr>
<tr>
<td>Kick Plate</td>
<td>1</td>
<td>8400 10&quot; X 2&quot; LDW</td>
<td>630</td>
<td>IVE</td>
</tr>
<tr>
<td>Wall Stop</td>
<td>1</td>
<td>WS406CCV</td>
<td>630</td>
<td>IVE</td>
</tr>
<tr>
<td>Silencier</td>
<td>3</td>
<td>SR64</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### HW SET: 615

**EACH TO HAVE:**

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
<th>Description</th>
<th>Code</th>
<th>Brand</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hinge</td>
<td>3</td>
<td>3CB1 4.5 X 4.5</td>
<td>652</td>
<td>IVE</td>
</tr>
<tr>
<td>Classroom Lock</td>
<td>1</td>
<td>ND94HD RHO</td>
<td>626</td>
<td>SCH</td>
</tr>
<tr>
<td>SFIC Permanent Core</td>
<td>1</td>
<td>80-037 (PERMANENT CORE)</td>
<td>626</td>
<td>SCH</td>
</tr>
<tr>
<td>Wall Stop</td>
<td>1</td>
<td>WS406CCV</td>
<td>630</td>
<td>IVE</td>
</tr>
<tr>
<td>Silencier</td>
<td>3</td>
<td>SR64</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### HW SET: 620

**EACH TO HAVE:**

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
<th>Description</th>
<th>Code</th>
<th>Brand</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hinge</td>
<td>3</td>
<td>3CB1 4.5 X 4.5</td>
<td>652</td>
<td>IVE</td>
</tr>
<tr>
<td>Storeroom Lock</td>
<td>1</td>
<td>ND96HD RHO</td>
<td>626</td>
<td>SCH</td>
</tr>
<tr>
<td>SFIC Permanent Core</td>
<td>1</td>
<td>80-037 (PERMANENT CORE)</td>
<td>626</td>
<td>SCH</td>
</tr>
<tr>
<td>Surface Closer</td>
<td>1</td>
<td>4041 CUSH</td>
<td>689</td>
<td>LCN</td>
</tr>
<tr>
<td>Set Seals</td>
<td>1</td>
<td>2525B</td>
<td>BRN</td>
<td>NGP</td>
</tr>
</tbody>
</table>

### HW SET: 625

**EACH TO HAVE:**

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
<th>Description</th>
<th>Code</th>
<th>Brand</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hinge</td>
<td>3</td>
<td>3CB1 4.5 X 4.5</td>
<td>652</td>
<td>IVE</td>
</tr>
<tr>
<td>Storeroom Lock</td>
<td>1</td>
<td>ND96HD RHO</td>
<td>626</td>
<td>SCH</td>
</tr>
<tr>
<td>SFIC Permanent Core</td>
<td>1</td>
<td>80-037 (PERMANENT CORE)</td>
<td>626</td>
<td>SCH</td>
</tr>
<tr>
<td>Surface Closer</td>
<td>1</td>
<td>4041 CUSH</td>
<td>689</td>
<td>LCN</td>
</tr>
<tr>
<td>Kick Plate</td>
<td>1</td>
<td>8400 10&quot; X 2&quot; LDW</td>
<td>630</td>
<td>IVE</td>
</tr>
<tr>
<td>Set Seals</td>
<td>1</td>
<td>2525B</td>
<td>BRN</td>
<td>NGP</td>
</tr>
<tr>
<td>Lock Guard</td>
<td>1</td>
<td>LG14</td>
<td>630</td>
<td>IVE</td>
</tr>
</tbody>
</table>
## DOOR HARDWARE

### HW SET: 630

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Item Description</th>
<th>Model/Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>HINGE</td>
<td>3CB1HW 5 X 4.5</td>
</tr>
<tr>
<td>1</td>
<td>STOREROOM LOCK</td>
<td>ND96HD RHO</td>
</tr>
<tr>
<td>1</td>
<td>SFIC PERMANENT</td>
<td>80-037 (PERMANENT CORE)</td>
</tr>
<tr>
<td>1</td>
<td>SURFACE CLOSER</td>
<td>4041 CUSH</td>
</tr>
<tr>
<td>1</td>
<td>KICK PLATE</td>
<td>8400 10&quot; X 2&quot; LDW</td>
</tr>
<tr>
<td>1</td>
<td>SEALS</td>
<td>134NA AL NGP</td>
</tr>
<tr>
<td>1</td>
<td>DOOR BOTTOM</td>
<td>220SA AL NGP</td>
</tr>
<tr>
<td>1</td>
<td>THRESHOLD</td>
<td>513 MS/LA AL NGP</td>
</tr>
</tbody>
</table>

### HW SET: 635

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Item Description</th>
<th>Model/Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>HINGE</td>
<td>3CB1 4.5 X 4.5</td>
</tr>
<tr>
<td>1</td>
<td>CLASSROOM LOCK</td>
<td>ND94HD RHO</td>
</tr>
<tr>
<td>1</td>
<td>SFIC PERMANENT</td>
<td>80-037 (PERMANENT CORE)</td>
</tr>
<tr>
<td>1</td>
<td>SURFACE CLOSER</td>
<td>4041 CUSH</td>
</tr>
<tr>
<td>1</td>
<td>KICK PLATE</td>
<td>8400 10&quot; X 2&quot; LDW</td>
</tr>
<tr>
<td>1</td>
<td>SEALS</td>
<td>134NA AL NGP</td>
</tr>
<tr>
<td>1</td>
<td>DOOR BOTTOM</td>
<td>220SA AL NGP</td>
</tr>
<tr>
<td>1</td>
<td>THRESHOLD</td>
<td>513 MS/LA AL NGP</td>
</tr>
</tbody>
</table>

### HW SET: 640

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Item Description</th>
<th>Model/Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>HINGE</td>
<td>3CB1 4.5 X 4.5</td>
</tr>
<tr>
<td>1</td>
<td>CLASSROOM LOCK</td>
<td>ND94HD RHO</td>
</tr>
<tr>
<td>1</td>
<td>SFIC PERMANENT</td>
<td>80-037 (PERMANENT CORE)</td>
</tr>
<tr>
<td>1</td>
<td>SURFACE CLOSER</td>
<td>4041</td>
</tr>
<tr>
<td>1</td>
<td>KICK PLATE</td>
<td>8400 10&quot; X 2&quot; LDW</td>
</tr>
<tr>
<td>1</td>
<td>SEALS</td>
<td>134NA AL NGP</td>
</tr>
<tr>
<td>1</td>
<td>DOOR BOTTOM</td>
<td>220SA AL NGP</td>
</tr>
<tr>
<td>1</td>
<td>THRESHOLD</td>
<td>513 MS/LA AL NGP</td>
</tr>
</tbody>
</table>
**HW SET: 700**

**EACH TO HAVE:**

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Description</th>
<th>Model/Code</th>
<th>Finish</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Hinge</td>
<td>3CB1 4.5 X 4.5</td>
<td>IVE</td>
</tr>
<tr>
<td>1</td>
<td>Storeroom Lock</td>
<td>ND96HD RHO</td>
<td>SCH</td>
</tr>
<tr>
<td>1</td>
<td>SFIC Permanent Core</td>
<td>80-037</td>
<td>SCH</td>
</tr>
<tr>
<td>1</td>
<td>Surface Closer</td>
<td>4041 EDA</td>
<td>SCH</td>
</tr>
<tr>
<td>1</td>
<td>Wall Stop</td>
<td>WS406CCV</td>
<td>IVE</td>
</tr>
<tr>
<td>3</td>
<td>Silencer</td>
<td>SR64</td>
<td>GRY IVE</td>
</tr>
</tbody>
</table>

**HW SET: 705**

**EACH TO HAVE:**

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Description</th>
<th>Model/Code</th>
<th>Finish</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Hinge</td>
<td>3CB1 4.5 X 4.5</td>
<td>IVE</td>
</tr>
<tr>
<td>1</td>
<td>Storeroom Lock</td>
<td>ND96HD RHO</td>
<td>SCH</td>
</tr>
<tr>
<td>1</td>
<td>SFIC Permanent Core</td>
<td>80-037</td>
<td>SCH</td>
</tr>
<tr>
<td>1</td>
<td>Overhead Holder</td>
<td>900F</td>
<td>GLY</td>
</tr>
<tr>
<td>3</td>
<td>Silencer</td>
<td>SR64</td>
<td>GRY IVE</td>
</tr>
</tbody>
</table>

**HW SET: 710**

**EACH TO HAVE:**

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Description</th>
<th>Model/Code</th>
<th>Finish</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>Hinge</td>
<td>3CB1 4.5 X 4.5</td>
<td>IVE</td>
</tr>
<tr>
<td>2</td>
<td>Manual Flush Bolt</td>
<td>FB458</td>
<td>IVE</td>
</tr>
<tr>
<td>1</td>
<td>Dust Proof Strike</td>
<td>DP1 (SET IN EPOXY)</td>
<td>IVE</td>
</tr>
<tr>
<td>1</td>
<td>Storeroom Lock</td>
<td>ND96HD RHO</td>
<td>SCH</td>
</tr>
<tr>
<td>1</td>
<td>SFIC Permanent Core</td>
<td>80-037</td>
<td>SCH</td>
</tr>
<tr>
<td>1</td>
<td>Astragal</td>
<td>148NA</td>
<td>AL NGP</td>
</tr>
<tr>
<td>1</td>
<td>Surface Closer</td>
<td>4041 HEDA</td>
<td>LCN</td>
</tr>
<tr>
<td>2</td>
<td>Wall Stop</td>
<td>WS406CCV</td>
<td>IVE</td>
</tr>
<tr>
<td>1</td>
<td>Set Seals</td>
<td>134NA</td>
<td>AL NGP</td>
</tr>
<tr>
<td>2</td>
<td>Door Bottom</td>
<td>220SA</td>
<td>AL NGP</td>
</tr>
<tr>
<td>1</td>
<td>Threshold</td>
<td>896-S MS/LA</td>
<td>AL NGP</td>
</tr>
</tbody>
</table>
## DOOR HARDWARE

### HW SET: 715

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Item Description</th>
<th>Model/Code</th>
<th>Brand</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>HINGE 3CB1 4.5 X 4.5</td>
<td>652</td>
<td>IVE</td>
</tr>
<tr>
<td>2</td>
<td>MANUAL FLUSH BOLT FB458</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>DUST PROOF STRIKE DP1 (SET IN EPOXY)</td>
<td>626</td>
<td>IVE</td>
</tr>
<tr>
<td>1</td>
<td>STOREROOM LOCK ND96HD RHO</td>
<td>626</td>
<td>SCH</td>
</tr>
<tr>
<td>1</td>
<td>SFIC PERMANENT CORE 80-037 (PERMANENT CORE)</td>
<td>626</td>
<td>SCH</td>
</tr>
<tr>
<td>1</td>
<td>ASTRAGAL 148NA</td>
<td></td>
<td>AL</td>
</tr>
<tr>
<td>1</td>
<td>SURFACE CLOSER 4041</td>
<td>689</td>
<td>LCN</td>
</tr>
<tr>
<td>2</td>
<td>WALL STOP WS406CCV</td>
<td>630</td>
<td>IVE</td>
</tr>
<tr>
<td>1</td>
<td>SET SEALS 134NA</td>
<td></td>
<td>AL</td>
</tr>
<tr>
<td>2</td>
<td>DOOR BOTTOM 220SA</td>
<td></td>
<td>AL</td>
</tr>
<tr>
<td>1</td>
<td>THRESHOLD 896-S MS/LA</td>
<td></td>
<td>AL</td>
</tr>
</tbody>
</table>

### HW SET: 720

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Item Description</th>
<th>Model/Code</th>
<th>Brand</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>HINGE 3CB1HW 4.5 X 4.5</td>
<td>652</td>
<td>IVE</td>
</tr>
<tr>
<td>1</td>
<td>CLASSROOM LOCK ND94HD RHO</td>
<td>626</td>
<td>SCH</td>
</tr>
<tr>
<td>1</td>
<td>SFIC PERMANENT CORE 80-037 (PERMANENT CORE)</td>
<td>626</td>
<td>SCH</td>
</tr>
<tr>
<td>1</td>
<td>SURFACE CLOSER 4041</td>
<td>689</td>
<td>LCN</td>
</tr>
<tr>
<td>1</td>
<td>OVERHEAD STOP 900S</td>
<td>630</td>
<td>GLY</td>
</tr>
<tr>
<td>1</td>
<td>KICK PLATE 8400 10&quot; X 2&quot; LDW</td>
<td>630</td>
<td>IVE</td>
</tr>
<tr>
<td>1</td>
<td>SET SEALS 134NA</td>
<td></td>
<td>AL</td>
</tr>
<tr>
<td>1</td>
<td>DOOR BOTTOM 220SA</td>
<td></td>
<td>AL</td>
</tr>
<tr>
<td>1</td>
<td>THRESHOLD 896-S MS/LA</td>
<td></td>
<td>AL</td>
</tr>
</tbody>
</table>

### HW SET: 725

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Item Description</th>
<th>Model/Code</th>
<th>Brand</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>HINGE 3CB1 4.5 X 4.5</td>
<td>652</td>
<td>IVE</td>
</tr>
<tr>
<td>1</td>
<td>PUSH PLATE 8200 6&quot; X 16&quot;</td>
<td>630</td>
<td>IVE</td>
</tr>
<tr>
<td>1</td>
<td>PULL PLATE 8303-0 4&quot; X 16&quot;</td>
<td>630</td>
<td>IVE</td>
</tr>
<tr>
<td>1</td>
<td>SURFACE CLOSER 4041</td>
<td>689</td>
<td>LCN</td>
</tr>
<tr>
<td>1</td>
<td>KICK PLATE 8400 10&quot; X 2&quot; LDW</td>
<td>630</td>
<td>IVE</td>
</tr>
<tr>
<td>1</td>
<td>FLOOR STOP FS438</td>
<td>626</td>
<td>IVE</td>
</tr>
<tr>
<td>1</td>
<td>SET SEALS 134NA</td>
<td></td>
<td>AL</td>
</tr>
<tr>
<td>1</td>
<td>DOOR BOTTOM 220SA</td>
<td></td>
<td>AL</td>
</tr>
<tr>
<td>1</td>
<td>THRESHOLD 896-S MS/LA</td>
<td></td>
<td>AL</td>
</tr>
</tbody>
</table>
## DOOR HARDWARE

**HW SET: 730**

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Quantity</th>
<th>Part Number</th>
<th>Manufacturer</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 EA</td>
<td>HINGE 3CB1 4.5 X 4.5</td>
<td></td>
<td>652 IVE</td>
<td></td>
</tr>
<tr>
<td>1 EA</td>
<td>CLASSROOM LOCK ND94HD RHO</td>
<td></td>
<td>626 SCH</td>
<td></td>
</tr>
<tr>
<td>1 EA</td>
<td>SFIC PERMANENT CORE 80-037 (PERMANENT CORE)</td>
<td></td>
<td>626 SCH</td>
<td></td>
</tr>
<tr>
<td>1 EA</td>
<td>OVERHEAD HOLDER 900F</td>
<td></td>
<td>630 GLY</td>
<td></td>
</tr>
<tr>
<td>3 EA</td>
<td>SILENCER SR64</td>
<td></td>
<td>GRY IVE</td>
<td></td>
</tr>
</tbody>
</table>

**HW SET: 735**

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Quantity</th>
<th>Part Number</th>
<th>Manufacturer</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 EA</td>
<td>HINGE 3CB1 4.5 X 4.5</td>
<td></td>
<td>652 IVE</td>
<td></td>
</tr>
<tr>
<td>2 EA</td>
<td>MANUAL FLUSH BOLT FB458</td>
<td></td>
<td>626 IVE</td>
<td></td>
</tr>
<tr>
<td>1 EA</td>
<td>DUST PROOF STRIKE DP1 (SET IN EPOXY)</td>
<td></td>
<td>626 IVE</td>
<td></td>
</tr>
<tr>
<td>1 EA</td>
<td>STOREROOM LOCK ND96HD RHO</td>
<td></td>
<td>626 SCH</td>
<td></td>
</tr>
<tr>
<td>1 EA</td>
<td>SFIC PERMANENT CORE 80-037 (PERMANENT CORE)</td>
<td></td>
<td>626 SCH</td>
<td></td>
</tr>
<tr>
<td>1 EA</td>
<td>ASTRAGAL 148NA</td>
<td></td>
<td>AL NGP</td>
<td></td>
</tr>
<tr>
<td>1 EA</td>
<td>SURFACE CLOSER 4041 H</td>
<td></td>
<td>689 LCN</td>
<td></td>
</tr>
<tr>
<td>2 EA</td>
<td>WALL STOP WS406CCV</td>
<td></td>
<td>630 IVE</td>
<td></td>
</tr>
<tr>
<td>2 EA</td>
<td>SILENCER SR64</td>
<td></td>
<td>GRY IVE</td>
<td></td>
</tr>
</tbody>
</table>

**HW SET: 800**

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Quantity</th>
<th>Part Number</th>
<th>Manufacturer</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 EA</td>
<td>HINGE 3CB1HW 4.5 X 4.5</td>
<td></td>
<td>652 IVE</td>
<td></td>
</tr>
<tr>
<td>1 EA</td>
<td>PUSH PLATE 8200 6&quot; X 16&quot;</td>
<td></td>
<td>630 IVE</td>
<td></td>
</tr>
<tr>
<td>1 EA</td>
<td>PULL PLATE 8303-0 4&quot; X 16&quot;</td>
<td></td>
<td>630 IVE</td>
<td></td>
</tr>
<tr>
<td>1 EA</td>
<td>SURFACE CLOSER 4041</td>
<td></td>
<td>689 LCN</td>
<td></td>
</tr>
<tr>
<td>1 EA</td>
<td>KICK PLATE 8400 10&quot; X 2&quot; LDW</td>
<td></td>
<td>630 IVE</td>
<td></td>
</tr>
<tr>
<td>1 EA</td>
<td>WALL STOP WS406CCV</td>
<td></td>
<td>630 IVE</td>
<td></td>
</tr>
<tr>
<td>3 EA</td>
<td>SILENCER SR64</td>
<td></td>
<td>GRY IVE</td>
<td></td>
</tr>
</tbody>
</table>

**HW SET: 810**

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Quantity</th>
<th>Part Number</th>
<th>Manufacturer</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 EA</td>
<td>HINGE 3CB1 4.5 X 4.5</td>
<td></td>
<td>652 IVE</td>
<td></td>
</tr>
<tr>
<td>1 EA</td>
<td>PASSAGE SET ND10S RHO</td>
<td></td>
<td>626 SCH</td>
<td></td>
</tr>
<tr>
<td>1 EA</td>
<td>KICK PLATE 8400 10&quot; X 2&quot; LDW</td>
<td></td>
<td>630 IVE</td>
<td></td>
</tr>
<tr>
<td>1 EA</td>
<td>WALL STOP WS406CCV</td>
<td></td>
<td>630 IVE</td>
<td></td>
</tr>
<tr>
<td>3 EA</td>
<td>SILENCER SR64</td>
<td></td>
<td>GRY IVE</td>
<td></td>
</tr>
</tbody>
</table>
## DOOR HARDWARE

<table>
<thead>
<tr>
<th>HW SET: 815</th>
</tr>
</thead>
<tbody>
<tr>
<td>EACH TO HAVE:</td>
</tr>
<tr>
<td>3 EA HINGE 3CB1 4.5 X 4.5 652 IVE</td>
</tr>
<tr>
<td>1 EA PRIVACY SET ND40S RHO 626 SCH</td>
</tr>
<tr>
<td>1 EA SURFACE CLOSER 4041 689 LCN</td>
</tr>
<tr>
<td>1 EA KICK PLATE 8400 10&quot; X 2&quot; LDW 630 IVE</td>
</tr>
<tr>
<td>1 EA WALL STOP WS406CCV 630 IVE</td>
</tr>
<tr>
<td>1 SET SEALS 2525B BRN NGP</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>HW SET: 900</th>
</tr>
</thead>
<tbody>
<tr>
<td>EACH TO HAVE:</td>
</tr>
<tr>
<td>12 EA SFIC PADLOCK KS43D1300 (SFIC-NON-KEYED) 606 SCH</td>
</tr>
<tr>
<td>1 EA KNOX BOX R3200 KEYED TO FIRE DEPT KEY SYSTEM BLK KNO</td>
</tr>
<tr>
<td>1 EA RECESSED MOUNT KIT RMK (RECESSED MOUNTING KIT) KNO</td>
</tr>
<tr>
<td>1 EA KEY CABINET 1205-AA 450 CAP. GRY LUN</td>
</tr>
<tr>
<td>1 EA ND SERVICE KIT 40-097 SCE</td>
</tr>
<tr>
<td>1 SET ACCESS/SECURITY CBORD ACCESS/SECURITY SYSTEMS DLR EQUIPMENT</td>
</tr>
<tr>
<td>1 EA SITEMASTER SITEMASTER 200 (DOWNLOADABLE VERSION) SCE</td>
</tr>
</tbody>
</table>

END OF SECTION
SECTION 08 80 00
GLAZING

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:
   1. Windows.
   2. Doors.
   4. Storefront framing.
   5. Interior borrowed lites.

B. Related Sections:
   1. Division 06 Section “Interior Architectural Woodwork” for sliding glass door hardware. Glass for sliding glass doors to be provided under this section.
   2. Division 08 Section “Fire Rated Glass and Framing” for fire-rated glass associated with the full glass enclosure.
   3. Division 08 Section “All Glass Entrances” for glass doors.
   4. Division 08 Section “Mirrors”.

1.02 DEFINITIONS

A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.

B. Glass Thickness: Indicated by thickness designations in millimeters according to ASTM C 1036.

C. Interspace: Space between lites of an insulating-glass unit.

1.03 PERFORMANCE REQUIREMENTS

A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

B. Delegated Design: Design glass, including comprehensive engineering analysis according to ICC’s 2006 International Building Code by a qualified professional engineer, using the following design criteria:
   1. Design Wind Pressures: Determine design wind pressures applicable to Project according to ASCE/SEI 7, based on heights above grade indicated on Drawings.
      a. Wind Design Data: As indicated on Drawings.
2. Vertical Glazing: For glass surfaces sloped 15 degrees or less from vertical, design glass to resist design wind pressure based on glass type factors for short-duration load.

3. Maximum Lateral Deflection: For glass supported on all four edges, limit center-of-glass deflection at design wind pressure to not more than 1/50 times the short-side length or 1 inch, whichever is less.

4. Differential Shading: Design glass to resist thermal stresses induced by differential shading within individual glass lites.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

1.04 PRECONSTRUCTION TESTING

A. Preconstruction Adhesion and Compatibility Testing: Test each glazing material type, tape sealant, gasket, glazing accessory, and glass-framing member for adhesion to and compatibility with elastomeric glazing sealants.

1. Testing will not be required if data are submitted based on previous testing of current sealant products and glazing materials matching those submitted.

2. Use ASTM C 1087 to determine whether priming and other specific joint-preparation techniques are required to obtain rapid, optimum adhesion of glazing sealants to glass, tape sealants, gaskets, and glazing channel substrates.

3. Test no fewer than eight samples of each type of material, including joint substrates, shims, sealant backings, secondary seals, and miscellaneous materials.

4. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.

5. For materials failing tests, submit sealant manufacturer's written instructions for corrective measures including the use of specially formulated primers.

1.05 SUBMITTALS

A. Product Data: For each glass product and glazing material indicated.

B. LEED Submittals:

1. Product Data for Credit EQ 4.1: For glazing sealants used inside of the weatherproofing system, including printed statement of VOC content.

C. Glass Samples: For each type of glass product other than clear monolithic vision glass; 12 inches square.

D. Glazing Accessory Samples: For sealants, in 12-inch lengths. Install sealant Samples between two strips of material representative in color of the adjoining framing system.

E. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

F. Delegated-Design Submittal: For glass indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
G. Qualification Data: For installers.

H. Product Certificates: For glass and glazing products, from manufacturer.

I. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for insulating glass.
   1. For glazing sealants, provide test reports based on testing current sealant formulations within previous 36-month period.

J. Preconstruction adhesion and compatibility test report.

K. Warranties: Sample of special warranties.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications for Insulating-Glass Units with Sputter-Coated, Low-E Coatings: A qualified insulating-glass manufacturer who is approved by coated-glass manufacturer.

B. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.

C. Glass Testing Agency Qualifications: A qualified independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.

D. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.

E. Source Limitations for Glass: Obtain tinted float glass, laminated glass, and insulating glass from single source from single manufacturer for each glass type.

F. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.

G. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.

H. Safety Glazing Labeling: Where safety glazing labeling is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
I. Fire-Protection-Rated Glazing Labeling: Permanently mark fire-protection-rated glazing with certification label of a testing agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, test standard, whether glazing is for use in fire doors or other openings, whether or not glazing passes hose-stream test, whether or not glazing has a temperature rise rating of 450 deg F, and the fire-resistance rating in minutes.

J. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.

K. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
1. Install glazing in mockups specified in Division 08 Section "Aluminum-Framed Entrances and Storefronts" and "Glazed Aluminum Curtain Walls" to match glazing systems required for Project, including glazing methods.
2. Following review and approval by Architect, approved mockups may become part of the completed Work.

L. Preinstallation Conference: Conduct conference at Project site.
1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
2. Review temporary protection requirements for glazing during and after installation.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

B. Comply with insulating-glass manufacturer's written recommendations for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

1.08 PROJECT CONDITIONS

A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.
1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or below 40 deg F.

1.09 WARRANTY

A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer's standard form in which coated-glass manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.
1. Warranty Period: 10 years from date of Substantial Completion.
B. Manufacturer's Special Warranty on Laminated Glass: Manufacturer's standard form in which laminated-glass manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.
   1. Warranty Period: 10 years from date of Substantial Completion.

C. Manufacturer's Special Warranty on Insulating Glass: Manufacturer's standard form in which insulating-glass manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.
   1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 GLASS PRODUCTS, GENERAL

A. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass lites in thicknesses as needed to comply with requirements indicated.
   1. Minimum Glass Thickness for Exterior Lites: Not less than 6.0 mm.
   2. Thickness of Tinted Glass: Provide same thickness for each tint color indicated throughout Project.

B. Strength: Where float glass is indicated, provide annealed float glass, Kind HS heat-treated float glass, or Kind FT heat-treated float glass. Where heat-strengthened glass is indicated, provide Kind HS heat-treated float glass or Kind FT heat-treated float glass. Where fully tempered glass is indicated, provide Kind FT heat-treated float glass.

C. Windborne-Debris-Impact Resistance: Provide exterior glazing that passes basic-protection testing requirements in ASTM E 1996 for Wind Zone 2 when tested according to ASTM E 1886. Test specimens shall be no smaller in width and length than glazing indicated for use on the Project and shall be installed in same manner as glazing indicated for use on the Project.
   1. Large-Missile Test: For glazing located within 30 feet of grade.
   2. Small-Missile Test: For glazing located more than 30 feet above grade.
   3. Large-Missile Test: For all glazing, regardless of height above grade.

D. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:
   1. For monolithic-glass lites, properties are based on units with lites 6.0 mm thick.
   2. For laminated-glass lites, properties are based on products of construction indicated.
   3. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
4. **U-Factors:** Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F.

5. **Solar Heat-Gain Coefficient and Visible Transmittance:** Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.

6. **Visible Reflectance:** Center-of-glazing values, according to NFRC 300.

### 2.02 GLASS PRODUCTS

**A.** Float Glass: ASTM C 1036, Type I, Quality-Q3, Class I (clear) unless otherwise indicated.

**B.** Heat-Treated Float Glass: ASTM C 1048; Type I; Quality-Q3; Class I (clear) unless otherwise indicated; of kind and condition indicated.

1. **Fabrication Process:** By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.
2. **For uncoated glass,** comply with requirements for Condition A.
3. **For coated vision glass,** comply with requirements for Condition C (other coated glass).

**C.** Silicone-Coated Spandrel Glass: ASTM C 1048, Condition C, Type I, Quality-Q3, and complying with other requirements specified.

1. **Products:** Subject to compliance with requirements, provide the following:
   a. Spandrel Glass as manufactured by Viracon.
2. **Glass:** Clear float.
3. **Silicone Coating Color:** As selected by Architect from manufacturer's full range.

### 2.03 LAMINATED GLASS

**A.** Manufacturers: Subject to compliance with requirements, provide products by one of the following:


**B.** Laminated Glass: ASTM C 1172, and complying with testing requirements in 16 CFR 1201 for Category II materials, and with other requirements specified. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.

1. **Construction:** Laminate glass with polyvinyl butyral interlayer or cast-in-place and cured-transparent-resin interlayer to comply with interlayer manufacturer's written recommendations.
2. **Interlayer Thickness:** Provide thickness not less than that indicated and as needed to comply with requirements.
3. **Interlayer Color:** Clear unless otherwise indicated.

**C.** Glass: Comply with applicable requirements in "Glass Products" Article as indicated by designations in "Laminated-Glass Types" Article.
2.04 COLOR LAMINATED GLASS


B. All glass quality to comply with detailed drawings for purpose of fabrication.

C. All glass quality to comply with ASTM C 1172 safety standards for laminated glass, produced with a formulated inter layer and substrate designed to laminate under heat and pressure between two pieces of clear glass.

2.05 INSULATING GLASS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

B. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190, and complying with other requirements specified.
   1. Sealing System: Dual seal, with manufacturer's standard primary and secondary.
   2. Spacer: Manufacturer's standard spacer material and construction.
   3. Desiccant: Molecular sieve or silica gel, or blend of both.

C. Glass: Comply with applicable requirements in "Glass Products" Article as indicated by designations in "Insulating-Glass Types" Article.

2.06 FIRE-PROTECTION-RATED GLAZING

A. Fire-Protection-Rated Glazing, General: Listed and labeled by a testing agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 252 for door assemblies and NFPA 257 for window assemblies.

B. Fire-Protection-Rated Tempered Glass: 5mm- thick, fire-protection-rated tempered glass, complying with testing requirements in 16 CFR 1201 for Category II materials.
   1. Products: Subject to compliance with requirements, provide products as manufactured by Safti First: www.safti.com:
      1) 20-45 minutes: “SuperLite C and C/P”.
      2) 20-180 minutes: “SuperLite C/S and C/SP”.

   2. Other approved manufacturers:
2.07 GLAZING GASKETS

A. Dense Compression Gaskets: Molded or extruded gaskets of profile and hardness required to maintain watertight seal, made from one of the following:
   1. Neoprene complying with ASTM C 864.
   2. EPDM complying with ASTM C 864.
   4. Thermoplastic polyolefin rubber complying with ASTM C 1115.

B. Soft Compression Gaskets: Extruded or molded, closed-cell, integral-skinned EPDM, silicone, or thermoplastic polyolefin rubber gaskets complying with ASTM C 509, Type II, black; of profile and hardness required to maintain watertight seal.
   1. Application: Use where soft compression gaskets will be compressed by inserting dense compression gaskets on opposite side of glazing or pressure applied by means of pressure-glazing stops on opposite side of glazing.

C. Lock-Strip Gaskets: Neoprene extrusions in size and shape indicated, fabricated into frames with molded corner units and zipper lock-strips, complying with ASTM C 542, black.

2.08 GLAZING SEALANTS

A. General:
   1. Compatibility: Provide glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
   2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
   3. VOC Content: For sealants used inside of the weatherproofing system, not more than 250 g/L when calculated according to 40 CFR 59, Subpart D.
   4. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.

B. Glazing Sealants: Provide glazing sealants as recommended by glass manufacturer for glass type and application indicated.
   1. Products: Subject to compliance with requirements, provide glazing sealants as manufactured by or products by one of the following:

C. Glazing Sealants for Fire-Rated Glazing Products: Products that are approved by testing agencies that listed and labeled fire-resistant glazing products with which they are used for applications and fire-protection ratings indicated.

2.09 GLAZING TAPES

A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; non-staining and non-migrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C 1281 and AAMA 800 for products indicated below:
   1. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
   2. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:
   1. AAMA 810.1, Type 1, for glazing applications in which tape acts as the primary sealant.
   2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.10 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

D. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

G. Perimeter Insulation for Fire-Resistive Glazing: Product that is approved by testing agency that listed and labeled fire-resistant glazing product with which it is used for application and fire-protection rating indicated.

H. Aluminum Gazing Channel: Extruded Aluminum, size as indicated on drawings; Class 1 clear anodized finish.
2.11 FABRICATION OF GLAZING UNITS

A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.

C. Grind smooth and polish exposed glass edges and corners.

2.12 MONOLITHIC-GLASS TYPES

A. Glass Type G8: Clear float glass.
   1. Thickness: 6-mm.

B. Glass Type G9: Clear float glass, fully tempered.
   1. Thickness: 6-mm.
   2. Provide safety glazing labeling.

C. Glass Type G10: Etched and Sealed (Frosted Glass), fully tempered.
   1. Basis of Design Product: As specified above for clear float glass, with an etched and sealed surface by Skyline Design: www.skylinedesign.com, or approved equal by Walker Glass: www.walker-glass.com. Include complete etching of panels where a white translucent appearance is required for all the glass. Provide etched surface on only part of the glass where specifically indicated. Generate pattern by computer.
   2. 12-mm thick clear, fully tempered (FT) float glass pane laminated to a 6-mm thick clear, fully tempered (FT) pane with etched and sealed (frosted) surface, with 60-mil clear interlayer.

D. Glass Type G11: Back Painted Glass:
   1. Prime glass of color and type indicated, which has factory applied manufacturer’s standard opacifier of the following material applied to second surface of lites, with resulting product complying with Specification No. 89-1-6 in GANA Tempering Division’s “Engineering Standards Manual”.
   2. 6-mm thick, clear, fully-tempered spandrel glass pane with opaque coating on surface closest to wall, colors as indicated on Drawings.

2.13 INSULATING-GLASS TYPES

A. Glass Type G-1: Low-e-coated, Tinted Insulating Glass:
   1. Outdoor Lite: 6-mm heat-strengthened clear tinted float glass. Low-e coating on #2 surface.
   2. Airspace: 13.2-mm, mill finish.
   3. Indoor Lite: 6-mm heat-strengthened float glass, clear.
   4. Total Unit Thickness: 25.2-mm (1-inch).
5.  Product: “VE1-42 HS/HS Insulating Glass” as manufactured by Viracon, with the following properties:
   a.  Visible Light Transmittance: 37%
   b.  Winter U-Value: 0.31
   c.  Summer U-Value: 0.29
   d.  Shading Coefficient: 0.36
   e.  Solar Heat Gain Coefficient: 0.31

B.  Glass Type G-2: Low-e-coated, Tinted Insulating Glass:
1.  Outdoor Lite: 6-mm heat-strengthened gray tinted float glass. Low-e coating on #2 surface.
2.  Airspace: 13.2-mm, mill finish.
3.  Indoor Lite: 6-mm heat-strengthened float glass, clear.
4.  Total Unit Thickness: 25.2-mm (1-inch).
5.  Product: “VE3-42 HS/HS Insulating Glass” as manufactured by Viracon with the following properties:
   a.  Visible Light Transmittance: 19%
   b.  Winter U-Value: 0.31
   c.  Summer U-Value: 0.29
   d.  Shading Coefficient: 0.25
   e.  Solar Heat Gain Coefficient: 0.21

C.  Glass Type G-4: Low-e-coated, Tinted Insulating Glass:
2.  Airspace: 13.2-mm, mill finish.
3.  Indoor Lite: 6-mm heat-strengthened float glass, clear.
4.  Total Unit Thickness: 25.2-mm (1-inch).

E.  Glass Type S-1: Insulating Spandrel Glass:
1.  Outdoor Lite: 6-mm heat-strengthened float glass. V-52 coating on #2 surface.
2.  Airspace: 13.2-mm, mill finish.
3.  Indoor Lite: 6-mm heat-strengthened float glass, clear with VS48 medium gray Viraspan coating on #4 surface.
4.  Total Unit Thickness: 25.2-mm (1-inch).

F.  Glass Type S-2: Insulating Spandrel Glass:
1.  Outdoor Lite: 6 mm clear heat-strengthened float glass. VE-42 coating on #2 surface.
2.  Airspace: 13.2 mm, mill finish.
3.  Indoor Lite: 6 mm heat-strengthened float glass, clear with subdued gray Viraspan coating on #4 surface.
4.  Total Unit Thickness: 25.2-mm (1-inch).
5.  Product: “VE1-42 Insulating HS/HS Spandrel Glass” as manufactured by Viracon.
G. Glass Type S-3: Laminated, Insulating Tinted Spandrel Glass:
   1. Outdoor Lite:
      a. 3-mm clear heat-strengthened glass.
      b. 0.32 mm Pure White polyvinylbutyral interlayer, tinted, 0.030 Clear PVB.
      c. 3-mm clear heat-strengthened glass.
   2. Airspace: 13.2 mm, mill finish.
   3. Indoor Lite: Clear heat-strengthened float glass.
   4. Total Unit Thickness: 1-1/16-inches.
   5. Product: “Clear Laminated Insulating VE-1–85 #5 HS / HS / HS Glass” as manufactured by Viracon with the following properties:
      a. Winter U-Value: 0.32
      b. Summer U-Value: 0.29

2.14 INSULATING-LAMINATED-GLASS TYPES


B. Glass Type G-3: Laminated, Insulating Glass with Tinted Interlayer. See Drawing 1/A8.8 for layout of laminations.
   1. Outdoor Lite:
      a. 3-mm clear heat-strengthened glass.
      b. 0.60 mm polyvinylbutyral interlayer, tinted. Color 0009 “Arctic Snow,” as manufactured by Vanceva, or comparable product “No. 6693” as manufactured by Pulp Studio.
      c. 3-mm clear heat-strengthened glass.
   2. Airspace: 13.2 mm, mill finish.
   3. Indoor Lite: 6-mm clear heat-strengthened float glass.
   4. Total Unit Thickness: 25.8-mm (1-1/16-inches)

C. Glass Type G-5: Laminated, Insulating Glass with Tinted Interlayer:
   1. Outdoor Lite:
      a. 3-mm clear heat-strengthened glass.
      b. 0.60 mm polyvinylbutyral interlayer, tinted. Color “True Blue”, No. 000D as manufactured by Vanceva, or as selected by Architect.
      c. 3-mm clear heat-strengthened glass.
   2. Airspace: 13.2 mm, mill finish.
   3. Indoor Lite: 6-mm clear heat-strengthened float glass.
   4. Total Unit Thickness: 25.8-mm (1-1/16-inches).

D. Glass Type G-6: Same as Glass Type G-5 with two layers of blue interlayer.
E. Glass Type G-7: Laminated, Insulating Glass with Colored Interlayer:
   1. Outdoor Lite:
      a. 3-mm clear heat-strengthened glass.
      b. Interlayer of colored films in 3 colors selected by Architect. See Drawing 1/A8.8 for layout of laminations:
         c. 3-mm clear heat-strengthened glass.
   2. Airspace: 13.2 mm, mill finish.
   3. Indoor Lite: Clear heat-strengthened float glass.
   4. Total Unit Thickness: 25.8-mm (1-1/16-inches).

2.15 FIRE-PROTECTION-RATED GLAZING TYPES (Glass Type G12)

A. Tempered Fire Rated Glazing Material:
   1. Thickness: 5 mm.
   2. Weight: 2.4 lbs./sq.ft.
   3. Fire Rating:
   4. Impact Safety Resistance: CPSC 16 CFR 1201 Cat. I & II:
      a. “SuperLite C/S and C/SP”.
   5. Appearance: Slight amber with some surface irregularity.
   6. Provide safety glazing labeling.
PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:
   1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
   2. Presence and functioning of weep systems.
   3. Minimum required face and edge clearances.
   4. Effective sealing between joints of glass-framing members.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that will leave visible marks in the completed work.

3.03 GLAZING, GENERAL

A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

B. Adjust glazing channel dimensions as required by Project conditions during installation to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.

D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.

E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
G. Provide spacers for glass lites where length plus width is larger than 50 inches.
   1. Locate spacers directly opposite each other on both inside and outside faces of glass.
      Install correct size and spacing to preserve required face clearances, unless gaskets and
      glazing tapes are used that have demonstrated ability to maintain required face
      clearances and to comply with system performance requirements.
   2. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant
      width. With glazing tape, use thickness slightly less than final compressed thickness of
      tape.

H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways
   in glazing channel, as recommended in writing by glass manufacturer and according to
   requirements in referenced glazing publications.

I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

J. Set glass lites with proper orientation so that coatings face exterior or interior as specified.

K. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or
   gasket on opposite side, provide adequate anchorage so gasket cannot walk out when
   installation is subjected to movement.

L. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by
   gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints
   with sealant recommended by gasket manufacturer.

3.04 TAPE GLAZING

A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush
   with or protrude slightly above sightline of stops.

B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes
   to make them fit opening.

C. Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover
   horizontal framing joints by applying tapes to jambs and then to heads and sills.

D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped.
   Seal joints in tapes with compatible sealant approved by tape manufacturer.

E. Do not remove release paper from tape until right before each glazing unit is installed.

F. Apply heel bead of elastomeric sealant.

G. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense
   compression gaskets formed and installed to lock in place against faces of removable stops.
   Start gasket applications at corners and work toward centers of openings.

H. Apply cap bead of elastomeric sealant over exposed edge of tape.
3.05 CLEANING AND PROTECTION

A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer.

C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains; remove as recommended in writing by glass manufacturer.

D. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.

E. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY

A. Section includes the following types of silvered flat glass mirrors:
   1. Annealed monolithic glass mirrors.

B. Related Sections:
   1. Division 08 Section "Glazing" for glass with reflective coatings used for vision and
      spandrel lites.
   2. Division 10 Section "Toilet and Bath Accessories" for metal-framed mirrors.

1.02 SUBMITTALS

A. Product Data: For each type of product indicated.
   1. Mirrors. Include description of materials and process used to produce each type of
      silvered flat glass mirror specified that indicates sources of glass, glass coating
      components, edge sealer, and quality-control provisions.

A. Samples: For each type of the following products:
   1. Mirrors: 12 inches square, including edge treatment on two adjoining edges and sand-
      blasted section.

B. LEED Submittals:
   1. Product Data for Credit EQ 4.1: For adhesives, including printed statement of VOC
      content.

C. Qualification Data: For qualified Installer.

D. Product Certificates: For each type of mirror and mirror mastic, from manufacturer.

E. Maintenance Data: For mirrors to include in maintenance manuals.

F. Warranty: Sample of special warranty.

1.03 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs glass installers for this Project who
   are certified under the National Glass Association's Certified Glass Installer Program.

B. Source Limitations for Mirrors: Obtain mirrors from single source from single manufacturer.

C. Source Limitations for Mirror Accessories: Obtain mirror glazing accessories from single
   source.
D. Glazing Publications: Comply with the following published recommendations:
   1. GANA's "Glazing Manual" unless more stringent requirements are indicated. Refer to
      this publication for definitions of glass and glazing terms not otherwise defined in this
      Section or in referenced standards.
   2. GANA Mirror Division's "Mirrors, Handle with Extreme Care: Tips for the Professional on
      the Care and Handling of Mirrors."

1.04 DELIVERY, STORAGE, AND HANDLING

A. Protect mirrors according to mirror manufacturer's written instructions and as needed to
   prevent damage to mirrors from moisture, condensation, temperature changes, direct
   exposure to sun, or other causes.

B. Comply with mirror manufacturer's written instructions for shipping, storing, and handling
   mirrors as needed to prevent deterioration of silvering, damage to edges, and abrasion of glass
   surfaces and applied coatings. Store indoors.

1.05 PROJECT CONDITIONS

A. Environmental Limitations: Do not install mirrors until ambient temperature and humidity
   conditions are maintained at levels indicated for final occupancy.

1.06 WARRANTY

A. Special Warranty: Manufacturer's standard form in which mirror manufacturer agrees to
   replace mirrors that deteriorate within specified warranty period. Deterioration of mirrors is
   defined as defects developed from normal use that are not attributed to mirror breakage or to
   maintaining and cleaning mirrors contrary to manufacturer's written instructions. Defects
   include discoloration, black spots, and clouding of the silver film.
   1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 SILVERED FLAT GLASS MIRRORS

A. Glass Mirrors, General: ASTM C 1503.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of
      the following:
B. Clear Glass: Mirror Select Quality.
   1. Nominal Thickness: 6.0 mm.

2.02 MISCELLANEOUS MATERIALS

A. Setting Blocks: Elastic material with a Shore, Type A durometer hardness of 85, plus or minus 5.

B. Edge Sealer: Coating compatible with glass coating and approved by mirror manufacturer for use in protecting against silver deterioration at mirrored glass edges.

C. Mirror Mastic: An adhesive setting compound, asbestos-free, produced specifically for setting mirrors and certified by both mirror manufacturer and mastic manufacturer as compatible with glass coating and substrates on which mirrors will be installed.

D. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.
   1. Use adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
      a. Mirror Mastic: Not more than 50 g/L.

2.03 FABRICATION

A. Mirror Sizes: To suit Project conditions, cut mirrors to final sizes and shapes.

B. Sandblasting: Sandblast mirrored coating off of glass at locations indicated on Drawings. Mask mirrored surface to prevent damage to areas not to be sandblasted. Match Architect’s sample for degree of finish.

C. Cutouts: Fabricate cutouts for notches and holes in mirrors without marring visible surfaces. Locate and size cutouts so they fit closely around penetrations in mirrors.

D. Mirror Edge Treatment: Rounded polished.
   1. Seal edges of mirrors with edge sealer after edge treatment to prevent chemical or atmospheric penetration of glass coating.
   2. Require mirror manufacturer to perform edge treatment and sealing in factory immediately after cutting to final sizes.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, over which mirrors are to be mounted, with Installer present, for compliance with installation tolerances, substrate preparation, and other conditions affecting performance of the Work.

B. Verify compatibility with and suitability of substrates, including compatibility of mirror mastic with existing finishes or primers.
C. Proceed with installation only after unsatisfactory conditions have been corrected and surfaces are dry.

3.02 PREPARATION

A. Comply with mastic manufacturer's written installation instructions for preparation of substrates, including coating substrates with mastic manufacturer's special bond coating where applicable.

3.03 INSTALLATION

A. General: Install mirrors to comply with mirror manufacturer's written instructions and with referenced GANA publications. Mount mirrors accurately in place in a manner that avoids distorting reflected images.

B. Provide a minimum air space of 1/8 inch between back of mirrors and mounting surface for air circulation between back of mirrors and face of mounting surface.

C. Wall-Mounted Mirrors: Install mirrors with mastic.
   1. Install mastic as follows:
      a. Apply barrier coat to mirror backing where approved in writing by manufacturers of mirrors and backing material.
      b. Apply mastic to comply with mastic manufacturer's written instructions for coverage and to allow air circulation between back of mirrors and face of mounting surface.
      c. After mastic is applied, align mirrors and press into place while maintaining a minimum air space of 1/8 inch between back of mirrors and mounting surface.
      d. Support unframed mirrors until adhesive has cured.

3.04 CLEANING AND PROTECTION

A. Protect mirrors from breakage and contaminating substances resulting from construction operations.

B. Do not permit edges of mirrors to be exposed to standing water.

C. Maintain environmental conditions that will prevent mirrors from being exposed to moisture from condensation or other sources for continuous periods of time.

D. Wash exposed surface of mirrors not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash mirrors as recommended in writing by mirror manufacturer.

END OF SECTION
SECTION 08 88 10

FIRE RATED GLASS AND FRAMING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Fire rated glazing.
   2. Fire rated glass framing.
   3. Applications of fire rated glazing include:
      a. Fire rated glazing as sidelites, borrowed lites, transoms and transparent wall
         applications in fire rated frames.

B. Related Sections:
   1. Division 01 Section “Submittal Procedures”.
   2. Division 08 Section “Hollow Metal Doors and Frames.”
   3. Division 08 Section “Flush Wood Doors.”
   4. Division 08 Section “Door Hardware.”

C. References:
      d. ASTM E2074: Standard Test Method for Fire Tests of Door Assemblies, including
         Positive Pressure Testing of Side-hinged and Pivoted Swinging Door Assemblies.
      e. ASTM E2110-1: Standard Test for Positive Pressure of Fire Tests of Window
         Assemblies.

   f.

   2. National fire Protection Association (NFPA):
      e.

   3. Underwrites Laboratories, Inc. (UL):
      c. UL 10 C: Standard for Safety of Positive Pressure Tests of Door Assemblies.
      e.

   4. Glass Association of North America (GANA)
      c.

1.02 SYSTEM DESCRIPTION

A. Performance Requirements: Provide a fire rated glazing system manufactured, fabricated and installed to maintain performance criteria stated by manufacturer without defects, damage, or failure.
   1. Fire Rating: 60 minutes.
   2. Fire resistive, safety rated glazing tested in accordance with ASTM E119, NFPA 80, NFPA 251, NFPA 252, NFPA 257, UL 9, UL 10B, UL 10C, and UL 263.
   3. Testing Laboratory: Fire test shall be conducted by a nationally recognized independent testing laboratory.

B. Listings and Labels:
   1. Fire rated glazing shall be under current follow-up services by a nationally recognized independent testing laboratory and maintain a current listing or certification. Assemblies shall be labeled in accordance with limits of listings.

C. Appearance:
   1. Fire resistance rated wall assembly shall have a neat finished appearance with minimum joints at decorative corner intersections.

1.03 SUBMITTALS

A. Submit listed submittals in accordance with Division 01 Section “Submittal Procedures”.

B. Shop Drawings: Submit shop drawings showing layouts, profiles and product components.

C. Samples for Initial Selection: For units with factory-applied color finishes.

D. Framing Samples for Verification: Submit (2) 12-inch long samples illustrating finish, color, and texture selected.

E. Glass Samples: Submit (2) 12- by 12-inch glass samples.

F. Technical Information: Submit latest edition of manufacturer’s product data.

G. LEED Submittal:
   1. Product Data for Credit EQ 4.1: For adhesives and sealants used as a part of the system, including printed statement of VOC content.

1.04 SOURCE QUALITY

A. Obtain fire rated glazing products from a single manufacturer.

B. Fabrication Dimensions: Fabricate to approved dimensions. The general contractor shall guarantee dimensions where practicable within required tolerances.
1.05 DELIVERY, STORAGE AND HANDLING

A. General: Comply with Division 01 Section “Product Requirements”.

B. Ordering: Comply with manufacturer’s ordering instructions and lead-time requirements to avoid construction delays.

C. Delivery: Deliver materials to specified destinations in manufacturer or distributor’s packaging.

D. Storage and Protection: Store off ground, under cover, protected from weather and construction activities and at temperature conditions recommended by manufacturer.

1.06 PROJECT CONDITIONS

A. Field Measurements: Verify actual measurements for openings by field measurements before fabrication. Show recorded measurements on shop drawings. Coordinate field measurements and fabrication schedule with construction progress to avoid construction delays.

1.07 WARRANTY

A. Project Warranty: Refer to Conditions of the Contract for project warranty provisions.

B. Manufacturer’s Warranty: Submit, for Owner’s acceptance, manufacturer’s standard warranty document. Manufacturer’s warranty is not intended to limit other rights that the Owner may have under the Contract Documents.
   1. Warranty Period: 5 years from date of shipping.

PART 2 - PRODUCTS

2.01 FIRE RATED GLAZING

A. Basis of Design Manufacturer: “SuperLiteTM II-XL 60” as manufactured and distributed by SAFTI FIRSTTM Fire Rated Glazing Solutions, a division of O’Keeffe’s Inc. www.safti.com.

B. Proprietary Products System: Fire rated glass comprised of two tempered lites with the cavity filled with proprietary fire resistive gel material.
   2. Weight: 9-lbs/sq. foot.
   3. Sound Transmission Rating: 42 STC
   4. Glazing materials shall be optically clear, colorless and free from usual distortion.
   5. Fire Rating: 60 minutes

C. Fire Rated Glazing Material:
   1. Each piece of fire-rated glazing material shall be labeled with a permanent logo including name of product, manufacturer, testing laboratory, fire rating period and safety glazing standards.
2. Glazing materials installed in Hazardous Locations, subject to human impact, shall be certified and permanently labeled as meeting applicable requirements reference in NFPA 80:
   a. CPSC 16 CFR 1201 Cat. I & II

D. Accessories:
   1. Glazing Accessories: Manufacturer recommended fire rated glazing accessory as follows:
   2. Glazing with EPDM tape or other listed flame resistant gasket material and calcium silicate setting blocks.

2.02 FIRE RATED, TEMPERATURE RISE FRAMING SYSTEM


B. Materials:
   1. Steel: Internal tube steel framing shall conform to ASTM A501. Formed steel retainers shall be galvanized conforming to ASTM A527.
   2. Insulation: The framing system shall insulate against effects of fire, smoke and heat transfer from either side. The perimeter of the framing system to the rough opening shall be firmly packed with mineral wool fire stop insulation.
   3. Fasteners: All fasteners shall be zinc-plated steel.
   4. Glazing Accessories: The glazing material perimeter shall be separated for the perimeter framing system with approved flame retardant glazing tape. The SuperLite II panel shall be caulked continuously around the edge to the tube steel frame utilizing neutral cure silicone.

2.03 FABRICATION

A. Window/wall assemblies shall be furnished knocked down for field assembly. Window/wall assemblies shall be field glazed.

B. Door assemblies shall be factory prepared for field mounting of hardware.

2.04 FINISHES

A. Covers shall be chemically cleaned and pretreated: then, finished with Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

PART 3 - EXECUTION

3.01 MANUFACTURER’S INSTRUCTIONS

A. Compliance: Comply with manufacturer’s product data including product technical bulletins and installation instructions.
3.02 EXAMINATION

A. Site Verification of Conditions: Verify substrate conditions, have been previously installed under other sections, and are acceptable for product installation in accordance with manufacturer’s instructions.

3.03 INSTALLATION

A. Fire wall installation shall be a specialty contractor with appropriate experience qualifications; and in strict accordance with the approved shop drawings. Only experienced mechanics familiar with this type of specialized work shall be employed.

B. Installation shall be in strict accordance with the fire glazing material manufacturer’s specifications. Field cutting or tampering is strictly prohibited.

3.04 CLEANING AND PROTECTION

A. Cleaning: Remove temporary coverings and protection of adjacent work areas. Clean installed products in accordance with manufacturer’s instructions prior to owner’s acceptance. Remove construction debris from project site and legally dispose of debris.

B. Protect glass from contact with contaminating substances resulting from construction operations. Remove such substances by method approved by manufacturer.

C. Wash glass on both faces not more than four days prior to date schedule for inspections intended to establish date of Substantial Completion. Wash glass by method recommended by glass manufacturer.

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

E. Remove construction debris from project site and legally dispose of debris.

END OF SECTION
SECTION 08 90 00

LOUVERS AND VENTS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Fixed, extruded-aluminum louvers.

B. Related Sections:
   1. Division 09 Section "Painting" for field painting louvers.
   2. Division 23 Sections for louvers that are a part of mechanical equipment.

1.02 DEFINITIONS

A. Louver Terminology: Definitions of terms for metal louvers contained in AMCA 501 apply to this Section unless otherwise defined in this Section or in referenced standards.

B. Horizontal Louver: Louver with horizontal blades; i.e., the axes of the blades are horizontal.

C. Drainable-Blade Louver: Louver with blades having gutters that collect water and drain it to channels in jambs and mullions, which carry it to bottom of unit and away from opening.

D. Storm-Resistant Louver: Louver that provides specified wind-driven rain performance, as determined by testing according to AMCA 500-L.

1.03 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design louvers, including comprehensive engineering analysis by a qualified professional engineer, using structural performance requirements and design criteria indicated.

B. Structural Performance: Louvers shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated without permanent deformation of louver components, noise or metal fatigue caused by louver blade rattle or flutter, or permanent damage to fasteners and anchors. Wind pressures shall be considered to act normal to the face of the building.
   1. Wind Loads: Determine loads based on pressures as indicated on Drawings.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes, without buckling, opening of joints, overstressing of components, failure of connections, or other detrimental effects.
   1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

D. Louver Performance Ratings: Provide louvers complying with requirements specified, as demonstrated by testing manufacturer's stock units identical to those provided, except for length and width according to AMCA 500-L.
1.04 SUBMITTALS

A. Product Data: For each type of product indicated.
   1. For louvers specified to bear AMCA seal, include printed catalog pages showing specified models with appropriate AMCA Certified Ratings Seals.

B. Shop Drawings: For louvers and accessories. Include plans, elevations, sections, details, and attachments to other work. Show frame profiles and blade profiles, angles, and spacing.
   1. Show weep paths, gaskets, flashing, sealant, and other means of preventing water intrusion.
   2. Show mullion profiles and locations.

C. Samples for Verification: For each type of metal finish required.

D. Delegated-Design Submittal: For louvers indicated to comply with structural 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 according to AMCA 500-L by a qualified testing agency or by manufacturer and witnessed by a qualified testing agency, for each type of louver and showing compliance with performance requirements specified.

1.05 QUALITY ASSURANCE

A. Source Limitations: Obtain louvers and vents from single source from a single manufacturer where indicated to be of same type, design, or factory-applied color finish.

B. Welding: Qualify procedures and personnel according to the following:
   1. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."


D. UL and NEMA Compliance: Provide motors and related components for motor-operated louvers that are listed and labeled by UL and comply with applicable NEMA standards.

1.06 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.
PART 2 - PRODUCTS

2.01 MATERIALS

A. Aluminum Extrusions: ASTM B 221, Alloy 6063-T5, T-52, or T6.

B. Aluminum Sheet: ASTM B 209, Alloy 3003 or 5005 with temper as required for forming, or as otherwise recommended by metal producer for required finish.
   1. Finish: As-Milled, all faces.

C. Fasteners: Use types and sizes to suit unit installation conditions.
   1. For fastening aluminum, use aluminum or 300 series stainless-steel fasteners.

D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.02 FABRICATION, GENERAL

A. Assemble louvers in factory to minimize field splicing and assembly. Disassemble units as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

B. Fabricate frames, including integral sills, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.
   1. Frame Type: Channel or Exterior Flange.

C. Include supports, anchorages, and accessories required for complete assembly.

D. Join frame members to each other and to fixed louver blades with fillet welds, threaded fasteners, or both, as standard with louver manufacturer unless otherwise indicated or size of louver assembly makes bolted connections between frame members necessary.

2.03 FIXED, EXTRUDED-ALUMINUM LOUVERS

A. Horizontal, Drainable-Blade Louver:
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      b. Airolite Company, LLC (The).
      c. American Warming and Ventilating, Inc.; a Mestek company.
      d. Cesco Products; a division of Mestek, Inc.
      e. Construction Specialties, Inc.
      f. Dowco Products Group; Safe-Air of Illinois, Inc.
      g. Greenheck Fan Corporation.
      h. Metal Form Manufacturing Inc.
      i. Nystrom Building Products.
      j. Ruskin Company; Tomkins PLC.
2. Louver Depth: 8-inches.
3. Frame and Blade Nominal Thickness: Not less than 0.060 inch for blades and 0.080 inch for frames.
4. Mullion Type: Exposed.
5. Louver Performance Ratings:
   a. Free Area: Not less than 6.0 sq. ft. for 48-inch- wide by 48-inch- high louver.
   b. Point of Beginning Water Penetration: Not less than 900 fpm.
   c. Air Performance: Not more than 0.15-inch wg static pressure drop at 900-fpm free-area velocity.
6. AMCA Seal: Mark units with AMCA Certified Ratings Seal.

2.04 LOUVER SCREENS

A. General: Provide screen at each exterior louver.
   1. Screen Location for Fixed Louvers: Interior face.
   2. Screening Type: Bird screening except where insect screening is indicated.

B. Secure screen frames to louver frames with machine screws with heads finished to match louver spaced a maximum of 6 inches from each corner and at 12 inches o.c.

C. Louver Screen Frames: Fabricate with mitered corners to louver sizes indicated.
   1. Metal: Same kind and form of metal as indicated for louver to which screens are attached. Reinforce extruded-aluminum screen frames at corners with clips.
   2. Finish: Mill finish unless otherwise indicated.
   3. Type: Non-rewirable, U-shaped frames.

D. Louver Screening for Aluminum Louvers:
   1. Bird Screening: Aluminum, 1/2-inch- square mesh, 0.063-inch wire.

2.05 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

2.06 ALUMINUM FINISHES

A. As-Milled Finish: Mill, for field painting.
   1. Color: “Sierra Tan”
PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates and openings, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Coordinate setting drawings, diagrams, templates, instructions, and directions for installation of anchorages that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.

3.03 INSTALLATION

A. Locate and place louvers and vents level, plumb, and at indicated alignment with adjacent work.

B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.

C. Form closely fitted joints with exposed connections accurately located and secured.

D. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.

E. Repair finishes damaged by cutting, welding, soldering, and grinding. Restore finishes so no evidence remains of corrective work. Return items that cannot be refinished in the field to the factory, make required alterations, and refinish entire unit or provide new units.

F. Protect unpainted galvanized and nonferrous-metal surfaces that will be in contact with concrete, masonry, or dissimilar metals from corrosion and galvanic action by applying a heavy coating of bituminous paint or by separating surfaces with waterproof gaskets or nonmetallic flashing.

G. Install concealed gaskets, flashings, joint fillers, and insulation as louver installation progresses, where weathertight louver joints are required. Comply with Division 07 Section "Joint Sealants" for sealants applied during louver installation.

3.04 ADJUSTING AND CLEANING

A. Test operation of adjustable louvers and adjust as needed to produce fully functioning units that comply with requirements.

B. Clean exposed surfaces of louvers and vents that are not protected by temporary covering, to remove fingerprints and soil during construction period. Do not let soil accumulate during construction period.
C. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Thoroughly rinse surfaces and dry.

D. Restore louvers and vents damaged during installation and construction so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Architect, remove damaged units and replace with new units.

END OF SECTION
SECTION 09 21 15

GYPSUM BOARD SHAFT WALL ASSEMBLIES

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes gypsum board shaft-wall assemblies for the following:
   1. Shaft-wall enclosures.

B. Related Sections include the following:
   1. Division 07 Section "Fire-Resistive Joint Systems" for head-of-wall assemblies that incorporate gypsum board shaft-wall assemblies.
   2. Division 09 Section "Gypsum Board" for acoustical insulation.

1.02 SUBMITTALS

A. Product Data: For each gypsum board shaft-wall assembly indicated.

B. LEED Submittals:
   1. Product Data for Credit EQ 4.1: For adhesives and sealants, including printed statement of VOC content.
   2. Product Data for Credit MR 4.1: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.
      a. Include statement indicating costs for each product having recycled content.

1.03 QUALITY ASSURANCE

A. Fire-Resistance Ratings: Provide materials and construction identical to those of assemblies with fire-resistance ratings determined according to ASTM E 119 by a testing and inspecting agency.

B. STC-Rated Assemblies: Provide materials and construction identical to those of assemblies tested according to ASTM E 90 and classified according to ASTM E 413 by a testing and inspecting agency.

C. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures for installing gypsum board shaft-wall assemblies including, but not limited to, the following:
   1. Fasteners proposed for anchoring nonstructural steel framing to building structure.
   2. Sprayed fire-resistive materials applied to structural steel framing.
   3. Elevator equipment, including hoistway doors, elevator call buttons, and elevator floor indicators.
   4. Wiring devices in shaft-wall assemblies.
   5. Doors and other items penetrating shaft-wall assemblies.
   6. Items supported by shaft-wall-assembly framing.
   7. Mechanical work enclosed within shaft-wall assemblies.
1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages, containers, and bundles bearing brand name and identification of manufacturer or supplier.

B. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes.

C. Stack panels flat on leveled supports off floor or slab to prevent sagging.

1.05 PROJECT CONDITIONS

A. Environmental Limitations: Comply with ASTM C 840 requirements or with gypsum board manufacturer’s written recommendations, whichever are more stringent.

B. Do not install interior products until installation areas are enclosed and conditioned.

C. Do not install panels that are wet, moisture damaged, or mold damaged.
   1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, and irregular shape.
   2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. American Gypsum Co.: www.americangypsum.com
   2. BPB America Inc.: www.bpb-na.com
   6. PABCO Gypsum: www.pabcogypsum.com
   7. USG Corporation: www.usg.com

2.02 GYPSUM BOARD SHAFT-WALL ASSEMBLIES, GENERAL

A. Provide materials and components complying with requirements of fire-resistance-rated assemblies indicated.
   1. Provide panels in maximum lengths available to eliminate or minimize end-to-end butt joints.
   2. Provide auxiliary materials complying with gypsum board shaft-wall assembly manufacturer’s written recommendations.
2.03 PANEL PRODUCTS

A. Recycled Content: Provide gypsum panel products with maximum amount of postconsumer and preconsumer recycled content by weight available.

B. Gypsum Liner Panels: Comply with ASTM C 442/C 442M.
   1. Type X: Manufacturer's proprietary liner panels with moisture-resistant paper faces.
      a. Core: 1 inch thick.
      b. Long Edges: Double bevel.

C. Gypsum Board: As specified in Division 09 Section "Gypsum Board."

2.04 NON-LOAD-BEARING STEEL FRAMING

A. Framing Members: Comply with ASTM C 754 for conditions indicated.

B. Steel Sheet Components: Comply with ASTM C 645 requirements for metal, unless otherwise indicated.
   1. Recycled Content: Provide steel sheet with average recycled content such that postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.

2.05 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced product standards and manufacturer's written recommendations.

B. Trim Accessories: Cornerbead, edge trim, and control joints of material and shapes specified in Division 09 Section "Gypsum Board" that comply with gypsum board shaft-wall assembly manufacturer's written recommendations for application indicated.

C. Gypsum Board Joint-Treatment Materials: As specified in Division 09 Section "Gypsum Board."

D. Laminating Adhesive: Adhesive or joint compound recommended by manufacturer for directly adhering gypsum face-layer panels and gypsum-base face-layer panels to backing-layer panels in multilayer construction.
   1. Use adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

E. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.

F. Track Fasteners: Power-driven fasteners of size and material required to withstand loading conditions imposed on shaft-wall assemblies without exceeding allowable design stress of track, fasteners, or structural substrates in which anchors are embedded.
   1. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times design load, as determined by testing per ASTM E 488 conducted by a qualified testing agency.
2. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times design load, as determined by testing per ASTM E 1190 conducted by a qualified testing agency.

G. Sound Attenuation Blankets: As specified in Division 09 Section "Gypsum Board".

H. Acoustical Sealant: As specified in Division 07 Section "Joint Sealants."
   1. Provide sealants that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.06 GYPSUM BOARD SHAFT-WALL ASSEMBLIES

A. Basis-of-Design Product: As indicated on Drawings by design designation of a qualified testing agency.

B. Fire-Resistance Rating: As indicated on Drawings.

C. STC Rating: As indicated on Drawings.

D. Studs: Manufacturer’s standard profile for repetitive members, corner and end members, and fire-resistance-rated assembly indicated.
   1. Depth: As indicated on Drawings.
   2. Minimum Base-Metal Thickness: 0.0329 inch.

E. Runner Tracks: Manufacturer’s standard J-profile track with long-leg length as standard with manufacturer, but at least 2 inches long and in depth matching studs.
   1. Minimum Base-Metal Thickness: Matching steel studs.

F. Firestop Tracks: Top runner manufactured to allow partition heads to expand and contract with movement of structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.
   1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
      a. Dietrich Metal Framing; "The System by Metal-Lite, Inc.”
      b. Fire Trak Corp.: "Fire Trak” attached to studs with "Fire Trak Slip Clip”:

G. Jamb Struts: Manufacturer’s standard J-profile strut with long-leg length of 3 inches, in depth matching studs, and not less than 0.0329 inch thick.

H. Room-Side Finish: As indicated on Drawings.

I. Shaft-Side Finish: As indicated by fire-resistance-rated assembly design designation.
PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates to which gypsum board shaft-wall assemblies attach or abut, with Installer present, including hollow-metal frames, elevator hoistway door frames, cast-in anchors, and structural framing. Examine for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, or mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Sprayed Fire-Resistive Materials: Coordinate with gypsum board shaft-wall assemblies so both elements of Work remain complete and undamaged. Patch or replace sprayed fire-resistive materials removed or damaged during installation of shaft-wall assemblies to comply with requirements specified in Division 07 Section "Applied Fireproofing."

1. Before sprayed fire-resistive materials are applied, attach offset anchor plates or ceiling runner tracks to surfaces indicated to receive sprayed fire-resistive materials. Where offset anchor plates are required, provide continuous plates fastened to building structure not more than 24 inches o.c.

B. After sprayed fire-resistive materials are applied, remove only to extent necessary for installation of gypsum board shaft-wall assemblies and without reducing the fire-resistive material thickness below that which is required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.

3.03 INSTALLATION

A. General: Install gypsum board shaft-wall assemblies to comply with requirements of fire-resistance-rated assemblies indicated, manufacturer’s written installation instructions, and the following:

1. ASTM C 754 for installing steel framing except comply with framing spacing indicated.

2. Division 09 Section "Gypsum Board" for applying and finishing panels.

B. Do not bridge architectural or building expansion joints with shaft-wall assemblies; frame both sides of expansion joints with furring and other support.

C. Install supplementary framing in gypsum board shaft-wall assemblies around openings and as required for blocking, bracing, and support of gravity and pullout loads of fixtures, equipment, services, heavy trim, furnishings, and similar items that cannot be supported directly by shaft-wall assembly framing.

1. At elevator hoistway entrance door frames, provide jamb struts on each side of door frame.
D. At penetrations in shaft wall, maintain fire-resistance rating of shaft-wall assembly by installing supplementary steel framing around perimeter of penetration and fire protection behind boxes containing wiring devices, elevator call buttons, elevator floor indicators, and similar items.

E. Isolate perimeter of gypsum panels from building structure to prevent cracking of panels, while maintaining continuity of fire-rated construction.

F. Firestop Tracks: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.

G. Control Joints: Install control joints at locations indicated on Drawings or according to ASTM C 840 and in specific locations approved by Architect, while maintaining fire-resistance rating of gypsum board shaft-wall assemblies.

H. Seal gypsum board shaft walls with acoustical sealant at perimeter of each assembly where it abuts other work and at joints and penetrations within each assembly. Install acoustical sealant to withstand dislocation by air-pressure differential between shaft and external spaces; maintain an airtight and smoke-tight seal; and comply with ASTM C 919 requirements or with manufacturer's written instructions, whichever are more stringent.

I. In elevator shafts where gypsum board shaft-wall assemblies cannot be positioned within 4 inches of the shaft face of structural beams, floor edges, and similar projections into shaft, install 1/2- or 5/8-inch-thick, gypsum board cants covering tops of projections. No recesses allowed (at steel beams especially).
   1. Slope cant panels at least 75 degrees from horizontal. Set base edge of panels in adhesive and secure top edges to shaft walls at 24 inches o.c. with screws fastened to shaft-wall framing.
   2. Where steel framing is required to support gypsum board cants, install framing at 24 inches o.c. and extend studs from the projection to shaft-wall framing.

J. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

3.04 PROTECTION

A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

B. Remove and replace panels that are wet, moisture damaged, or mold damaged.
   1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, and irregular shape.
   2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION
SECTION 09 22 16
NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes non-load-bearing steel framing members for the following applications:
   1. Interior framing systems (e.g., supports for partition walls, framed soffits, furring, etc.).
   2. Interior suspension systems (e.g., supports for ceilings, suspended soffits, etc.).

B. Related Sections:
   1. Division 05 Section "Cold-Formed Metal Framing" for exterior and interior load-bearing and exterior non-load-bearing wall studs.
   2. Division 06 Section "Rough Carpentry" for wood blocking installed with metal framing.
   3. Division 07 Section "Thermal Insulation" for insulation installed with Z-shaped furring members.
   4. Division 09 Section "Gypsum Board Shaft Wall Assemblies" for non-load-bearing metal shaft-wall framing, gypsum panels, and other components of shaft-wall assemblies.
   5. Division 09 Section "Gypsum Board" for gypsum panels to be installed over non-load bearing metal framing and other components of wall assemblies.
   6. Division 09 Section "Absorptive Panel Acoustical Ceilings" for other ceilings requiring gypsum board suspension systems.

1.02 SUBMITTALS

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

B. LEED Submittal:
   1. Product Data for Credit MR 4.1 and Credit MR 4.2: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.
      a. Include statement indicating costs for each product having recycled content.

1.03 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

B. Sound Transmission Characteristics: For STC-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.
PART 2 - PRODUCTS

2.01 NON-LOAD-BEARING STEEL FRAMING, GENERAL

A. Recycled Content of Steel Products: Provide products with average recycled content of steel products such that postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.

B. Framing Members, General: Comply with ASTM C 754 for conditions indicated.
   1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal, unless otherwise indicated.
   2. Protective Coating: Manufacturer's standard corrosion-resistant zinc coating, unless otherwise indicated.

2.02 SUSPENSION SYSTEM COMPONENTS

A. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.0625-inch- diameter wire, or double strand of 0.0475-inch- diameter wire.

B. Hanger Attachments to Concrete:
   1. Powder-Actuated Fasteners: Suitable for application indicated, fabricated from corrosion-resistant materials with clips or other devices for attaching hangers of type indicated, and capable of sustaining, without failure, a load equal to 10 times that imposed by construction as determined by testing according to ASTM E 1190 by an independent testing agency.

C. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.162-inch diameter.

D. Flat Hangers: Steel sheet, 1 by 3/16 inch by length indicated.

E. Carrying Channels: Cold-rolled, commercial-steel sheet with a base-metal thickness of 0.0538 inch and minimum 1/2-inch- wide flanges.
   1. Depth: 2-1/2 inches.

F. Furring Channels (Furring Members):
      a. Minimum Base Metal Thickness: 0.0312 inch.

G. Grid Suspension System for Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.
   1. Products: Subject to compliance with requirements, provide one of the following:
      b. Chicago Metallic Corporation; “640-C Drywall Furring System”: www.usg.com
      c. USG Corporation; “Drywall Suspension System”: www.chicagometallic.com
2.03 STEEL FRAMING FOR FRAMED ASSEMBLIES

A. Steel Studs and Runners: ASTM C 645.
   1. Minimum Base-Metal Thickness: 0.027 inch.
      a. Provide minimum base metal thickness of 0.0312 inch at the following locations:
         1) All standard and fire door frames.
         2) Walls supporting ceramic tile.
         3) Other locations indicated on Drawings.

   2. Depth: As indicated on Drawings.

B. Flexible Drywall Track (Contractor Option):
   1. Provide runner track capable of forming outside radius of 7 inches.
   2. Size: Coordinate with wall being framed.
   3. Channel:
      a. ASTM A653, galvanized steel.
      b. Standard protective coating equal or superior to
      c. ASTM A653 coating designation G-40 or A-40
      d. 20 gauge

   4. Slidable Strap:
      a. ASTM A653, galvanized steel.
      b. Standard protective coating equal or superior to
      c. ASTM A653 coating designation G-60 or A-60.
      d. Dimensions: 0.750 inches by 0.023 inch.

   5. Products:
      a. "Flex-C Trac System" as manufactured by Flex-Ability Concepts: www.flexc.com
      b. Radius Track Corp.: www.radiustrack.com

C. Slip-Type Head Joints: Where indicated, provide one of the following:
   1. Single Long-Leg Runner System: ASTM C 645 top runner with 2-inch- deep flanges in
      thickness not less than indicated for studs, installed with studs friction fit into top
      runner and with continuous bridging located within 12 inches of the top of studs to
      provide lateral bracing.
   2. Double-Runner System: ASTM C 645 top runners, inside runner with 2-inch- deep
      flanges in thickness not less than indicated for studs and fastened to studs, and outer
      runner sized to friction fit inside runner.
   3. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes
      applied to interior partition framing resulting from deflection of structure above; in
      thickness not less than indicated for studs and in width to accommodate depth of studs.
      a. Available Products: Subject to compliance with requirements, products that may
      be incorporated into the Work include, but are not limited to, the following:
         1) Steel Network Inc. (The); VertiClip SLD or VertiTrack VTD Series:
            www.steelnetwork.com
         2) Superior Metal Trim; Superior Flex Track System (SFT):
            www.superiormetaltrim.com
D. Firestop Tracks: Top runner manufactured to allow partition heads to expand and contract with movement of the structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.
   1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
      a. Fire Trak Corp.; Fire Trak attached to studs with Fire Trak Slip Clip: www.firetrak.com
      b. Metal-Lite, Inc.; The System: www.metal-lite.net

E. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
   1. Minimum Base-Metal Thickness: 0.0312 inch.

F. Hat-Shaped, Rigid Furring Channels: ASTM C 645.
   1. Minimum Base Metal Thickness: 0.0312 inch.
   2. Depth: 7/8 inch.

G. Cold-Rolled Furring Channels: 0.0538-inch bare-steel thickness, with minimum 1/2-inch-wide flanges.
   1. Depth: As indicated on Drawings.
   2. Furring Brackets: Adjustable, corrugated-edge type of steel sheet with minimum bare-steel thickness of 0.0312 inch.
   3. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.0625-inch-diameter wire, or double strand of 0.0475-inch-diameter wire.

H. Z-Shaped Furring: With slotted or non-slotted web, face flange of 1-1/4 inches, wall attachment flange of 7/8 inch, minimum bare-metal thickness of 0.0179 inch, and depth required to fit insulation thickness indicated.

2.04 AUXILIARY MATERIALS

A. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

B. Isolation Strip at Exterior Walls: Provide the following:
   1. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch thick, in width to suit steel stud size.
PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.

1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.

B. Coordination with Sprayed Fire-Resistive Materials:

1. Before sprayed fire-resistive materials are applied, attach offset anchor plates or ceiling runners (tracks) to surfaces indicated to receive sprayed fire-resistive materials. Where offset anchor plates are required, provide continuous plates fastened to building structure not more than 24 inches o.c.

2. After sprayed fire-resistive materials are applied, remove them only to extent necessary for installation of non-load-bearing steel framing. Do not reduce thickness of fire-resistant materials below that required for fire-resistance ratings indicated. Protect adjacent fire-resistant materials from damage.

3.03 INSTALLATION, GENERAL

A. Installation Standard: ASTM C 754.

1. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.

3.04 INSTALLING SUSPENSION SYSTEMS

A. Install suspension system components in sizes and spacings indicated on Drawings, but not less than those required by referenced installation standards for assembly types and other assembly components indicated.

B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.

C. Suspend hangers from building structure as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.

   a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, counter-splaying, or other equally effective means.
2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.
   a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.

3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.

4. Do not connect or suspend steel framing from ducts, pipes, or conduit.

D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.

E. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

F. Seismic Bracing: Sway-brace suspension systems with hangers used for support.

G. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

3.05 INSTALLING FRAMED ASSEMBLIES

A. Where studs are installed directly against exterior concrete walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.

B. Install studs so flanges within framing system point in same direction.
   1. Space studs as indicated on Drawings, or as follows:
      a. Single-Layer Application: 16 inches o.c., unless otherwise indicated.
      b. Multilayer Application: 16 inches o.c., unless otherwise indicated.
      c. Tile backing panels: 12 inches o.c., unless otherwise indicated.

C. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.
   1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
   2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
      a. Install two studs at each jamb, unless otherwise indicated.
      b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint in finished assembly.
c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.

3. Other Framed Openings: Frame openings other than door openings the same as required for door openings, unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.

4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.
   a. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.

5. Sound-Rated Partitions:
   a. Set runner channel in double bead of acoustical sealant as specified in Division 09 Section "Gypsum Board."
   b. Install framing to comply with sound-rated assembly indicated.

6. Curved Partitions:
   a. Bend track to uniform curve and locate straight lengths so they are tangent to arcs.
   b. Begin and end each arc with a stud, and space intermediate studs equally along arcs. On straight lengths of not less than 2 studs at ends of arcs, place studs 6 inches o.c.

D. Z-Furring Members:
1. Erect insulation (specified in Division 07 Section "Thermal Insulation") vertically and hold in place with Z-furring members spaced 24 inches o.c.
2. Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.
3. At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw-attach short flange of furring channel to web of attached channel. At interior corners, space second member no more than 12 inches from corner and cut insulation to fit.

E. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

END OF SECTION
SECTION 09 29 00

GYPSUM BOARD

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes the following:
1. Interior gypsum board.
2. Tile backing panels.
3. Acoustic insulation.

B. Related Sections include the following:
1. Division 05 Section "Cold-Formed Metal Framing" for load-bearing steel framing that supports gypsum board.
2. Division 06 Section "Rough Carpentry" for wood blocking to be installed before gypsum board.
3. Division 07 Section “EPDM Roofing” for gypsum board as part of roof assembly.
4. Division 09 Section “Non-Structural Metal Framing” for non-structural framing and suspension systems that support gypsum board.
5. Division 09 Section "Gypsum Board Shaft Wall Assemblies" for metal shaft-wall framing, gypsum shaft liners, and other components of shaft-wall assemblies.
6. Division 09 painting Sections for primers applied to gypsum board surfaces.

1.02 SUBMITTALS

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

B. LEED Submittals:
1. Product Data for Credit MR 4.1 and MR 4.2: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.
   a. Include statement indicating costs for each product having recycled content.

2. Product Data for Credit EQ 4.1: For adhesives used to laminate gypsum board panels to substrates, including printed statement of VOC content.

3. Product Certificates for Credit MR 5.1: For products and materials required to comply with requirements for regional materials, certificates indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating distance to Project, cost for each regional material, and fraction by weight that is considered regional.

4. Product Certificates for Credit MR 5.1: For products and materials required to comply with requirements for regionally manufactured and regionally extracted and manufactured materials. Include statement indicating cost for each regionally manufactured material.
1.03 QUALITY ASSURANCE

A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E90 and classified according to ASTM E413 by an independent testing agency.

C. Mockups: Before beginning gypsum board installation, install mockups of at least 100 sq. ft. in surface area to demonstrate aesthetic effects and set quality standards for materials and execution.
   1. Install mockups for the following:
      a. Each level of gypsum board finish indicated for use in exposed locations.
   2. Apply or install final decoration indicated, including painting, on exposed surfaces for review of mockups.
   3. Simulate finished lighting conditions for review of mockups.
   4. Following review and approval by Architect, approved mockups may become part of the completed Work.

1.04 PERFORMANCE CRITERIA

A. Abuse Resistant Gypsum Board:
      a. Wall Assembly Fire-Resistance Rating: As indicated on Drawings.

1.05 STORAGE AND HANDLING

A. Store materials inside under cover and keep them dry and protected against damage from weather, condensation, direct sunlight, construction traffic, and other causes. Stack panels flat to prevent sagging.

1.06 PROJECT CONDITIONS

A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.

B. Do not install interior products until installation areas are enclosed and conditioned.

C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.
   1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
   2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.
PART 2 - PRODUCTS

2.01 PANELS, GENERAL

A. Recycled Content: Provide gypsum panel products with maximum amount of postconsumer and preconsumer recycled content by weight available.

B. Size: Provide in maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.02 INTERIOR GYPSUM BOARD

A. General: Complying with ASTM C 36/C 36M or ASTM C 1396/C 1396M, as applicable to type of gypsum board indicated and whichever is more stringent.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   b. BPB America Inc.: www.bpba.com
   c. Georgia-Pacific Gypsum LLC. www.gp.com
   d. Lafarge North America Inc. www.lafarge-na.com
   e. National Gypsum Company: www.nationalgypsum.com
   f. USG Corporation: www.usg.com

B. Regular Type:
   1. Thickness: 5/8 inch.
   2. Long Edges: Tapered.

C. Type X:
   1. Thickness: 5/8 inch.
   2. Long Edges: Tapered.

D. Abuse-Resistant Type: Manufactured to produce greater resistance to surface indentation and through-penetration (impact resistance) than standard, regular-type and Type X gypsum board.
   1. Core: 5/8 inch, Type X.
   2. Long Edges: Tapered.

E. Water-Resistant Gypsum Backing Board: ASTM C 1396/C 1396M, with manufacturer's standard edges.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      b. CertainTeed Corp. www.certainteed.com
      c. Georgia-Pacific Gypsum LLC. www.gp.com
      d. Lafarge North America Inc. www.lafarge-na.com
      e. USG Corporation: www.usg.com
2. Core: 5/8 inch, Type X or Type C as required by fire-resistance-rated assembly indicated on Drawings.

F. Flexible Gypsum Board: ASTM C 1396/C 1396M. Manufactured to bend to fit radii and to be more flexible than standard regular-type gypsum board of same thickness.
2. Long Edges: Tapered.

2.03 TILE BACKING PANELS

1. Products: Subject to compliance with requirements, provide one of the following:
   d. USG Corporation; “DUROCK Cement Board”: [www.usg.com](http://www.usg.com)
2. Thickness: 5/8-inch, or as indicated on Drawings.

2.04 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.
1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
2. Shapes:
   a. Cornerbead.
   b. LC-Bead: J-shaped; exposed long flange receives joint compound.
   c. L-Bead: L-shaped; exposed long flange receives joint compound.
   d. U-Bead: J-shaped; exposed short flange does not receive joint compound with removable strip covering slot opening.
   e. Expansion (control) joint.
3. Premanufactured Reveal Trim:
   a. Provide reveal trim of extruded aluminum, 6063 T-5 alloy, 0.050-inch nominal wall thickness with a factory primed finish. Size as indicated on Drawings.
   b. Provide premanufactured “X” and “T” intersections to match reveal trim.
   c. 1-inch expansion joint for gypsum board walls: Provide 3-piece Drywall Control Joint #DRM-50-100 3-PC as manufactured by Fry Reglet or equivalent.
   d. Provide extrusions and intersections as manufactured by Fry Reglet: [www.fryreglet.com](http://www.fryreglet.com), or SOFTFORMS, LLC: [www.pitconindustries.com](http://www.pitconindustries.com).

2.05 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475/C 475M.

B. Joint Tape:
   1. Interior Gypsum Wallboard: Paper.
   2. Tile Backing Panels: As recommended by panel manufacturer.
C. Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
   1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
   2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
      a. Use setting-type compound for installing paper-faced metal trim accessories.
   3. Fill Coat: For second coat, use setting-type, sandable topping compound.
   4. Finish Coat: For third coat, use setting-type, sandable topping compound.

D. Joint Compound for Tile Backing Panels:
   1. Cementitious Backer Units: As recommended by backer unit manufacturer.
   2. Joint Compound for Water Resistant Backing Panels: Use setting-type taping compound and setting-type, sandable topping compound.

2.06 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.

B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
   1. Use adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
   1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.
   2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.

D. Unfaced, Mineral-Wool Blanket Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.
   1. Basis of Design Product: Subject to compliance with requirements, provide “Linacoustic” as manufactured by Johns-Manville, www.jm.com, or products by one of the following:

E. Acoustical Joint Sealant: Manufacturer's standard non-sag, paintable, non-staining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
1. Provide sealants that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2. Products: Subject to compliance with requirements, provide one of the following:
   a. Accumetric LLC; BOSS 824 Acoustical Sound Sealant: [www.accumetricinc.com](http://www.accumetricinc.com).
   b. Grabber Construction Products; Acoustical Sealant GSC: [www.grabberman.com](http://www.grabberman.com).
   c. Pecora Corporation; AC-20 FTR or AIS-919: [www.pecora.com](http://www.pecora.com).
   e. USG Corporation; SHEETROCK Acoustical Sealant: [www.usg.com](http://www.usg.com).

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames and framing, for compliance with requirements and other conditions affecting performance.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 APPLYING AND FINISHING PANELS, GENERAL

A. Comply with ASTM C 840.

B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.

D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.

E. Form control and expansion joints with space between edges of adjoining gypsum panels.
F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
   1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
   2. Fit gypsum panels around ducts, pipes, and conduits.
   3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- wide joints to install sealant.

G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch-wide spaces at these locations, and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

I. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer’s written recommendations for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.

J. Install sound attenuation blankets before installing gypsum panels, unless blankets are readily installed after panels have been installed on one side.

3.03 APPLYING INTERIOR GYPSUM BOARD

A. Install interior gypsum board in the following locations:
   1. Regular Type: At locations not indicated as requiring fire-resistance-ratings.
   2. Type X: Where required for fire-resistance-rated assembly.
   3. Ceiling Type: Ceiling surfaces.
   4. Abuse-Resistant Type: As indicated on Drawings.
   5. Moisture- and Mold-Resistant Type: At walls with light moisture (e.g. at lavatories, drinking fountains, urinals, water closets, etc.)

B. Single-Layer Application:
   1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing, unless otherwise indicated.
   2. On partitions/walls, apply gypsum panels vertically (parallel to framing) or horizontally (perpendicular to framing), unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
      a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
   3. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
C. Multilayer Application:
   1. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
   2. On Z-furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.
   3. Fastening Methods: Fasten base layers and face layers separately to supports with screws.

D. Laminating to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's written recommendations and temporarily brace or fasten gypsum panels until fastening adhesive has set.

E. Curved Surfaces:
   1. Install panels horizontally (perpendicular to supports) and unbroken, to extent possible, across curved surface plus 12-inch-long straight sections at ends of curves and tangent to them.
   2. For double-layer construction, fasten base layer to studs with screws 16 inches o.c. Center gypsum board face layer over joints in base layer, and fasten to studs with screws spaced 12 inches o.c.

3.04 APPLYING TILE BACKING PANELS

A. Cementitious Backer Units: ANSI A108.1, at locations indicated to receive tile.

B. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.

3.05 INSTALLING TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

B. Control Joints: At a minimum, install control joints at locations indicated on Drawings, or according to ASTM C 840, and in specific locations approved by Architect for visual effect. Contact Architect if other locations are recommended for additional control joints.

C. Interior Trim: Install in the following locations:
   1. Cornerbead: Use at outside corners.
   2. LC-Bead or J: Use at exposed panel edges.
   3. Curved-Edge Cornerbead: Use at curved openings and edges.
   4. Expansion Reveal Trim: Where indicated on Drawings.
D. Reveal Trim:
   1. Lengths shall be secured to framing with screws or other approved fastener, at a
      minimum 12-inches o.c.
   2. Make butt joints neat, with tight joints. All corners shall be neatly mitered.
   3. Wipe excess joint compound from all visible surfaces immediately.

3.06 FINISHING GYPSUM BOARD

A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations,
   fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces
   for decoration. Promptly remove residual joint compound from adjacent surfaces.

B. Prefill open joints, rounded or beveled edges, and damaged surface areas.

C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as
   not intended to receive tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C
   840:
   1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
   2. Level 2: Panels that are substrate for tile.
   3. Level 5: At all panel surfaces that will be exposed to view, unless otherwise indicated.
   4. Primer and its application to surfaces are specified in other Division 09 Sections.

E. Cementitious Backer Units: Finish according to manufacturer's written instructions.

3.07 PROTECTION

A. Protect installed products from damage from weather, condensation, direct sunlight,
   construction, and other causes during remainder of the construction period.

B. Remove and replace panels that are wet, moisture damaged, and mold damaged.
   1. Indications that panels are wet or moisture damaged include, but are not limited to,
      discoloration, sagging, or irregular shape.
   2. Indications that panels are mold damaged include, but are not limited to, fuzzy or
      splotchy surface contamination and discoloration.

3.08 CONSTRUCTION WASTE MANAGEMENT

A. Construction waste shall be managed in accordance with provisions of Division 01 Section
   “Construction Waste Management and Disposal”. Documentation shall be submitted to satisfy
   the requirements of that section.

END OF SECTION
SECTION 09 30 00

TILING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Ceramic and porcelain tile.
   2. Crack isolation membrane.
   3. Metal edge strips.

B. Related Sections:
   1. Division 07 Section "Joint Sealants" for sealing of expansion, contraction, control, and isolation joints in tile surfaces.
   2. Division 09 Section "Gypsum Board" for cementitious backer units.

1.02 DEFINITIONS

A. General: Definitions in the ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.


C. Module Size: Actual tile size plus joint width indicated.

D. Face Size: Actual tile size, excluding spacer lugs.

1.03 PERFORMANCE REQUIREMENTS

A. Static Coefficient of Friction: For tile installed on walkway surfaces, provide products with the following values as determined by testing identical products per ASTM C 1028:
   1. Level Surfaces: Minimum 0.6.

1.04 SUBMITTALS

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

B. LEED Submittal:
   1. Product Data for Credit EQ 4.1: For sealants, including printed statement of VOC content.
C. Shop Drawings: Show locations of each type of tile and tile pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.

D. Samples for Initial Selection: For each type of tile and grout indicated. Include Samples of accessories involving color selection.

E. Samples for Verification:
   1. Full-size units of each type and composition of tile and for each color and finish required.
   2. Assembled samples mounted on a rigid panel, with grouted joints, for each type and composition of tile and for each color and finish required. Make samples at least 18 inches square, but not fewer than 4 tiles. Use grout of type and in color or colors approved for completed Work.
   3. Metal edge strips in 6-inch lengths.

F. Qualification Data: For qualified Installer.

G. Master Grade Certificates: For each shipment, type, and composition of tile, signed by tile manufacturer and Installer.

H. Product Certificates: For each type of product, signed by product manufacturer.

I. Material Test Reports: For each tile-setting and -grouting product.

1.05 QUALITY ASSURANCE

A. Source Limitations for Tile: Obtain tile of each type from one source or producer.
   1. Obtain tile of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.

B. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from one manufacturer and each aggregate from one source or producer.

C. Source Limitations for Other Products: Obtain each of the following products specified in this Section from a single manufacturer for each product:
   1. Stone thresholds.
   2. Waterproof membrane.
   3. Crack isolation membrane.
   4. Joint sealants.
   5. Cementitious backer units.
   6. Metal edge strips.

D. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
   1. Build mockup of approximately 100 square feet of each type of floor tile installation.
   2. Build mockup of approximately 100 square feet, to include each type and color of wall tile installation.
3. Following review and approval by Architect, approved mockups may become part of the completed Work.

E. Preinstallation Conference: Conduct conference at Project site.
   1. Review requirements in ANSI A108.01 for substrates and for preparation by other trades.
   2. Meeting agenda shall include, but not be limited to:
      a. Surface preparation.
      b. Tile and installation material compatibility.
      c. Edge protection and transition.
      d. Movement joint profiles.
      e. Crack isolation techniques.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling tile packages.

B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.

C. Store aggregates where grading and other required characteristics can be maintained and contamination can be avoided.

D. Store liquid materials in unopened containers and protected from freezing.

E. Handle tile that has temporary protective coating on exposed surfaces to prevent coated surfaces from contacting backs or edges of other units. If coating does contact bonding surfaces of tile, remove coating from bonding surfaces before setting tile.

1.07 PROJECT CONDITIONS

A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer’s written instructions.

1.08 EXTRA MATERIALS

A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed for each type, composition, color, pattern, and size indicated.
   2. Grout: Furnish quantity of grout equal to 3 percent of amount installed for each type, composition, and color indicated.
PART 2 - PRODUCTS

2.01 PRODUCTS, GENERAL

A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.
   1. Provide tile complying with Standard grade requirements unless otherwise indicated.

B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCA installation methods specified in tile installation schedules, and other requirements specified.

C. Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.

D. Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer unless otherwise indicated.

E. Factory-Applied Temporary Protective Coating: Where indicated under tile type, protect exposed surfaces of tile against adherence of mortar and grout by precoating with continuous film of petroleum paraffin wax, applied hot. Do not coat unexposed tile surfaces.

2.02 MANUFACTURERS

A. Basis-of-Design Products: Subject to compliance with requirements, provide products listed, or comparable product by one of the following:
   5. Florim USA: www.florimusacom.

B. The Architect reserves the right to accept or reject any product subject to compliance with design standards.

2.03 TILE PRODUCTS

A. Tile Type (CT1): Glazed wall tile.
   3. Thickness: 5/16 inch.
   4. Face: Pattern of design indicated, with manufacturer’s standard edges.
   5. Finish: Bright, opaque glaze.
6. **Tiling**
   - **Tile Color and Pattern**: Colors as indicated on Drawings or as selected by Architect from manufacturer’s full range in Price Group 2, to include field tile and 3 accent colors in percentages as indicated on Drawings.
   - **Grout Color**: As selected by Architect from manufacturer's full range.
   - **Mounting**: Factory, back mounted.
   - **Trim Units**: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile. Provide shapes as follows, selected from manufacturer's standard shapes:
     - Base for Thin-Set Mortar Installations: 4-1/2 by 8-1/2 inches cover base.
     - External Corners for Thin-Set Mortar Installations: Surface bullnose, same size as adjoining flat tile.
     - Internal Corners: Field-butted square corners.

B. **Tile Type GT-1, GT-2, GT-3**: Glass Wall Tile.
   1. **Basis-of-Design Product**: Subject to compliance with requirements, provide “Reflections” as manufactured by DalTile: [www.daltile.com](http://www.daltile.com).
   2. **Module Size**: 4-1/4 by 12-inches, nominal.
   3. **Thickness**: 5/16 inch.
   4. **Tile Colors**: As indicated on Drawings or as selected by Architect from manufacturer’s full range.

C. **Tile Type PT1, PT2, PT3, PT4**: Porcelain Floor Tile.
   1. **Basis of Design Manufacturer**: Provide “Metal Wood” as distributed by Arizona Tile: [www.arizonatile.com](http://www.arizonatile.com).
   2. **Composition**: Porcelain.
   3. **Module Size**:
      - PT1 and PT2: 12 by 24-inches.
      - PT3 and PT4: 6 by 24-inches.
   4. **Tile Colors**: As indicated on Drawings or as selected by Architect from manufacturer’s full range.
   5. **Grout Color**: As selected by Architect from manufacturer’s full range.

2.04 **TILE BACKING PANELS**
   - **Cementitious Backer Units**: See Division 09 Section “Gypsum Board”.

2.05 **CRACK ISOLATION MEMBRANE**
   - **General**: Manufacturer’s standard product that complies with ANSI A118.12 for high performance and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.
   - **General**: Manufacturer’s standard product, selected from the following that complies with ANSI A118.10 and is recommended by the manufacturer for the application indicated.
C. Fabric-Reinforced, Fluid-Applied Membrane: System consisting of liquid-latex rubber or elastomeric polymer and continuous fabric reinforcement.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      c. MAPEI Corporation; Mapelastic L (PRP M19) or Mapelastic HPG with MAPEI Fiberglass Mesh. www.mapei.com.

2.06 SETTING MATERIALS

   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

2. Provide prepackaged, dry-mortar mix containing dry, redispersible, vinyl acetate or acrylic additive to which only water must be added at Project site.

3. Provide white thin-set mortar for use with Glass Tile.

2.07 GROUT MATERIALS


B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Bonsal American: www.bonsalamerican.com
   2. Bostik, Inc. www.bostik-us.com
   3. C-Cure: www.c-cure.com
   4. Custom Building Products: www.custombuildingproducts.com
   5. Laticrete International, Inc. www.laticrete.com
   6. MAPEI Corporation: www.mapei.us/
   7. Summitville Tiles, Inc. www.summitville.com
2.08 ELASTOMERIC SEALANTS

A. General: Provide sealants, primers, backer rods, and other sealant accessories that comply with the following requirements and with the applicable requirements in Division 07 Section "Joint Sealants."

2.09 MISCELLANEOUS MATERIALS

A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.

B. Metal Edge Strips: Angle or L-shape, height to match tile and setting-bed thickness, metallic, designed specifically for flooring applications; stainless-steel, ASTM A 666, 300 Series exposed-edge material.

C. Temporary Protective Coating: Product indicated below that is formulated to protect exposed surfaces of tile against adherence of mortar and grout; compatible with tile, mortar, and grout products; and easily removable after grouting is completed without damaging grout or tile.

1. Grout release in form of manufacturer's standard proprietary liquid coating that is specially formulated and recommended for use as temporary protective coating for tile.

D. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.

E. Grout Sealer: Manufacturer's standard silicone product for sealing grout joints and that does not change color or appearance of grout.

2.10 MIXING MORTARS AND GROUT

A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.

B. Add materials, water, and additives in accurate proportions.

C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.
PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.

1. Verify that substrates for setting tile are firm, dry, clean, free of coatings that are incompatible with tile-setting materials including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.

2. Verify that concrete substrates for tile floors installed with thin-set mortar comply with surface finish requirements in ANSI A108.01 for installations indicated.
   a. Verify that surfaces that received a steel trowel finish have been mechanically scarified.
   b. Verify that protrusions, bumps, and ridges have been removed by sanding or grinding.

3. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.

4. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with thin-set mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.

B. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

C. Field-Applied Temporary Protective Coating: If indicated under tile type or needed to prevent grout from staining or adhering to exposed tile surfaces, precoat them with continuous film of temporary protective coating, taking care not to coat unexposed tile surfaces.
3.03 TILING

A. Comply with TCA's "Handbook for Ceramic Tile Installation" for TCA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 Series "Specifications for Installation of Ceramic Tile" that are referenced in TCA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.
   1. For the following installations, follow procedures in the ANSI A108 Series of tile installation standards for providing 95 percent mortar coverage:
      a. Tile floors composed of tiles 8 by 8 inches or larger.
      b. Tile floors composed of rib-backed tiles.

B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

D. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.
   1. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.
   2. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.

E. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:
   2. Glazed Wall Tile: 1/16 inch.

F. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.
   1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.
   2. Prepare joints and apply sealants to comply with requirements in Division 07 Section "Joint Sealants."

G. Metal Edge Strips: Install where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with top of tile.

H. Grout Sealer: Apply grout sealer to grout joints in tile floors according to grout-sealer manufacturer's written instructions. As soon as grout sealer has penetrated grout joints, remove excess sealer and sealer from tile faces by wiping with soft cloth.
3.04  TILE BACKING PANEL INSTALLATION
A.  See Division 09 Section “Gypsum Board” for installation of cementitious backer units

3.05  WATERPROOFING INSTALLATION
A.  Install waterproofing to comply with ANSI A108.13 and manufacturer's written instructions to produce waterproof membrane of uniform thickness and bonded securely to substrate.
B.  Do not install tile or setting materials over waterproofing until waterproofing has cured and been tested to determine that it is watertight.

3.06  CRACK ISOLATION MEMBRANE INSTALLATION
A.  Install crack isolation membrane to comply with ANSI A108.17 and manufacturer's written instructions to produce membrane of uniform thickness and bonded securely to substrate.
B.  Do not install tile or setting materials over crack isolation membrane until membrane has cured.

3.07  CLEANING AND PROTECTING
A.  Cleaning:  On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
   1.  Remove grout residue from tile as soon as possible.
   2.  Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation.  Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned.  Protect metal surfaces and plumbing fixtures from effects of cleaning.  Flush surfaces with clean water before and after cleaning.
   3.  Remove temporary protective coating by method recommended by coating manufacturer and that is acceptable to tile and grout manufacturer.  Trap and remove coating to prevent drain clogging.
B.  Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear.  If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.
C.  Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.
D.  Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.
3.08 INTERIOR TILE INSTALLATION SCHEDULE

A. Tile Installation F111: Cement mortar bed (thickset) with cleavage membrane; TCA F111 and ANSI A108.1A. Verify existing conditions.
   1. Tile Type: Porcelain Floor Tile.

B. Interior Floor Installations, Existing Concrete Subfloor:
   1. Tile Installation F113: Thin-set mortar; TCA F113.
      a. Tile Type: Porcelain Floor Tile.
      b. Thin-Set Mortar: Dry-set or Latex- portland cement mortar for slab-on-grade.
         1) For above-grade structural slabs it is mandatory to use mortar as recommended by manufacturer for application and substrate.
      c. Grout: Standard unsanded cement grout for slab-on-grade.
         1) For above-grade structural slabs it is mandatory to use only mortar as recommended by manufacturer for application and substrate.
   2. If cracks are evident in existing floors, install floor tile using method F125 with crack isolation membrane.

C. Interior Wall Installations, Metal Studs or Furring:
   1. Tile Installation W244: Thin-set mortar on cementitious backer units TCA W244.
      a. Tile Type: Glazed Wall Tile.
      b. Thin-Set Mortar: Latex- portland cement mortar.

D. Interior Glass Wall Tile Installation, Metal Studs or Furring:
   1. Tile Installation W244: Thin-set mortar on cementitious backer with cleavage / crack suppression membrane units TCA W244.
      a. Tile Type: Glass Wall Tile.
      b. Thin-Set Mortar: White latex- portland cement mortar.
      d. Install glass tile in accordance with manufacturer’s instructions and recommendations.
      e. Install glass tile on the wall leaving even spacing between tiles of at least 1/16-inch. Use plastic spacers whenever possible.
      f. Install control joints where the tile abuts restraining surfaces and around the perimeter of the tile work.
      g. Allow the adhesive to cure according to the manufacturer’s instructions (at least 24 hours).
      h. Grout with an unsanded grout to prevent scratching of the surface. Grout joints should be filled to approximately 2/3 of the thickness of the tile.

END OF SECTION
SECTION 09 51 13
WOOD ACOUSTICAL WALL AND CEILING PANELS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. All labor, materials, and plant as required for the fabrication, delivery, and installation of
      wood acoustical panel wall and ceiling system complete in all respects as described and
      specified herein.

B. Related Sections:
   1. Division 09 Section “Non-Structural Metal Framing” for gypsum board ceiling suspension
      systems.
   2. Division 09 Section “Gypsum Board” for gypsum board partitions.
   3. Division 09 Sections for other ceiling systems.
   4. Division 09 Section “Painting” for paint finishes of wall and ceiling surface behind and
      between panels.
   5. Division 21 Sections “Wet Pipe Sprinkler Systems” and “Dry Pipe Sprinkler Systems” for
      life safety equipment.
   6. Division 23 Sections for air handling, heating and air conditioning, plumbing and other
      mechanical services as required.
   7. Division 26 Section “Lighting and Accessories” for light fixtures and electrical services
      and connections.

1.02 QUALITY ASSURANCE

A. Manufacturer and Installer Qualifications: Firm manufacturing the specified product shall have
   adequate capacity required for projects listed and have successfully completed similar projects
   for a period of not less than five years. The installer should be approved by the manufacturer
   as qualified to perform work required.

B. Single Source: It is the clear intent of this specification to provide a complete, fully integrated
   system, supplied by a single company. Except as described, “Stick built” parts and pieces from
   various and different manufacturers will not be accepted. All custom acoustical wall and
   ceiling panels shall be purchased from a single supplier.

C. Reference Standards: Conform to all governing laws, building codes, and the following
   performance criteria:
   1. Fire Performance Characteristics: Provide ceiling panels with surface-burning
      characteristics as determined by testing in accordance with ASTM E-84 by a testing
      organization acceptable to authorities having jurisdiction.
   2. Acoustical Performance Characteristics: Provide ceiling panels with acoustical
      absorption characteristics as indicated in Part 2, which have been determined by testing
      fully assembled production material in accordance with ASTM C-423 (Type E 400
      mounting method as defined by ASTME-795) by a testing organization acceptable to
authors having jurisdiction. Approved testing organization must be independent of
the manufacturer.

1.03 SUBMITTALS

A. Shop Drawings: Submit CAD generated shop drawings prepared by the manufacturer showing
all necessary details and dimension requirements.

B. Samples: Submit manufacturer's standard 8 by 11-inch sample panels of each type of product
as specified. Product shall be original production material in veneer finish specified for final
use.

C. Certification: Submit to the owner a certificate of compliance to specified acoustical and fire
performance criteria as stated section 1.02 and Part 2 of this specification, signed by an officer
of the panel manufacturer, and attach independent laboratory test results for each product
used, showing that the products supplied as components meet or exceed the specified
requirements. Submit additional test results to owner as requested detailing compliance to
updated code requirements.

D. Manufacturers Approval: The manufacturer shall have the right to approve the selection of
the installing contractor and to verify that said contractor has sufficient experience and
expertise to complete the project in a satisfactory manner.

E. LEED Submittals:
   1. Credits MR 4.1 and 4.2 - Recycled Content:
      a. Submit documentation from manufacturer indicating separate percentages, by
         weight, of pre-consumer and post-consumer recycled content per unit of product.
         Also include material costs, excluding cost of installation.

   2. Credits MR 5.1 and 5.2 - Local/Regional Materials:
      a. Indicate location of manufacturing facility, including name, address, and distance
         between manufacturing facility and the project site. Provide manufacturer’s
documentation indication location where the base materials were extracted,
mined, quarried, harvested, etc., and the distance between this location and the
project site. Also include material costs, excluding cost of installation.
1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver fabricated units and related components to the site for installation in accordance with a reasonable schedule furnished by the contractor. On-site storage shall be such as to assure that all panels and associated materials are protected from damage.

B. Prior to panel installation the site must be free of all wet and dusty trades and the climatic conditions stabilized to normal operational levels. Panels shall be allowed to stabilize on site 72 hours prior to installation.

C. Panels must be stored, installed, and maintained only in secure ambient environment (humidity minimum 35% - maximum 55%, Temperature not to exceed 80 deg F (27 deg C).

1.05 GUARANTEE

A. Furnish to the Architect in the Owner’s name, the manufacturers written guarantee covering the products supplied against defects in materials and workmanship under normal operating conditions for a period of one year from the date of shipment. Submit certificates of compliance showing warranty period by dates for each project completed to the Owner.

B. Manufacturer must demonstrate the ability to fully bond the project for its full material value.

PART 2 - PRODUCTS

2.01 ACOUSTIC PANELS


B. Acoustic Panels:
   1. The panels shall be acoustical wood planks consisting of medium density fiberboard (MDF) finished in natural wood veneer. Panels shall be perforated by means of transverse “V” routing on 8mm centers.
   2. The face shall be grooved, the plank shall be perforated from behind and the back is laminated with an acoustically transparent black mat.
   3. The perimeter shall be constructed of matching hardwood faced particle core of adequate thickness to match the core material.
   4. The planks shall be cut to fit on site and shall be installed on steel furring with insulation placed behind the wood planks. Plank width shall be 7-9/16-inches wide by 120-inches long and have tongue and groove edges which shall be mounted to steel furring channels. Actual dimensions shall not vary from determined sizes by more than +/- 1/16-inch vertically and horizontally.
   5. The panels shall be constructed using fire retardant core components meeting or exceeding Class A (Flame-spread of 25 or less and Smoke Developed of 450 or less) when tested in accordance with ASTM E-84 or UL-723 procedures.
   6. The panels shall be installed onto a Drywall Suspension Grid, as specified in Division 09 Section “Non-Structural Metal Framing”.
7. Veneer:
   a. Oak, or as selected by Architect, laquered to match Architects sample.
   b. Veneer shall be quarter cut, slip matched. Clear lacquer finish to 30% sheen.

8. Edge Banding: Provide hardwood edge banding to match veneer.

C. Ceiling Installation:
   1. All grid suspension hardware (hanger wires, rods, anchors, mouldings, etc.), to be supplied by the installing contractor.
   2. Installation shall be in accordance with the manufacturer's instructions and as shown on approved shop drawings. Installer shall provide shimming and adjustments as required to maintain consistent alignment of joints and of finished panel faces.

D. Wall Panel Installation:
   1. Installation shall be by use of concealed aluminum panel clips factory supplied and field attached to the back of the panels, engaged into factory supplied wall clips or continuous Z track fastened to the wall. Clip spacing to be maximum horizontal centres of 24-inches. Adhesively mounted clips are not acceptable.
   2. Installation shall be in accordance with the manufacturer's instructions and as shown on manufacturer's shop drawings. Installer shall provide shimming and adjustments as required to maintain consistent alignment of joints and of finished panel faces.

E. Installation Accessories:
   1. Reveals at Border: “Shadow Molding” as manufactured by Decoustics to match face veneers.

F. 2.02 ACOUSTICAL PROPERTIES

A. Wall and Ceiling panels shall have noise reduction coefficient values of the following when tested in accordance with paragraph 1.02 of this specification.

<table>
<thead>
<tr>
<th>Frequency (Hz)</th>
<th>Panel Type</th>
<th>125</th>
<th>250</th>
<th>500</th>
<th>1000</th>
<th>2000</th>
<th>4000</th>
<th>NRC</th>
<th>SAA</th>
</tr>
</thead>
<tbody>
<tr>
<td>125</td>
<td>Solo 8 - 25mm (ceiling)</td>
<td>0.71</td>
<td>0.88</td>
<td>0.86</td>
<td>0.89</td>
<td>0.70</td>
<td>0.71</td>
<td>0.85</td>
<td>0.81</td>
</tr>
<tr>
<td>250</td>
<td>Solo 8 - 25mm (wall)</td>
<td>0.10</td>
<td>0.45</td>
<td>1.03</td>
<td>0.96</td>
<td>0.51</td>
<td>0.51</td>
<td>0.75</td>
<td>0.73</td>
</tr>
</tbody>
</table>
PART 3 - EXECUTION

3.01  EXAMINATION

A. Verify existing conditions before starting work.
B. Verify that layout of hangers will not interfere with other work.

3.02  INSTALLATION - SUSPENSION SYSTEM

A. Install suspension system in accordance with ASTM C 636, ASTM E 580, and manufacturer's instructions and as supplemented in this section.
B. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.
C. Install after major above-ceiling work is complete. Coordinate the location of hangers with other work.
D. Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.
E. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.
F. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.
G. Support fixture loads using supplementary hangers located within 6 inches of each corner, or support components independently.
H. Do not eccentrically load system or induce rotation of runners.
I. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
   1. Use longest practical lengths.
   2. Overlap and rivet corners.
3.03 INSTALLATION - ACOUSTICAL UNITS
   A. Install acoustical units in accordance with manufacturer's instructions.
   B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.
   C. Fit border trim neatly against abutting surfaces.
   D. Install units after above-ceiling work is complete.
   E. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.
   F. Cutting Acoustical Units:
      1. Cut to fit irregular grid and perimeter edge trim.
      2. Make field cut edges of same profile as factory edges.
   G. Install hold-down clips on ceiling panels within 20 feet of an exterior door.

3.04 ERECTION TOLERANCES
   A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.
   B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

3.05 ADJUSTMENT AND REPLACEMENT
   A. The Owner shall inspect the installation and product on completion. The manufacturer shall provide repair or replacement of components not conforming to requirements as stated herein and said work will then become bound by the terms of this specification.
   B. Installation labor for removal and replacement of product improperly installed and not conforming to specified installation instructions as detailed in section 1.03 and Part 2 and shown on Drawings, shall be the responsibility of the installing Contractor.

3.06 CONSTRUCTION WASTE MANAGEMENT
   A. Construction waste shall be managed in accordance with provisions of Division 01 Section “Construction Waste Management and Disposal.” Documentation shall be submitted to satisfy the requirements of that section.

END OF SECTION
SECTION 09 51 15

ABSORPTIVE PANEL ACOUSTICAL CEILINGS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. All labor, materials, and plant as required for the fabrication and delivery of flat and curved absorptive panel acoustical ceilings.

B. Related Sections:
   1. Division 09 Section "Non-Structural Metal Framing" for gypsum board suspension systems.
   2. Division 09 Section "Gypsum Board" for gypsum board partitions.
   3. Division 09 Sections for other ceiling systems.
   4. Division 09 Section "Painting" for paint finishes of wall and ceiling surface behind and between panel ceilings.
   5. Division 21 Sections "Wet Pipe Sprinkler Systems" and "Dry Pipe Sprinkler Systems" for life safety equipment.
   6. Division 23 Sections for air handling, heating and air conditioning, plumbing and other mechanical services as required.
   7. Division 26 Section "Lighting and Accessories" for light fixtures and electrical services and connections.

1.02 QUALITY ASSURANCE

A. Manufacturer and Installer Qualifications: Firm manufacturing the specified product shall have adequate capacity required for projects listed and have successfully completed similar projects for a period of not less than five years. The installer should be approved by the manufacturer as qualified to perform work required.

B. Reference Standards: Conform to all governing laws, building codes, and the following performance criteria:
   1. Fire Performance Characteristics: Provide ceiling panels with surface-burning characteristics as determined by testing panel assemblies in accordance with ASTM E84 test procedures. Testing must be performed by a testing organization acceptable to authorities having jurisdiction.
      a. ASTM E-84 – Classification: Class "A" or "1"
      b. Flame Spread: 25 or less
      c. Smoke Developed: 450 or less.

   2. Acoustical Performance Characteristics: Provide ceiling panels with acoustical absorption characteristics as indicated in Part 2, which have been determined by testing fully assembled production material in accordance with ASTM C-423 (Type "E400" mounting as defined by ASTM E-795) by a testing organization acceptable to authorities having jurisdiction. Approved testing organization must be independent of the manufacturer.
3. Ceiling panels shall have toxicity characteristics, which have been determined by testing full assemblies (component tests are not acceptable) of identical materials and construction in accordance with section 27-348 of the New York State uniform fire prevention and building code MEA division.
   a. MEA Acceptance Number MEA 327-00-M.

4. Grid system: Provide a report by an independent structural engineer indicating that grid system is suitable for installation in a seismic zone D (previously 4) area.

1.03 SUBMITTALS

A. Shop Drawings: Submit CAD generated shop drawings prepared by the manufacturer showing all necessary details and dimension requirements.

B. Samples: Submit manufacturer’s standard 8 by 11-inch sample panels of each type of product as specified. Product shall be original production material in veneer finish specified for final use.

C. Certification: Submit to the owner a certificate of compliance to specified acoustical and fire performance criteria as stated section 1.02 and Part 2 of this specification, signed by an officer of the panel manufacturer, and attach independent laboratory test results for each product used, showing that the products supplied as components meet or exceed the specified requirements. Submit additional test results to owner as requested detailing compliance to updated code requirements.

D. Manufacturers Approval: The manufacturer shall have the right to approve the selection of the installing contractor and to verify that said contractor has sufficient experience and expertise to complete the project in a satisfactory manner.

E. LEED Submittals:
   1. Credits MR 4.1 and 4.2 - Recycled Content:
      a. Submit documentation from manufacturer indicating separate percentages, by weight, of pre-consumer and post-consumer recycled content per unit of product. Also include material costs, excluding cost of installation.

   2. Credits MR 5.1 and 5.2 - Local/Regional Materials:
      a. Indicate location of manufacturing facility, including name, address, and distance between manufacturing facility and the project sit. Provide manufacturer’s documentation indication location where the base materials were extracted, mined, quarried, harvested, etc., and the distance between this location and the project site. Also include material costs, excluding cost of installation.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver fabricated units and related components to the site for installation in accordance with a reasonable schedule furnished by the contractor. On-site storage shall be such as to assure that all panels and associated materials are protected from damage, and storage area is climatically controlled to normal operational levels.
B. Prior to panel installation, the site must be free of all wet and dusty trades and the climatic conditions stabilized to normal operational levels. Panels shall be allowed to stabilize on site 24 hours prior to installation.

C. Panels must only be handled by persons wearing clean light-weight gloves. It is very important that personnel installing hardware (clips, ceiling suspension members/systems, springs etc.) do not handle the panels before putting the clean lightweight gloves on.

1.05 GUARANTEE

A. Furnish to the Architect in the Owner’s name, the manufacturers written guarantee covering the products supplied against defects in materials and workmanship under normal operating conditions for a period of one year from the date of shipment. Submit certificates of compliance showing warranty period by dates for each project completed to the Owner.

PART 2 - PRODUCTS

2.01 ACOUSTICAL ABSORPTIVE CEILING PANELS

A. Provide acoustical ceiling treatment as manufactured by one of the following:
   1. Decoustics Limited: www.decoustics.com
   2. Wall Technology: www.walltechnology.com

B. Furnish and deliver prefabricated acoustical ceiling panels as described in this section for installation in areas as shown on drawings meeting or exceeding the following requirements.

2.02 CURVED CEILING PANEL SYSTEM (Typical Light Reflectors)

A. Panels:
   1. Fabricate panels to sizes and configurations indicated; attach facing materials to cores to produce installed panels with uniform visible surfaces similar to gypsum board.
   2. Provide complete system of panels, concealed supports and hangers as follows:
      a. Type ME/VATT panels with Claro acoustically transparent textured finish by Decoustics, Mounting E-400, 1-1/16-inch thick (1-inch thick acoustical core with 6 to 7 lbs./ft.$^3$ density and 1/16-inch rigid (high density) facing) with concealed Z clip support system.
         1) Returns: Factory applied 4-inch angular perimeter returns to create a panel appearing to be 4-inches thick.
         2) Curvature: Precure edges and panels to radius indicated on the drawings.
         3) Edges: Coated mill finished aluminum in color to match panel face.
         4) Marking: Mark backs of panels with text indicating Project ID Number, panel number, location code and quantity of units per size, each of which correspond to the approved shop drawings.
         5) Color: Manufacturer’s standard white color, or as approved by the Architect.
   3. Provide sizes as shown on the drawings.
   4. Provide removable panels where access is required.
5. Panel Supports: Manufacturer’s standard concealed z-clip system suited to framing system indicated and which will permit removal and replacement of each panel without removing other panels.

6. Products: "Type ME/VATT Panels with Claro Acoustically Transparent Textured Finish" as manufactured by Decoustics.

B. Suspension System:
1. Comply with the requirements of Division 09 Section “Non-Structural Metal Framing” for gypsum board ceiling suspension system members. Curve main channel members to match radius of panels to be provided.
2. Include hat channels running longitudinally down length of panel support system. Place at spacing recommended by the manufacturer for the type of panels indicated.
3. Coordinate suspension system with and design suspension system to accommodate suspended linear pendant light fixtures as scheduled. Verify weight of light fixtures with light fixture manufacturer.
4. Stainless Steel Aircraft Cable: Satin stainless steel or as approved by the Architect, 0.125-inch minimum diameter, unless otherwise required to carry indicated weight of panels. Include required anchoring accessories.

2.03 FLAT CEILING PANEL SYSTEM

A. Panels:
1. Fabricate panels to 48-inch by 48-inch size; attach facing materials to cores to produce installed panels with uniform visible surfaces similar to gypsum board.
2. Provide complete system of panels, concealed supports and hangers as follows:
   a. Modular type panels for mounting in standard steel T-bar grid as specified below, 1-1/16-inch thick (1-inch thick acoustical core with 6 to 7 lbs./ft.\(^3\) density and 1/16-inch rigid (high density) facing) with concealed saddle and spring clip support system with defined 0.125-inch joints.
      1) Edges: Coated mill finished aluminum in color to match panel face.
      2) Color: Manufacturer’s standard white color as approved by the Architect.
3. Panel Supports: Manufacturer’s standard concealed saddle for use over specified T-bar grid suspension system with panels held securely in place by spring clip system and which will permit removal and replacement of each panel without removing other panels.
4. Products: "Ceilencio Modular Type Panels with Claro Acoustically Transparent Textured Finish" as manufactured by Decoustics.

B. T-Bar Suspension System:
1. Comply with ASTM C635, as applicable to the type of suspension system required for the type of ceiling units indicated. Provide 1.5-inch high steel T-bar system compatible with required acoustical treatment.
   b. Hanger Wires: Galvanized carbon steel, ASTM A641, soft temper, pre-stretched, yield-stress load of at least 3 times design load, not less than 12-gauge (0.106-inch).
2. Products: Subject to compliance with requirements, provide products by one of the following:

2.04 ACOUSTICAL PROPERTIES

A. Panels shall have noise reduction coefficient values of the following when tested in accordance with Article 1.02 of this specification.

<table>
<thead>
<tr>
<th>Panel Type</th>
<th>Thickness</th>
<th>Finish</th>
<th>125</th>
<th>250</th>
<th>500</th>
<th>1000</th>
<th>2000</th>
<th>4000</th>
<th>NRC</th>
<th>SAA</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME/VATT</td>
<td>1-1/16&quot;</td>
<td>Claro</td>
<td>0.26</td>
<td>0.45</td>
<td>0.87</td>
<td>1.08</td>
<td>1.15</td>
<td>1.08</td>
<td>0.90</td>
<td>0.88</td>
</tr>
<tr>
<td>QPP-19</td>
<td>1-3/8&quot;</td>
<td>Claro</td>
<td>0.74</td>
<td>0.79</td>
<td>0.72</td>
<td>1.00</td>
<td>1.02</td>
<td>0.78</td>
<td>0.90</td>
<td>0.88</td>
</tr>
<tr>
<td>QPP-50</td>
<td>2-3/8&quot;</td>
<td>Claro</td>
<td>0.80</td>
<td>0.87</td>
<td>1.00</td>
<td>1.07</td>
<td>1.06</td>
<td>1.00</td>
<td>1.00</td>
<td>0.98</td>
</tr>
</tbody>
</table>

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that layout of hangers will not interfere with other work.

3.02 INSTALLATION - GENERAL

A. Install suspension system in accordance with ASTM C 636, ASTM E 580, and manufacturer's instructions and as supplemented in this section.

B. Install after major above-ceiling work is complete. Coordinate the location of hangers with other work.

C. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.

D. Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.

E. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.

F. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.

G. Support fixture loads using supplementary hangers located within 6 inches of each corner, or support components independently.
H. Do not eccentrically load system or induce rotation of runners.

3.03 INSTALLATION – CURVED PANEL SYSTEM

A. Suspension System:
1. Accurately measure area and establish layout of acoustical ceiling treatment, in conjunction with related light fixtures, to ensure exact layout of the system.
2. Comply with the requirements of Division 09 Section “Gypsum Board” as applicable to the work of this section.
3. Support suspension system on aircraft cable securely anchored to structure above. Locate hanger wires within 12-inches of each panel corner and at a spacing not to exceed 48-inches on center each way.
4. Comply with specific recommendations of panel manufacturer for conditions peculiar to this project.

B. Panels:
1. Install materials in accordance with manufacturer’s printed instructions, and to comply with governing regulations, fire resistance rating requirements as indicated, and industry standards applicable to the work. Do not start this work until above ceiling work is complete, painting is complete, and all floor coverings have been installed (carpet excepted).
   a. Panels must only be handled by persons wearing clean light-weight gloves. It is very important that personnel installing hardware (clips, ceiling suspension members/systems, springs etc.) do not handle the panels before putting the clean lightweight gloves on.

2. Install metal supports on suspension system using quantities and types of supports recommended by manufacturer for system and substrate.
3. Locate accurately so that panels will be plumb, level, uniform at joints and to assure that finished surfaces will be in a true plane.

3.04 INSTALLATION – FLAT PANEL SYSTEM

A. Suspension System:
1. Install suspension system to comply with ASTM C636, with hangers supported only from building structural members as indicated.
2. Locate hangers near each end (within 12-inches) and spaced not more than 4'-0” along each carrying channel or direct-hung runner. Install additional hanger wires at recessed light fixtures, HVAC diffusers, and other items resting on same ceiling component.
   a. Secure wire hangers by looping and wire-tying, either directly to structures or to inserts, eye-screws, or other devices which are secure and appropriate for the substrate, and which will not deteriorate or fail with age or elevated temperatures.
B. Panel Installation:
   1. Install materials in accordance with manufacturer’s printed instructions, and to comply with governing regulations, fire resistance rating requirements as indicated, and industry standards applicable to the work. Do not start this work until painting is complete and all floor coverings have been installed (carpet excepted).
   2. Install metal saddles on suspension system as recommended by manufacturer.
   3. Install panel retaining springs and spring retaining clips per manufacturer’s printed instructions and as required to hold panels in place without exposed fastening devices on the panel surface. Maintain consistent 0.125-inch joint between adjacent panels and between panels and adjacent construction.
   4. Locate accurately so that panels will be plumb, level, uniform at joints and to assure that finished surfaces will be in a true plane.

3.05 ERECTION TOLERANCES
   A. Maximum Variation from Flat and Level Surface: 1/8-inch in 10 feet.
   B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

3.06 CLEANING AND PROTECTION
   A. Clean exposed surfaces of acoustical ceiling treatment. Comply with manufacturer’s instructions for cleaning and repair of minor finish damage. Remove and replace work which cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.
   B. The Installer shall advise the Contractor of required protection for the acoustical ceiling treatment, including temperature and humidity limitations and dust control, so that the work will be without damage and deterioration at the time of acceptance by the Owner.

3.07 ADJUSTMENT AND REPLACEMENT
   A. The Owner shall inspect the installation and product on completion. The manufacturer shall provide repair or replacement of components not conforming to requirements as stated herein, and said work will then become bound by the terms of this specification.
   B. Installation labor for removal and replacement of product improperly installed and not conforming to specified installation methods as detailed shown on approved shop drawings, shall be the responsibility of the installing Contractor.

END OF SECTION
SECTION 09 51 23
ACOUSTICAL TILE CEILINGS

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes acoustical tiles for ceilings and the following:
   1. Exposed suspension systems.

B. Related Sections include the following:
   1. Division 09 Section "Acoustical Panel Ceilings" for ceilings consisting of wood, mineral-base, and glass-fiber-base acoustical panels and exposed suspension systems.
   2. Division 09 Section "Curved Profile Ceiling Suspension Systems."

1.02 DEFINITIONS

A. AC: Articulation Class.

B. CAC: Ceiling Attenuation Class.

C. LR: Light-Reflectance coefficient.

D. NRC: Noise Reduction Coefficient.

1.03 SUBMITTALS

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

B. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:
   1. Ceiling suspension system members.
   2. Method of attaching hangers to building structure.
   3. Size and location of initial access modules for acoustical tile.
   4. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
   5. Minimum Drawing Scale: 1/8 inch = 1 foot.

C. Samples for Initial Selection: For components with factory-applied color finishes.

D. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.
   1. Acoustical Tile: Set of full-size Samples of each type, color, pattern, and texture.
   2. Concealed Suspension System Members: 12-inch long Sample of each type.
   3. Exposed Moldings and Trim: Set of 12-inch long Samples of each type and color.
E. LEED Submittals:
   1. Product Data for Credit MR 4.1 and MR 4.2: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.
      a. Include statement indicating costs for each product having recycled content.
   2. Product Data for Credit EQ 4.1: For adhesives and sealants, including printed statement of VOC content.

F. Qualification Data: For testing agency.

G. Field quality-control test reports.

H. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each acoustical tile ceiling.

I. Research/Evaluation Reports: For acoustical tile ceiling and components and anchor and fastener type.

J. Maintenance Data: For finishes to include in maintenance manuals.

1.04 QUALITY ASSURANCE

A. Acoustical Testing Agency Qualifications: An independent testing laboratory, or an NVLAP-accredited laboratory, with the experience and capability to conduct the testing indicated. NVLAP-accredited laboratories must document accreditation, based on a "Certificate of Accreditation" and a "Scope of Accreditation" listing the test methods specified.

B. Source Limitations:
   1. Acoustical Ceiling Tile: Obtain each type through one source from a single manufacturer.
   2. Suspension System: Obtain each type through one source from a single manufacturer.

C. Source Limitations: Obtain each type of acoustical ceiling tile and supporting suspension system through one source from a single manufacturer.
   1. Surface-Burning Characteristics: Provide acoustical tiles with the following surface-burning characteristics complying with ASTM E 1264 for Class A materials as determined by testing identical products per ASTM E 84:
      a. Smoke-Developed Index: 450 or less.

D. Seismic Standard: Provide acoustical tile ceilings designed and installed to withstand the effects of earthquake motions according to the following:

E. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
   1. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

F. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical tiles, suspension system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical tiles, permit them to reach room temperature and a stabilized moisture content.

C. Handle acoustical tiles carefully to avoid chipping edges or damaging units in any way.

1.06 PROJECT CONDITIONS

A. Environmental Limitations: Do not install acoustical tile ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
   1. Pressurized Plenums: Operate ventilation system for not less than 48 hours before beginning acoustical tile ceiling installation.

1.07 COORDINATION

A. Coordinate layout and installation of acoustical tiles and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

1.08 WARRANTY

A. Acoustical Panel: Submit a written warranty executed by the manufacturer, agreeing to repair or replace acoustical panels that fail within the warranty period. Failures include, but are not limited to:
   1. Acoustical Panels: Sagging and warping as a result of defects in materials or factory workmanship.
   2. Grid System: Rusting and manufacturer's defects
3. Acoustical Panels designated as inherently resistive to the growth of micro-organisms: Visible sag and will resist the growth of mold/mildew and gram positive and gram negative odor and stain causing bacteria.

B. Warranty Period:
   1. Acoustical panels: Ten years from date of substantial completion.
   2. Grid: Ten years from date of substantial completion.

C. The Warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

1.09 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Acoustical Ceiling Units: Full-size tiles equal to 2.0 percent of quantity installed.
   2. Suspension System Components: Quantity of each concealed grid and exposed component equal to 2.0 percent of quantity installed.

PART 2 - PRODUCTS

2.01 ACOUSTICAL TILES, GENERAL

A. Recycled Content: Provide acoustical tiles with postconsumer and preconsumer recycled content.

B. Acoustical Tile Standard: Provide manufacturer's standard tiles of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances, unless otherwise indicated.
   1. Mounting Method for Measuring NRC: Type E-400; plenum mounting in which face of test specimen is 15-3/4 inches away from test surface per ASTM E 795.

C. Acoustical Tile Colors and Patterns: Match appearance characteristics indicated for each product type.
   1. Where appearance characteristics of acoustical tiles are indicated by referencing pattern designations in ASTM E 1264 and not manufacturers' proprietary product designations, provide products selected by Architect from each manufacturer's full range that comply with requirements indicated for type, pattern, color, light reflectance, acoustical performance, edge detail, and size.

D. Broad Spectrum Antimicrobial Fungicide and Bactericide Treatment: Provide acoustical tiles treated with manufacturer's standard antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested according to ASTM D 3273 and evaluated according to ASTM D 3274 or ASTM G 21.
E. Antimicrobial Fungicide Treatment: Provide acoustical tiles with face and back surfaces coated with antimicrobial treatment consisting of manufacturer’s standard formulation with fungicide added to inhibit growth of mold and mildew and showing no mold or mildew growth when tested according to ASTM D 3273 and evaluated according to ASTM D 3274 or ASTM G 21.

2.02 ACOUSTICAL TILES FOR ACOUSTICAL TILE CEILING

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
   2. BPB USA: [www.bpb-na.com](http://www.bpb-na.com)
   3. USG Interiors, Inc.: [www.usg.com](http://www.usg.com)

B. Acoustical Ceiling Tiles (ACT-1):
   3. Type and Form: Type IV, Form 2.
   4. Pattern: E.
   5. LR: Not less than 0.90.
   6. NRC: Not less than 0.70.
   7. CAC: Not less than 35.
   8. Thickness: 3/4 inch.
   10. Modular Size: 24 by 48 inches.
   12. Use with suspended grid system SG-1.

C. Acoustical Ceiling Tiles (ACT-2):
      a. Product shall be low formaldehyde – contributing less than 13.5 ppb in typical conditions per ASHRAE Standard 62, “Ventilation for Acceptable Indoor Air Quality,” California Code Title 24, and other building types in CHPS Section 01350.
   3. Type and Form: Type XII, Form 2.
   4. Pattern: E.
   5. LR: Not less than 0.90.
   6. NRC: 0.95.
   8. Edge: Square.
   9. Modular Size: Varies, see Drawings.
   11. Use with suspended grid system SG-1.
2.03 METAL SUSPENSION SYSTEMS, GENERAL

A. Recycled Content: Provide products made from steel sheet with average recycled content such that postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.

B. Metal Suspension System Standard: Provide manufacturer's standard metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635.

C. Finishes and Colors, General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Provide manufacturer's standard factory-applied finish for type of system indicated.

D. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.
   1. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated, and with capability to sustain, without failure, a load equal to 10 times that imposed by ceiling construction, as determined by testing per ASTM E 1190, conducted by a qualified testing and inspecting agency.

E. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:
   2. Size: Select wire diameter so its stress at 3 times hanger design load (ASTM C 635, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.106-inch-diameter wire.

2.04 METAL SUSPENSION SYSTEMS FOR ACOUSTICAL TILE CEILING

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
   2. Chicago Metallic Corporation: www.chicagometallic.com
   3. USG Interiors, Inc.: www.usg.com

A. Suspended Grid System SG-1:
   1. Components: All main beams and cross tees shall be commercial quality hot-dipped galvanized steel, as per ASTM A 653. Main beams and cross tees are double-web steel construction with type exposed flange design. Exposed surfaces chemically cleansed, capping pre-finished galvanized steel in baked polyester paint. Main beams and cross tees shall have rotary stitching.
      b. Color: White and match the actual color of the selected ceiling tile, unless noted otherwise.
      c. Attachment Devices: Size for five times design load indicated in ASTM C 635, Table 1, Direct Hung unless otherwise indicated.
d. Wire for Hangers and Ties: ASTM A 641, Class 1 zinc coating, soft temper, pre-stretched, with a yield stress load of at least time three design load, but not less than 12 gauge.

e. Edge Moldings and Trim: Galvanized steel of types and profiles indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations, including light fixtures, that fit type of edge detail and suspension system indicated. Provide moldings with exposed flange of the same width and finish as exposed runner.

f. Product: "Prelude ML 15/16-inch Exposed Tee" as manufactured by Armstrong World Industries, Inc. or equivalent.

2.05 METAL EDGE MOLDINGS AND TRIM

A. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension system runners.

1. Provide manufacturer's standard edge moldings that fit acoustical tile edge details and suspension systems indicated and that match width and configuration of exposed runners, unless otherwise indicated.

2. For curved edges of ceiling, provide edge moldings fabricated to diameter required to fit edge exactly.

B. Extruded-Aluminum Edge Moldings and Trim: Where indicated, provide manufacturer's extruded-aluminum edge moldings and trim of profile indicated or referenced by manufacturer's designations, including splice plates, corner pieces, and attachment and other clips, complying with seismic design requirements and the following:

2.06 MISCELLANEOUS MATERIALS

A. Tile Adhesive: Type recommended by tile manufacturer, bearing UL label for Class 0-25 flame spread.

1. Use adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, including structural framing and substrates to which acoustical tile ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical tile ceilings.

1. Proceed with installation only after unsatisfactory conditions have been corrected.
3.02 PREPARATION

A. Testing Substrates: Before installing adhesively applied tiles on wet-placed substrates such as cast-in-place concrete or plaster, test and verify that moisture level is below tile manufacturer's recommended limits.

B. Measure each ceiling area and establish layout of acoustical tiles to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width tiles at borders, and comply with layout shown on reflected ceiling plans.

3.03 INSTALLATION, SUSPENDED ACOUSTICAL TILE CEILINGS

A. General: Install acoustical tile ceilings to comply with ASTM C 636 and seismic design requirements indicated, per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."

B. Suspend ceiling hangers from building's structural members and as follows:
   1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
   2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
   3. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
   4. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
   5. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
   6. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
   7. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
   8. Do not attach hangers to steel roof deck. Attach hangers to structural members.
   9. Space hangers not more than 48 inches o.c. along each member supported directly from hangers, unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
   10. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
C. Install edge moldings and trim of type indicated at perimeter of acoustical tile ceiling area and where necessary to conceal edges of acoustical tiles.
   1. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet. Miter corners accurately and connect securely.

D. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

E. Install acoustical tiles in coordination with suspension system and exposed moldings and trim. Place splines or suspension system flanges into kerfed edges so tile-to-tile joints are closed by double lap of material.
   1. Fit adjoining tile to form flush, tight joints. Scribe and cut tile for accurate fit at borders and around penetrations through tile.
   2. Hold tile field in compression by inserting leaf-type, spring-steel spacers between tile and moldings, spaced 12 inches o.c.

3.04 CLEANING

A. Replace damaged and broken panels.

B. Clean exposed surfaces of acoustical tile ceilings, including trim and edge moldings. Comply with manufacturer’s written instructions for cleaning and touchup of minor finish damage. Remove and replace tiles and other ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION
SECTION 09 51 33

METAL PANEL SOFFIT SYSTEM

PART 1 - GENERAL

A. SUMMARY

B. Section includes snap-in acoustical metal pans and the following suspension system for ceilings:
   1. Direct-hung, concealed grid designed to support metal pans.

C. Related Sections
   1. Division 09 Section "Acoustical Tile Ceilings" for ceilings consisting of mineral-base acoustical tiles used with concealed suspension systems, stapling, or adhesive bonding.
   2. Divisions 21, 23, and 26 Sections for light fixtures, sprinklers, and air-distribution components.

D. References:
   3. ASTM C 423 “Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method”.
   5. ASTM C 636 “Recommended Practice for Installation of Metal Ceiling Suspension Systems for Acoustical and Lay-in Panels”.
   7. ASTM A 653 “Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process”.

1.02 PERFORMANCE REQUIREMENTS

A. Structural Performance: Exterior snap-in metal pan ceilings shall withstand exterior exposure and the effects of gravity loads and the following loads and stresses without showing permanent deformation of ceiling system components including pans and suspension system; noise or metal fatigue caused by vibration, deflection, and displacement of ceiling units; or permanent damage to fasteners and anchors.
   1. Wind Load: Uniform pressure as indicated on Drawings, acting inward or outward.

B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
   1. Temperature Change (Range): 100 deg F.
1.03 SUBMITTALS

A. Product data: Manufacturers standard data sheets listing dimensions and details.

B. LEED Submittals:
   1. Product Data for Credit MR 4.1 and MR 4.2: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.
      a. Include statement indicating costs for each product having recycled content.
   2. Product Data for Credit EQ 4.1: For sealants, including printed statement of VOC content.

C. Samples for Initial Selection: For components with factory-applied color and other decorative finishes.

D. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below:
   1. Metal Pans: Set of 6-inch- square Samples of each type, finish, color, pattern, and texture. Show pan edge profile.
   2. Exposed Suspension System Members, Moldings and Trim: Set of 12-inch- long Samples of each type, finish, and color.
   3. Sound Absorber: Match size of Sample metal pan.

E. Performance Data: For installed products indicated to comply with design loads and other criteria, include structural analysis and other analytical data signed and sealed by the qualified professional engineer responsible for their preparation.

F. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from Installers of the items involved:
   1. Ceiling panel joint locations and sizes.
   2. Ceiling perimeter and penetrations through the ceiling; and trim and moldings.

G. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each acoustical metal pan ceiling.

H. Maintenance Data: For finishes to include in maintenance manuals.

1.04 QUALITY ASSURANCE

A. Acoustical Testing Agency Qualifications: An independent testing laboratory or an NVLAP-accredited laboratory, with the experience and capability to conduct the testing indicated. NVLAP-accredited laboratories must document accreditation, based on a "Certificate of Accreditation" and a "Scope of Accreditation" listing the test methods specified.
B. Source Limitations:
   1. Acoustical Ceiling Pans: Obtain each type from single source from single manufacturer.
   2. Suspension Systems: Obtain each type from single source from single manufacturer.

C. Source Limitations for Acoustical Metal Pan Ceilings: Obtain each combination of acoustical metal pans and exposed suspension systems from one source with resources to provide products of consistent quality in appearance, physical properties, and performance.

D. Surface-Burning Characteristics: Complying with ASTM E 1264 for Class A materials as determined by testing identical products according to ASTM E 84 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.

E. Seismic Standard: Provide acoustical metal pan ceilings designed and installed to withstand the effects of earthquake motions according to the following:

F. Preinstallation Conference: Conduct conference at Project site.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical metal pans, suspension system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

B. Handle acoustical metal pans, suspension system components, and accessories carefully to avoid damaging units and finishes in any way.

1.06 PROJECT CONDITIONS

A. Environmental Requirements:
   1. Verify weather tightness of area to receive suspension system prior to installation.
   2. Wet trades work to be thoroughly dry and complete prior to suspension system installation.
   3. Installation to begin only when temperature and humidity conditions approximate interior conditions which will exist when area is complete and occupied.
   4. Deliver materials in manufacturers original packaging, unopened and undamaged.
   5. Store materials in an enclosed dry location at room temperature and protect from damage.

1.07 WARRANTY

A. Acoustical Panels: Submit a written warranty executed by the manufacture agreeing to repair or replacement of acoustical panels that fail within the warranty period, Failures include but are not limited to:
1. Acoustical metal panels: Sagging, warping, rusting and manufacturer’s defects
2. Acoustical suspension: Rusting and manufacturer’s defects

B. Warranty period for Acoustical Metal Pan Ceiling is 1 years from date of Substantial Completion

1.08 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Acoustical Metal Pans: Full-size units equal to 2 percent of quantity installed.
   2. Suspension System Components: Quantity of each grid and exposed molding and trim equal to 2 percent of quantity installed.
   3. Hold-Down Clips: Equal to 2 percent of quantity installed.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design Product: “Snap-in Exterior Metal Panel Ceiling System” as manufactured Simplex Ceilings, [www.simplexceilings.com](http://www.simplexceilings.com), by or products by one of the following:
   1. American Decorative Ceilings: [www.am-dec.com](http://www.am-dec.com).
   7. Simplex Ceilings, a division of Intalite Inc. [www.simplexceilings.com](http://www.simplexceilings.com).
   8. USG Interiors, Inc. [www.usg.com](http://www.usg.com).

2.02 MATERIALS

A. Recycled Content: Provide products made from steel sheet with average recycled content such that postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.

B. Suspension System:
   1. Main Tee: Snap-bar formed into T-shape to receive the vertical flanges of metal soffit panels with tight panel interlock, alignment and adjacent panels level at the ceiling plane. Formed from 0.020 inch HDG steel.
   2. Spacer Tee: Manufactured from 0.015 in. galvanized steel formed into T-shape.
   3. Panel Retention Clip for UL Class 30 exterior soffits: Formed from 16 ga. galvanized steel wire into angled V shape to interlock four panel corners to Main Tee.
   4. Brace Clip for UL Class 30 exterior soffits: Manufactured from 0.040-inch galvanized steel for fastener attachment to suspension and bracing.
   5. Structural bracing to meet requirements of UL Class 30 classification and specified project design requirements.
C. Metal Panels:
   1. Snap-In Metal Panels for Exterior Soffits:
      a. Panels shall measure 20- by 60- inches with 90-degree upturned legs on all four sides. Panels shall be formed with square edges.
      b. Panels formed from 0.040-inch aluminum, perforated with 0.0625-inch diameter holes at 0.226-inch lineal centers, 12-percent open area.
      c. Finish to be painted with a baked enamel finish “Satin Silver Metallic” or as selected by Architect from manufacturers full range.
   2. Acoustical Material:
      a. Black acoustical non-woven fiber adhered with glue to the back of the panel.

D. Perimeter Treatment:
   1. Exterior Wall Channel and Hold-Down Insert: Channel made from 0.032-inch aluminum in C-shape, with 3/4-inch top leg, 2-1/2-inch I.D., and 2-inch bottom leg. Hold-Down Insert is formed from same material as wall channel in C-shape, with 3/4-inch legs, 2-7/16-inch I.D., 22 inches long.

E. Accessories:
   1. Exterior Panel Access Door Assembly: Where required for access, provide in same size and finish as panels. Provide with four exposed fasteners that lock to the suspension support angles.
   2. Expansion Joints: Formed from 0.032-inch aluminum into a C-shape, with 1-3/4-inch top leg, 2-1/2-inch I.D., and 2 inch bottom leg. Top angle to be formed from same material with 1/2-inch vertical and 4 inch horizontal leg.

2.03 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, including structural framing to which acoustical metal pan ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with
requirements for installation tolerances and other conditions affecting performance of acoustical metal pan ceilings.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. General:
1. For exterior soffit applications install in accordance with ASTM C636.

B. Suspension:
1. Snap-Bar Main Tees: Install 60-inches O.C., by direct suspension from existing structure, with not less than 12 gage steel hanger wires spaced no more than 48-inches O.C. along main tee length. Wrap hanger wires tightly 3 full turns at each end. Brace against wind uplift as necessary to meet UL 580 Class 30.
2. Cross Tees: Install perpendicular to main tees 20 in. O.C.

C. Metal Panels:
1. Snap-in Metal Panels: Install Metal Panel into Main Tee carrier ensuring embosses on vertical legs are fully engaged into Main Tee and panel edges are aligned.
2. For snap-in pans, fit adjoining units to form flush, tight joints.
3. For Seismic and Exterior Soffit applications install wire retention clips through holes in panel vertical flanges, connecting four panel corners together and secure by tying wire clips across top of Snap-Bar Main Tee.

D. Perimeter Treatment:
1. Perimeter treatment: Install channel on vertical surfaces, intersecting suspension components, by appropriate method in accordance with industry accepted practice.
2. Do not use exposed fasteners, including pop rivets, on moldings and trim.
3. Hold-down inserts install between the top leg of the wall channel and all metal panels.
4. Additional Hanger Wires at locations where imposed loads could cause deflection exceeding 1/360 span.

3.03 CLEANING AND REPAIR

A. Clean exposed surfaces of acoustical metal pan ceilings, including trim and edge moldings after removing strippable, temporary protective covering, if any. Comply with manufacturer's written instructions for stripping of temporary protective covering, cleaning, and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage, including dented and bent units.

B. Remove damaged components, replace with undamaged components. Clean with non-solvent based non-abrasive commercial cleaning solution.

END OF SECTION
SECTION 09 53 13
CURVED PROFILE CEILING SUSPENSION SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Metal ceiling panels.
   2. Exposed grid suspension system.
   3. Wire hangers, fasteners, main runners, cross tees, and wall angle moldings.

B. Related Sections:
   1. Division 09 Section “Acoustical Tile Ceilings” for other ceiling systems.
   2. Division 23 Sections for HVAC items installed in curved ceilings.
   3. Division 26 Sections for Electrical items installed in curved ceilings.

C. References:
      b. ASTM A 653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.
      c. ASTM A 1008 "Standard Specification for Steel, Sheet, Cold Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability"
      e. ASTM C 636 Recommended Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels.
      g. ASTM E 1264 Classification for Acoustical Ceiling Products.

1.02 SUBMITTALS

A. Product Data: Submit manufacturer’s technical data for each type of acoustical ceiling unit and suspension system required.

B. Samples: Minimum 3- by 3-inch samples of specified acoustical panel; 8-inch long samples of exposed wall molding and suspension system, including main runner and 4-foot cross tees.

C. Shop Drawings: Layout and details of acoustical ceilings. Show locations of items which are to be coordinated with, or supported by the ceilings.
D. LEED Submittals:
   1. Credits MR 4.1 and 4.2 - Recycled Content:
      a. Submit documentation from manufacturer indicating separate percentages, by 
         weight, of pre-consumer and post-consumer recycled content per unit of product. 
         Also include material costs, excluding cost of installation.
   2. Credit MR 5.1 - Local/Regional Materials:
      a. Indicate location of manufacturing facility, including name, address, and distance 
         between manufacturing facility and the project site. Provide manufacturer’s 
         documentation indication location where the base materials were extracted, 
         mined, quarried, harvested, etc., and the distance between this location and the 
         project site. Also include material costs, excluding cost of installation.

1.03 QUALITY ASSURANCE
   A. Single-Source Responsibility: Provide acoustical panel units and grid components by a single 
      manufacturer.
   B. Fire Performance Characteristics: Identify acoustical ceiling components with appropriate 
      markings of applicable testing and inspecting organization.
   C. Surface Burning Characteristics: As follows, tested per ASTM E 84 and complying with ASTM E 
      1264 for Class A products.
      1. Flame Spread: 25 or less
      2. Smoke Developed: 50 or less
   D. Coordination of Work: Coordinate acoustical ceiling work with installers of related work 
      including, but not limited to building insulation, gypsum board, light fixtures, mechanical 
      systems, electrical systems, and sprinklers.

1.04 DELIVERY, STORAGE, AND HANDLING
   A. Deliver acoustical ceiling units to project site in original, unopened packages and store them in 
      a fully enclosed space where they will be protected against damage from moisture, direct 
      sunlight, surface contamination, and other causes.
   B. Before installing ceiling units, permit them to reach room temperature and a stabilized 
      moisture content.
   C. Handle ceiling units carefully to avoid any distortion or damaged units in any way.

1.05 PROJECT CONDITIONS
   A. Environmental Limitations: Do not install acoustical tile ceilings until spaces are enclosed and 
      weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and 
      ambient temperature and humidity conditions are maintained at the levels indicated for 
      Project when occupied for its intended use.
1.06 WARRANTY

A. Submit a written warranty executed by the manufacturer, agreeing to repair or replace acoustical panels that fail within the warranty period. Failures include, but are not limited to:
   1. Acoustical Panels: Sagging and warping
   2. Grid System: Rusting and manufacturer’s defects

B. Warranty Period:
   1. Acoustical panels: Thirty years from date of substantial completion.
   2. Grid: Thirty years from date of substantial completion.
   3. Panels and grid systems supplied by one source manufacturer: Fifteen years from date of substantial completion.

C. The Warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

1.07 MAINTENANCE

A. Extra Materials: Deliver extra materials to Owner. Furnish extra materials described below that match products installed. Packaged with protective covering for storage and identified with appropriate labels.

B. Ceiling Units: Furnish quality of full-size units equal to 5.0 percent of amount installed.

C. Exposed Suspension System Components: Furnish quantity of each exposed suspension component equal to 2.0 percent of amount installed.

PART 2 - PRODUCTS

2.01 MANUFACTURER

A. Basis of Design: Provide “Serpentina Waves Kits” curved ceiling clouds and suspension system as manufactured by Armstrong World Industries, Inc. www.armstrong.com, or equivalent products as manufactured by one of the following:

2.02 METAL ACCENT CLOUD PANELS

A. Acoustical Panels (AP2):
   1. Patterns: 2 perforation patterns as indicated on drawings, or as selected by Architect.
   2. Composition: Aluminum.
   3. Color: As shown on drawings or as selected by Architect from manufacturer’s standard range.
   4. Cloud Size: 4- by 4-foot and custom sizes as indicated on Drawings.
   5. Edge detail: Concealed grid components with 1/4-inch black reveal between panels.
   6. Arc Dimensions: As shown on Drawings.
   7. Flame Spread: Class A as per ASTM E 1264
B. Accessories:
   1. Acoustical Fleece laminated backing.
   2. Perimeter trim.

2.03 SUSPENSION SYSTEMS

A. Components: Main beams fabricated from painted commercial quality extruded aluminum; cross tee base metal and end detail are fabricated from commercial quality hot dipped galvanized steel complying with ASTM A 653. Concealed main beams have a 15/16-inch type flange design.

B. Color: As selected by Architect from manufacturer’s full range to match the color of selected ceiling tile, unless noted otherwise.

C. Vault or hill main beams curved to arcs as shown on Drawings, hung 24-inches or 48-inches on centers.

D. Semi-concealed Connector Cross Tee:

E. Waves Connector Sleeves: Slip over flange of main beams: Lengths as required.

F. Semi-Concealed Components:
   1. Corner post pre-assembled corner.
   2. Trim clip factory installed twist-in clip with pre-punched holes for attachment of cross tees to perimeter trim.
   3. Splice plates used to align and secure joints between sections of Perimeter Trim. One splice plate needed for each joint.
   4. Perimeter hold down clips as needed to maintain contact between panel and trim.
   5. Strong Back: Used for aid stability and squaring of the system during installation. Also eliminates hanger wires on perimeter cross tees. Note: Hanger wires are to be attached to the main runners, not the Strong Back.

G. Edge Moldings and Trim:
   1. “Serpentina Perimeter Trim” (SPT) for floating ceiling applications. Sizes and lengths as required for panel sizes indicated.

H. Accessories: Hold Down Clips used as necessary to hold infill panels flush with suspension system.

I. Attachment Devices: Size for five times design load indicated in ASTM C 635, Table 1, Direct Hung unless otherwise indicated.

J. Wire for Hangers and Ties: ASTM A 641, Class 1 zinc coating, soft temper, pre-stretched, with a yield stress load of at least time three design load, but not less than 12 gauge.
PART 3 - EXECUTION

3.01 EXAMINATION

A. Do not proceed with installation until all wet work such as concrete, terrazzo, plastering and painting has been completed and thoroughly dried out, unless expressly permitted by manufacturer's printed recommendations.

3.02 PREPARATION

A. Coordinate panel layout with mechanical and electrical fixtures.

B. Coordination: Furnish layouts for preset inserts, clips, and other ceiling anchors whose installation is specified in other sections.
   1. Furnish concrete inserts and similar devices to other trades for installation well in advance of time needed for coordination of other work.

3.03 INSTALLATION

A. Install suspension system and panels in accordance with manufacturer’s instructions and in compliance with ASTM C 636 and with the authorities having jurisdiction.

B. Suspend main beam from overhead construction with hanger wires spaced 4’-0” on center along the length of the main runner. Install hanger wires plumb and straight.
   1. Install hanger wires within 12-inches of each panel corner and set back from edge so as not to be visible in finished construction.

C. Install wall moldings at intersection of suspended ceiling and vertical surfaces. Miter corners where wall moldings intersect or install corner caps.

D. Install acoustical panels in coordination with suspended system, with edges resting on flanges of main runner and cross tees. Cut and fit panels neatly against abutting surfaces. Support edges by wall moldings.

3.04 ADJUSTING AND CLEANING

A. Replace damaged and broken panels.

B. Clean exposed surfaces of acoustical ceilings, including trim, edge moldings, and suspension members. Comply with manufacturer's instructions for cleaning and touch up of minor finish damage. Remove and replace work that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.
3.05 CONSTRUCTION WASTE MANAGEMENT

A. Construction waste shall be managed in accordance with provisions of Division 01 Section “Construction Waste Management and Disposal”. Documentation shall be submitted to satisfy the requirements of that section.

END OF SECTION
SECTION 09 65 13
RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.01 SUMMARY

A. This section includes:
   1. Resilient base.
   2. Resilient stair treads and risers.
   3. Resilient molding accessories.

B. Related Sections:
   1. Division 09 Section “Linoleum Flooring” for linoleum sheet floor covering.
   2. Division 09 Section “Carpet Tile” for carpet floor covering.

1.02 SUBMITTALS

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

B. LEED Submittals:
   1. Product Data for Credit EQ 4.1: For adhesives, including printed statement of VOC content.

C. Samples for Initial Selection: For each type of product indicated.

D. Samples for Verification: For each type of product indicated, in manufacturer's standard-size, but not less than 12 inches long, of each resilient product color, texture, and pattern required.

E. Product Schedule: For resilient products. Use same designations indicated on Drawings.

1.03 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer to perform work of this Section who specializes in installing resilient products similar to those required for this Project and with a record of successful in-service performance.

B. Source Limitations: Obtain each type and color of product specified from one source with resources to provide products of consistent quality in appearance and physical properties without delaying the Work.

C. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
   1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.
1.04  DELIVERY, STORAGE, AND HANDLING

A.  Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 degrees F or more than 90 degrees F.

1.05  PROJECT CONDITIONS

A.  Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 degrees F or more than 95 degrees F, in spaces to receive resilient products during the following time periods:
   1.  48 hours before installation.
   2.  During installation.
   3.  48 hours after installation.

B.  Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 degrees F or more than 95 degrees F.

C.  Install resilient products after other finishing operations, including painting, have been completed.

1.06  EXTRA MATERIALS

A.  Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1.  Furnish not less than 10 linear feet for every 500 linear feet or fraction thereof, of each type, color, pattern, and size of resilient product installed.

PART 2 - PRODUCTS

2.01  RESILIENT BASE (RB)

A.  Resilient Base: Subject to compliance with requirements, provide products by one of the following:
   c.  Burke Mercer Flooring Products; Division of Burke Industries, Inc.  www.burkeflooring.com
   d.  Endura Rubber Flooring; Division of Burke Industries, Inc.  www.burkeflooring.com
   e.  Flexco, Inc.  www.flexofloors.com
   f.  Johnsonite.  www.johnsonite.com
   g.  Mondo Rubber International, Inc.  www.mondousa.com
   h.  Musson, R. C.  Rubber Co.  www.mussonrubber.com
   i.  Nora Rubber Flooring; Freudenberg Building Systems, Inc.  www.norarubber.com
   j.  Roppe Corporation, USA.  www.roppe.com
   k.  VPI, LLC; Floor Products Division.  www.vpicorp.com
   1. Material Requirement: Type TP (rubber, thermoplastic).

C. Minimum Thickness: 0.125 inch.

D. Height: 4 inches.

E. Lengths: Coils in manufacturer's standard length.

F. Outside Corners: Preformed.

G. Inside Corners: Job formed or preformed.

H. Finish: As selected by Architect from manufacturer's full range.

I. Colors and Patterns: As selected by Architect from full range of industry colors.

2.02 RESILIENT STAIR ACCESSORIES (R)

A. Resilient Stair Treads:
   1. Basis of Design Product: Provide "Hammered" rubber stair tread with integral riser and
   2. Subject to approval by Architect, provide comparable products by one of the following:
      a. Burke Mercer Flooring Products; Division of Burke Industries, Inc. www.burkeflooring.com
      b. Endura Rubber Flooring; Division of Burke Industries, Inc. www.burkeflooring.com
      c. Flexco, Inc. www.flexofloors.com
      e. Musson, R. C. Rubber Co. www.mussonrubber.com
      f. Nora Rubber Flooring; Freudenberg Building Systems, Inc. www.norarubber.com
      g. Roppe Corporation, USA. www.roppe.com
      h. VPI, LLC; Floor Products Division. www.vpicorp.com

B. Resilient Stair Treads Standard: ASTM F 2169.
   1. Material Requirement: Type TS (rubber, vulcanized thermoset).
   2. Surface Design:
      a. Class 2, Pattern: Hammered.
   3. Manufacturing Method: Group 1, tread with embedded abrasive strips or Group 2,
      tread with contrasting color for the visually impaired, as selected by Architect.

C. Nosing Style: Square, adjustable to cover angles between 60 and 90 degrees.

D. Nosing Height: 2 inches.

E. Thickness: 1/4 inch and tapered to back edge.
RESILIENT BASE AND ACCESSORIES

F. Size: Lengths and depths to fit each stair tread in one piece.

G. Risers: Smooth, flat, coved-toe, 7 inches high by length matching treads; produced by same manufacturer as treads and recommended by manufacturer for installation with treads.
1. Thickness: 0.125 inch.

H. Stringers: Of same thickness as risers, height and length after cutting to fit risers and treads and to cover stair stringers; produced by same manufacturer as treads and recommended by manufacturer for installation with treads.

I. Floor Tile: 24- by 24-inch rubber tile, 0.125-inch thick. Match stair treads.

J. Colors and Patterns: Match Architect’s sample.

2.03 RESILIENT MOLDING ACCESSORIES

A. Resilient Molding Accessories:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Burke Mercer Flooring Products: www.burkeflooring.com
   b. Flexco, Inc.: www.flexofloors.com
   c. Johnsonite: www.johnsonite.com
   d. Roppe Corporation, USA: www.roppe.com
   e. VPI, LLC; Floor Products Division: www.vpicorp.com

B. Description: Carpet edge for glue-down applications, nosing for carpet, nosing for resilient floor covering, reducer strip for resilient floor covering, or joiner for tile and carpet as required.

C. Material: Rubber.

D. Colors, Finish, and Patterns: As shown on Drawings, or as selected by Architect from full range of industry colors.

2.04 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.
1. Use adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
   a. Cove Base Adhesives: Not more than 50 g/L.
   b. Rubber Floor Adhesives: Not more than 60 g/L.

C. Stair-Tread-Nose Filler: Two-part epoxy compound recommended by resilient tread manufacturer to fill nosing substrates that do not conform to tread contours.
D. Floor Polish: Provide protective liquid floor polish products as recommended by resilient stair tread manufacturer.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Prepare substrates according to manufacturer’s written instructions to ensure adhesion of resilient products.

B. Concrete Substrates for Resilient Accessories: Prepare according to ASTM F 710.
   1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
   2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
   3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install resilient products until they are same temperature as the space where they are to be installed.
   1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

E. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

3.03 RESILIENT BASE INSTALLATION

A. Comply with manufacturer’s written instructions for installing resilient base.

B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
C. Install resilient base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.

D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

E. Do not stretch resilient base during installation.

3.04 RESILIENT ACCESSORY INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient accessories.

B. Resilient Stair Accessories:
   1. Use stair-tread-nose filler to fill nosing substrates that do not conform to tread contours.
   2. Tightly adhere to substrates throughout length of each piece.
   3. For treads installed as separate, equal-length units, install to produce a flush joint between units.

C. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of carpet and resilient floor covering that would otherwise be exposed.

3.05 CLEANING AND PROTECTION

A. Perform the following operations immediately after installing resilient products:
   1. Remove adhesive and other surface blemishes using cleaner recommended by resilient product manufacturers.
   2. Sweep or vacuum horizontal surfaces thoroughly.
   3. Do not wash resilient products until after time period recommended by resilient product manufacturer.
   4. Damp-mop or sponge resilient products to remove marks and soil.

B. Protect resilient products against mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by resilient product manufacturer.
   1. Apply protective floor polish to vinyl resilient products installed on floors that are free from soil, visible adhesive, and surface blemishes, if recommended by manufacturer.
      a. Coordinate selection of floor polish with Owner's maintenance service.
   2. Cover resilient products installed on floors with undyed, untreated building paper until inspection for Substantial Completion.
   3. Do not move heavy and sharp objects directly over stair accessories. Place plywood or hardboard panels over surfaces and under objects while they are being moved. Slide or roll objects over panels without moving panels.
C. Final Cleaning: Clean resilient products not more than 4 days before dates scheduled for inspections intended to establish date of Substantial Completion in each area of Project. Clean products according to manufacturer’s written recommendations.
   1. After cleaning, reapply polish on vinyl products on floors and stairs to restore protective floor finish according to resilient product manufacturer’s written recommendations. Coordinate with Owner’s maintenance program.

END OF SECTION
SECTION 09 65 17
LINOLEUM FLOORING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Linoleum sheet flooring.

B. Related Sections:
   1. Division 09 Section "Resilient Base and Accessories" for resilient base, reducer strips, and other accessories installed with linoleum floor covering.

1.02 SUBMITTALS

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

B. LEED Submittals:
   1. Product Data for Credit MR 6.0: For linoleum flooring, including printed statement of costs for each rapidly renewable material.
   2. Product Data for Credit EQ 4.1: For adhesives, including printed statement of VOC content.

C. Shop Drawings: For each type of floor covering. Include floor covering layouts, locations of seams, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
   1. Show details of special patterns.

D. Samples for Initial Selection: For each type of floor covering indicated.
   1. Include similar Samples of installation accessories involving color selection.

E. Samples for Verification: In manufacturer's standard size, but not less than 6-by-9-inch sections of each color and pattern of floor covering required.
   1. Heat-Welding Bead: Include manufacturer’s standard-size Samples, but not less than 9 inches long, of each color required.

F. Heat-Welded Seam Samples: For each floor covering product and welding bead color and pattern combination required; with seam running lengthwise and in center of 6-by-9-inch Sample applied to rigid backing and prepared by Installer for this Project.

G. Product Schedule: For floor covering. Use same designations indicated on Drawings.

H. Qualification Data: For qualified Installer.

I. Maintenance Data: For each type of floor covering to include in maintenance manuals.
1.03 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in techniques required by manufacturer for floor covering installation.
   1. Engage an installer who employs workers for this Project who are trained or certified by manufacturer for installation techniques required.

B. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
   1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

C. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
   1. Build mockups for floor coverings including accessories.
      a. Size: Minimum 100 sq. ft. for each type, color, and pattern in locations directed by Architect.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Store floor coverings and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 65 deg F or more than 90 deg F.
   1. Floor Tile: Store on flat surfaces.
   2. Sheet Flooring: Store rolls upright.

1.05 PROJECT CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive floor coverings during the following time periods:
   1. 72 hours before installation.
   2. During installation.
   3. 72 hours after installation.

B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.

C. Close spaces to traffic during floor covering installation.

D. Close spaces to traffic for 72 hours after floor covering installation.

E. Install floor coverings after other finishing operations, including painting, have been completed.
1.06 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Sheet Flooring: Furnish not less than 10 linear feet for every 500 linear feet or fraction thereof, in roll form and in full roll width for each color, pattern, and type of sheet flooring installed.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

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

2.02 LINOLEUM FLOOR COVERING

A. Linoleum Floor Covering (LF1 and LF2):
   1. Sheet Flooring: ASTM F 2034, Type I, linoleum sheet with backing.
      a. Roll Size: In manufacturer's standard length by not less than 78 inches wide.
   3. Thickness: 0.10 inch.
   4. Colors and Patterns: As selected by Architect from full range of industry colors.
   5. Product: “Granette” as manufactured by Armstrong World Industries, Inc.

B. Linoleum Floor Covering (LF3):
   1. Sheet Flooring: ASTM F 2034, Type I, linoleum sheet with backing.
      a. Roll Size: In manufacturer's standard length by not less than 78 inches wide.
   3. Thickness: 0.10 inch.
   4. Colors and Patterns: As selected by Architect from full range of industry colors.

2.03 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by manufacturer to suit products and substrate conditions indicated.
1. Use adhesives that have a VOC content of not more than 50 g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

   1. As selected by Architect from manufacturer's full range.

D. Floor Polish: Provide protective liquid floor polish products as recommended by manufacturer.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine subfloors prior to installation to determine that surfaces are smooth and free from cracks, holes, ridges, and other defects that might prevent adhesive bond or impair durability or appearance of the flooring material.

B. Inspect subfloors prior to installation to determine that surfaces are free from curing, sealing, parting and hardening compounds; residual adhesives; adhesive removers; and other foreign materials that might prevent adhesive bond. Visually inspect for evidence of moisture, alkaline salts, carbonation, dusting, mold, or mildew.

C. Report conditions contrary to contract requirements that would prevent a proper installation. Do not proceed with the installation until unsatisfactory conditions have been corrected.

D. Failure to call attention to defects or imperfections will be construed as acceptance and approval of the subfloor. Installation indicates acceptance of substrates with regard to conditions existing at the time of installation.

3.02 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of floor coverings.

B. Concrete Substrates: Prepare according to ASTM F 710.
   1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
   2. Remove substrate coatings and other substances that are incompatible with floor covering adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
   3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
   4. Moisture Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.
D. Do not install floor coverings until they are same temperature as space where they are to be installed.
   1. Move floor coverings and installation materials into spaces where they will be installed at least 72 hours in advance of installation.

E. Sweep and vacuum clean substrates to be covered by floor coverings immediately before installation.

3.03 INSTALLATION, GENERAL

A. Comply with manufacturer’s written instructions for installing floor coverings.

B. Scribe and cut floor coverings to butt neatly and tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings.

C. Extend floor coverings into toe spaces, door reveals, closets, and similar openings.

D. Maintain reference markers, holes, or openings that are in place or marked for future cutting by repeating on floor coverings as marked on subfloor. Use chalk or other nonpermanent marking device.

E. Install floor coverings on covers for telephone and electrical ducts and similar items in finished floor areas. Maintain overall continuity of color and pattern between pieces of floor covering installed on covers and adjoining floor covering. Tightly adhere floor covering edges to substrates that abut covers and to cover perimeters.

F. Adhere floor coverings to substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

G. Heat-Welded Seams: Comply with ASTM F 1516. Rout joints and use welding bead to permanently fuse sections into a seamless floor covering. Prepare, weld, and finish seams to produce surfaces flush with adjoining floor covering surfaces.

3.04 LINOLEUM SHEET FLOORING INSTALLATION

A. Unroll sheet floorings and allow them to stabilize before cutting and fitting.

B. Lay out sheet floorings as follows:
   1. Maintain uniformity of floor covering direction.
   2. Minimize number of seams; place seams in inconspicuous and low-traffic areas, at least 6 inches away from parallel joints in floor covering substrates.
   3. Match edges of floor coverings for color shading at seams.
   4. Avoid cross seams.
   5. Eliminate deformations that result from hanging method used during drying process (stove bar marks).
   6. Adhere flooring to the subfloor without cracks, voids, raising and puckering at the seams. Roll with a 100-pound (45.36 kg) roller in the field areas. Hand-roll flooring at
the perimeter and the seams to assure adhesion. Refer to specific rolling instructions of the flooring manufacturer.

7. Prepare heat-welded seams with special routing tool supplied for this purpose and heat weld with linoleum welding rod in seams. Use methods and sequence of work in conformance with written instructions of the flooring manufacturer. Finish all seams flush and free from voids, recesses, and raised areas.

3.05 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protection of floor coverings.

B. Perform the following operations immediately after completing floor covering installation:
   1. Remove adhesive and other blemishes from exposed surfaces.
   2. Sweep and vacuum surfaces thoroughly.
   3. Damp-mop surfaces to remove marks and soil.

C. Protect floor coverings from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Floor Polish: Remove soil, visible adhesive, and surface blemishes from floor coverings before applying liquid floor polish.
   1. Apply two coats.

E. After allowing drying room film (yellow film caused by linseed oil oxidation) to disappear, cover floor coverings until Substantial Completion.

END OF SECTION
SECTION 09 66 13

RESTORATION OF PORTLAND CEMENT TERRAZZO

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Restoration and repair of existing poured-in-place portland cement terrazzo flooring, base, and stair treads.

B. Related Sections:
   1. Division 07 Section "Joint Sealants" for sealants installed with terrazzo.

1.02 SUBMITTALS

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

B. LEED Submittals:
   1. Product Data for Credit MR 4.1: For marble chips or aggregates, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.
      a. Include statement that indicates cost for each product having recycled content.
   2. Product Data for Credit EQ 4.1: For adhesives, including printed statement of VOC content.

C. Shop Drawings: Include terrazzo installation requirements. Include plans, elevations, sections, component details, and attachments to other work. Show layout of the following:
   1. Divider strips.
   2. Control-joint strips.
   3. Accessory strips.
   4. Abrasive strips.
   5. Stair treads, risers, and landings.
   6. Precast terrazzo jointing and edge configurations.

D. Samples for Confirmation: NTMA color plates showing the full range of colors and patterns available for each terrazzo type indicated.

E. Qualification Data: For qualified Installer.

F. Maintenance Data: For terrazzo to include in maintenance manuals.
1.03 QUALITY ASSURANCE

A. Installer Qualifications: An installer who is a contractor member of NTMA.

B. Source Limitations for Marble Chips or Aggregates: Obtain each color, grade, type, and variety of granular materials from one source with resources to provide materials of consistent quality in appearance and physical properties.

C. NTMA Standards: Comply with NTMA's "Terrazzo Specifications and Design Guide" and with written recommendations for restoration of terrazzo type indicated unless more stringent requirements are specified.

D. Preinstallation Conference: Conduct conference at Project site.
   1. Review methods and procedures related to restoration of terrazzo including, but not limited to, the following:
      a. Inspect and discuss condition of substrate and other preparatory work performed by other trades.
      b. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
      c. Review special terrazzo designs and patterns.
      d. Review dust-control procedures.
      e. Review weather and forecasted weather conditions and procedures for coping with unfavorable conditions.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in supplier's original wrappings and containers, labeled with source's or manufacturer's name, material or product brand name, and lot number if any.

B. Store materials in their original, undamaged packages and containers, inside a well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.

1.05 PROJECT CONDITIONS

A. Environmental Limitations: Maintain temperature above 50 deg F (10 deg C) for 48 hours before and during restoration of terrazzo.

B. Control and collect dust produced by grinding operations. Protect adjacent construction from detrimental effects of grinding operations.
   1. Provide dustproof partitions and temporary enclosures to limit dust migration and to isolate areas from noise.
PART 2 - PRODUCTS

2.01 PORTLAND CEMENT TERRAZZO

A. Existing Portland Cement Terrazzo: Field verify existing type.

B. Materials:
      a. Color for Exposed Matrix: As required to match existing.
   4. Marble Chips or Aggregates: To match existing and complying with NTMA gradation
      standards for mix indicated and containing no deleterious or foreign matter.
      a. Dust Content: Less than 1.0 percent by weight.
   5. Matrix Pigments, if required to match existing: Pure mineral or synthetic pigments,
      alkali resistant, durable under exposure to sunlight, and compatible with terrazzo
      matrix.
   6. Bonding Agent, if required by existing system: Neat portland cement or epoxy or acrylic
      bonding agents formulated for use with topping indicated.
   7. Underbed Reinforcement, if required by existing system: Galvanized welded-wire
      reinforcement, 2 by 2 inches (51 by 51 mm) by 0.062-inch- (1.57-mm-) diameter wire,
      complying with ASTM A 185 and ASTM A 82, except for minimum wire size.
   8. Isolation Membrane, if required by existing system: Polyethylene sheeting,
      ASTM D 2103, Type 13300, 4 mils (0.1 mm) thick; or unperforated asphalt felt,
      ASTM D 226, Type I (No. 15).
   9. Portland Cement Terrazzo to Match Existing: Comply with NTMA's "Terrazzo
      Specifications and Design Guide" for terrazzo type indicated for matrix and marble-chip
      proportions and mixing.
      a. Formulated Mix Color and Pattern: As required to match existing.

2.02 STRIP MATERIALS

A. Standard Divider Strips: One-piece, flat-type strips for grouting into sawed joints prepared in
   concrete slab or underbed.
   1. Material: To match existing.
   2. Depth: To match existing.
   3. Width: To match existing.

B. Control-Joint Strips: To match existing.

C. Accessory Strips: To match existing.

D. Abrasive Strips: To match existing.
2.03 MISCELLANEOUS ACCESSORIES

A. Strip Adhesive: Adhesive recommended by manufacturer for this use.
   1. Use adhesives that have a VOC content of 70 g/L or less when calculated according to

B. Anchoring Devices: To match existing.

C. Isolation and Expansion-Joint Material: To match existing.

D. Portland Cement Terrazzo Cleaner: Chemically neutral cleaner with pH factor between 7 and
   10 that is biodegradable, phosphate free, and recommended by cleaner manufacturer for use
   on terrazzo type indicated.

E. Sealer: Slip- and stain-resistant, penetrating-type sealer that is chemically neutral with pH
   factor between 7 and 10; does not affect color or physical properties of terrazzo; is
   recommended by sealer manufacturer; and complies with NTMA's "Terrazzo Specifications
   and Design Guide" for terrazzo type indicated.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates and areas, with Installer present, for compliance with requirements for
   installation tolerances and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions, including levelness tolerances,
   have been corrected.

3.02 PREPARATION

A. Clean substrates to produce clean, dry, and neutral substrate for terrazzo application.
   1. Remove substances, including oil, grease, and curing compounds, that might impair
      bond of terrazzo system.
   2. Roughen concrete substrates before installing terrazzo system according to NTMA's
      written recommendations.

B. Protect other work from dust generated by grinding operations. Control dust to prevent air
   pollution and comply with environmental protection regulations.
   1. Erect and maintain temporary enclosures and other suitable methods to limit dust
      migration and to ensure adequate ambient temperatures and ventilation conditions
      during installation.
3.03 INSTALLATION, GENERAL

A. Comply with NTMA's written recommendations for terrazzo and accessory installation.

B. Repair: Cut out and replace terrazzo areas that evidence lack of bond with substrate or underbed, including areas that emit a "hollow" sound if tapped. Cut out terrazzo areas in panels defined by strips and replace to match adjacent terrazzo, or repair panels according to NTMA's written recommendations, as approved by Architect.

3.04 PORTLAND CEMENT TERRAZZO RESTORATION

A. Restoration of existing portland cement terrazzo according to NTMA's "Terrazzo Specifications and Design Guide" for terrazzo type indicated.

B. Terrazzo Topping Thickness: To match existing.

C. Refinishing Terrazzo Floors and Bases:
   1. Initial Grinding:
      a. Grind with 24 or finer grit stone — fine mesh sand can be used if needed — all in the presence of water.
      b. Follow initial grind with 80 or finer grit stones in the presence of water, but omit sand.

   2. Grouting:
      a. Cleanse floor with ample clean water and rinse.
      b. Remove excess rinse water and machine or hand-apply grout, using a cement/acrylic, with or without color added to match the matrix of the Terrazzo floor, taking care to fill voids.

   3. Curing Grout: The grout shall remain on the surface for a minimum of 72 hours.

   4. Fine Grinding: Grind with 80 or finer grit stones until all grout has been removed from the Terrazzo surface.

   5. Cleaning and Sealing:
      a. Wash all surfaces with a neutral cleaner; follow by rinsing with clean water and allow to dry.
      b. Apply one coat of sealer, as per manufacturer's directions.

   6. Protection:
      a. Upon completion, this work shall be ready for final inspection and acceptance by the owner or his agent. The General Contractor shall protect the finished floor from all trades that will follow.

D. Note: All work mentioned above shall be executed with conventional terrazzo grinding equipment according to trade practice. No lighter type machines, such as floor scrubbing machines, will be accepted.
E. Finishing:
   1. Seed additional aggregates in matrix to uniformly distribute granular material on surface.
   2. Delay fine grinding until heavy trade work is complete and construction traffic through area is restricted.
   3. Fine Grinding: Grind with stones 120 grit or finer until all grout is removed from surface. Repeat rough grinding, grout coat, and fine grinding if large voids exist after initial fine grinding. Produce surface with a minimum of 70 percent aggregate exposure.

3.05 CLEANING AND PROTECTION

A. Portland Cement Terrazzo Cleaning:
   1. Remove grinding dust from installation and adjacent areas.
   2. Wash surfaces with cleaner immediately after final cleaning of terrazzo flooring.
   3. Wash surfaces with cleaner according to NTMA's written recommendations and manufacturer's written instructions; rinse surfaces with water and allow to dry thoroughly.

B. Sealing:
   1. Seal surfaces according to NTMA's written recommendations.
   2. Apply sealer according to sealer manufacturer's written instructions.

C. Protection: Provide final protection and maintain conditions, in a manner acceptable to Installer, that ensure that terrazzo is without damage or deterioration at time of Substantial Completion.

END OF SECTION
SECTION 09 68 13

TILE CARPETING

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes:
   1. Modular, tufted carpet tile.
   2. Walk-off entry carpet tile.

B. Related Sections include the following:
   1. Division 02 Section "Selective Structure Demolition" for removing existing floor coverings.
   2. Division 09 Section "Resilient Base and Accessories" for resilient wall base and accessories installed with carpet tile.

1.02 SUBMITTALS

A. Product Data: For each type of product indicated. Include manufacturer's written data on physical characteristics, durability, and fade resistance. Include installation recommendations for each type of substrate.

B. Shop Drawings: Show the following:
   1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet tiles.
   2. Carpet tile type, color, and dye lot.
   3. Type of subfloor.
   4. Type of installation.
   5. Pattern of installation.
   6. Pattern type, location, and direction.
   7. Pile direction.
   8. Type, color, and location of insets and borders.
   9. Type, color, and location of edge, transition, and other accessory strips.
   10. Transition details to other flooring materials.

C. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.

D. LEED Submittal:
   1. Product Data for Credit EQ 4.3:
      a. For carpet tile, documentation indicating compliance with testing and product requirements of Carpet and Rug Institute's "Green Label Plus" program.
      b. For installation adhesive, including printed statement of VOC content.

E. Product Schedule: For carpet tile. Use same designations indicated on Drawings.
F. Qualification Data: For Installer.

G. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency.

H. Maintenance Data: For carpet tiles to include in maintenance manuals. Include the following:
   1. Methods for maintaining carpet tile, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
   2. Precautions for cleaning materials and methods that could be detrimental to carpet tile.

I. Warranty: Special warranty specified in this Section.

1.03 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who is certified by the Floor Covering Installation Board or who can demonstrate compliance with its certification program requirements.

B. Fire-Test-Response Characteristics: Provide products with the critical radiant flux classification indicated in Part 2, as determined by testing identical products per ASTM E 648 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.

C. Mockups: Before installing carpet tile, build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
   1. Approved mockups may become part of the completed Work if undamaged at time of Substantial Completion.

D. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1.04 DELIVERY, STORAGE, AND HANDLING

A. Comply with CRI 104, Section 5, "Storage and Handling."

1.05 PROJECT CONDITIONS

A. Comply with CRI 104, Section 7.2, "Site Conditions; Temperature and Humidity" and Section 7.12, "Ventilation."

B. Environmental Limitations: Do not install carpet tiles until wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

C. Do not install carpet tiles over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet tile manufacturer.
D. Where demountable partitions or other items are indicated for installation on top of carpet tiles, install carpet tiles before installing these items.

1.06 WARRANTY

A. Special Warranty for Carpet Tiles: Manufacturer's standard form in which manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.

1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.
2. Failures include, but are not limited to, more than 10 percent loss of face fiber, edge raveling, snags, runs, loss of tuft bind strength, dimensional stability, excess static discharge, and delamination.
3. Warranty Period: Lifetime from date of Substantial Completion.

1.07 EXTRA MATERIALS

A. Furnish extra materials described below, before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Carpet Tile: Full-size units equal to 5 percent of amount installed for each type indicated, but not less than 10 sq. yd.

PART 2 - PRODUCTS

2.01 CARPET TILE

A. Products: Subject to compliance with requirements, provide carpet tile as manufactured by Shaw Carpets: www.shawcontractgroup.com, or alternate products by one of the following:


B. Provide Basis of Design Carpet Tile with the following characteristics:

2. Pile Characteristic: Multi-level pattern loop.
4. Pile Thickness: 0.123 for finished carpet tile.
5. Stitches: 09.00.
7. Surface Pile Weight: 26 oz./sq. yd.
8. Primary Backing: SYNTHETIC.
10. Size: 24 by 24 inches.
12. Environmental Requirements: Provide carpet tile that complies with testing and product requirements of Carpet and Rug Institute's "Green Label Plus" program:
   a. Post consumer recycled content: 0
   b. Post industrial recycled content: 37.2
c. Green label certification #59269968

d. Green label plus certification #GLP9968.

13. Performance Characteristics: As follows:
a. Flammability: ASTM E-648 flooring radiant panel class I, ASTM E-662 NBS smoke chamber less than 450
b. Dimensional Tolerance: Within 1/32 inch of specified size dimensions, as determined by physical measurement.
c. Antimicrobial Activity: Not less than 2-mm halo of inhibition for gram-positive bacteria; not less than 1-mm halo of inhibition for gram-negative bacteria; no fungal growth; per AATCC 174.
d. Electrostatic Propensity: Less than 3.5 kV per AATCC 134.

2.02 BASIS OF DESIGN - CARPET TILE

A. Products: Subject to compliance with requirements, provide carpet tile as manufactured by Shaw Carpets: www.shawcontractgroup.com:

2.03 CARPET TILE – ALTERNATE MANUFACTURER #1

A. Products: Subject to compliance with requirements, provide carpet tile as manufactured by Collins & Aikman: www.tandus.com.
2.04 CARPET TILE – ALTERNATE MANUFACTURER #2

A. Products: Subject to compliance with requirements, provide carpet tile as manufactured by Karastan Carpets: [www.karastan.com](http://www.karastan.com).


2.05 WALK-OFF ENTRY TILE

A. Basis of Design Product: Provide “Welcome Walk-off Entry Tile” as manufactured by Shaw: [www.shawcontract.com](http://www.shawcontract.com), or comparable product by one of the following:

2. Interface: [www.interfaceflooring.com](http://www.interfaceflooring.com).

B. Provide Walk-off Entry Tile with the following characteristics:

1. Style Number: 59410.
2. Color Name: Grey.
3. Color Number: 10121.
5. Size: 24- by 24-inches.
9. Primary Backing: Synthetic.
10. Secondary Backing: “ecoworx”.
11. Gauge: 0.
12. Face Weight: 50.0 ozs/square yard.
13. Finished Pile Thickness: 0.158.
15. Pattern Repeat: n/a.
17. Electrostatic Propensity: less than 3.5 KV.
19. Post Consumer Recycled Content: 0.
20. Post Industrial Recycled Content: 25.0%.
22. Green Label Plus Certification #GLP0520.
2.06 INSTALLATION ACCESSORIES

A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer.

B. Adhesives: Water-resistant, mildew-resistant, non-staining, pressure-sensitive type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet tile and is recommended by carpet tile manufacturer for releasable installation.
   1. VOC Limits: Provide adhesives with VOC content not more than 50 g/L when calculated according to 40 CFR 59, Subpart D (EPA method 24).

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance. Examine carpet tile for type, color, pattern, and potential defects.

B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:
   1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials that may interfere with adhesive bond. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by carpet tile manufacturer.
   2. Subfloor finishes comply with requirements specified in Division 03 Section "Cast-in-Place Concrete" for slabs receiving carpet tile.
   3. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. General: Comply with CRI 104, Section 6.2, "Site Conditions; Floor Preparation," and with carpet tile manufacturer’s written installation instructions for preparing substrates indicated to receive carpet tile installation.

B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch wide or wider and protrusions more than 1/32 inch, unless more stringent requirements are required by manufacturer's written instructions.

C. Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by carpet tile manufacturer.
D. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

3.03 INSTALLATION

A. General: Comply with CRI 104, Section 14, "Carpet Modules," and with carpet tile manufacturer's written installation instructions.

B. Installation Method: Glue down; install every tile with full-spread, releasable, pressure-sensitive adhesive.

C. Maintain dye lot integrity. Do not mix dye lots in same area.

D. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.

E. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, non-staining marking device.

G. Install pattern parallel to walls and borders.

3.04 CLEANING AND PROTECTION

A. Perform the following operations immediately after installing carpet tile:
   1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet tile manufacturer.
   2. Remove yarns that protrude from carpet tile surface.

B. Protect installed carpet tile to comply with CRI 104, Section 16, "Protection of Indoor Installations."

C. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

END OF SECTION
SECTION 09 75 00
STONE FACING

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes the following interior applications of dimension stone:
   1. Wall paneling.
   2. Base.

B. Related Sections include the following:
   1. Division 06 Section "Interior Architectural Woodwork" for casework as substrate for interior stone facing.

1.02 PERFORMANCE REQUIREMENTS

A. General: Design stone anchors and anchoring systems according to ASTM C 1242.

1.03 SUBMITTALS

A. Product Data: For the following:
   1. Each variety of stone. Include data on physical properties required by referenced ASTM standards.
   2. Stone installation materials and other manufactured products.

B. Shop Drawings: Include large scale plans, elevations, sections, details, and attachments to other work.

C. Samples for Initial Selection: For joint materials involving color selection.

D. Samples for Verification:
   1. For each stone type indicated, in sets of Samples not less than 12 inches square. Include two Samples in each set and show the full range of variations in appearance characteristics expected in completed Work.
   2. For each color of sealant required.

E. LEED Submittal:
   1. Product Data for Credit EQ 4.1: For adhesives and sealants, including printed statement of VOC content.

F. Qualification Data: For Installer and fabricator.

G. Sealant Compatibility Test Report: From sealant manufacturer, complying with requirements in Division 07 Section "Joint Sealants" and indicating that sealants will not stain or damage stone.
H. Maintenance Data: For interior stone facing to include in maintenance manuals. Include Product Data for stone-care products used or recommended by Installer and names, addresses, and telephone numbers of local sources for products.

1.04 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate interior stone facing similar in material, design, and extent to that indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.

B. Installer Qualifications: Fabricator of interior stone facing.
   1. Installer's responsibilities include fabricating and installing interior stone facing, including anchoring system.

C. Source Limitations for Stone: Obtain stone from a single quarry with resources to provide materials of consistent quality in appearance and physical properties.

D. Source Limitations for Other Materials: Obtain each type of grout, stone accessory, sealant, and other material through one source from a single manufacturer.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Lift stone with wide-belt slings; do not use wire rope or ropes that might cause staining. Move stone, if required, using dollies with cushioned wood supports.

B. Store stone on wood A-frames or pallets with non-staining separators and non-staining, waterproof covers. Ventilate under covers to prevent condensation.

C. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

1.06 PROJECT CONDITIONS

A. Maintain air and material temperatures to comply with requirements of installation material manufacturers, but not less than 50 deg F during installation and for 7 days after completion.

B. Field Measurements: Verify dimensions of construction to receive interior stone facing by field measurements before fabrication and indicate measurements on Shop Drawings.

1.07 COORDINATION

A. Time delivery and installation of interior stone facing to avoid extended on-site storage and to coordinate with work adjacent to interior stone facing.
PART 2 - PRODUCTS

2.01 MARBLE (ST2)

A. Marble: Comply with ASTM C 503.

B. Variety and Source: Subject to compliance with requirements, provide the following:

C. Cut: Vein cut.

D. Cut stone from one block or contiguous, matched blocks in which natural markings occur.

E. Finish: Polished.

F. Match Architect's samples for color, finish, and other stone characteristics relating to aesthetic effects.

2.02 SETTING MATERIALS

A. Molding Plaster: ASTM C 59/C 59M.

B. Hydrated Lime: ASTM C 207, Type S.

C. Aggregate: ASTM C 144.

D. Water: Potable.

E. Adhesives, General: Use only adhesives formulated for stone and ceramic tile and recommended by their manufacturer for the application indicated.

F. Water-Cleanable Epoxy Adhesive: ANSI A118.3, with a VOC content of 65 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      e. MAPEI Corp. www.mapei.com.
2.03 POINTING MORTAR MATERIALS

A. Portland Cement: ASTM C 150, Type I or II. Provide natural color or white cement as required to produce mortar color indicated.
   1. Low-Alkali Cement: Not more than 0.60 percent total alkali when tested according to ASTM C 114.

B. Hydrated Lime: ASTM C 207, Type S.

C. Portland Cement-Lime Mix: Packaged blend of portland cement complying with ASTM C 150, Type I or III, and hydrated lime complying with ASTM C 207, Type S.

D. Colored Portland Cement-Lime Mix: Packaged blend of portland cement complying with ASTM C 150, Type I or Type III; hydrated lime complying with ASTM C 207, Type S; and mortar pigments. Use a mix of formulation required to produce color indicated or, if not indicated, as selected from manufacturer's standard formulations. Pigments shall not exceed 10 percent of portland cement by weight.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Essroc, Italcementi Group; "Capitol PCL Blend" or "Saylor's Plus".
      b. Holcim (US) Inc.; Rainbow "Mortamix Custom Color Cement/Lime".
      c. Lafarge North America Inc.; “Eaglebond”.
      d. Lehigh Cement Company; "Lehigh Custom Color Portland/Lime Cement”.

E. Aggregate: ASTM C 144, except with 100 percent passing No. 16 sieve.
   1. White Aggregates: Natural white sand or ground white stone.
   2. Colored Aggregates: Natural-colored sand or ground marble, granite, or other durable stone; of color necessary to produce required mortar color.

F. Mortar Pigments: Natural and synthetic iron oxides, compounded for use in mortar mixes. Use only pigments with a record of satisfactory performance in mortar and containing no carbon black.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Bayer, Industrial Chemicals Division; Bayferrox Iron Oxide Pigments.
      b. Davis Colors; True Tone Mortar Colors.
      c. Solomon Colors; SGS Mortar Colors.

G. Water: Potable.

2.04 STONE ACCESSORIES

A. Temporary Setting Shims: Rigid plastic shims, non-staining to stone, sized to suit joint thickness.

B. Setting Shims for Direct-Mount Anchoring Systems: Strips of resilient plastic or neoprene, nonstaining to stone, of thickness needed to prevent point loading of stone on anchors and of depths to suit anchors without intruding into required depths of pointing materials.
C. Cleaner: Stone cleaner specifically formulated for stone types, finishes, and applications indicated, as recommended by stone producer. Do not use cleaning compounds containing acids, caustics, harsh fillers, or abrasives.

D. Stone Sealer: Colorless, stain-resistant sealer that does not affect color or physical properties of stone surfaces, as recommended by stone producer for application indicated.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

2.05 STONE FABRICATION, GENERAL
A. Select stone for intended use to prevent fabricated units from containing cracks, seams, and starts that could impair structural integrity or function.
   1. Repairs that are characteristic of the varieties specified are acceptable provided they do not impair structural integrity or function and are not aesthetically unpleasing, as judged by Architect.

B. Fabricate interior stone facing in sizes and shapes required to comply with requirements indicated, including details on Drawings and Shop Drawings.
   1. For marble, comply with recommendations in MIA's "Dimension Stone--Design Manual."

C. Cut stone to produce pieces of thickness, size, and shape indicated and to comply with fabrication and construction tolerances recommended by applicable stone association.
   1. Where items are installed with adhesive or where edges of stone is visible in the finished work, make items uniform in thickness and of identical thickness for each type of item; gage back of stone if necessary.
   2. Clean sawed backs of stones to remove rust stains and iron particles.
   3. Dress joints straight and at right angle to face, unless otherwise indicated.
   4. Ease exposed edges 1/16-inch radius.
   5. Cut and drill sinkages and holes in stone for anchors, supports, and lifting devices as indicated or needed to set stone securely in place; shape beds to fit supports.
   6. Provide openings, reveals, and similar features as needed to accommodate adjacent work.

D. Fabricate molded work to produce stone shapes with a uniform profile throughout entire unit length and with precisely formed arris slightly eased to prevent snipping, and matched at joints between units.
   1. Produce moldings with machines having abrasive shaping wheels made to reverse contour of molding shape; do not sculpt moldings.
   2. Miter moldings at corners, unless otherwise indicated, with edges of miters slightly eased at outside corners.
E. Finish exposed faces and edges of stone to comply with requirements indicated for finish of each type of stone required and to match approved Samples and mockups.

F. Carefully inspect finished stone units at fabrication plant for compliance with requirements for appearance, material, and fabrication. Replace defective units.
   1. Grade and mark stone for overall uniform appearance when assembled in place. Natural variations in appearance are acceptable if installed stone units match range of colors and other appearance characteristics represented in approved Samples.

2.06 STONE PANELING

A. Arrange panels in shop or other suitable space in proposed orientation and sequence for examination by Architect. Mark units with temporary sequence numbers to indicate position in proposed layout.
   1. Lay out elevations for approved by Architect.
   2. Notify Architect seven days in advance of date and time when layout will be available for viewing.
   3. Provide lighting of similar type and level as that of final installation for viewing layout, unless otherwise approved by Architect.
   4. Rearrange panels as directed by Architect until layout is approved.
   5. Do not trim non-modular-size units to less than modular size until after Architect's approval of layout, unless otherwise approved by Architect.
   6. Mark backs of units and Shop Drawings with sequence numbers based on approved layout. Mark backs of units to indicate orientation of units in completed Work.

B. Nominal Thickness: 3/4 inch, unless otherwise indicated.

C. Joints: 1/16-inch wide grouted joints.

D. Quirk-miter corners, unless otherwise indicated. Install anchorage in top and bottom bed joints of corner units.

E. Pattern Arrangement: Fabricate and arrange panels with veining and other natural markings to comply with the following requirements:
   1. Arrange panels with veining horizontal.
   2. Arrange panels in blend pattern.

2.07 MIXES

A. Spotting Plaster: Stiff mix of molding plaster and water.

B. Pointing Mortar: Comply with ASTM C 270, Proportion Specification, for types of mortar indicated. Provide pointing mortar mixed to match Architect's sample and complying with the following:
   1. Pigmented Pointing Mortar: Select and proportion pigments with other ingredients to produce color required. Do not exceed pigment-to-cement ratio of 1:10, by weight.
   2. Type: O.
3. Mix Proportions: 1 part portland cement and 2-1/2 to 4 parts lime with aggregate ratio of 2-1/4 to 3 times volume of cement and lime.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine surfaces indicated to receive interior stone facing and conditions under which interior stone facing will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
   1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of interior stone facing.
   2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Clean dirty or stained stone surfaces by removing soil, stains, and foreign materials before setting. Clean stone by thoroughly scrubbing with fiber brushes and then drenching with clear water. Use only mild cleaning compounds that contain no caustic or harsh materials or abrasives.

3.03 SETTING OF STONE, GENERAL

A. Do necessary field cutting as stone is set. Use power saws with diamond blades to cut stone. Cut lines straight and true, with edges eased slightly to prevent snipping.

B. Contiguous Work: Provide reveals and openings as required to accommodate contiguous work.

C. Set stone to comply with requirements indicated on Drawings and Shop Drawings. Install anchors, supports, fasteners, and other attachments indicated or necessary to secure stone in place. Shim and adjust anchors, supports, and accessories to set stone accurately in locations indicated, with edges and faces aligned according to established relationships and indicated tolerances.

D. Erect stone units level, plumb, and true with uniform joint widths. Use temporary shims to maintain joint width.

E. Provide expansion, control, and pressure-relieving joints of widths and at locations indicated.
   1. Sealing of expansion, control, and pressure-relieving joints is specified in Division 07 Section "Joint Sealants."
   2. Keep expansion, control, and pressure-relieving joints free of plaster, mortar, grout, and other rigid materials.

3.04 CONSTRUCTION TOLERANCES

A. Variation from Plumb: For vertical lines and surfaces, do not exceed 1/8 inch in 96 inches, 1/4 inch maximum.
B. Variation from Level: For lintels, sills, chair rails, horizontal bands, horizontal grooves, and other conspicuous lines, do not exceed 1/8 inch in 10 feet, 1/4 inch in 20 feet, 3/8 inch maximum.

C. Variation in Joint Width: Do not vary joint thickness more than 1/16 inch or 1/4 of nominal joint width, whichever is less.

D. Variation in Plane between Adjacent Stone Units (Lipping): Do not exceed 1/32-inch difference between planes of adjacent units.

3.05 INSTALLATION OF STONE PANELING

A. Set units firmly against setting spots. Locate setting spots at anchors and spaced not more than 18 inches apart across back of unit, but provide no fewer than 1 setting spot per 2 sq. ft., unless otherwise indicated.

B. Set units on direct-mount anchoring system with anchors securely attached to stone and to backup surfaces. Comply with recommendations in ASTM C 1242.
   1. Provide compressible filler in ends of dowel holes and bottoms of kerfs to prevent end bearing of dowels and anchor tabs on stone. Fill remainder of anchor holes and kerfs with sealant indicated for filling kerfs.
   2. Set stone supported on clips or continuous angles on resilient setting shims. Use material of thickness required to maintain uniform joint widths and to prevent point loading of stone on anchors. Hold shims back from face of stone a distance at least equal to width of joint.

C. Minimum Anchors: Provide anchors at a maximum of 24 inches o.c. around perimeter of interior stone facing panels with a minimum of 4 anchors per panel.

D. Minimum Anchors: Provide a minimum of 4 anchors per panel up to 12 sq. ft. in face area, plus a minimum of 2 additional anchors for each additional 8 sq. ft..

E. Point joints after setting.

3.06 POINTING JOINTS WITH MORTAR

A. Prepare stone-joint surfaces for pointing with mortar by removing temporary shims, dust, and mortar particles. Where setting spots occur at joints, rake out excess setting mortar or plaster to a depth of not less than 1/2 inch.

B. Point stone joints by placing pointing mortar in layers not more than 3/8 inch. Compact each layer thoroughly and allow to become thumbprint hard before applying next layer. Apply mortar first to areas where depths are greater than surrounding areas until a uniform depth is formed.

C. Tool joints when pointing mortar is thumbprint hard. Use a round jointer having a diameter 1/8 inch larger than width of joint.
3.07 ADJUSTING AND CLEANING

A. In-Progress Cleaning: Clean interior stone facing as work progresses. Remove adhesive, grout, mortar, and sealant smears immediately.

B. Remove and replace interior stone facing of the following description:
   1. Broken, chipped, stained, or otherwise damaged stone.
   2. Defective stone facing.
   3. Defective joints, including misaligned joints.
   4. Interior stone facing and joints not matching approved Samples and mockups.
   5. Interior stone facing not complying with other requirements indicated.

C. Replace in a manner that results in interior stone facing's matching approved Samples and mockups, complying with other requirements, and showing no evidence of replacement.

D. Clean interior stone facing no fewer than six days after completion of grouting and pointing, using clean water and soft rags or stiff-bristle fiber brushes. Do not use wire brushes, acid-type cleaning agents, cleaning compounds with caustic or harsh fillers, or other materials or methods that could damage stone.

E. Sealer Application: Apply stone sealer to comply with stone producer’s and sealer manufacturer's written instructions and recommendations.

3.08 PROTECTION

A. Protect stone surfaces, edges, and corners from construction damage. Use securely fastened untreated wood, plywood, or heavy cardboard to prevent damage.

B. Before inspection for Substantial Completion, remove protective coverings and clean surfaces.

END OF SECTION
SECTION 09 77 00

FIBERGLASS REINFORCED PANELS

PART 1 - GENERAL

1.01 SUMMARY

A. This section includes:
   1. Prefinished Fiberglass Reinforced Plastic (FRP) wall panels for decorative and/or sanitary environments.

1.02 SUBMITTALS

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

B. LEED Submittals:
   1. Product Data for Credit EQ 4.1: For adhesives, including printed statement of VOC content.

C. Samples for Initial Selection: For each type of product indicated.

D. Samples for Verification: For each type of product indicated, in manufacturer’s standard-size, but not less than 8- by 12-inches, of each resilient product color, texture, and pattern required.

E. Product Schedule: For resilient products. Use same designations indicated on Drawings.

1.03 QUALIFICATIONS

A. All materials unless otherwise indicated are to be products of one manufacturer.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer to perform work of this Section who specializes in installing resilient products similar to those required for this Project and with a record of successful in-service performance.

B. Source Limitations: Obtain each type and color of product specified from one source with resources to provide products of consistent quality in appearance and physical properties without delaying the Work.

1.05 ENVIRONMENTAL CONDITIONS

A. Building should be fully enclosed prior to installation with sufficient heat (70-degrees F) and ventilation consistent with good working conditions for finish work.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Materials are to be factory packaged on strong pallets. All materials are to be stored lying flat, under cover and protected from the elements.
B. Panels should be allowed to acclimate to room temperature prior to installation.

C. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 degrees F or more than 95 degrees F, in spaces to receive resilient products during the following time periods:
   1. 48 hours before installation.
   2. During installation.
   3. 48 hours after installation.

1.07 WARRANTY

A. All products shall be warranted to be free from defects for a period of 1 year after installation.

PART 2 - PRODUCTS

2.01 MANUFACTURER

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Kemlite Company: www.kemlite.com
   2. Marlite: www.marlite.com

2.02 MATERIALS

A. All sanitary wall panels shall be:
   1. 0.090-inch thick fiberglass reinforced panels.
   2. Panel finish as selected by Architect from manufacturer's standard range.

2.03 ACCESSORIES

A. All trim specified shall be extruded aluminum or extruded rigid PVC.
   1. Extruded PVC Trim Profiles for 0.090-inch thick panels. All products are as manufactured by Marlite, or equivalent.
      a. Inside Corner: “M 350”.
      b. Outside Corner: “M 360”.
      c. Division: “M 365”.
      d. Edge: “M 370”.
   
   2. Extruded Aluminum Trim Profiles for 0.090-inch thick panels. All products are as manufactured by Marlite, or equivalent.
      a. Inside Corner: “F 550 SS”.
      b. Outside Corner: “F 561 SS”.
      c. Division: “F 565 SS”.
      d. Edge: “F 570 SS”.

   3. Trim Finish: As selected by Architect from manufacturer's standard range.
B. Extruded PVC to be color-thru:
   1. Color as selected by Architect from manufacturer’s standard range.

C. Extruded Aluminum Finish: Bright Anodized.
   1. Color as selected by Architect from manufacturer’s standard range.

D. Outside Corner Guard:
   1. Stainless Steel. "F 560" as manufactured by Marlite, or equivalent.
   2. Finish: Stainless Steel, No. 8 Polished.

E. All PVC Base Molding shall be rigid extruded PVC with integral color.
   1. Base Profiles for 0.090-inch thick panels. All products are as manufactured by Marlite, or equivalent.
      a. FRP Base Molding: "M 612".
      b. Inside Corner: "M 651".
      c. Outside Corner: "M 660".
      d. LH End Cap: "M 620".
      e. RH End Cap: "M 625".
   2. Base Finish:
      a. Black: "P 200".
      b. Quarry Red: "P 203".

F. Adhesive: Water-resistant, non-flammable adhesive, meeting ASTM Specification C557. Provide "C-551 FRP Adhesive" as manufactured by Marlite, or equivalent.
   1. Use adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
      a. Not more than 60 g/L.

2.04 SEALANT

A. Clear Silicone Sealant: "MS-250" as manufactured by Marlite, or equivalent.

B. White Silicone Sealant: "MS-251" as manufactured by Marlite, or equivalent.

C. Color Match Sealant: Colors to coordinate with panels as selected by Architect.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Open cartons and carefully inspect all panels.

3.02 PREPARATION

A. Panels must be applied over a smooth, solid, flat, clean sub-wall such as drywall or plywood.
3.03 CONDITIONING

A. Panels should be opened and allowed to acclimate for 48 hours prior to installation. Room temperature should be approximately 70-degrees F.

3.04 INSTALLATION

A. Install all panels in strict accordance with manufacturer's installation instructions.

B. All moldings must provide for a minimum 1/8-inch expansion joint to insure proper installation.

3.05 MAINTENANCE

A. Wipe down using a damp cloth and mild soap solution or cleaner.

B. Refer to manufacturer's specific cleaning recommendations Do not use abrasive cleaners.

END OF SECTION
SECTION 09 79 00

GRILLE CLOTH

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Grille cloth panels for concealment of speakers in locations as shown on the Drawings.

1.02 LEED SUBMITTALS

A. General:
   1. Submit material cost breakdowns for all products used as part of this work, submitted in the format of the Material Tracking Worksheets, per Section 01 33 29 of these specifications.
   2. Submit additional materials information (e.g. recycled content, manufacturing location), to complete the information provided in the Material Tracking Worksheets where specified in this article or requested by the Architect.
   3. Submit Letters of Certification, Product Cut Sheets, Material Safety Data Sheets, or other items to support the information provided in the Material Tracking Worksheets where requested by the Architect.
   4. Submit Material Safety Data Sheets for all applicable products. If the MSDS does not show the product’s Volatile Organic Compound (VOC) content, this information must be provided through other published product literature from the manufacturer, or stated in a letter of certification (on the manufacturer’s letterhead) from the product manufacturer.

B. Recycled Content Materials: (Credit MR4).
   1. Submit product data or other published information indicating separate percentages, by weight, of pre-consumer and post-consumer recycled content per unit of product. Also include material costs, excluding cost of installation.
      a. Include information on Material Tracking Worksheets.

C. Local/Regional Materials: (Credit MR5).
   1. Submit location of manufacturing facility including name, address and distance between manufacturing facility and the project site. Provide manufacturer’s documentation indicating location where the base materials were extracted, mined, quarried, harvested, etc. and the distance between this location and the project site. Also include material costs, excluding costs of installation.
      a. Include information on Material Tracking Worksheets.
1.03 SUBMITTALS

A. Product Data:
1. Submit product data for fabric specified including technical information, maintenance instructions, data of physical characteristics, durability, fade resistance and flame resistance characteristics.
2. Submit product data for mounting system including all extrusion configurations anticipated and all accessories required.

B. Samples:
1. Submit samples of each type, pattern and color of fabric, 8- by 10-inches or larger.
2. Submit samples 12-inch long of each required rigid plastic mounting extrusion.

C. Certification: Submit manufacturer’s certification that materials furnished comply with requirements specified. If requested, submit independent laboratory test data to substantiate compliance.

D. Maintenance Data:
1. Submit maintenance data consisting of manufacturer’s printed instructions for fabric for inclusion in operating and maintenance manual specified in Division 01.
   a. Include methods and frequency recommended for maintaining optimum condition under anticipated use conditions.
   b. Include precautions for use of cleaning materials and methods which could be detrimental to finishes and performance or might damage fabric material.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced Installer who has specialized in the installation of fabrics similar to that required for this project.

B. Manufacturer Qualifications: Provide fabric produced by a single manufacturer with not less than 3 years production experience, whose published product literature clearly indicated compliance with requirements indicated.

C. Fire Hazard Classification: Provide materials bearing the UL label and marking, indicating the fire hazard classification of the fabric, as determined by ASTM E84, flame spread not more than 25, smoke developed not more than 50.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to the project site in original packages or containers clearly labeled to identify manufacturer, brand name, quality or grade, and fire hazard classification.

B. Store materials in original undamaged packages in a well ventilated area protected from weather, moisture, soiling and extreme temperatures or humidity. Do not store wallcoverings in an upright position. Maintain temperature in storage area above 40 deg. F.

C. Comply with manufacturer’s special delivery, storage or handling requirements.
1.06 PROJECT/SITE CONDITIONS

A. Maintain a constant minimum temperature of not less than 60 deg F at areas of installation for at least 10 days before and 10 days after the application of materials.

B. Illuminate areas of installation using permanent building lighting system. Temporary lighting alone will not be acceptable.

1.07 SEQUENCING AND SCHEDULING

A. Schedule installation with other construction activities to minimize the possibility of damage and soiling during the remainder of the construction period.

1.08 MAINTENANCE

A. Maintenance Materials:
   1. After completion of work, deliver to the project site not less than 5 linear yards of each type, color, and pattern of fabric installed, furnished from the same product run as the materials installed.
      a. Package replacement materials with protective covering or wrapping, clearly identified with appropriate labels as replacement material.
      b. Include accessory material as required.

PART 2 - PRODUCTS

2.01 GENERAL

A. Recycled Content: Materials/products shall contain the maximum amount of recycled content allowed that retains material integrity.

B. Local/Regional Materials: Preference shall be given to materials that are manufactured, harvested, extracted, mined, quarried, etc. within a 500 mile radius of the project site.

2.02 FABRIC (GCL)

A. Provide natural woven fabric of 100% Xorel by Carnegie, www.carnegiefabrics.com, without any backing. Provide material which has been treated for stain and mildew resistance.
   1. Width: 54-inch minimum.
   3. Color: No. 76, or as selected by Architect.
2.03 ACCESSORY MATERIALS

A. Support System:
   1. Provide fabric support system of 1-inch rigid plastic extrusions, 1-inch welt-less mounting system as manufactured by Novawall Systems, Inc.: www.novawall.com, or approved equal. Include the following components as required to achieve layout shown on the Drawings:
      a. Perimeter exposed edges covered to create a welting.
      b. Mid-Wall Dividers: Butted.
      c. Corners: 90 deg. square seamed outside corner.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Field measure each area which is to receive the grille cloth treatment to establish the correct layout of supporting members.

B. Install materials in accordance with manufacturer’s instructions, and to comply with governing regulations, fire resistance rating requirements as indicated, and industry standards applicable to the work.

C. Apply the rigid plastic mounting system to surfaces which are to receive the treatment. Secure with manufacturer’s recommended mechanical devices or diverging stapler using 1-inch staples spaced on 2-inch centers.
   1. Other fasteners may be used as may be required for specific substrates, providing they are in strict accordance with the manufacturer’s printed instructions and comply with governing regulations and fire resistance rating requirements specified.

D. Install mounting system plumb, straight, flush, and in proper alignment.

E. Cut the fabric from each roll maintaining sequence of drops and matching direction of weave for sequential and uniform installation. Apply horizontally without vertical joints.

F. Stretch the fabric and secure into the locking jaws so that it will be smooth, free of wrinkles and the weave straight and parallel to perimeter anchors, plumb and aligned horizontally and vertically.

3.02 CLEANUP

A. Upon completion of work, remove surplus materials, rubbish, and debris resulting from installation and leave areas of work in a neat, clean condition.

3.03 PROTECTION

A. Provide protective methods and materials to ensure that fabric will be without deterioration or damage at time of completion.
3.04 INDOOR AIR QUALITY MANAGEMENT (Credit EQ3)

A. Manage indoor air quality in accordance with provisions of Division 01 Section “Testing for Indoor Air Quality”.

3.05 CONSTRUCTION WASTE MANAGEMENT (Credit MR2)

A. Manage construction waste in accordance with provisions of Division 01 Section “Construction Waste Management and Disposal”. Submit documentation to satisfy the requirements of that section.

END OF SECTION
SECTION 09 84 10

FABRIC WRAPPED TACKABLE WALL PANELS

PART 1 - GENERAL

1.01 SUMMARY

A. This section includes:
   1. Class A fabric-covered fiberboard panels manufactured from recycled wood fiber material.

B. Related Sections:
   1. Division 06 Section “Rough Carpentry” for concealed wood blocking.
   2. Division 09 Section “Non-Load-Bearing Wall Framing” for support framing.
   3. Division 09 Section “Gypsum Board” for substrate.

C. References:
   2. AATCC 16 - Colorfastness to Light; American Association of Textile Chemists & Colorists.

1.02 SUBMITTALS

A. Submit under provisions of Division 01 Section “Submittal Procedures.”

B. Product Data: Manufacturer's catalog data, detail sheets, and specifications.

C. LEED Submittals:
   1. Product Data for Credit MR 4.1 and Credit MR 4.2: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
   2. Product Certificates for Credit MR 5.1: For products and materials required to comply with requirements for regionally manufactured materials. Include statement indicating cost, location of manufacturer, and distance to Project for each regionally manufactured material.
   3. Product Data for Credit EQ 4.1: For installation adhesives, documentation including printed statement of VOC content and chemical components.
   4. Product Data for Credit EQ 4.4: For composite wood products used in sound-absorbing wall units, documentation indicating that product contains no urea formaldehyde.

D. Samples for Color Selection: Two each of manufacturer's full range of fabric colors applied to substrate material: 7- by 7- inches.
E. Quality Assurance/Control Submittals:
   1. Manufacturer's installation instructions.

F. Closeout Submittals: Maintenance and cleaning instructions.

1.03 QUALITY ASSURANCE

A. Source Limitations: Obtain fabric-wrapped tackable wall panels from single source from single manufacturer.

B. Manufacturer's Qualifications:
   1. Minimum 10 years experience in producing acoustical panels of the type specified herein.

C. Surface-Burning Characteristics: As determined by testing per ASTM E 84.
   1. Flame-Spread Index: 25 or less.
   2. Smoke-Developed Index: 450 or less.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Comply with fabric and fabric-wrapped, wall panel manufacturers' written instructions for minimum and maximum temperature and humidity requirements for shipment, storage, and handling.

B. Deliver materials and panels in unopened bundles and store in a temperature-controlled dry place with adequate air circulation.

C. Inspect the materials upon delivery to assure that specified products have been received.
   1. Report damaged material immediately to the delivering carrier and note such damage on the carrier's freight bill of lading.

D. Store materials in a dry place, indoors, or on raised platform protected from weather damage.

1.05 PROJECT CONDITIONS

A. Environmental Limitations: Do not install fabric-wrapped wall panels until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work at and above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

B. Environmental Requirements: For 24 hours before, during, and continually after installation, maintain temperature and humidity conditions that will approximate interior conditions following building occupancy.

C. Air-Quality Limitations: Protect fabric-wrapped wall panels from exposure to airborne odors such as tobacco smoke, and install panels under conditions free from odor contamination of ambient air.
1.06 WARRANTY

A. Special Warranty: Manufacturer’s standard form in which manufacturer agrees to repair or replace components of fabric-wrapped wall panels that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
   a. Fabric sagging, distorting, or releasing from panel edge.
   b. Warping of core.

2. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide “DesignWall Interior Panels” as manufactured by Homasote Company, [www.homasote.com](http://www.homasote.com), or products by one of the following:

   1. MPC, Inc. [www.mpcsilentwall.com](http://www.mpcsilentwall.com).

B. Provide all fabric-wrapped tackable wall panels from a single manufacturer.

2.02 FABRIC WRAPPED TACKABLE WALL PANELS

A. Class A Acoustic Panels:

   1. Substrate: NCFR(R) fiberboard manufactured from 100 percent recycled wood fiber material; physical properties as follows:
      a. Thickness: 1/2 inch.
      b. Density: 34-40pcf (545-640 kg/cubic m).
      c. Water Absorption by volume (2 hour immersion): 5 percent maximum.
      d. Expansion, 50 to 90 percent relative humidity: 0.30 percent.
      e. R-value: 0.85 (0.015).
      f. NRC: 0.20.
      g. Flame Spread: 25, per ASTM E 84.
      h. Smoke Developed: 20, per ASTM E 84.
      i. Fuel Contributed: 10.
      j. Classification: Class A, per NFPA.

   2. Panel Finish: Custom Fabric Wrapped (F1, F2, and F3):
      a. Fabric: “Nexus”, as manufactured by Carnegie Fabrics: [www.carnegiefabrics.com](http://www.carnegiefabrics.com), with physical properties as follows:
         1) Content: 100% Xorel.
         2) ASTM E 84: Class A.
         3) NFPA-265 Room Corner Test: Passes.
         5) Qualifies For Heavy Duty Contract Use No Wear After 1,000,000 Double Rubs Wyzenbeek Abrasion Test ASTM - D4157FAA.
6) Eco Info:
   a) Free Of Chlorine & Plasticizers.
   b) Anti Bacterial.
   c) Safely Disposable.
   d) Free Of PVC, chlorine, plasticizers, and heavy metals.
   e) Free of topical finishes, dioxin and Xorel.
   f) Meets The Requirements of Section 01350 Ozone Depleting
      Chemicals. Indoor Environmental and Air Quality.

7) Unbacked.
8) GSA-PBS: Passes.
9) Color: As indicated on Drawings or as selected by Architect.

3. Panel Finish: Custom Fabric Wrapped (F4):
   a. Fabric: “Hard Rock”, as manufactured by Knoll Textiles: [www.knoll.com], with
      physical properties as follows:
      1) Content: Olefin 39.00%.
      2) Post Industrial Recycled Polyester: 61.00%.
      3) Width: 66-inches.
      4) Backing: Acrylic.
      5) Weight per Linear Yard: 12.00 ounces.
      6) Knoll Grade: 40.
      7) Testing:
         a) Wyzenbeek Published: 100,000
         b) Brush Pill: 5
         c) Colorfastness Dry: 5
         d) Lightfastness 40 hrs: 5
         e) Seam Slippage Warp: 28.57
         f) Seam Slippage Weft: 45.51
         g) Tensile Strength Warp: 120
         h) Tensile Strength Weft: 147
         i) ASTM E 84 Adhered, with acrylic backing: Class A
         j) ASTM E 84 Unadhered, as stocked: Class A
         k) CAL 117: Pass
         l) NFPA 260 (UFAC): Class 1

8) Color: As indicated on Drawings or as selected by Architect.

4. Fabrication: Wrap fabric around long edges of panel to back side and laminate to
   substrate.

2.03 ACCESSORIES

A. Metal Frame Clips: Manufacturer's standard clip for securing panels to framing.
B. Adhesive: APA approved panel adhesive.
C. Screws:
   1. Metal Framing: 22-25 gage, drywall type steel screw.
   2. Metal Framing: 20 gage or heavier, self-tapping drywall type steel screw.

2.04 MATERIALS

A. General:
   1. Minimum Recycled Content: Provide fabric-wrapped wall panels with postconsumer recycled content plus one-half of preconsumer recycled content of 75 percent by weight.
   2. Regional Materials: Provide fabric-wrapped wall panels that have been manufactured within 500 miles of Project site.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates upon which work will be installed.
B. Verify framing member spacing complies with manufacturer's requirements depending on substrates and installation methods.
C. Verify environmental conditions are, and will continue to be, maintained in accordance with manufacturer's recommendations.
D. Coordinate with responsible entity to perform corrective work on unsatisfactory substrates or conditions.
E. Starting work by installer is acceptance of substrate and environmental conditions.

3.02 PREPARATION

A. Follow manufacturer's instructions for allowing panels to be exposed to environmental temperature and humidity conditions for not less than 24 hours before start of installation.
B. Temporarily position Burlap Panels in place and request Architect's approval, to ensure that desired appearance is obtained.

3.03 INSTALLATION

A. Follow manufacturer's instructions for cutting and installation of panels:
   1. Metal Framed Walls.
   2. Finished Walls (walls with continuous substrate in place).
3.04 CLEANING

A. Follow manufacturer's instructions for cleaning panels soiled during installation.

B. Replace panels that cannot be cleaned to "as new" condition.

END OF SECTION
SECTION 09 84 33
SOUND-ABSORBING WALL UNITS

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes shop-fabricated, fabric-wrapped panel units tested for acoustical performance, including:
   1. Sound-absorbing wall panels.

B. Related Sections:
   1. Division 09 Section "Fabric-Wrapped Tackable Wall Panels" for fabric-wrapped wall panels that are not required to be tested for acoustical performance and for coordinating requirements for fabric.

1.02 DEFINITIONS

A. NRC: Noise Reduction Coefficient.

1.03 SUBMITTALS

A. Product Data: For each type of fabric facing, panel edge, core material, and mounting indicated.

B. LEED Submittals:
   1. Product Data for Credit MR 4.1 and Credit MR 4.2: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
   2. Product Certificates for Credit MR 5.1: For products and materials required to comply with requirements for regionally manufactured materials. Include statement indicating cost, location of manufacturer, and distance to Project for each regionally manufactured material.
   3. Laboratory Test Reports for Credit EQ 4: For sound-absorbing wall units, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services’ "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers," including 2004 Addenda.

C. Shop Drawings: For sound-absorbing wall units. Include mounting devices and details; details at panel head, base, joints, and corners; and details at ceiling, floor base, and wall intersections. Indicate panel edge and core materials.
   1. Include elevations showing panel sizes and direction of fabric weave and pattern matching.

D. Samples for Color Selection: For each type of fabric facing from sound-absorbing wall unit manufacturer’s full range.
E. Panel Samples: For the following products, prepared on Samples of size indicated below:
   1. Panel Edge: 12-inch-long Sample(s) showing each edge profile, corner, and finish.
   2. Core Material: 12-inch-square Sample at corner.

F. Product Certificates: For each type of sound-absorbing wall unit, from manufacturer.

G. Maintenance Data: For sound-absorbing wall units to include in maintenance manuals. Include fabric manufacturers' written cleaning and stain-removal recommendations.

H. Warranty: Sample of special warranty.

1.04 QUALITY ASSURANCE

A. Source Limitations: Obtain sound-absorbing wall units from single source from single manufacturer.

B. Fire-Test-Response Characteristics: Provide sound-absorbing wall units meeting the following as determined by testing identical products by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
   1. Surface-Burning Characteristics: As determined by testing per ASTM E 84.
      a. Flame-Spread Index: 25 or less.
      b. Smoke-Developed Index: 450 or less.
      c. 
   2. Fire Growth Contribution: Meeting acceptance criteria of local code and authorities having jurisdiction when tested according to NFPA 265.

C. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials, fabrication, and installation.
   1. Build mockup of typical wall area as directed by Architect.
   2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

D. Preinstallation Conference: Conduct conference at Project site.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Comply with fabric and sound-absorbing wall unit manufacturers' written instructions for minimum and maximum temperature and humidity requirements for shipment, storage, and handling.

B. Deliver materials and units in unopened bundles and store in a temperature-controlled dry place with adequate air circulation.
1.06 PROJECT CONDITIONS

A. Environmental Limitations: Do not install sound-absorbing wall units until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work at and above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

B. Lighting: Do not install sound-absorbing wall units until a permanent level of lighting is provided on surfaces to receive the units.

C. Air-Quality Limitations: Protect sound-absorbing wall units from exposure to airborne odors, such as tobacco smoke, and install units under conditions free from odor contamination of ambient air.

D. Field Measurements: Verify locations of sound-absorbing wall units and actual dimensions of openings and penetrations by field measurements before fabrication.

1.07 WARRANTY

A. Special Warranty: Manufacturer’s standard form in which manufacturer agrees to repair or replace components of sound-absorbing wall units that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to the following:
   b. Fabric sagging, distorting, or releasing from panel edge.
   c. Warping of core.
   d.

2. Warranty Period: Three years from date of Substantial Completion.

1.08 EXTRA MATERIALS

A. Furnish extra materials from same production run that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fabric: For each fabric, color, and pattern installed, provide length equal to 10 percent of amount installed, but no fewer than 10 yards.

2. Mounting Devices: Full-size units equal to 5 percent of amount installed, but no fewer than five devices.
PART 2 - PRODUCTS

2.01 SOUND-ABSORBING WALL UNITS (AWP)

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated or comparable product by one of the following:

B. General Requirements for Sound-Absorbing Wall Units: Provide sound-absorbing wall panels that comply with the testing and product requirements of the California Department of Health Services’ "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers," including 2004 Addenda.

C. Sound-Absorbing Wall Panel:
   2. Acoustical Panels shall be constructed of a composite core construction of dimensionally stable rigid fiberglass of 6-7 pcf density laminated to 1/16-inch or 1/8-inch 16-20 pcf molded glass fiber. Thickness: 2-inches.
   3. Sizes: Panels are to be manufactured according to field dimensions supplied by the installing contractor. Standard tolerances are ± 1/16-inch in width and length.
   4. Edge profile: Square.
   5. Corner detail: Square.
   7. Fabric Wrapped Panel Finish (F1, F2, and F3):
      a. Fabric: “Nexus”, as manufactured by Carnegie Fabrics: www.carnegiefabrics.com, with physical properties as follows:
         1) Content: 100% Xorel.
         2) ASTM E 84: Class A.
         3) NFPA-265 Room Corner Test: Passes.
         5) Qualifies For Heavy Duty Contract Use No Wear After 1,000,000 Double Rubs Wyzenbeek Abrasion Test ASTM - D4157FAA.
         6) Eco Info:
            a) Free Of Chlorine & Plasticizers.
            b) Anti Bacterial.
            c) Safely Disposable.
d) Free Of PVC, chlorine, plasticizers, and heavy metals.
e) Free of topical finishes, dioxin and Xorel.
f) Meets The Requirements of Section 01350 Ozone Depleting Chemicals. Indoor Environmental and Air Quality.

7) Unbacked.
8) GSA-PBS: Passes.
9) Colors: As indicated on Drawings or as selected by Architect.

8. Fabric Wrapped Panel Finish (F4):
a. Fabric: “Hard Rock”, as manufactured by Knoll Textiles: [www.knoll.com](http://www.knoll.com), with physical properties as follows:
   1) Content: Olefin 39.00%.
   2) Post Industrial Recycled Polyester: 61.00%.
   3) Width: 66-inches.
   4) Backing: Acrylic.
   5) Weight per Linear Yard: 12.00 ounces.
   6) Knoll Grade: 40.
   7) Testing:
      a) Wyzenbeek Published: 100,000
      b) Brush Pill: 5
      c) Colorfastness Dry: 5
      d) Lightfastness 40 hrs: 5
      e) Seam Slippage Warp: 28.57
      f) Seam Slippage Weft: 45.51
      g) Tensile Strength Warp: 120
      h) Tensile Strength Weft: 147
      i) ASTM E 84 Adhered, with acrylic backing: Class A
      j) ASTM E 84 Unadhered, as stocked: Class A
      k) CAL 117: Pass
      l) NFPA 260 (UFAC): Class 1

b. Finish shall be applied directly over the face and edges of the panel and returned to the back of the panel to provide a full finished edge. All corners shall be fully tailored.

8) Color: As indicated on Drawings or as selected by Architect.

9. Mounting shall be: Aluminum Z Clips. Leveling angles shall be supplied if appropriate. Adhesive, miscellaneous fasteners, (i.e. nails, screws, etc.) and standard continuous wall leveling angle are to be supplied by the Contractor.

10. Acoustical Performance – panels shall have a minimum NRC of 1.05 in accordance with ASTM C-423 (Type "A" Mounting).

11. Flammability – All panel components shall have a Class "A" flame spread rating of 25 or less in accordance with ASTM E-84.
2.02 MATERIALS

A. General:
   1. Minimum Recycled Content: Provide sound-absorbing wall units with postconsumer recycled content plus one-half of preconsumer recycled content of 35 percent by weight.
   2. Regional Materials: Preference shall be given to sound-absorbing wall units that have been manufactured within 500 miles of Project site.

B. Core Materials: Manufacturer’s standard.
   1. Glass-Fiber Board: ASTM C 612, Type standard with manufacturer; nominal density of 6 to 7 lb/cu. ft., unfaced, and dimensionally stable, molded rigid board; and with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.

C. Mounting Devices: Concealed on back of unit, recommended by manufacturer to support weight of unit, and as follows:
   1. Metal Clips or Bar Hangers: Manufacturer’s standard two-part metal "Z" clips, with one part of each clip mechanically attached to back of unit and the other part to substrate, designed to permit unit removal.

2.03 FABRICATION

A. General: Use manufacturer’s standard construction except as otherwise indicated; with facing material applied to face, edges, and back border of dimensionally stable core; and with rigid edges to reinforce panel perimeter against warpage and damage.
   1. Glass-Fiber Board Cores: Chemically harden core edges and areas of core where mounting devices are attached.

B. Core-Face Layer: Evenly stretched over core face and edges and securely attached to core; free from puckers, ripples, wrinkles, or sags.

C. Facing Material: Apply fabric facing fully covering visible surfaces of unit; with material stretched straight, on the grain, tight, square, and free from puckers, ripples, wrinkles, sags, blisters, seams, adhesive, or other visible distortions or foreign matter.
   1. Square Corners: Tailor corners.
   2. Fabrics with Directional or Repeating Patterns or Directional Weave: Mark fabric top and attach fabric in same direction so pattern or weave matches in adjacent units.

D. Dimensional Tolerances of Finished Units: Plus or minus 1/16 inch for the following:
   1. Thickness.
   2. Edge straightness.
   3. Overall length and width.
   4. Squareness from corner to corner.
PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine fabric, fabricated units, substrates, areas, and conditions, for compliance with requirements, installation tolerances, and other conditions affecting performance of sound-absorbing wall units.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install sound-absorbing wall units in locations indicated with vertical surfaces and edges plumb, top edges level and in alignment with other units, faces flush, and scribed to fit adjoining work accurately at borders and at penetrations.

B. Comply with sound-absorbing wall unit manufacturer's written instructions for installation of units using type of mounting devices indicated. Mount units securely to supporting substrate.

C. Align and level fabric pattern and grain among adjacent units.

3.03 INSTALLATION TOLERANCES

A. Variation from Plumb and Level: Plus or minus 1/16 inch.

B. Variation of Panel Joints from Hairline: Not more than 1/16 inch wide.

3.04 CLEANING

A. Clip loose threads; remove pills and extraneous materials.

B. Clean panels on completion of installation to remove dust and other foreign materials according to manufacturer's written instructions.

END OF SECTION
SECTION 09 91 00

PAINTING

PART 1 - GENERAL

1.01 SUMMARY

A. This section includes surface preparation and field painting of the following:
   1. Exposed exterior items and surfaces.
   2. Exposed interior items and surfaces.
   3. Surface preparation, priming, and finish coats specified in this Section are in addition to shop priming and surface treatment specified in other Sections.

B. Related Sections include the following:
   1. Division 05 Section “Structural Steel” for shop priming structural steel.
   2. Division 05 Section “Metal Fabrications” for shop priming ferrous metal.
   3. Division 08 Section “Hollow Metal Doors and Frames” for shop priming steel doors and frames.
   4. Division 09 Section “Gypsum Board” for surface preparation for gypsum board.

1.02 DEFINITIONS

A. General: Standard coating terms:
   1. Flat refers to a sheen finish with a gloss range lower than 5 when measured with a 60-degree meter.
   2. Eggshell refers to a low-sheen finish with a gloss range between 5 and 10 when measured with a 60-degree meter.
   3. Satin refers to a low-sheen finish with a gloss range between 10 and 20 when measured with a 60-degree meter.
   4. Semi-Gloss refers to a medium-sheen finish with a gloss range between 35 and 70 when measured with a 60-degree meter.
   5. Full gloss refers to a high-sheen finish with a gloss range higher than 70 when measured with a 60-degree meter.

1.03 SUBMITTALS

A. Product Data: For each paint system specified. Include block fillers and primers.
   1. Material List: Provide an inclusive list of required coating materials. Indicate each material and cross-reference specific coating, finish system, and application. Identify each material by manufacturer’s catalog number and coating material proposed for use.
   2. Manufacturer’s Information: Provide manufacturer’s technical information, including label analysis and instructions for handling, storing and applying each coating material proposed for use.
   3. Certification by the manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOC’s).
B. Samples for Initial Selection: Manufacturer’s color charts showing the full range of colors available for each type of finish-coat material indicated.
   1. After color selection, the Architect will furnish color chips for surfaces to be coated.

C. Product Data Sheets and MSDS for each product to be used as required by the U.S.G.B.C. as proof that each product meets the requirements of either Green Seal’s GS-11 or GC-03 documents. This is a requirement in order to receive the possible one point for Credit 4.2 for Low-Emitting Materials in the Indoor Environmental Quality section of the Leadership in Energy and Environmental Design initiative of the U.S. Green Building Council.

1.04 QUALITY ASSURANCE

A. Applicator Qualifications: Engage an experienced applicator that has completed painting system applications similar in material and extent to that indicated for this Project with a record of successful in-service performance.

B. Source Limitations: Obtain block fillers, primers and undercoat materials for each coating system from the same manufacturer as the finish coats.

1.05 MOCK-UPS

A. Provide mock-up for each gloss for each interior color selected or approximately 100 square feet.

B. Provide mock-up of “Spatter Coat” on interior concrete in unobtrusive location or location to be covered in finished construction for review by Architect. Approved mock-up shall become the standard for the balance of the painting of interior concrete.

C. After review and approval by Architect, approved mock-ups may become part of the finished work.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to the Project Site in manufacturer’s original, unopened packages and containers bearing manufacturer’s name and label, and the following information:
   1. Product name or title of material.
   2. Product description (generic classification or binder type).
   3. Manufacturer’s stock number and date of manufacture.
   4. Contents by volume, for pigment and vehicle constituents.
   5. Thinning instructions.
   6. Application instructions.
   7. Color name and number.
   8. VOC content.
B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 degrees F (7 degrees C). Maintain containers used in storage in a clean condition, free of foreign materials and residue.
   1. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily. Take necessary measures to ensure that workers and work areas are protected from fire and health hazards resulting from handling, mixing and application.

1.07 PROJECT CONDITIONS

A. Apply water-based paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 50 and 90 degrees F (10 and 32 degrees C).

B. Apply solvent-thinned paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 45 and 95 degrees F (7.2 and 35 degrees C).

C. Do not apply paint in snow, rain, fog, or mist, or when the relative humidity exceeds 85 percent, or at temperatures less than 5 degrees F (3 degrees C) above the dew point, or to damp or wet surfaces.
   1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by manufacturer during application and drying periods.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers Names: The following manufacturer is referred to in the paint schedule by use if shortened versions of the name, which is shown below.

B. Products: Subject to compliance with requirements, provide one of the products in the paint schedules or comparable products by one of the following:

2.02 PAINT MATERIALS, GENERAL

A. Material Compatibility: Provide block fillers, primers, undercoaters, and finish-coat materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
B. Material Quality: Provide manufacturer’s best-quality “professional” paint material of the various coating types specified. Paint-material containers not displaying manufacturer’s product identification will not be acceptable.
   1. Proprietary Names: Use of manufacturer’s proprietary product names to designate colors or materials is not intended to imply that products named are required to be used to the exclusion of equivalent products of other manufacturers. Furnish manufacturer’s material data and certificates of performance for proposed substitutions.

C. Colors: Match CSU-Pueblo campus standard colors. For Architect selected colors, provide color matches indicated by reference to manufacturer’s color designations.

2.03 CONCRETE MASONRY UNIT BLOCK FILLERS

A. Concrete Masonry Unit Block Fillers: Factory formulated high-performance latex block fillers
   1. Devoe High Performance Coatings; Interior / Exterior Water Based Heavy Duty Acrylic Block Filler #4000-1000 (67 g/L VOC): Applied at a dry film thickness of not less than 5.1 to 14.7 mils.

2.04 EXTERIOR PRIMERS

A. Exterior Concrete, Masonry, and Non-Ferrous Metals Primer: Factory-formulated alkali-resistant acrylic-latex primer for exterior application.
   1. ICI Paints; Prep & Prime 100% Acrylic Water Based Primer Sealer (2010) (Low VOC).

B. Exterior Ferrous or Galvanized Metal Primer: Factory-formulated rust-inhibitive metal primer for interior or exterior application.
   1. Devoe High Performance Coatings; Direct to Metal Primer & Flat Finish 4020-1000 or 4020-7100 (91 g/L VOC).

2.05 INTERIOR PRIMERS

A. Interior Primer for Wood, Drywall, Masonry, Plaster, Galvanized Metal and Aluminum: Factory-formulated latex-based primer for interior application.
   1. ICI Paints; Prep & Prime Gripper Interior/Exterior Water-Based Primer Sealer 3210-1200 or 3210-1300. (99 g/L VOC).

2.06 EXTERIOR FINISH COATS

   1. ICI Paints; Dulux Professional Exterior 100% Acrylic Flat Finish 2200-XXXX (100g/L VOC).

   1. ICI Paints; Dulux Professional Exterior 100% Acrylic Satin Finish 2402-XXXX (150 g/L VOC).
C. Exterior Semigloss Acrylic Enamel: Factory-formulated semigloss waterborne acrylic latex enamel for exterior application.
   1. ICI Paints; Dulux Professional Exterior 100% Acrylic Semi-Gloss Finish 2406-XXXX (150 g/L VOC).

2.07 INTERIOR FINISH COATS

A. Interior Flat Acrylic Paint: Factory-formulated flat acrylic-emulsion latex paint for interior application.
   1. ICI Paints; Dulux Ultra Velvet Sheen Interior Flat Latex Wall & Trim Finish 1201-XXXX (92 g/L VOC).

   1. ICI Paints; Dulux Ultra Interior Acrylic Wall & Trim Enamel 1403-XXXX (112 g/L VOC).

C. Interior Semigloss Acrylic Enamel: Factory-formulated semigloss acrylic-latex enamel for interior application.
   1. ICI Paints; Dulux Ultra Semi-Gloss Interior Acrylic Wall & Trim Enamel 1407-XXXX (150 g/L VOC).

2.08 INTERIOR CLEAR WOOD FINISHES

A. Interior Satin Acrylic Polyurethane: Factory-formulated satin acrylic polyurethane for interior application.
   1. Pittsburgh Paints; 77-49 REZ Interior Acrylic Polyurethane Satin Clear Finish (236 g/L VOC).

   1. Pittsburgh Paints; 77-45 REZ Interior Acrylic Polyurethane Gloss Clear Finish (235 g/L VOC).

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that site environmental conditions are appropriate for application of coatings specified

B. Immediately prior to coating application, ensure that surfaces to receive coatings are dry.

C. Ensure that moisture-retaining substrates to receive coatings have moisture content within tolerances allowed by coating manufacturer, using moisture measurement techniques recommended by coating manufacturer.

D. Immediately prior to coating application, examine surfaces to receive coatings for surface imperfections and for contaminants which could impair performance or appearance of coatings, including but not limited to, loose primer, rust, scale, oil grease, mildew, algae, or fungus, stains or marks, cracks, indentations, or abrasions.
E. Correct the above conditions and any other conditions which could impair performance or appearance of coatings in accordance with specified surface preparation procedures before proceeding with coating application.

3.02 PREPARATION

A. Do not start work until surfaces to be finished are in proper condition to produce finished surfaces of uniform, satisfactory appearance.

B. Stains and Marks: Remove completely, if possible, using materials and methods recommended by coating manufacturer; seal with shellac or other coating acceptable to paint manufacturer stains and marks that might bleed through paint finishes which cannot be completely removed.

C. Remove or protect hardware, electrical plates, mechanical grilles and louvers, lighting fixture trim, and other items not indicated to receive coatings which are adjacent to surfaces to receive coatings.

D. Remove mildew from impervious surfaces by scrubbing with solution of trisodium phosphate and bleach. Rinse with clean water and allow substrate to thoroughly dry.

E. For specific substrate preparation, see individual specifications.

3.03 APPLICATION

A. Apply paint products in accordance with manufacturer’s printed instructions. Do not apply coatings to surfaces that are not dry.

B. Apply each coat to uniform thickness and finish in accordance with manufacturer’s instructions, with each coat slightly darker than preceding coat. Allow each coat to dry thoroughly before applying next coat.

C. Remove dust and other foreign materials from substrate immediately prior to applying each coat.

D. If sprayed, then back-rolled.

3.04 EXTERIOR PAINT SCHEDULE

A. Concrete: Provide the following finish systems over exterior concrete substrates:
   1. Flat Acrylic Finish:
      a. Primer: ICI Paints; Prep & Prime 100% Acrylic Water Based Primer Sealer (2010); 1.2 to 1.5 Dry Mils.
      b. Intermediate: Dulux Professional Exterior 100% Acrylic Flat Finish 2200-XXXX; 1.0 to 1.2 Dry Mils.
      c. Finish Coat: Dulux Professional Exterior 100% Acrylic Flat Finish 2200-XXXX; 1.0 to 1.2 Dry Mils.
2. Low-Luster Acrylic Finish:
   a. Primer: ICI Paints; Prep & Prime 100% Acrylic Water Based Primer Sealer (2010); 1.2 to 1.5 Dry Mils.
   b. Intermediate: Dulux Professional Exterior 100% Acrylic Satin Finish 2402-XXXX; 0.9 to 1.2 Dry Mils.
   c. Finish Coat: Dulux Professional Exterior 100% Acrylic Satin Finish 2402-XXXX; 0.9 to 1.2 Dry Mils.

3. Semi-gloss Acrylic-Enamel Finish:
   a. Primer: ICI Paints; Prep & Prime 100% Acrylic Water Based Primer Sealer (2010); 1.2 to 1.5 Dry Mils.
   b. Intermediate: Dulux Professional Exterior 100% Acrylic Semi-Gloss Finish 2406-XXXX; 0.9 to 1.1 Dry Mils.
   c. Finish Coat: Dulux Professional Exterior 100% Acrylic Semi-Gloss Finish 2406-XXXX; 0.9 to 1.1 Dry Mils.

B. Ferrous Metal: Provide the following finish systems over exterior ferrous metal. Primer is not required on shop-primed items.

1. Flat Acrylic Finish:
   a. Primer: Devoe High Performance Coatings; Direct to Metal Primer & Flat Finish 4020-1000 or 4020-7100; 2.0 to 3.0 Dry Mils.
   b. Intermediate: Dulux Professional Exterior 100% Acrylic Flat Finish 2200-XXXX; 1.0 to 1.2 Dry Mils.
   c. Finish Coat: Dulux Professional Exterior 100% Acrylic Flat Finish 2200-XXXX; 1.0 to 1.2 Dry Mils.

2. Low-Luster Acrylic Finish:
   a. Primer: Devoe High Performance Coatings; Direct to Metal Primer & Flat Finish 4020-1000 or 4020-7100; 2.0 to 3.0 Dry Mils.
   b. Intermediate: Dulux Professional Exterior 100% Acrylic Satin Finish 2402-XXXX; 2.0 to 3.0 Dry Mils.
   c. Finish Coat: Dulux Professional Exterior 100% Acrylic Satin Finish 2402-XXXX; 2.0 to 3.0 Dry Mils.

3. Semigloss Acrylic-Enamel Finish:
   a. Primer: Devoe High Performance Coatings; Direct to Metal Primer & Flat Finish 4020-1000 or 4020-7100; 2.0 to 3.0 Dry Mils.
   b. Intermediate: Dulux Professional Exterior 100% Acrylic Semi-Gloss Finish 2406-XXXX; 0.9 to 1.1 Dry Mils.
   c. Finish Coat: Dulux Professional Exterior 100% Acrylic Semi-Gloss Finish 2406-XXXX; 0.9 to 1.1 Dry Mils.
C. Zinc-Coated Metal: Provide the following finish systems over exterior zinc-coated metal surfaces:
   1. Flat Acrylic Finish:
      a. Primer: Devoe High Performance Coatings; Direct to Metal Primer & Flat Finish 4020-1000 or 4020-7100; 2.0 to 3.0 Dry Mils.
      b. Intermediate: Dulux Professional Exterior 100% Acrylic Flat Finish 2200-XXXX; 1.0 to 1.2 Dry Mils.
      c. Finish Coat: Dulux Professional Exterior 100% Acrylic Flat Finish 2200-XXXX; 1.0 to 1.2 Dry Mils.

   2. Low-Luster Acrylic Finish:
      a. Primer: Devoe High Performance Coatings; Direct to Metal Primer & Flat Finish 4020-1000 or 4020-7100; 2.0 to 3.0 Dry Mils.
      b. Intermediate: Dulux Professional Exterior 100% Acrylic Satin Finish 2402-XXXX; 2.0 to 3.0 Dry Mils.
      c. Finish Coat: Dulux Professional Exterior 100% Acrylic Satin Finish 2402-XXXX; 2.0 to 3.0 Dry Mils.

   3. Semigloss Acrylic-Enamel Finish:
      a. Primer: Devoe High Performance Coatings; Direct to Metal Primer & Flat Finish 4020-1000 or 4020-7100; 2.0 to 3.0 Dry Mils.
      b. Intermediate: Dulux Professional Exterior 100% Acrylic Semi-Gloss Finish 2406-XXXX; 0.9 to 1.1 Dry Mils.
      c. Finish Coat: Dulux Professional Exterior 100% Acrylic Semi-Gloss Finish 2406-XXXX; 0.9 to 1.1 Dry Mils.

D. Aluminum: Provide the following finish systems over exterior aluminum surfaces:
   1. Flat Acrylic Finish:
      a. Primer: ICI Paints; Prep & Prime 100% Acrylic Water Based Primer Sealer (2010); 2.0 to 3.0 Dry Mils.
      b. Intermediate: Dulux Professional Exterior 100% Acrylic Flat Finish 2200-XXXX; 1.0 to 1.2 Dry Mils.
      c. Finish Coat: Dulux Professional Exterior 100% Acrylic Flat Finish 2200-XXXX; 1.0 to 1.2 Dry Mils.

   2. Low-Luster Acrylic Finish:
      a. Primer: ICI Paints; Prep & Prime 100% Acrylic Water Based Primer Sealer (2010); 2.0 to 3.0 Dry Mils.
      b. Intermediate: Dulux Professional Exterior 100% Acrylic Satin Finish 2402-XXXX; 2.0 to 3.0 Dry Mils.
      c. Finish Coat: Dulux Professional Exterior 100% Acrylic Satin Finish 2402-XXXX; 2.0 to 3.0 Dry Mils.
3. **Semigloss Acrylic-Enamel Finish:**
   a. Primer: ICI Paints; Prep & Prime 100% Acrylic Water Based Primer Sealer (2010); 2.0 to 3.0 Dry Mils.
   b. Intermediate: Dulux Professional Exterior 100% Acrylic Semi-Gloss Finish 2406-XXXX; 0.9 to 1.1 Dry Mils.
   c. Finish Coat: Dulux Professional Exterior 100% Acrylic Semi-Gloss Finish 2406-XXXX; 0.9 to 1.1 Dry Mils.

### 3.05 INTERIOR PAINT SCHEDULE

#### A. Concrete:
Provide the following paint systems over interior concrete substrates:

1. **Flat Acrylic Finish:**
   a. Finish Coat: Dulux Ultra Velvet Sheen Interior Flat Latex Wall & Trim Finish 1201-XXXX.
   b. Apply paint with sprayer “spatter technique” to achieve approximately 50% coverage of existing interior concrete (existing concrete should be visible through new coating).

#### B. Concrete Masonry Units:
Provide the following finish systems over interior concrete masonry:

1. **Flat Acrylic Finish:**
   a. Primer: Devoe High Performance Coatings; Interior / Exterior Water Based Heavy Duty Acrylic Block Filler #4000-1000; 5.1 to 14.7 Dry Mils.
   b. Intermediate: Dulux Ultra Velvet Sheen Interior Flat Latex Wall & Trim Finish 1201-XXXX; 1.1 to 1.3 Dry Mils.
   c. Finish Coat: Dulux Ultra Velvet Sheen Interior Flat Latex Wall & Trim Finish 1201-XXXX; 1.1 to 1.3 Dry Mils.

2. **Low-Luster Acrylic Finish:**
   a. Primer: Devoe High Performance Coatings; Interior / Exterior Water Based Heavy Duty Acrylic Block Filler #4000-1000; 5.1 to 14.7 Dry Mils.
   b. Intermediate: Dulux Ultra Interior Acrylic Wall & Trim Enamel 1403-XXXX; 1.5 to 1.7 Dry Mils.
   c. Finish Coat: Dulux Ultra Interior Acrylic Wall & Trim Enamel 1403-XXXX; 1.5 to 1.7 Dry Mils.

3. **Semigloss Acrylic-Enamel Finish:**
   a. Primer: Devoe High Performance Coatings; Interior / Exterior Water Based Heavy Duty Acrylic Block Filler #4000-1000; 5.1 to 14.7 Dry Mils.
   b. Intermediate: Dulux Ultra Semi-Gloss Interior Acrylic Wall & Trim Enamel 1407-XXXX; 1.5 to 1.7 Dry Mils.
   c. Finish Coat: Dulux Ultra Semi-Gloss Interior Acrylic Wall & Trim Enamel 1407-XXXX; 1.5 to 1.7 Dry Mils.
C. Gypsum Board: Provide the following finish systems over interior gypsum board surfaces:
   1. Flat Acrylic Finish:
      a. Primer: ICI Paints; Prep & Prime Gripper Interior/Exterior Water-Based Primer Sealer 3210-1200 or 3210-1300; 1.0 to 1.3 Dry Mils.
      b. Intermediate: Dulux Ultra Velvet Sheen Interior Flat Latex Wall & Trim Finish 1201-XXXX; 1.1 to 1.3 Dry Mils.
      c. Finish Coat: Dulux Ultra Velvet Sheen Interior Flat Latex Wall & Trim Finish 1201-XXXX; 1.1 to 1.3 Dry Mils.

   2. Low-Luster Acrylic Finish:
      a. Primer: ICI Paints; Prep & Prime Gripper Interior/Exterior Water-Based Primer Sealer 3210-1200 or 3210-1300; 1.0 to 1.3 Dry Mils.
      b. Intermediate: Dulux Ultra Interior Acrylic Wall & Trim Enamel 1403-XXXX; 1.5 to 1.7 Dry Mils.
      c. Finish Coat: Dulux Ultra Interior Acrylic Wall & Trim Enamel 1403-XXXX; 1.5 to 1.7 Dry Mils.

   3. Semigloss Acrylic-Enamel Finish:
      a. Primer: ICI Paints; Prep & Prime Gripper Interior/Exterior Water-Based Primer Sealer 3210-1200 or 3210-1300; 1.2 to 1.5 Dry Mils.
      b. Intermediate: Dulux Ultra Semi-Gloss Interior Acrylic Wall & Trim Enamel 1407-XXXX; 1.5 to 1.7 Dry Mils.
      c. Finish Coat: Dulux Ultra Semi-Gloss Interior Acrylic Wall & Trim Enamel 1407-XXXX; 1.5 to 1.7 Dry Mils.

D. Plaster: Provide the following finish systems over new interior plaster surfaces:
   1. Flat Acrylic Finish:
      a. Primer: ICI Paints; Prep & Prime Gripper Interior/Exterior Water-Based Primer Sealer 3210-1200 or 3210-1300; 1.2 to 1.5 Dry Mils.
      b. Intermediate: Dulux Ultra Velvet Sheen Interior Flat Latex Wall & Trim Finish 1201-XXXX; 1.1 to 1.3 Dry Mils.
      c. Finish Coat: Dulux Ultra Velvet Sheen Interior Flat Latex Wall & Trim Finish 1201-XXXX; 1.1 to 1.3 Dry Mils.

   2. Low-Luster Acrylic Finish:
      a. Primer: ICI Paints; Prep & Prime Gripper Interior/Exterior Water-Based Primer Sealer 3210-1200 or 3210-1300; 1.2 to 1.5 Dry Mils.
      b. Intermediate: Dulux Ultra Interior Acrylic Wall & Trim Enamel 1403-XXXX; 1.5 to 1.7 Dry Mils.
      c. Finish Coat: Dulux Ultra Interior Acrylic Wall & Trim Enamel 1403-XXXX; 1.5 to 1.7 Dry Mils.
E. Wood and Hardboard: Provide the following paint finish systems over new interior wood surfaces:
1. Clear Wood Finish – Satin Acrylic Polyurethane:
   a. First Coat: Pittsburgh Paints; 77-49 REZ Interior Acrylic Polyurethane Satin Clear Finish (236 g/L VOC); 0.9 to 1.1 Dry Mils.
   b. Finish Coat: Pittsburgh Paints; 77-49 REZ Interior Acrylic Polyurethane Satin Clear Finish (236 g/L VOC); 0.9 to 1.1 Dry Mils.

F. Ferrous Metal: Provide the following finish systems over ferrous metal:
1. Flat Acrylic Finish:
   a. Primer: Devoe High Performance Coatings; Direct to Metal Primer & Flat Finish 4020-1000 or 4020-7100; 2.0 to 3.0 Dry Mils.
   b. Intermediate: Dulux Ultra Velvet Sheen Interior Flat Latex Wall & Trim Finish 1201-XXXX; 1.1 to 1.3 Dry Mils.
   c. Finish Coat: Dulux Ultra Velvet Sheen Interior Flat Latex Wall & Trim Finish 1201-XXXX; 1.1 to 1.3 Dry Mils.

2. Low-Luster Acrylic Finish:
   a. Primer: Devoe High Performance Coatings; Direct to Metal Primer & Flat Finish 4020-1000 or 4020-7100; 2.0 to 3.0 Dry Mils.
   b. Intermediate: Dulux Ultra Interior Acrylic Wall & Trim Enamel 1403-XXXX; 1.5 to 1.7 Dry Mils.
   c. Finish Coat: Dulux Ultra Interior Acrylic Wall & Trim Enamel 1403-XXXX; 1.5 to 1.7 Dry Mils.

3. Semigloss Acrylic-Enamel Finish:
   a. Primer: Devoe High Performance Coatings; Direct to Metal Primer & Flat Finish 4020-1000 or 4020-7100; 2.0 to 3.0 Dry Mils.
   b. Intermediate: Dulux Ultra Semi-Gloss Interior Acrylic Wall & Trim Enamel 1407-XXXX; 1.5 to 1.7 Dry Mils.
   c. Finish Coat: Dulux Ultra Semi-Gloss Interior Acrylic Wall & Trim Enamel 1407-XXXX; 1.5 to 1.7 Dry Mils.

G. Zinc-Coated Metal: Provide the following finish systems over interior zinc-coated metal surfaces:
1. Flat Acrylic Finish:
   a. Primer: ICI Paints; Prep & Prime Gripper Interior/Exterior Water-Based Primer Sealer 3210-1200 or 3210-1300; 2.0 to 3.0 Dry Mils.
   b. Intermediate: Dulux Ultra Velvet Sheen Interior Flat Latex Wall & Trim Finish 1201-XXXX; 1.1 to 1.3 Dry Mils.
   c. Finish Coat: Dulux Ultra Velvet Sheen Interior Flat Latex Wall & Trim Finish 1201-XXXX; 1.1 to 1.3 Dry Mils.
2. Low-Luster Acrylic Finish:
   a. Primer: ICI Paints; Prep & Prime Gripper Interior/Exterior Water-Based Primer Sealer 3210-1200 or 3210-1300; 2.0 to 3.0 Dry Mils.
   b. Intermediate: Dulux Ultra Interior Acrylic Wall & Trim Enamel 1403-XXXX; 1.5 to 1.7 Dry Mils.
   c. Finish Coat: Dulux Ultra Interior Acrylic Wall & Trim Enamel 1403-XXXX; 1.5 to 1.7 Dry Mils.

3. Semigloss Acrylic-Enamel Finish:
   a. Primer: ICI Paints; Prep & Prime Gripper Interior/Exterior Water-Based Primer Sealer 3210-1200 or 3210-1300; 2.0 to 3.0 Dry Mils.
   b. Intermediate: Dulux Ultra Semi-Gloss Interior Acrylic Wall & Trim Enamel 1407-XXXX; 1.5 to 1.7 Dry Mils.
   c. Finish Coat: Dulux Ultra Semi-Gloss Interior Acrylic Wall & Trim Enamel 1407-XXXX; 1.5 to 1.7 Dry Mils.

H. Aluminum: Provide the following finish systems over interior zinc-coated metal surfaces:
1. Flat Acrylic Finish:
   a. Primer: ICI Paints; Prep & Prime Gripper Interior/Exterior Water-Based Primer Sealer 3210-1200 or 3210-1300; 2.0 to 3.0 Dry Mils.
   b. Intermediate: Dulux Ultra Velvet Sheen Interior Flat Latex Wall & Trim Finish 1201-XXXX; 1.1 to 1.3 Dry Mils.
   c. Finish Coat: Dulux Ultra Velvet Sheen Interior Flat Latex Wall & Trim Finish 1201-XXXX; 1.1 to 1.3 Dry Mils.

2. Low-Luster Acrylic Finish:
   a. Primer: ICI Paints; Prep & Prime Gripper Interior/Exterior Water-Based Primer Sealer 3210-1200 or 3210-1300; 2.0 to 3.0 Dry Mils.
   b. Intermediate: Dulux Ultra Interior Acrylic Wall & Trim Enamel 1403-XXXX; 1.5 to 1.7 Dry Mils.
   c. Finish Coat: Dulux Ultra Interior Acrylic Wall & Trim Enamel 1403-XXXX; 1.5 to 1.7 Dry Mils.

3. Semigloss Acrylic-Enamel Finish:
   a. Primer: ICI Paints; Prep & Prime Gripper Interior/Exterior Water-Based Primer Sealer 3210-1200 or 3210-1300; 2.0 to 3.0 Dry Mils.
   b. Intermediate: Dulux Ultra Semi-Gloss Interior Acrylic Wall & Trim Enamel 1407-XXXX; 1.5 to 1.7 Dry Mils.
   c. Finish Coat: Dulux Ultra Semi-Gloss Interior Acrylic Wall & Trim Enamel 1407-XXXX; 1.5 to 1.7 Dry Mils.

I. All-Service Jacket over Insulation: Provide the following finish system on cotton or canvas insulation covering:
1. Flat Acrylic Finish:
   a. First Coat: ICI Paints; Prep & Prime Gripper Interior/Exterior Water-Based Primer Sealer 3210-1200 or 3210-1300; 1.1 to 1.3 Dry Mils.
   b. Finish Coat: Dulux Ultra Velvet Sheen Interior Flat Latex Wall & Trim Finish 1201-XXXX; 1.1 to 1.3 Dry Mils.
3.06 WASTE MANAGEMENT AND DISPOSAL

A. Paint, stain and wood preservative finishes and related materials (thinners, solvents, etc.) are regarded as hazardous products and are subject to regulations for disposal. Obtain information on these controls from applicable government departments having jurisdiction.

B. All waste materials shall be separated and recycled. Where paint recycling is available, collect waste paint by type and provide for delivery to recycling or collection facility. Materials that cannot be reused must be treated as hazardous waste and disposed of in an appropriate manner.

C. Place materials defined as hazardous or toxic waste, including used sealant and adhesive tubes and containers, in containers or areas designated for hazardous waste.

D. To reduce the amount of contaminants entering waterways, sanitary/storm drain systems or into the ground the following procedures shall be strictly adhered to:
   1. Retain cleaning water for water-based materials to allow sediments to be filtered out. In no case shall equipment be cleaned using free draining water.
   2. Retain cleaners, thinners, solvents and excess paint and place in designated containers and ensure proper disposal.
   3. Return solvent and oil soaked rags used during painting operations for contaminant recovery, proper disposal, or appropriate cleaning and laundering.
   4. Dispose of contaminants in an approved legal manner in accordance with hazardous waste regulations.
   5. Empty paint cans are to be dry prior to disposal or recycling (where available).
   6. Close and seal tightly partly used cans of materials including sealant and adhesive containers and store protected in well ventilated fire-safe area at moderate temperature.

E. Set aside and protect surplus and uncontaminated finish materials not required by the Owner and deliver or arrange collection for verifiable re-use or re-manufacturing.

END OF SECTION
SECTION 10 11 00

VISUAL DISPLAY SURFACES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Markerboards.
   2. Visual display rails.

B. Related Sections:
   1. Division 06 Section “Plastic Fabrications” for custom chalk trays.

1.02 DEFINITIONS

A. Visual Display Board Assembly: Visual display surface that is factory fabricated into composite panel form, either with or without a perimeter frame; including markerboards.

1.03 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for visual display surfaces.

B. LEED Submittals:
   1. Product Data for Credit EQ 4.4: For composite wood products, documentation indicating that the product contains no urea formaldehyde.
   2. Product Data for Credit EQ 4.1: For adhesives, including printed statement of VOC content and chemical components.

C. Shop Drawings: For visual display surfaces. Include plans, elevations, sections, details, and attachments to other work.
   1. Show locations of panel joints.
   2. Include sections of typical trim members.

D. Samples for Initial Selection: For each type of visual display surface indicated, for units with factory-applied color finishes, and as follows:
   1. Actual sections of porcelain-enamel face sheet.
   2. Include accessory samples to verify color selected.
E. Samples for Verification: For each type of visual display surface indicated.
   1. Visual Display Surface: Not less than 8-1/2 by 11 inches, mounted on substrate indicated for final Work. Include one panel for each type, color, and texture required.
   2. Trim: 6-inch- long sections of each trim profile.
   4. Accessories: Full-size sample of each type of accessory.

F. Product Schedule: For visual display surfaces. Use same designations indicated on Drawings.

G. Qualification Data: For qualified Installer.

H. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for surface-burning characteristics of fabrics.

I. Maintenance Data: For visual display surfaces to include in maintenance manuals.

J. Warranties: Sample of special warranties.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of motor-operated, sliding visual display units required for this Project.

B. Source Limitations: Obtain visual display surfaces from single source from single manufacturer.

C. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
   1. Flame-Spread Index: 25 or less.
   2. Smoke-Developed Index: 450 or less.

D. Preinstallation Conference: Conduct conference at Project site.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver factory-built visual display surfaces, including factory-applied trim where indicated, completely assembled in one piece without joints, where possible. If dimensions exceed maximum manufactured panel size, provide two or more pieces of equal length as acceptable to Architect. When overall dimensions require delivery in separate units, prefit components at the factory, disassemble for delivery, and make final joints at the site.

B. Store visual display surfaces vertically with packing materials between each unit.
1.06 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install visual display surfaces until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above ceilings 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.

B. Field Measurements: Verify actual dimensions of construction contiguous with visual display surfaces by field measurements before fabrication.
   1. Allow for trimming and fitting where taking field measurements before fabrication might delay the Work.

1.07 WARRANTY

A. Special Warranty for Porcelain-Enamel Face Sheets: Manufacturer’s standard form in which manufacturer agrees to repair or replace porcelain-enamel face sheets that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Surfaces lose original writing and erasing qualities.
      b. Surfaces exhibit crazing, cracking, or flaking.
   2. Warranty Period: Life of the building.

B. Warranty – Tackless Display Rails: Provide manufacturer’s 10 year guarantee.

PART 2 - PRODUCTS

2.01 MATERIALS, GENERAL

A. Porcelain-Enamel Face Sheet: Porcelain-enamel-clad, ASTM A 463/A 463M, Type 1, stretcher-leveled aluminized steel, with 0.024-inch uncoated thickness; with porcelain-enamel coating fused to steel at approximately 1000 deg F.
   1. Gloss Finish: Low gloss; dry-erase markers wipe clean with dry cloth or standard eraser. Suitable for use as projection screen.

B. Extruded Aluminum: ASTM B 221, Alloy 6063.

2.02 MARKERBOARD ASSEMBLIES

A. Porcelain-Enamel Markerboards: Balanced, high-pressure, factory-laminated markerboard assembly of three-ply construction consisting of backing sheet, core material, and 0.013-inch-thick, porcelain-enamel face sheet with low-gloss finish.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. AARCO Products, Inc. www.aarcoproducts.com
      b. ADP Lemco, Inc. www.adplemco.com
      c. Aywon: www.aywon.com
      d. Best-Rite Manufacturing: www.moorecoin.com
2.03 TACKLESS DISPLAY RAIL
A. Basis of Design Product: Subject to compliance with requirements, provide “Best-Bite Tackless Paper Holder” as manufactured by Best-Rite Manufacturing: www.moorecoinc.com, or products by one of the following:

B. Provide tackless paper holders which allow display or paper items without damaging them or leaving unsightly holes without use of tacks or tape.

C. Tackless paper holders shall have a roller system which provides a secure hold and quick release.

D. Provide with mounting screws.

2.04 MARKERBOARD ACCESSORIES
A. Aluminum Frames and Trim: Fabricated from not less than 0.062-inch-thick, extruded aluminum; standard size and shape.
1. Factory-Applied Trim: Manufacturer's standard with minimal profile.

B. Chalktray: Custom, continuous. As shown on Drawings.

2.05 FABRICATION
A. Porcelain-Enamel Visual Display Assemblies: Laminate porcelain-enamel face sheet and backing sheet to core material under heat and pressure with manufacturer's standard flexible, waterproof adhesive.

B. Visual Display Boards: Factory assemble visual display boards unless otherwise indicated.
1. Where factory-applied trim is indicated, trim shall be assembled and attached to visual display boards at manufacturer's factory before shipment.
C. Factory-Assembled Visual Display Units: Coordinate factory-assembled units with trim and accessories indicated. Join parts with a neat, precision fit.

D. Aluminum Frames and Trim: Fabricate units straight and of single lengths, keeping joints to a minimum. Miter corners to a neat, hairline closure.
   1. Where factory-applied trim is indicated, trim shall be assembled and attached to visual display units at manufacturer's factory before shipment.

2.06 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.07 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances, surface conditions of wall, and other conditions affecting performance of the Work.

B. Examine walls and partitions for proper preparation and backing for visual display surfaces.

C. Examine walls and partitions for suitable framing depth where sliding visual display units will be installed.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Comply with manufacturer's written instructions for surface preparation.

B. Clean substrates of substances that could impair the performance of and affect the smooth, finished surfaces of visual display boards, including dirt, mold, and mildew.

C. Prepare surfaces to achieve a smooth, dry, clean surface free of flaking, unsound coatings, cracks, defects, projections, depressions, and substances that will impair bond between visual display surfaces and wall surfaces.
D. Prepare recesses for sliding visual display units as required by type and size of unit.

3.03 INSTALLATION, GENERAL

A. General: Install visual display surfaces in locations and at mounting heights indicated on Drawings, or if not indicated, at heights indicated below. Keep perimeter lines straight, level, and plumb. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for complete installation.

3.04 INSTALLATION OF FACTORY-FABRICATED VISUAL DISPLAY BOARDS AND ASSEMBLIES

A. Visual Display Boards: Attach concealed clips, hangers, and grounds to wall surfaces and to visual display boards with fasteners at not more than 16 inches o.c. Secure both top and bottom of boards to walls.
   1. Field-Applied Custom Chalktrays Trim: Attach trim over edges of visual display boards and conceal grounds and clips. Attach chalktrays to boards with fasteners at not more than 12 inches o.c.

3.05 INSTALLATION OF TACKLESS DISPLAY RAILS

A. Display Rails: Install rails in locations and at mounting heights indicated on Drawings. Attach to wall surface with fasteners at not more than 16 inches o.c.

3.06 CLEANING AND PROTECTION

A. Clean visual display surfaces according to manufacturer's written instructions. Attach one cleaning label to visual display surface in each room.

B. Touch up factory-applied finishes to restore damaged or soiled areas.

C. Cover and protect visual display surfaces after installation and cleaning.

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes the following:
   1. Plaques.
   2. Dimensional characters.

B. Related Sections include the following:
   1. Division 01 Section "Temporary Facilities and Controls" for temporary Project identification signs and for temporary information and directional signs.
   2. Division 14 Sections "Electric Traction Elevators" for code-required elevator signage.
   3. Division 22 Section "Identification for Plumbing Piping and Equipment" for labels, tags, and nameplates for plumbing systems and equipment.
   4. Division 23 Section "Identification for HVAC Piping and Equipment" for labels, tags, and nameplates for HVAC systems and equipment.
   5. Division 26 Sections for electrical service and connections for illuminated signs.
   6. Division 26 Section "Electrical Identification" for labels, tags, and nameplates for electrical equipment.
   7. Division 26 Section "Lighting and Accessories" for illuminated Exit signs.

C. Owner Furnished Signage: Room identification signs will be provided and installed by Owner.

1.02 DEFINITIONS


1.03 SUBMITTALS

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

B. Shop Drawings: Show fabrication and installation details for signs.
   1. Show sign mounting heights, locations of supplementary supports to be provided by others, and accessories.
   2. Provide message list, typestyles, graphic elements and layout for each sign.

C. Samples for Initial Selection: Manufacturer’s color charts consisting of actual units or sections of units showing the full range of colors available for the following:
   1. Aluminum.

D. Samples for Verification: For each of the following products and for the full range of color, texture, and sign material indicated, of sizes indicated:
   1. Plaque Casting: 6 inches square.
2. Dimensional Characters: Full-size Samples of each type of dimensional character (letter, number, and graphic element).
3. Aluminum: For each form, finish, and color, on 6-inch-long sections of extrusions and squares of sheet at least 4 by 4 inches.
4. Accessories: Manufacturer’s full-size pin-mounting unit.

E. Sign Schedule: Use same designations indicated on Drawings.

F. Qualification Data: For Installer and fabricator.

G. Maintenance Data: For signs to include in maintenance manuals.

H. Warranty: Special warranty specified in this Section.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: Fabricator of products.

B. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.

C. Source Limitations for Signs: Obtain each sign type indicated from one source from a single manufacturer.


1.05 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit installation of signs in exterior locations to be performed according to manufacturers' written instructions and warranty requirements.

B. Field Measurements: Verify recess openings by field measurements before fabrication and indicate measurements on Shop Drawings.

1.06 COORDINATION

A. Coordinate placement of anchorage devices with templates for installing signs.
1.07 WARRANTY

A. Special Warranty: Manufacturer’s standard form in which manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Deterioration of metal finishes beyond normal weathering.
   2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Aluminum Castings: ASTM B 26/B 26M, of alloy and temper recommended by sign manufacturer for casting process used and for use and finish indicated.

B. 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-H32.

2.02 PLAQUES

A. Basis-of-Design Product: Subject to compliance with requirements, provide Cast Aluminum Plaque as manufactured by Gemini Incorporated, www.signletters.com, or comparable product by one of the following:

B. Etched Plaques: Provide metal sheet or plate for etching, as follows:
   1. Plaque Material: Aluminum.
   2. Edge Style: Plain bevel.
   4. Thickness: 0.250 inch thick.

C. Plaque Schedule:
   1. Plaque Type: Wall mounted dedication plaque:
      b. Character Size: Variable. Text will be provided by Owner.
         1) For bid, assume (50) 3/4-inch characters, (75) 9/16-inch characters, and (150) 3/8-inch characters.
c. Character Finish/Color: Black.
d. Text/Message: To be determined.
e. Location: As indicated.
f. Quantity: One.

2.03 DIMENSIONAL CHARACTERS

1. Basis-of-Design Product: Subject to compliance with requirements, provide Cast Aluminum Letters as manufactured by Gemini Incorporated, www.signletters.com, or comparable product by one of the following:

B. Cast Characters: Produce characters with smooth flat faces, sharp corners, and precisely formed lines and profiles, free of pits, scale, sand holes, and other defects. Cast lugs into back of characters and tap to receive threaded mounting studs. Alloy and temper recommended by sign manufacturer for casting process used and for use and finish indicated. Comply with the following requirements.
   2. Thickness: As indicated.
   4. Mounting: Concealed studs, non-corroding for substrates encountered.
      a. Aluminum letters under 18-inches shall use aluminum studs.
      b. All other letters shall use stainless steel studs.

C. Dimensional Character Sign Schedule:
   1. Sign Type: Exterior cast or cut pin-mounted letters and numbers:
      a. Letterstyle: "Optima"
      b. Character Size: As shown on Drawings.
      c. Mounting Substrate: Locations shown on Drawings.

   2. Sign Type: Interior cast or cut pin-mounted letters and numbers:
      a. Letterstyle: "Optima"
      b. Character Size: As shown on Drawings.
      c. Mounting Substrate: Locations shown on Drawings.

2.04 ACCESSORIES

A. Anchors and Inserts: Provide nonferrous-metal or hot-dip galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or lead expansion-bolt devices for drilled-in-place anchors. Furnish inserts, as required, to be set into concrete or masonry work.
2.05 FABRICATION

A. General: Provide manufacturer's standard 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. Preassemble signs in the shop to greatest extent possible. Disassemble signs only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation, in location not exposed to view after final assembly.
   4. Conceal fasteners if possible; otherwise, locate fasteners where they will be inconspicuous.

2.06 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.07 ALUMINUM FINISHES

A. Clear Anodic Finish: Manufacturer's standard Class 1 clear anodic coating, 0.018 mm or thicker, over a polished (buffed) mechanical finish, complying with AAMA 611.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

B. Verify that items, including anchor inserts, are sized and located to accommodate signs.

C. Proceed with installation only after unsatisfactory conditions have been corrected.
3.02 INSTALLATION

A. 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.

B. Dimensional Characters: Mount characters using standard fastening methods to comply with manufacturer’s written instructions for character form, type of mounting, wall construction, and condition of exposure indicated. Provide heavy paper template to establish character spacing and to locate holes for fasteners.
   1. Flush Mounting: Mount characters with backs in contact with wall surface.
   2. Projected Mounting: Mount characters at projection distance from wall surface indicated.

3.03 CLEANING AND PROTECTION

A. After installation, clean soiled sign surfaces according to manufacturer’s written instructions. Protect signs from damage until acceptance by Owner.

END OF SECTION
SECTION 10 21 13
TOILET COMPARTMENTS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Phenolic-core toilet compartments configured as toilet enclosures and urinal screens.

B. Related Sections:
   1. Division 05 Section "Metal Fabrications" for supports that attach ceiling-hung compartments to overhead structural system.
   2. Division 06 Section "Rough Carpentry" for blocking.
   3. Division 10 Section "Toilet and Bath Accessories" for toilet tissue dispensers, grab bars, purse shelves, and similar accessories.

1.02 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. LEED Submittals:
   1. Product Data for Credit MR 4.1 and Credit MR 4.2: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating costs for each product having recycled content.

C. Shop Drawings: For toilet compartments. Include plans, elevations, sections, details, and attachments to other work.
   1. Show locations of cutouts for compartment-mounted toilet accessories.
   2. Show locations of reinforcements for compartment-mounted grab bars.
   3. Show locations of centerlines of toilet fixtures.
   4. Show overhead support or bracing locations.

D. Samples for Initial Selection: For each type of unit indicated. Include Samples of hardware and accessories involving material and color selection.

E. Samples for Verification: For the following products, in manufacturer's standard sizes unless otherwise indicated:
   1. Each type of material, color, and finish required for units, prepared on 6-inch-square Samples of same thickness and material indicated for Work.
   2. Each type of hardware and accessory.

F. Product Certificates: For each type of toilet compartment, from manufacturer.

G. Maintenance Data: For toilet compartments to include in maintenance manuals.
1.03 QUALITY ASSURANCE


B. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84, or another standard acceptable to authorities having jurisdiction, by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
   1. Flame-Spread Index: 25 or less.
   2. Smoke-Developed Index: 450 or less.

C. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA) and Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities" and ICC/ANSI A117.1 for toilet compartments designated as accessible.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver items in manufacturer's original unopened protective packaging.

B. Store materials in original protective packaging to prevent physical damage or wetting.

C. Handle so as to prevent damage to finished surfaces.

1.05 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of toilet fixtures, walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements before fabrication.

1.06 WARRANTY

A. Furnish ten-year limited warranty for panels, doors, and stiles against breakage, corrosion, delamination, and defects in factory workmanship.

B. Furnish one-year guarantee against defects in material and workmanship for stainless steel door hardware and mounting brackets.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Stainless-Steel Castings: ASTM A 743/A 743M.

2.02 PHENOLIC-CORE UNITS (TP)

A. Basis-of-Design Product: Subject to compliance with requirements, provide “Model 1180 Duraline Series” as manufactured by Bobrick Washroom Equipment, Inc. [www.bobrick.com], or comparable product by one of the following:
   1. Accurate Partitions Corporation: [www.accuratepartitions.com].
5. General Partitions Mfg. Corp. [www.generalpartitions.com](http://www.generalpartitions.com).

B. Toilet-Enclosure Style: Ceiling hung.

C. Urinal-Screen Style: Wall hung with ceiling hung front pilaster.

D. Door, Panel, and Pilaster Construction: Solid phenolic-core panel material with melamine facing on both sides fused to substrate during panel manufacture (not separately laminated), and with eased and polished edges. Provide minimum 3/4-inch-thick doors and pilasters and minimum 1/2-inch-thick panels.

E. Pilaster Sleeves (Caps): Fabricated from stainless-steel sheet, not less than 0.031-inch nominal thickness and 3 inches high, finished to match hardware.

F. Brackets (Fittings):
   1. Full-Height (Continuous) Type: Manufacturer’s standard design; stainless steel.

G. Phenolic-Panel Finish:
   1. Facing Sheet Finish: One color and pattern in each room.
   2. Color and Pattern: As selected by Architect from manufacturer’s full range, with manufacturer’s standard dark color core.

2.03 ACCESSORIES

A. Hardware and Accessories: Manufacturer’s standard design, heavy-duty operating hardware and accessories.
   1. Material: Stainless steel or Chrome-plated brass.
   2. Hinges: Manufacturer’s standard paired, self-closing type that can be adjusted to hold doors open at any angle up to 90 degrees.
      a. Hinges shall be attached to door and stile by theft-resistant, one-way stainless steel machine screws into factory-installed metal inserts. Fasteners secured directly into the core are not acceptable.
      b. Metal-to-metal connection shall withstand a direct pull of over 1,500 lb. per screw.
   3. Latch and Keeper: Manufacturer’s standard surface-mounted latch unit designed for emergency access and with combination rubber-faced door strike and keeper. Provide units that comply with regulatory requirements for accessibility at compartments designated as accessible.
   4. Coat Hook: Manufacturer’s standard combination hook and rubber-tipped bumper, sized to prevent in-swinging door from hitting compartment-mounted accessories.
5. **Door Bumper**: Manufacturer's standard rubber-tipped bumper at out-swinging doors.

6. **Door Pull**: Manufacturer's standard unit at out-swinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at compartments designated as accessible.

B. **Anchorages and Fasteners**: Manufacturer's standard exposed fasteners of stainless steel or chrome-plated steel or brass, finished to match the items they are securing, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use stainless steel, hot-dip galvanized steel, or other rust-resistant, protective-coated steel.

2.04 **FABRICATION**

A. **Ceiling-Hung Units**: Provide manufacturer's standard corrosion-resistant anchoring assemblies with leveling adjustment nuts at pilasters for connection to structural support above finished ceiling. Provide assemblies that support pilasters from structure without transmitting load to finished ceiling. Provide sleeves (caps) at tops of pilasters to conceal anchorage.

B. **Door Size and Swings**: Unless otherwise indicated, provide 24-inch-wide, in-swinging doors for standard toilet compartments and 36-inch-wide, out-swinging doors with a minimum 32-inch-wide, clear opening for compartments designated as accessible.

**PART 3 - EXECUTION**

3.01 **INSPECTION**

A. Check areas scheduled to receive compartments for correct dimensions, plumbness of walls, and soundness of surfaces that would affect installation of mounting brackets.

B. Verify spacing of plumbing fixtures to assure compatibility with installation of compartments.

C. Do not begin installation of compartments until conditions are satisfactory.

3.02 **INSTALLATION**

A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.

1. **Maximum Clearances**:
   a. Pilasters and Panels: 1/2 inch.
   b. Panels and Walls: 1 inch.

2. **Stirrup Brackets**: Secure panels to walls and to pilasters with no fewer than three brackets attached at midpoint and near top and bottom of panel.
   a. Locate wall brackets so holes for wall anchors occur in masonry or tile joints.
   b. Align brackets at pilasters with brackets at walls.
B. Ceiling-Hung Units: Secure pilasters to supporting structure and level, plumb, and tighten. Hang doors and adjust so bottoms of doors are level with bottoms of pilasters when doors are in closed position.

C. Urinal Screens: Attach with anchoring devices to suit supporting structure. Set units level and plumb, rigid, and secured to resist lateral impact.

3.03 ADJUSTING

A. Hardware Adjustment: Adjust and lubricate hardware according to hardware manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors to return doors to fully closed position.

END OF SECTION
SECTION 10 26 00

CORNER GUARDS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Corner guards.

B. Related Sections:
   1. Division 08 Section "Door Hardware" for metal armor, kick, mop, and push plates.
   2. Division 09 Section "Fiberglass Reinforced Plastic Panels" for other wall protection materials.

1.02 SUBMITTALS

A. Product Data: Include construction details, material descriptions, impact strength, fire-test-response characteristics, dimensions of individual components and profiles, and finishes for each corner guard.

B. LEED Submittals:
   1. Product Data for Credit EQ 4.1: For adhesives, including printed statement of VOC content.

C. Shop Drawings: For each corner guard, showing locations and extent. Include sections, details, and attachments to other work.
   1. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

D. Samples for Color Selection: For each type of corner guard indicated.

E. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below. Include Samples of accent strips to verify color selected.
   1. Corner Guards: 12 inches long. Include examples of joinery, corners, end caps, top caps, and field splices.

F. Qualification Data: For qualified Installer.

G. Material Certificates: For each impact-resistant plastic material, from manufacturer.

H. Material Test Reports: For each impact-resistant plastic material.
I. Maintenance Data: For each corner guard to include in maintenance manuals.
   1. Include recommended methods and frequency of maintenance for maintaining optimum condition of plastic covers under anticipated traffic and use conditions. Include precautions against using cleaning materials and methods that may be detrimental to plastic finishes and performance.

J. Warranty: Sample of special warranty.

1.03 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by manufacturer.

B. Source Limitations: Obtain corner guards from single source from single manufacturer.

C. Product Options: Drawings indicate size, profiles, and dimensional requirements of corner guards and are based on the specific system indicated. Refer to Division 01 Section "Quality Requirements."
   1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

D. Surface-Burning Characteristics: Provide impact-resistant, plastic wall protection units with surface-burning characteristics as determined by testing identical products per ASTM E 84, NFPA 255, or UL 723 by UL or another qualified testing agency.


F. Preinstallation Conference: Conduct conference at Project site.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Store corner guards in original undamaged packages and containers inside well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.
   1. Maintain room temperature within storage area at not less than 70 deg F during the period plastic materials are stored.
   2. Keep plastic sheet material out of direct sunlight.
   3. Store plastic wall protection components for a minimum of 72 hours, or until plastic material attains a minimum room temperature of 70 deg F.
      a. Store corner-guard covers in a vertical position.

1.05 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install corner guard units until building is enclosed and weatherproof, wet work is complete and dry, and HVAC system is operating and maintaining temperature at 70 deg F for not less than 72 hours before beginning installation and for the remainder of the construction period.
1.06 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of corner guards that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Structural failures.
      b. Deterioration of plastic and other materials beyond normal use.
   2. Warranty Period: Five years from date of Substantial Completion.

1.07 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Corner-Guard Covers: Full-size plastic covers of maximum length equal to 2 percent of each type, color, and texture of units installed, but no fewer than two units of longest length installed.

B. Include mounting and accessory components. Replacement materials shall be from same production run as installed units.

PART 2 - PRODUCTS

2.01 MATERIALS

A. PVC Plastic: ASTM D 1784, Class 1, textured, chemical- and stain-resistant, high-impact-resistant PVC or acrylic-modified vinyl plastic with integral color throughout; extruded and sheet material, thickness as indicated.
   1. Impact Resistance: Minimum 25.4 ft-lbf/in. of notch when tested according to ASTM D 256, Test Method A.
   2. Chemical and Stain Resistance: Tested according to ASTM D 543 or ASTM D 1308.
   3. Self-extinguishing when tested according to ASTM D 635.
   4. Flame-Spread Index: 25 or less.
   5. Smoke-Developed Index: 450 or less.

B. Aluminum Extrusions: Alloy and temper recommended by manufacturer for type of use and finish indicated, but with not less than strength and durability properties specified in ASTM B 221 for Alloy 6063-T5.

C. Fasteners: Aluminum, nonmagnetic stainless-steel, or other noncorrosive metal screws, bolts, and other fasteners compatible with items being fastened. Use security-type fasteners where exposed to view.

D. Adhesive: As recommended by impact-resistant plastic wall protection manufacturer and with a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2.02 CORNER GUARDS

A. Flush-Mounted, Resilient, Plastic Corner Guards (CG): Assembly consisting of snap-on plastic cover that is flush with adjacent wall surface, installed over continuous retainer; including mounting hardware; fabricated with 90- or 135-degree turn to match wall condition; full wall height.

1. Basis of Design Product: Subject to compliance with requirements, provide “Defender Series #2365” as manufactured by WallGuard.com: www.wallguard.com, or products by one of the following:

2. Cover: Extruded rigid plastic, minimum 0.100-inch wall thickness; as follows:
   a. Profile: Nominal 3-inch- long leg and 1/4-inch corner radius.
   b. Height: Full height of wall.
   c. Color and Texture: As selected by Architect from manufacturer’s full range.

3. Retainer: Minimum 0.060-inch- thick, one-piece, extruded aluminum.

4. Retainer Clips: Manufacturer’s standard impact-absorbing clips.

5. Aluminum Cove Base: Nominal 4 inches high.

2.03 FABRICATION

A. Fabricate corner guard units to comply with requirements indicated for design, dimensions, and member sizes, including thicknesses of components.

B. Assemble components in factory to greatest extent possible to minimize field assembly. Disassemble only as necessary for shipping and handling.

C. Fabricate components with tight seams and joints with exposed edges rolled. Provide surfaces free of wrinkles, chips, dents, uneven coloration, and other imperfections. Fabricate members and fittings to produce flush, smooth, and rigid hairline joints.
PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates and wall areas, with Installer present, for compliance with requirements for installation tolerances, fire rating, and other conditions affecting performance of work.

B. Examine walls to which corner guards will be attached for blocking, grounds, and other solid backing that have been installed in the locations required for secure attachment of support fasteners.
   1. For corner guard units attached with adhesive or foam tape, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Complete finishing operations, including painting, before installing corner guard system components.

B. Before installation, clean substrate to remove dust, debris, and loose particles.

3.03 INSTALLATION

A. General: Install corner guards, plumb, and true to line without distortions. Do not use materials with chips, cracks, voids, stains, or other defects that might be visible in the finished Work.
   1. Provide mounting hardware, anchors, and other accessories required for a complete installation.
      a. Provide anchoring devices to withstand imposed loads.
      b. Adjust end and top caps as required to ensure tight seams.

3.04 CLEANING

A. Immediately after completion of installation, clean plastic covers and accessories using a standard, ammonia-based, household cleaning agent.

B. Remove excess adhesive using methods and materials recommended in writing by manufacturer.

3.05 SCHEDULE

A. Install full height corner guards at all outside corners of gypsum board partitions.

END OF SECTION
SECTION 10 28 00

TOILET ACCESSORIES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
1. Public-use washroom accessories.
2. Childcare accessories.
3. Custodial accessories.
4. Warm-air dryers.

B. Owner-Furnished Material for Installation by Contractor: Toilet paper dispensers, soap dispensers, and paper towel dispensers.

C. Owner-Furnished/Owner-Installed Items: Toilet seat-cover dispenser (TA-6).

D. Related Sections:
1. Division 08 Section "Mirrors" for frameless mirrors.
2. Division 22 Section "Plumbing Fixtures" for underlavatory guards.
3. Division 26 – Electrical sections for wiring of warm air dryers.

1.02 SUBMITTALS

A. Product Data: For each type of product indicated. Include the following:
1. Construction details and dimensions.
2. Anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
3. Material and finish descriptions.
4. Features that will be included for Project.
5. Manufacturer’s warranty.

B. Samples: Full size, for each accessory item to verify design, operation, and finish requirements.
1. Approved full-size Samples will be returned and may be used in the Work.

C. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.
1. Identify locations using room designations indicated.
2. Identify products using designations indicated.

D. Maintenance Data: For toilet and bath accessories to include in maintenance manuals.

E. Warranty: Sample of special warranty.
1.03 QUALITY ASSURANCE

A. Source Limitations: For products listed together in the same Part 2 articles, obtain products 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.

1.04 COORDINATION

A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.

B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Stainless Steel: ASTM A 666, Type 304, 0.031-inch minimum nominal thickness unless otherwise indicated.

B. Brass: ASTM B 19, flat products; ASTM B 16/B 16M, rods, shapes, forgings, and flat products with finished edges; or ASTM B 30, castings.

C. Steel Sheet: ASTM A 1008/A 1008M, Designation CS (cold rolled, commercial steel), 0.036-inch minimum nominal thickness.

D. Galvanized-Steel Sheet: ASTM A 653/A 653M, with G60 hot-dip zinc coating.


F. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.

G. Chrome Plating: ASTM B 456, Service Condition Number SC 2 (moderate service).

2.02 PUBLIC-USE WASHROOM ACCESSORIES

A. Manufacturers: Subject to compliance with requirements, provide product indicated, or products by one of the following:
   1. American Specialties, Inc. www.americanspecialties.com
   2. Bobrick Washroom Equipment, Inc. www.bobrick.com
   4. GAMCO Specialty Accessories: www.gamcouusa.com
   5. Tubular Specialties Manufacturing, Inc. www.caltsm.com

TOILET ACCESSORIES
10 28 00 - 2
B. Toilet Tissue (Roll) Dispenser (TA2):

C. Paper Towel (Folded) Dispenser (TA12):

D. Liquid-Soap Dispenser (TA3):

E. Grab Bars (TA7, TA8, and TA9):
   3. Material: Stainless steel, 0.05 inch thick.
   4. Finish: Smooth, No. 4 finish (satin) on ends and slip-resistant texture in grip area.
   6. Length:
      a. (TA7) = 42-inches long.
      b. (TA8) = 36-inches long.
      c. (TA9) = 18-inches long (vertical).

F. Sanitary Napkin Dispenser (TA4):
   1. Basis-of-Design Product: "Model B-43500x2 50 Napkin/Tampon Vendor" as manufactured by Bobrick.
   2. Type: Sanitary napkin and tampon.
   4. Capacity: 31 napkins (3-inches x 4-1/4-inch x 1-inch or smaller) and 22 tampons (5-1/8-inch long x 3/4-inch dia. or smaller), suitable for all popular brands.
   5. Operation: $.50 double-coin operation. Two mechanisms shall be included. Coin mechanisms shall be replaceable without removing cabinet from wall.
   7. Lockset: Tumbler type with separate lock and key for coin box.

G. Sanitary-Napkin Disposal (TA5):
   3. Door or Cover: Self-closing, disposal-opening cover.
   5. Material and Finish: Stainless steel, No. 4 finish (satin).

H. Mirror (TA11): See Section 08 83 00 “Mirrors”.

TOILET ACCESSORIES
10 28 00 - 3
2.03  CHILD CARE ACCESSORIES

A. Manufacturers: Subject to compliance with requirements, provide product indicated, or products by one of the following:
   1. American Specialties, Inc.  www.americanspecialties.com
   2. Brocar Products, Inc.  www.brocar.com
   4. GAMCO Specialty Accessories:  www.gamcousa.com
   5. Koala Kare Products:  www.koalabear.com
   6. SSC, Inc.  www.safestrap.com
   7. Tubular Specialties Manufacturing, Inc.  www.caltsm.com

B. Diaper-Changing Station (TA10):
   2. Description: Horizontal unit that opens by folding down from stored position and with child-protection strap.
      a. Engineered to support a minimum of 250-lb static load when opened.
   3. Mounting: Surface mounted, with unit projecting not more than 4 inches from wall when closed.
   5. Material and Finish: HDPE in manufacturer’s standard color as selected.

2.04  WARM-AIR DRYERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   3. American Specialties, Inc.  www.americanspecialties.com
   5. Bradley Corporation:  www.bradleycorp.com
   7. GAMCO Specialty Accessories:  www.gamcousa.com
   8. Tubular Specialties Manufacturing, Inc.  www.caltsm.com
   9. World Dryer Corporation:  www.worlddryer.com

B. Warm-Air Dryer (TA1):
      a. Operation Time: 30 to 40 seconds.
   4. Cover Material and Finish: Vitreous enamel cast iron cover, color as selected by Architect.
5. Electrical Requirements: 115 V, 20 A, 2400 W.

2.05 UNDERLAVATORY GUARDS

A. (TA13): Not used.

2.06 CUSTODIAL ACCESSORIES

A. Manufacturers: Subject to compliance with requirements, provide product indicated, or products by one of the following:
   1. American Specialties, Inc.  www.americanspecialties.com
   2. Bobrick Washroom Equipment, Inc.  www.bobrick.com
   4. GAMCO Specialty Accessories:  www.gamcousa.com
   5. Tubular Specialties Manufacturing, Inc.  www.caltsm.com

B. Mop and Broom Holder (TA14): See Division 22 – Plumbing.

C. Stainless Steel Splash Guard / Wall Protection (TA15): See Division 22 – Plumbing.

2.07 FABRICATION

A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.

B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner’s representative.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install accessories according to manufacturers’ written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.

B. Grab Bars: Install to withstand a downward load of at least 250 lbf, when tested according to ASTM F 446.
3.02 ADJUSTING AND CLEANING

A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.

B. Remove temporary labels and protective coatings.

C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

END OF SECTION
SECTION 10 44 13
FIRE EXTINGUISHER CABINETS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Fire protection cabinets for the following:
      a. Portable fire extinguishers.

B. Related Sections:
   1. Division 09 painting Sections for field painting fire protection cabinets.
   2. Division 10 Section "Signage" for directional signage to out-of-sight fire extinguishers and cabinets.
   3. Division 10 Section "Fire Extinguishers."
   4. Division 26 Section "Interior Lighting" for fire extinguisher location lights.

1.02 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for fire protection cabinets.
   1. Fire Protection Cabinets: Include roughing-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type, trim style, and panel style.
   2. Show location of knockouts for hose valves.

B. Shop Drawings: For fire protection cabinets. Include plans, elevations, sections, details, and attachments to other work.

C. Samples for Initial Selection: For each type of fire protection cabinet indicated.

D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below:
   1. Size: 6 by 6 inches square.

E. Product Schedule: For fire protection cabinets. Coordinate final fire protection cabinet schedule with fire extinguisher schedule to ensure proper fit and function.

F. Maintenance Data: For fire protection cabinets to include in maintenance manuals.

1.03 QUALITY ASSURANCE

A. Fire-Rated, Fire Protection Cabinets: Listed and labeled to comply with requirements in ASTM E 814 for fire-resistance rating of walls where they are installed.
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. Preinstallation Conference: Conduct conference at Project site.
   1. Review methods and procedures related to fire protection cabinets including, but not limited to, the following:
      a. Schedules and coordination requirements.

1.04 COORDINATION

A. Coordinate size of fire protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.

B. Coordinate size of fire protection cabinets to ensure that type and capacity of fire hoses, hose valves, and hose racks indicated are accommodated.

C. Coordinate sizes and locations of fire protection cabinets with wall depths.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Stainless-Steel Sheet: ASTM A 666, Type 304.

B. Tempered Float Glass: ASTM C 1048, Kind FT, Condition A, Type I, Quality q3, 3 mm thick, Class 1 (clear).

2.02 FIRE PROTECTION CABINET

A. Cabinet Type: Suitable for fire extinguisher.
   1. Basis of Design Product: Subject to compliance with requirements, provide “Cosmopolitan Series, No. 1837-F-17" as manufactured by JL Industries: www.jlindustries.com, or comparable product by one of the following:

B. Cabinet Construction: Nonrated, 1-hour fire rated, 2-hour fire rated, as indicated on Drawings.
   1. Fire-Rated Cabinets: Construct fire-rated cabinets with double walls fabricated from 0.0428-inch- thick, cold-rolled steel sheet lined with minimum 5/8-inch- thick, fire-barrier material. Provide factory-drilled mounting holes.

C. Cabinet Material: Stainless-steel sheet.
   1. Shelf: Same metal and finish as cabinet.

D. Semirecessed Cabinet: Cabinet box partially recessed in walls of sufficient depth to suit style of trim indicated; with one-piece combination trim and perimeter door frame overlapping.
surrounding wall surface with exposed trim face and wall return at outer edge (backbend). Provide where walls are of insufficient depth for recessed cabinets but are of sufficient depth to accommodate semirecessed cabinet installation.

1. Rolled-Edge Trim: 2-1/2-inch backbend depth.

E. Cabinet Trim Material: Same material and finish as door.

F. Door Material: Stainless-steel sheet.

G. Door Style: Fully glazed panel with frame.

H. Door Glazing: Tempered float glass (clear).

I. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.

1. Provide projecting lever handle with "Saf-T-Loc" cam-action latch.
2. Provide manufacturer's standard continuous hinge permitting door to open 180 degrees.

J. Accessories:

1. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to fire protection cabinet, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.
2. Lettered Door Handle: One-piece, cast-iron door handle with the word "FIRE" embossed into face.
3. Door Lock: Cam lock that allows door to be opened during emergency by pulling sharply on door handle.
4. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated.
   a. Identify fire extinguisher in fire protection cabinet with the words "FIRE EXTINGUISHER."
      1) Location: Applied to glass cabinet door.
      2) Application Process: Vinyl letters.
      3) Lettering Color: Red.
      4) Orientation: Vertical.

K. Finishes:

1. Stainless Steel: No. 4 directional satin finish.

2.03 FABRICATION

A. Fire Protection Cabinets: Provide manufacturer's standard box (tub) with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.

1. Weld joints and grind smooth.
2. Provide factory-drilled mounting holes.
3. Prepare doors and frames to receive locks.
4. Install door locks at factory.

B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles selected.
   1. Fabricate door frames with tubular stiles and rails and hollow-metal design, minimum 1/2 inch thick.
   2. Fabricate door frames of one-piece construction with edges flanged.
   3. Miter and weld perimeter door frames.

C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

2.04 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces of fire protection cabinets from damage by applying a strippable, temporary protective covering before shipping.

C. Finish fire protection cabinets after assembly.

D. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.05 STAINLESS-STEEL FINISHES

A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.

B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
   1. Run grain of directional finishes with long dimension of each piece.
   2. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
   3. No. 4 Directional Satin Finish.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine walls and partitions for suitable framing depth and blocking where semirecessed cabinets will be installed.

B. Proceed with installation only after unsatisfactory conditions have been corrected.
3.02 PREPARATION

A. Prepare recesses for semirecessed fire protection cabinets as required by type and size of cabinet and trim style.

3.03 INSTALLATION

A. General: Install fire protection cabinets in locations and at mounting heights indicated or, if not indicated, at heights acceptable to authorities having jurisdiction.
   1. Fire Protection Cabinets: 54 inches above finished floor to top of cabinet.

B. Fire Protection Cabinets: Fasten cabinets to structure, square and plumb.
   1. Unless otherwise indicated, provide recessed fire protection cabinets. If wall thickness is not adequate for recessed cabinets, provide semirecessed fire protection cabinets.
   2. Provide inside latch and lock for break-glass panels.
   3. Fasten mounting brackets to inside surface of fire protection cabinets, square and plumb.

3.04 ADJUSTING AND CLEANING

A. Remove temporary protective coverings and strippable films, if any, as fire protection cabinets are installed unless otherwise indicated in manufacturer’s written installation instructions.

B. Adjust fire protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.

C. On completion of fire protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.

D. Touch up marred finishes, or replace fire protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire protection cabinet and mounting bracket manufacturers.

E. Replace fire protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION
SECTION 10 44 16

FIRE EXTINGUISHERS

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes portable, hand-carried fire extinguishers.

B. Related Sections:
   1. Division 10 Section "Fire Extinguisher Cabinets."

1.02 SUBMITTALS

A. Product Data: For each type of product indicated. Include rating and classification, material descriptions, dimensions of individual components and profiles, and finishes for fire extinguisher and mounting brackets.

B. Operation and Maintenance Data: For fire extinguishers to include in maintenance manuals.

C. Warranty: Sample of special warranty.

1.03 QUALITY ASSURANCE

A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."

B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.
   1. Provide fire extinguishers approved, listed, and labeled by FMG.

1.04 COORDINATION

A. Coordinate type and capacity of fire extinguishers with fire protection cabinets to ensure fit and function.

1.05 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Failure of hydrostatic test according to NFPA 10.
      b. Faulty operation of valves or release levers.

   2. Warranty Period: Six years from date of Substantial Completion.
PART 2 - PRODUCTS

2.01 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

A. Fire Extinguishers: Type, size, and capacity for each fire protection cabinet and mounting bracket indicated, to match existing campus standard.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Amerex Corporation: www.amerex-fire.com
   b. Ansul Incorporated; Tyco International Ltd. www.ansul.com
   c. Badger Fire Protection; a Kidde company: www.badgerfire.com
   d. Buckeye Fire Equipment Company: www.buckeyef.com
   e. Fire End & Croker Corporation: www.croker.com
   g. Larsen's Manufacturing Company: www.larsensmfg.com
   h. Potter Roemer LLC: www.potterroemer.com
   i. Pyro-Chem; Tyco Safety Products: www.pyrochem.com

2. Valves: Manufacturer's standard.
3. Handles and Levers: Manufacturer's standard.
4. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B and bar coding for documenting fire extinguisher location, inspections, maintenance, and recharging.

B. Multipurpose Dry-Chemical Type in Steel Container: UL-rated 4-A:60-B:C, 10-lb nominal capacity, with monoammonium phosphate-based dry chemical in enameled-steel container.

2.02 MOUNTING BRACKETS

A. Mounting Brackets: Manufacturer's standard galvanized steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or red baked-enamel finish.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Amerex Corporation: www.amerex-fire.com
   b. Ansul Incorporated; Tyco International Ltd. www.ansul.com
   c. Badger Fire Protection; a Kidde company: www.badgerfire.com
   d. Buckeye Fire Equipment Company: www.buckeyef.com
   e. Fire End & Croker Corporation: www.croker.com
   g. Larsen's Manufacturing Company: www.larsensmfg.com
   h. Potter Roemer LLC: www.potterroemer.com

B. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Architect.
1. Identify bracket-mounted fire extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to mounting surface.
PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine fire extinguishers for proper charging and tagging.
   1. Remove and replace damaged, defective, or undercharged fire extinguishers.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. General: Install fire extinguishers and mounting brackets in locations indicated and in compliance with requirements of authorities having jurisdiction.
   1. Mounting Brackets: 54 inches above finished floor to top of fire extinguisher.

B. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.

END OF SECTION
SECTION 11 52 13

PROJECTION SCREENS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Electrically operated projection screens and controls.

B. Related Sections:
   1. Division 05 Section "Metal Fabrications" for metal support framing for projection screens.
   2. Division 06 Section "Rough Carpentry" for wood blocking for screen installation.
   3. Division 26 Sections for electrical service and connections including device boxes for switches and conduit, where required, for low-voltage control wiring.

1.02 DEFINITIONS

A. Gain of Front-Projection Screens: Ratio of light reflected from screen material to that reflected perpendicularly from a magnesium carbonate surface as determined per SMPTE RP 94.

B. Half-Gain Angle: The angle, measured from the axis of the screen surface to the most central position on a perpendicular plane through the horizontal centerline of the screen where the gain is half of the peak gain.

1.03 SUBMITTALS

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

B. Shop Drawings: For projection screens. Show layouts and types of projection screens. Include the following:
   1. For manually operated projection screens:
      a. Drop lengths.
      b. Anchorage details.
      c. Accessories.
   2. For electrically operated projection screens and controls:
      a. Location of screen centerline relative to ends of screen case.
      b. Location of wiring connections for electrically operated units.
      c. Location of seams in viewing surfaces.
      d. Drop lengths.
      e. Anchorage details, including connection to supporting structure for suspended units.
      f. Details of juncture of exposed surfaces with adjacent finishes.
      g. Accessories.
      h. Wiring diagrams.
C. Samples for Initial Selection: For finishes of surface-mounted screen cases.

D. Maintenance Data: For projection screens to include in maintenance manuals.

1.04 QUALITY ASSURANCE

A. Source Limitations for Projection Screens: Obtain projection screens from single manufacturer. Obtain accessories, including necessary mounting hardware, from screen 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.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Environmental Limitations: Do not deliver or install projection screens until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

B. Store rear-projection screens in manufacturer's protective packaging and according to manufacturer's written instructions.

1.06 COORDINATION

A. Coordinate layout and installation of projection screens with adjacent construction, including ceiling suspension systems, light fixtures, HVAC equipment, fire-suppression system, and partitions.

PART 2 - PRODUCTS

2.01 ELECTRICALLY OPERATED PROJECTION SCREENS

A. General: Manufacturer's standard units consisting of case, screen, motor, controls, mounting accessories, and other components necessary for a complete installation. Provide units that are listed and labeled as an assembly by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.

1. Controls: Remote, three-position control switch installed in recessed device box with flush cover plate matching other electrical device cover plates in room where switch is installed.
   a. Provide one control switch for each screen.
   b. Provide power supply for low-voltage systems if required.
   c. Provide video interface control for connecting to projector. Projector provides signal to raise or lower screen.

2. Motor in Roller: Instant-reversing motor of size and capacity recommended by screen manufacturer; with permanently lubricated ball bearings, automatic thermal-overload protection, preset limit switches to automatically stop screen in up and down positions,
and positive-stop action to prevent coasting. Mount motor inside roller with vibration isolators to reduce noise transmission.

3. Screen Mounting: Top edge securely anchored to rigid metal roller and bottom edge formed into a pocket holding a 3/8-inch- diameter metal rod with ends of rod protected by plastic caps.
   a. Roller for motor in roller supported by vibration- and noise-absorbing supports.

4. Tab Tensioning: Provide units that have a durable low-stretch cord, such as braided polyester, on each side of screen connected to edge of screen by tabs to pull screen flat horizontally. In lieu of tab tensioning, screens may be constructed from vinyl-coated screen cloth that contains horizontal stiffening monofilaments to resist edge curling.

B. Surface-Mounted, Metal-Encased, Electrically Operated Screens: motor in roller units designed and fabricated for surface mounting on wall or ceiling, fabricated from formed-steel sheet not less than 0.027 inch thick or from aluminum extrusions; with flat back design and vinyl covering or baked-enamel finish. Provide with matching end caps and concealed mounting.
   1. Products: Subject to compliance with requirements, provide "Cosmopolitan Electrol" as manufactured by Da-Lite Screen Company, www.dalite.com, or comparable product by one of the following:

2.02 FRONT-PROJECTION SCREEN MATERIAL

A. Matte-White Viewing Surface: Peak gain not less than 0.9, and gain not less than 0.8 at an angle of 50 degrees from the axis of the screen surface.
   1. Products: Subject to compliance with requirements, provide "Matte White" as manufactured by Da-Lite Screen Company, www.dalite.com, or comparable product by one of the following:


C. Mildew-Resistance Rating: 0 or 1 when tested according to ASTM G 21.

D. Flame Resistance: Passes NFPA 701.

E. Flame-Spread Index: Not greater than 75 when tested according to ASTM E 84.

F. Seamless Construction: Provide screens, in sizes indicated, without seams.
   1. Seams: Where length of screen indicated exceeds maximum length produced without seams in material specified, provide screen with horizontal seam placed as follows:
      a. At top of screen at juncture between extra drop length and viewing surface.
G. Edge Treatment: Black masking borders.

H. Size of Viewing Surface: As scheduled.

I. Provide extra drop length of dimensions and at locations indicated.
   1. Color: Same as viewing surface.
   2. Extra Drop Length: As needed at top of screen for bottom of screen to be 36 inches above floor.

PART 3 - EXECUTION

3.01 FRONT-PROJECTION SCREEN INSTALLATION

A. Install front-projection screens at locations indicated to comply with screen manufacturer's written instructions.

B. Install front-projection screens with screen cases in position and in relation to adjoining construction indicated. Securely anchor to supporting substrate in a manner that produces a smoothly operating screen with vertical edges plumb and viewing surface flat when screen is lowered.
   1. Install low-voltage controls according to NFPA 70 and complying with manufacturer's written instructions.
      a. Wiring Method: Install wiring in raceway except in accessible ceiling spaces and in gypsum board partitions where unenclosed wiring method may be used. Use UL-listed plenum cable in environmental air spaces, including plenum ceilings. Conceal raceway and cables except in unfinished spaces.
   2. Test electrically operated units to verify that screen controls, limit switches, closures, and other operating components are in optimum functioning condition.
   3. Test manually operated units to verify that screen-operating components are in optimum functioning condition.

END OF SECTION
SECTION 12 21 13
HORIZONTAL LOUVER BLINDS

PART 1 - GENERAL

1.01 SUMMARY
A. This Section includes the following:
   1. Horizontal louver blinds with aluminum slats.

B. Related Sections include the following:
   1. Division 06 Section "Rough Carpentry" for wood blocking and grounds for mounting horizontal louver blinds and accessories.

1.02 SUBMITTALS
A. Product Data: For each type of product indicated.
B. Shop Drawings: Show fabrication and installation details for horizontal louver blinds.
C. Samples for Color Selection: For each type and color of horizontal louver blind indicated.
   1. Include similar Samples of accessories involving color selection.
D. Window Treatment Schedule: For horizontal louver blinds. Use same designations indicated on Drawings.
E. Product Certificates: For each type of horizontal louver blind, signed by product manufacturer.
F. Maintenance Data: For horizontal louver blinds to include in maintenance manuals.

1.03 QUALITY ASSURANCE
A. Source Limitations: Obtain horizontal louver blinds through one source from a single manufacturer.
B. Fire-Test-Response Characteristics: Provide horizontal louver blinds with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.
C. Product Standard: Provide horizontal louver blinds complying with WCSC A 100.1.

1.04 DELIVERY, STORAGE, AND HANDLING
A. Deliver horizontal louver blinds in factory packages, marked with manufacturer and product name, and location of installation using same designations indicated on Drawings and in a window treatment schedule.
1.05 PROJECT CONDITIONS

A. Environmental Limitations: Do not install horizontal louver blinds until construction and wet and dirty finish work in spaces, including painting, is complete and dry and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

B. Field Measurements: Where horizontal louver blinds are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operable glazed units’ operation hardware throughout the entire operating range. Notify Architect of discrepancies. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.06 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Furnish 10 full size units in most common size(s) as approved by Architect.

PART 2 - PRODUCTS

2.01 HORIZONTAL LOUVER BLINDS, ALUMINUM SLATS

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
   1. Hunter Douglas: www.hunterdouglas.com
   2. Levolor, a Newell Rubbermaid Company: www.levelor.com
   3. Springs Window Fashions Division, Inc. www.springswindowfashions.com

B. Slats: Aluminum; alloy and temper recommended by producer for type of use and finish indicated; with crowned profile and radiused corners.
   1. Width: 1 inch.
   2. Thickness: Manufacturer’s standard.
   3. Finish: One color.
      a. Ionized Coating: Antistatic, dust-repellent, baked polyester finish.
      b. Reflective Coating: Manufacturer’s special coating enhancing the reflection of solar energy on the outside-facing slat surface at exterior window locations.

C. Headrail: Formed steel or extruded aluminum; long edges returned or rolled; fully enclosing operating mechanisms on three sides and end plugs and the following:
   1. Capacity: One blind per headrail.

D. Bottom Rail: Formed-steel or extruded-aluminum tube, with plastic or metal capped ends top contoured to match crowned shape of slat; with enclosed ladders and tapes to prevent contact with sill.

E. Ladders: Evenly spaced to prevent long-term slat sag.
   1. For Blinds with Nominal Slat Width 1 Inch or Less: Braided string.
F. Lift Cords: Manufacturer’s standard.

G. Tilt Control: Enclosed worm-gear mechanism and linkage rod, and the following:
   2. Length of Tilt Control: Manufacturer’s standard.
   3. Tilt: Full.

H. Lift Operation: Manual, cord lock; locks pull cord to stop blind at any position in ascending or descending travel.

I. Tilt-Control and Cord-Lock Position: Right and left side of headrail, respectively, unless otherwise indicated.

J. Valance: Manufacturer’s standard.
   1. Finish Color Characteristics: Match color, texture, pattern, and gloss of slats.

K. Mounting: Wall mounting, permitting easy removal and replacement without damaging blind or adjacent surfaces and finishes; with spacers and shims required for blind placement and alignment indicated.
   1. Provide intermediate support brackets if end support spacing exceeds spacing recommended by manufacturer for weight and size of blind.

L. Hold-Down Brackets and Hooks or Pins: Manufacturer’s standard.

M. Colors, Textures, Patterns, and Gloss: As selected by Architect from manufacturer’s full range.

2.02 HORIZONTAL LOUVER BLIND FABRICATION

A. Concealed Components: Non-corrodible or corrosion-resistant-coated materials.

B. Unit Sizes: Obtain units fabricated in sizes to fill window and other openings as follows, measured at 74 deg F:
   1. Blind Units Installed between (inside) Jambs: Width equal to 1/4 inch per side or 1/2 inch total, plus or minus 1/8 inch, less than jamb-to-jamb dimension of opening in which each blind is installed. Length equal to 1/4 inch, plus or minus 1/8 inch, less than head-to-sill dimension of opening in which each blind is installed.
   2. Blind Units Installed outside Jambs: Width and length as indicated, with terminations between blinds of end-to-end installations at centerlines of mullion or other defined vertical separations between openings.

C. Installation Brackets: Designed for easy removal and reinstallation of blind, for supporting headrail, valance, and operating hardware, and for hardware position and blind mounting method indicated.

D. Installation Fasteners: No fewer than two fasteners per bracket, fabricated from metal noncorrosive to blind hardware and adjoining construction; type designed for securing to supporting substrate; and supporting blinds and accessories under conditions of normal use.
E. Color-Coated Finish:
   1. Metal: For components exposed to view, apply manufacturer's standard baked finish complying with manufacturer's written instructions for surface preparation including pretreatment, application, baking, and minimum dry film thickness.

F. Component Color: Provide rails, cords, ladders, and exposed-to-view metal and plastic matching or coordinating with slat color, unless otherwise indicated.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, and other conditions affecting performance.
   1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install horizontal louver blinds level and plumb and aligned with adjacent units according to manufacturer's written instructions, and located so exterior slat edges in any position are not closer than 2 inches to interior face of glass. Install intermediate support as required to prevent deflection in headrail. Allow clearances between adjacent blinds and for operating glazed opening's operation hardware if any.

B. Flush Mounted: Install horizontal louver blinds with slat edges flush with finish face of opening if slats are tilted open.

3.03 ADJUSTING

A. Adjust horizontal louver blinds to operate smoothly, easily, safely, and free of binding or malfunction throughout entire operational range.

3.04 CLEANING AND PROTECTION

A. Clean horizontal louver blind surfaces after installation, according to manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that horizontal louver blinds are without damage or deterioration at time of Substantial Completion.

C. Replace damaged horizontal louver blinds that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.

END OF SECTION
SECTION 12 36 40
STONE COUNTERTOPS

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes:
   1. Stone countertops.

B. Related Sections:
   1. Division 05 Section "Metal Fabrications" for steel countertop supports.
   2. Division 06 Section "Interior Architectural Woodwork" for casework.

C. References:
   1. ASTM C 119-04: Terminology Relating to Dimension Stone
   3. ASTM C 615-03: Specification for Granite Dimension Stone
   4. ASTM C 880-98: Test Method for Flexural Strength of Dimensional Stone

1.02 SUBMITTALS

A. Product Data: For each stone type, stone accessory, and other manufactured products.
   1. Each stone type: Physical properties

B. Shop Drawings: Include plans, sections, details, and attachments to other work. Show fabrication and installation details for dimension stone cladding:
   1. Include dimensions and profiles of stone units.
   2. Show locations and details of joints.
   3. Show locations and details of anchors and supports.

C. Stone Samples: (2) Sets for each stone required, exhibiting the full range of color characteristics expected; not less than 12 inches square.
   1. Grout Samples: Full range of exposed color and texture.
   2. Sealant Samples: For each type and color of joint sealant required.

D. LEED Submittal:
   1. Product Data for Credit EQ 4.1: For adhesives and sealants, documentation including printed statement of VOC content.

E. Sealant Compatibility Test Report: Submit test report from sealant manufacturer, in accordance with Division 07 Section "Joint Sealants" stating that sealants will not stain stone.

F. Maintenance Data: Provide maintenance manuals for stone countertops. Include stone-care products recommended by stone source.
1.03 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate stone countertops similar to that indicated for this Project and whose products have a record of successful in-service performance.

B. Source Limitations for Stone: Obtain each variety of stone from a single quarry.
   1. Obtain each variety of stone from a single quarry, whether specified in this Section or in another Section of the Specifications.
   2. Make stone slabs available for Architect to examine for appearance characteristics.
      a. Architect will select aesthetically acceptable slabs and will indicate aesthetically unacceptable portions of slabs.

C. Mockup: Build mockup to demonstrate aesthetic effects and set quality standards for materials and execution.
   1. Build mockup of typical countertop as shown on Drawings.
   2. Approved mockup may become part of the completed Work.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Lift stone with wide-belt slings; do not use wire rope or ropes that might cause staining. Move stone, if required, using dollies with cushioned wood supports.

B. Store stone on wood A-frames or pallets with non-staining separators and non-staining, waterproof covers. Ventilate under covers to prevent condensation.

1.05 PROJECT CONDITIONS

A. Field Measurements: Verify dimensions of construction to receive stone countertops by field measurements before fabrication. Indicate field measurements on shop drawings.

PART 2 - PRODUCTS

2.01 STONE SOURCE


2.02 STONE MATERIAL

A. Granite: ASTM C 615.

B. Cut stone from one block or contiguous, matched blocks in which natural markings occur.
C. Granite Type (ST1):
   2. Finish:
      a. Polished.
   3. Thickness: Not less than 3/4-inches on plywood support subtop, with 1-1/2-inch square edges.

2.03 STONE ACCESSORIES

A. General: Use only adhesives formulated for stone and recommended by manufacturer for the application shown on Drawings.

B. Water-Cleanable Epoxy Adhesive: ANSI A118.3, with a VOC content of 65 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Water-Cleanable Epoxy Grout: ANSI A118.3, chemical-resistant, water-cleanable, tilesetting and -grouting epoxy, with a VOC content of 65 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

D. Stone Adhesive: 2-part epoxy or polyester adhesive, formulated specifically for bonding stone to stone, with an initial set time of not more than 2 hours at 70 deg F, and with a VOC content of 65 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

E. Sealant for Countertops: Manufacturer’s standard sealant of characteristics indicated below that comply with applicable requirements in Division 07 Section "Joint Sealants" and will not stain the stone it is applied to.
   2. Color: As selected by Architect.
   3. Use sealants that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

F. Stone Cleaner: Cleaner specifically formulated for stone type, finish, and application indicated, as recommended by stone producer. Do not use cleaning compounds containing acids, caustics, harsh fillers, or abrasives.

G. Stone Sealer: Colorless, stain-resistant sealer that does not affect color or physical properties of stone surfaces, as recommended by stone producer for application indicated.

2.04 STONE FABRICATION, GENERAL

A. General: Fabricate stone per requirements, including Drawings and Shop Drawings.
B. Select stone for intended use to prevent fabricated units from containing cracks, seams, and starts that could impair structural integrity or function.
   1. Repairs that are characteristic of the varieties specified are acceptable provided they do not impair structural integrity or function and are not aesthetically unpleasing, as judged by Architect.

C. Grade and mark stone for final locations to produce assembled countertop units with an overall uniform appearance.

D. Fabricate stone countertops in sizes and shapes required to comply with requirements indicated, including details on Drawings and Shop Drawings.
   1. Comply with recommendations in NBGQA's "Specifications for Architectural Granite."
   2. Clean sawed backs of stones to remove rust stains and iron particles.
   3. Dress joints straight and at right angle to face, unless otherwise indicated.
   4. Cut and drill sinkages and holes in stone for anchors, supports, and attachments.
   5. Provide openings, reveals, and similar features as needed to accommodate adjacent work.
   6. Fabricate molded edges with machines having abrasive shaping wheels made to reverse contour of edge profile to produce uniform shape throughout entire length of edge and with precisely formed arris slightly eased to prevent snipping, and matched at joints between units. Form corners of molded edges as indicated with outside corners slightly eased, unless otherwise indicated.
   7. Finish exposed faces of stone to comply with requirements indicated for finish of each type of stone required and to match approved Samples and mockups. Provide matching finish on exposed edges of countertops, splashes, and cutouts.

E. Carefully inspect finished stone units at fabrication plant for compliance with requirements for appearance, material, and fabrication. Replace defective units.

2.05 STONE COUNTERTOPS

A. General: Comply with recommendations in MIA's "Dimension Stone - Design Manual."

B. Nominal Thickness: Gage backs to provide units of identical thickness.
   1. 3/4-inches.

C. Edges: 1-1/2-inches. Straight, slightly eased at all exposed edges.

D. Joints: Fabricate countertops in sections for joining in field, and as follows:
   2. Review proposed joints with Architect.
E. Cutouts and Holes:
   1. Undercounter Fixtures: Make cutouts for undercounter fixtures in shop using template or pattern furnished by fixture manufacturer. Form cutouts to smooth, even curves.
   2. Counter-Mounted Fixtures: Prepare countertops in shop for field cutting openings for counter-mounted fixtures. Mark tops for cutouts and drill holes at corners of cutout locations.
   3. Fittings: Drill countertops in shop for plumbing fittings, counter mounted soap dispensers, and similar items.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates indicated to receive stone countertops and conditions under which stone countertops will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
   1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Clean dirty or stained stone surfaces by removing soil, stains, and foreign materials before setting. Clean stone by thoroughly scrubbing with fiber brushes and then drenching with clear water. Use only mild cleaning compounds that contain no caustic or harsh materials or abrasives. Allow stone to dry before installing.

3.03 CONSTRUCTION TOLERANCES

A. Variation from Plumb: For vertical lines and surfaces, do not exceed 1/16 inch in 48 inches.
B. Variation from Level: Do not exceed 1/8 inch in 96 inches, 1/4 inch maximum.
C. Variation in Joint Width: Do not vary joint thickness more than 1/4 of nominal joint width.
D. Variation in Plane at Joints (Lipping): Do not exceed 1/64-inch difference between planes of adjacent units.
E. Variation in Line of Edge at Joints (Lipping): Do not exceed 1/64-inch difference between edges of adjacent units, where edge line continues across joint.

3.04 INSTALLATION OF COUNTERTOPS

A. Install countertops over plywood subtops with full spread of water-cleanable epoxy adhesive.
B. Do not cut stone in field. If stone countertops require additional fabrication not specified to be performed at Project site, return to fabrication shop for adjustment.
C. Set stone to comply with requirements shown on Drawings and Shop Drawings. Shim and adjust stone to location shown. Install countertops with uniform joints of widths shown and with edges and faces aligned.

D. Bond joints with stone adhesive and draw tight as countertops are set. Mask areas of countertops adjacent to joints to prevent adhesive smears.

E. Space joints with 1/16-inch gap for filling with grout. Use temporary shims to ensure uniform spacing.

F. Install backsplash and end splash by adhering to wall with water-cleanable epoxy adhesive. Leave 1/16-inch gap between countertop and splash for filling with sealant. Use temporary shims to ensure uniform spacing.

G. Grout joints to comply with ANSI A108.10. Remove temporary shims before grouting. Tool grout uniformly and smoothly with plastic tool.

3.05 ADJUSTING AND CLEANING

A. In-Progress Cleaning: Clean countertops as work progresses. Remove adhesive, grout, mortar, and sealant smears immediately.

B. Remove and replace stone countertops of the following description:
   1. Broken, chipped, stained, or otherwise damaged stone. Stone may be repaired if methods and results are approved by Architect.
   2. Defective countertops.
   3. Defective joints, including misaligned joints.
   4. Interior stone countertops and joints not matching approved Samples and mockups.
   5. Interior stone countertops not complying with other requirements indicated.

C. Replace in a manner that results in stone countertops matching approved Samples and mockups, complying with other requirements, and showing no evidence of replacement.

D. Following installation and after sealants are cured, clean stone countertops using clean water and soft rags.

E. Sealer Application: Apply stone sealer to comply with stone producer's and sealer manufacturer's instructions.

END OF SECTION
SECTION 12 49 40

ROLLER SHADES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Manual and electrically operated sunscreens.
   3. Local group and master control system for shade operation.

B. Intent:
   1. The intent of this specification is to provide all components for a complete installation of the manual and electrically operated single and double-roller shades. Provide all necessary hardware, connections, and parts required for a functional installation.

C. Related Sections:
   1. Division 06 Section “Rough Carpentry” for wood blocking and grounds for mounting roller shades and accessories.
   2. Division 09 Section “Gypsum Board” for coordination with gypsum board assemblies for the installation of shade pockets, closures, and related accessories.
   3. Division 09 Sections for Acoustical Ceilings: Coordination with acoustical ceiling systems for installation of shade pockets, closures and related accessories.
   4. Division 26 Electrical Sections for electric service for motor controls.

D. References:
   2. NFPA 70 - National Electrical Code.

1.02 SUBMITTALS

A. Submit under provisions of Division 01 Section “Submittal Procedures”.

B. Submit Environmental Certification and Third Party Evaluation per Article 1.03 - Quality Assurance.

C. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Styles, material descriptions, dimensions of individual components, profiles, features, finishes and operating instructions.
   3. Storage and handling requirements and recommendations.
   4. Mounting details and installation methods.
   5. Typical wiring diagrams including integration of motor controllers with building management system, audiovisual and lighting control systems as applicable.
D. **Shop Drawings:** Plans, elevations, sections, product details, installation details, operational clearances, wiring diagrams and relationship to adjacent work.
   1. Prepare shop drawings using base sheets provided electronically by the Architect.

E. **Window Treatment Schedule:** For all roller shades. Use same room designations as indicated on the Drawings and include opening sizes and key to typical mounting details.

F. **Selection Samples:** For each finish product specified, one set of shade cloth options and aluminum finish color samples representing manufacturer's full range of available colors and patterns.

G. **Verification Samples:** For each finish product specified, one complete set of shade components, unassembled, demonstrating compliance with specified requirements. Shadecloth sample and aluminum finish sample as selected. Mark face of material to indicate interior faces.

H. **Maintenance Data:** For roller shades to include in maintenance manuals. Include the following:
   1. Methods for maintaining roller shades and finishes.
   2. Precautions about cleaning materials and methods that could be detrimental to fabrics, finishes, and performance.
   3. Operating hardware.
   4. Motorized shade operator.

### 1.03 QUALITY ASSURANCE

A. **Source Limitations:** Obtain roller shades through one source from a single manufacturer.

B. **Installer Qualifications:** Installer trained and certified by the manufacturer with a minimum of ten years experience in installing products comparable to those specified in this section.

C. **Fire-Test-Response Characteristics:** Provide roller shade band materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:

D. **Electrical Components:** NFPA Article 100 listed and labeled by either UL or ETL or other testing agency acceptable to authorities having jurisdiction, marked for intended use, and tested as a system. Individual testing of components will not be acceptable in lieu of system testing.

E. **Anti-Microbial Characteristics:** 'No Growth' per ASTM G 21 results for fungi ATCC9642, ATCC9644, ATCC9645.

F. **Environmental Certification:** Submit written certification from the manufacturer, including third party evaluation, recycling characteristics, and perpetual use certification as specified below. Initial submittals, which do not include the Environmental Certification, below will be rejected. Materials that are simply 'PVC free' without identifying their inputs shall not qualify as meeting the intent of this specification and shall be rejected.
G. Third Party Evaluation: Provide documentation stating the shade cloth has undergone third party evaluation for all chemical inputs, down to a scale of 100 parts per million, that have been evaluated for human and environmental safety. Identify any and all inputs, which are known to be carcinogenic, mutagenic, teratogenic, reproductively toxic, or endocrine disrupting. Also identify items that are toxic to aquatic systems, contain heavy metals, or organohalogens. The material shall contain no inputs that are known problems to human or environmental health per the above major criteria, except for an input that is required to meet local fire codes.

H. Recycling Characteristics: Provide documentation that the shade cloth can and is part of a closed loop of perpetual use and not be required to be down cycled, incinerated or otherwise thrown away. Scrap material can be sent back to the mill for reprocessing and recycling into the same quality yarn and woven into new material, without down cycling. Certify that this process is currently underway and will be utilized for this project.

I. Perpetual Use Certification: Certify that at the end of the useful life of the shade cloth, that the material can be sent back to the manufacturer for recapture as part of a closed loop of perpetual use and that the material can and will be reconstituted into new yarn, for weaving into new shade cloth. Provide information on each shade band indicating that the shade band can be sent back to the manufacturer for this purpose.

J. Mock-Up: Provide a mock-up of one roller shade assembly of each type for evaluation of mounting, appearance, and accessories.
   1. Locate mock-ups in windows designated by Architect.
   2. Following review and approval by Architect, approved mockups may become part of the completed Work.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver shades in factory-labeled packages, marked with manufacturer and product name, fire-test-response characteristics, and location of installation using same room designations indicated on Drawings and in the Window Treatment Schedule.

1.05 PROJECT CONDITIONS

A. Environmental Limitations: Install roller shades after finish work including painting is complete and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

B. Field Measurements: Where roller shades are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operable glazed units’ operation hardware throughout the entire operating range. Notify Architect of discrepancies. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
1.06 WARRANTY

A. Roller Shade Hardware, Chain and Shadecloth (except “EcoVeil”): Manufacturer's standard non-depreciating twenty-five year limited warranty.

B. Roller Shade Motors and Motor Control Systems: Manufacturer's standard non-depreciating five-year warranty.

C. Roller Shade Installation: One year from date of Substantial Completion, not including scaffolding, lifts or other means to reach inaccessible areas.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design: To establish a standard of quality, design, and function desired, Drawings and specifications are based on products by MechoShade Systems, Inc. [www.mechoshade.com](http://www.mechoshade.com).

B. Other Manufacturers:
   1. Insolrol: [www.insolrol.com](http://www.insolrol.com).

2.02 ROLLER SHADES

A. Manual and electrically operated interior solar roller shades, operating independently of each other, in exterior windows of rooms and spaces as shown on Drawings.

B. Manual and electrically operated motorized interior “double”, solar and room darkening blackout roller shades, operating independently of each other, in exterior windows of rooms and spaces shown on Drawings, and related motor control systems.

2.03 SHADE CLOTH

A. Environmentally Certified Shadecloth: MechoShade Systems, Inc., “EcoVeil” group, 1350 Series, fabricated from TPO for both core yarn and jacket, single thickness, non-raveling 0.030 inch thick fabric.
   1. Weave: 5 percent open 2 by 2 basketweave.
   2. Color: As indicated on Drawings or as selected by Architect from manufacturer’s full range.
B. Vinyl Room Darkening Shadecloth (Single-Fabric): MechoShade Systems, Inc., "0700 series", blackout material, washable and colorfast laminated and embossed vinyl coated fabric, 0.012 inches thick blackout material and weighing 0.81 lbs. per square yard, with a minimum of 62 threads per square inch in colors selected from manufacturer's available range.
   1. Color: As indicated on Drawings or as selected by Architect from manufacturer’s full range.

2.04 SHADE BAND

A. Shade Bands: Construction of shade band includes the fabric, the hem weight, hem-pocket, shade roller tube, and the attachment of the shade band to the roller tube. Sewn hems and open hem pockets are not acceptable.
   1. Hem Pockets and Hem Weights: Fabric hem pocket with RF-welded seams (including welded ends) and concealed hem weights. Hem weights shall be of appropriate size and weight for shade band. Hem weight shall be continuous inside a sealed hem pocket. Hem pocket construction and hem weights shall be similar, for all shades within one room.
   2. Shade band and Shade Roller Attachment:
      a. Use extruded aluminum shade roller tube of a diameter and wall thickness required to support shade fabric without excessive deflection. Roller tubes less than 1.55 inch in diameter for manual shades, and less than 2.55 inches for motorize shades are not acceptable.
      b. Provide for positive mechanical engagement with drive / brake mechanism.
      c. Provide for positive mechanical attachment of shade band to roller tube; shade band shall be made removable / replaceable with a "snap-on" snap-off" spline mounting, without having to remove shade roller from shade brackets.
      d. Mounting spline shall not require use of adhesives, adhesive tapes, staples, and/or rivets.
      e. Any method of attaching shade band to roller tube that requires the use of: adhesive, adhesive tapes, staples, and/or rivets are not acceptable.

2.05 ROLLER SHADE FABRICATION

A. Unit Sizes: Obtain units fabricated in sizes to fill window and other openings as follows, measured at 74 deg F:
   1. Shade Units Installed between (Inside) Jambs: Edge of shade not more than 1/4 inch from face of jamb. Length equal to head to sill dimension of opening in which each shade is installed.
   2. Shade Units Installed Outside Jambs: Width and length as indicated, with terminations between shades of end-to-end installations at centerlines of mullion or other defined vertical separations between openings.

B. Fabricate shadecloth to hang flat without buckling or distortion. Fabricate with heat-sealed trimmed edges to hang straight without curling or raveling. Fabricate unguided shadecloth to roll true and straight without shifting sideways more than 1/8-inch in either direction per 8 feet of shade height due to warp distortion or weave design. Fabricate hem as follows:
   1. Concealed hemtube.
C. Provide battens in standard shades as required to assure proper tracking and uniform rolling of the shadebands. Contractor shall be responsible for assuring the width-to-height (W:H) ratios shall not exceed manufacturer's standards or, in absence of such standards, shall be responsible for establishing appropriate standards to assure proper tracking and rolling of the shadecloth within specified standards. Battens shall be roll-formed stainless steel or tempered steel, as required.

D. For railroaded shadebands, provide seams in railroaded multi-width shadebands as required to meet size requirements and in accordance with seam alignment as acceptable to Architect. Seams shall be properly located. Furnish battens in place of plain seams when the width, height, or weight of the shade exceeds manufacturer's standards. In absence of such standards, assure proper use of seams or battens as required to, and assure the proper tracking of the railroaded multi-width shadebands.

E. Provide battens for railroaded shades when width-to-height (W:H) ratios meet or exceed manufacturer's standards. In absence of manufacturer's standards, be responsible for proper use and placement of battens to assure proper tracking and roll of shadebands.

F. Blackout shadebands, when used in side channels, shall have horizontally mounted roll-formed stainless steel or tempered-steel battens not more than 3 feet on center extending fully into the side channels. Battens shall be concealed in an integrally-colored fabric to match the inside and outside colors of the shadeband, in accordance with manufacturer's published standards for spacing and requirements.
   1. Battens shall be roll formed of stainless steel or tempered steel and concave to match the contour of the roller tube.
   2. Batten pockets shall be self-colored fabric front and back RF welded into the shadecloth. A self-color opaque liner shall be provided front and back to eliminate any see through of the batten pocket that shall not exceed 1-1/2 inches high and be totally opaque. A see-through moiré effect, which occurs with multiple layers of transparent fabrics, shall not be acceptable.

2.06 COMPONENTS

A. Access and Material Requirements:
   1. Provide shade hardware allowing for the removal of shade roller tube from brackets without removing hardware from opening and without requiring end or center supports to be removed.
   2. Provide shade hardware that allows for removal and re-mounting of the shade bands without having to remove the shade tube, drive or operating support brackets.
   3. Use only Delrin engineered plastics by DuPont for all plastic components of shade hardware. Styrene based plastics, and /or polyester, or reinforced polyester will not be acceptable.
B. Motorized Shade Hardware and Shade Brackets:
   1. Provide shade hardware constructed of minimum 1/8-inch thick plated steel, or heavier, thicker, as required to support 150 percent of the full weight of each shade.
   2. Provide shade hardware system that allows for field adjustment of motor or replacement of any operable hardware component without requiring removal of brackets, regardless of mounting position (inside, or outside mount).
   3. Provide shade hardware system that allows for operation of multiple shade bands offset by a maximum of 8-45 degrees from the motor axis between shade bands (4-22.5 degrees) on each side of the radial line, by a single shade motor (multi-banded shade, subject to manufacturer’s design criteria).

C. Concealed Components: Non-corrodible or corrosion-resistant-coated materials.
   1. Lifting Mechanism: With permanently lubricated moving parts.

D. Drive Chain: #10 qualified stainless steel chain rated to 90 lb. minimum breaking strength. Nickel plate chain shall not be accepted.

2.07 SHADE MOTOR DRIVE SYSTEM
A. Shade Motors:
   1. Tubular, asynchronous (non-synchronous) motors, with built-in reversible capacitor operating at 110v AC (60hz), single phase, temperature Class A, thermally protected, totally enclosed, maintenance free with line voltage power supply equipped with locking disconnect plug assembly furnished with each motor.
   2. Conceal motors inside shade roller tube.
   3. Maximum current draw for each shade motor of 2.3 amps.
   4. Use motors rated at the same nominal speed for all shades in the same room.

B. Total hanging weight of shade band shall not exceed 80 percent of the rated lifting capacity of the shade motor and tube assembly.

2.08 MOTOR CONTROL SYSTEMS
A. IQ/MLC: Specifications and design of shade motors and motor control system are based on the IQ/MLC motor logic control system manufactured by MechoShade Systems, Inc. Other systems may be acceptable provide that all of the following performance capabilities are provided. Motor logic control systems not in complete compliance with these performance criteria shall not be accepted as equal systems.
   1. Motor Control System:
      a. Provide power to each shade motor via individual 3 conductor line voltage circuits connecting each motor to the relay based motor logic controllers (IQ/MLC).
      b. Control system components shall provide appropriate (spike and brown out) over-current protection (+/- 10 percent of line voltage) for each of the four individual motor circuits and shall be rated by UL or ETL as a recognized component of this system and tested as an integrated system.
      c. Motor control system shall allow each group of four shade motors in any combination to be controlled by each of four local switch ports, with up to fourteen possible "sub-group" combinations via local 3 button wall switches and
all at once via a master 3 button switch. System shall allow for overlapping switch combinations from two or more local switches.

d. Multiple "sub-groups" from different IQ/MLC control components shall be capable of being combined to form "groups" operated by a single 3 button wall switch, from either the master port or in series from a local switch port.

e. Each shade motor shall be accessible (for control purposes) from up to four local switches and one master switch.

f. Control system shall allow for automatic alignment of shade hem bars in stopped position at 25 percent, 50 percent, and 75 percent of opening heights, and up to three user-defined intermediate stopping positions in addition to all up / all down, regardless of shade height, for a total of five positions. Control system shall allow shades to be stopped at any point in the opening height noting that shades may not be in alignment at these non-defined positions).

g. Control system shall have two standard operating modes: Normal mode allowing the shades to be stopped anywhere in the window’s opening height and uniform mode, allowing the shades to only be stopped at the predefined intermediate stop positions. Both modes shall allow for all up / all down positioning.

h. Control system components shall allow for interface with both audiovisual system components and building fire and life safety system via a dry contact terminal block.

i. Control system components shall allow for interface with external analog input control devices such as solar activated controllers, 24 hour timers, and similar items; via a dry contact terminal block.

j. Reconfiguration of switch groups shall not require rewiring of the hardwired line voltage motor power supply wiring, or the low voltage control wiring. Reconfiguration of switch groups shall be accomplished within the motor control device (IQ/MLC).

2. Wall Switches:

a. Three-button architectural flush mounted switches with metal cover plate and no exposed fasteners.

b. Connect local wall switches to control system components via low voltage (12V DC) 4-conductor modular cable equipped with RJ-11 type connectors supplied, installed and certified under Division 26 - Electrical.

c. Connect master wall switches to control system components via low voltage (12V DC) 6-conductor modular cable equipped with RJ-12 type connectors supplied, installed and certified under Division 26 - Electrical.

2.09 ACCESSORIES

A. Roller Shade Pocket for recessed mounting in acoustical tile, drywall ceilings, or as indicated on the Drawings.

1. Provide either extruded aluminum and or formed steel shade pocket, sized to accommodate roller shades, with exposed extruded aluminum closure mount, tile support and removable closure panel to provide access to shades.

a. Provide "Vented Pocket" such that there will be a minimum of four 1 inch (25.4 mm) diameter holes per foot allowing the solar gain to flow above the ceiling line.
B. Fascia:
   1. Continuous removable extruded aluminum fascia that attaches to shade mounting
      brackets without the use of adhesives, magnetic strips, or exposed fasteners.
   2. Fascia shall be able to be installed across two or more shade bands in one piece.
   3. Fascia shall fully conceal brackets, shade roller and fabric on the tube.
   4. Provide bracket / fascia end caps where mounting conditions expose outside of roller
      shade brackets.

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 roller shades level, plumb, square, and true according to manufacturer's written
      instructions, and located so shade band is not closer than 2 inches to interior face of glass.
      Allow proper clearances for window operation hardware.
   
   B. Turn-Key Single-Source Responsibility for Motorized Interior Roller Shades: To control the
      responsibility for performance of motorized roller shade systems, assign the design,
      engineering, and installation of motorized roller shade systems, motors, controls, and low
      voltage electrical control wiring specified in this Section to a single manufacturer and their
      authorized installer/dealer. The Architect will not produce a set of electrical drawings for the
      installation of control wiring for the motors, or motor controllers of the motorized roller
      shades. Power wiring (line voltage), shall be provided by the roller shade installer/dealer, in
      accordance with the requirements provided by the manufacturer. Coordinate the following
      with the roller shade installer/dealer:
      1. Main Contractor shall provide power panels and circuits of sufficient size to
         accommodate roller shade manufacturer’s requirements, as indicated on the
         mechanical and electrical drawings.
      2. Main Contractor shall coordinate with requirements of roller shade installer/dealer,
         before inaccessible areas are constructed.
      3. Roller shade installer/dealer shall run line voltage as dedicated home runs (of sufficient
         quantity, in sufficient capacity as required) terminating in junction boxes in locations
         designated by roller shade dealer.
4. Roller shade installer/dealer shall provide and run all line voltage (from the terminating points) to the motor controllers, wire all roller shade motors to the motor controllers, and provide and run low voltage control wiring from motor controllers to switch/control locations designated by the Architect. All above-ceiling and concealed wiring shall be plenum-rated, or installed in conduit, as required by the electrical code having jurisdiction.

5. Main Contractor shall provide conduit with pull wire in all areas, which might not be accessible to roller shade contractor due to building design, equipment location or schedule.

C. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

D. Clean roller shade surfaces after installation, according to manufacturer's written instructions.

E. Engage Installer to train Owner's maintenance personnel to adjust, operate and maintain roller shade systems.

3.04 PROTECTION

A. Protect installed products until completion of project.

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

END OF SECTION
SECTION 12 61 00

FIXED AUDIENCE SEATING

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes fixed audience seating with the following:
   1. Standard mounting.
   2. Molded-plastic chairs with upholstered inserts.
   3. Self-rising seat mechanism.

B. Related Sections:
   1. Division 26 Sections for electrical service and connections to seating junction box locations for aisle lighting fixtures and power receptacles.

1.02 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for fixed audience seating. Include electrical characteristics.

B. LEED Submittals:
   1. Credits MR 4.1 and 4.2 - Recycled Content: Submit documentation from manufacturer indicating separate percentages, by weight, of pre-consumer and post-consumer recycled content per unit of product. Also include material costs, excluding cost of installation.
   2. Credit EQ 4.2 - VOC Content: Submit product data and material safety data sheets (MSDS) for materials used on the interior of the building indicating chemical composition and VOC content of each product used.
   3. Product Data for Credit EQ 4.4: For each composite wood product, documentation indicating that product contains no urea formaldehyde.
   4. Credits MR 5.1 and 5.2 - Local/Regional Materials: Indicate location of manufacturing facility, including name, address, and distance between manufacturing facility and the project sit. Provide manufacturer’s documentation indication location where the base materials were extracted, mined, quarried, harvested, etc., and the distance between this location and the project site. Also include material costs, excluding cost of installation.
   5. Certificates for Credit MR 7: Chain-of-custody certificates certifying that wood and wood-based materials comply with forest certification requirements. Include evidence that manufacturer is certified for chain of custody by an FSC-accredited certification body.
      a. Include statement indicating costs for each certified wood product.

C. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
   1. Seating Layout: Show seating layout, aisle widths, row-lettering and chair-numbering scheme, chair widths, and chair spacing in each row.
2. Accessories: Show accessories, including locations of left- and right-hand tablet arms, electrical devices, accessibility provisions, and attachments to other work.
3. Wiring Diagrams: For power, signal, and control wiring.

D. Samples for Initial Selection: For each type of exposed finish, color, texture, and pattern indicated.

E. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below:
   1. Molded Plastic: Manufacturer's standard-size unit, not less than 3 inches square.
   2. Baked-on Coating Finishes: Manufacturer's standard-size unit, not less than 3 inches square.
   3. Wood and Plywood Materials and Finishes: Manufacturer's standard-size unit, not less than 3 inches square.
   4. Upholstery Fabric: Full width by 36-inch-long section of fabric from dye lot to be used for the Work, with specified treatments applied. Show complete pattern repeat. Mark top and face of fabric.
   5. Row-Letter and Chair-Number Plates: Full-size units with letters and numbers marked.
   7. Exposed Fasteners: Full-size units of each type.

F. Letter signed by manufacturer a signed letter of approval from seating manufacturer accepting the specified fabric and acknowledging that it is suitable and will prove successful in-service performance for the application indicated.

G. Field quality-control reports.

H. Maintenance Data: For fixed audience seating to include in maintenance manuals. Include the following:
   2. Precautions for cleaning materials and methods that could be detrimental to seating finishes and performance.

I. Warranty: Sample of special warranty.

1.03 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of seating required, including accessories and mounting components, from single source from single manufacturer.

B. Forest Certification: Fabricate products with wood components produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."

C. Fire-Test-Response Characteristics of Upholstered Chairs:
   1. Fabric: Class 1 according to DOC CS 191 and 16 CFR 1610.61, tested according to California Technical Bulletin 117.

D. 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.

E. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
1. Build mockups for the following types of fixed audience seating including fabric, finishes, and accessories:
   a. Size: One typical seat.

2. Following review and approved by Architect, or approved mockup may become part of the completed Work.

F. Preinstallation Conference: Conduct conference at Project site.

1.04 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install seating until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above ceilings is complete, and temporary or permanent HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

B. Field Measurements: Verify actual dimensions of seating layout and construction contiguous with seating by field measurements before fabrication.

1.05 COORDINATION

A. Coordinate layout and installation of electrical wiring and devices with seating layout to ensure that floor junction boxes for electrical devices are accurately located to allow connection without exposed conduit.
1. Coordinate wiring and power receptacles installed in seating with requirements in Division 26 Sections.

1.06 WARRANTY

A. Special Warranty: Manufacturer’s standard form in which manufacturer agrees to repair or replace components of fixed audience seating that fail in materials or workmanship within specified warranty period.
1. Failures include, but are not limited to, the following:
   a. Structural failures including standards, beams, and pedestals.
   b. Faulty operation of self-rising seat mechanism.
   c. Faulty operation of electrical components.
   d. Wear and deterioration of fabric and stitching beyond normal use.
   e. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.

2. Warranty Periods: As follows, from date of Substantial Completion.
FIXED AUDIENCE SEATING

1.07 EXTRA MATERIALS

A. Furnish extra materials from the same production run that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Chair Seats and Backs: Furnish a quantity of full-size units equal to 5 percent of amount installed for each type and size of chair seat and back.
   2. Upholstered, Slip-on Cushions: Furnish a quantity of full-size units equal to 5 percent of amount installed for each type and size of cushion.
   3. Tablet Arms: Furnish a quantity of full-size units equal to 5 percent of amount installed for each type and size of tablet arm.
   4. Armrests: Furnish a quantity of full-size units equal to 5 percent of amount installed for each type of armrest.
   5. Power Receptacles: Furnish a quantity of full-size units equal to 5 percent of amount installed.

PART 2 - PRODUCTS

2.01 LOCAL / REGIONAL MATERIALS

A. Preference shall be given to supplier whose facilities are within a 500 mile radius of the project site.

B. Preference shall also be given to materials that are harvested, extracted, mined, quarried, manufactured, etc. within a 500 mile radius of the project site.

2.02 MATERIALS AND FINISHES

A. Steel: ASTM A 36/A 36M plates, shapes, and bars; ASTM A 513 mechanical tubing; ASTM A 1008/A 1008M cold-rolled sheet; and ASTM A 1011 hot-rolled sheet and strip.

B. Cast Iron: ASTM A 48/A 48M, Class 25, gray iron castings free of blow holes and hot checks with parting lines ground smooth.

C. Metal Finish: Finish exposed metal parts with manufacturer’s standard minimum 1.5-mil-thick, polyester baked-on powder or minimum 1.5-mil-thick, epoxy baked-on powder coating.
   1. Color: As selected by Architect from manufacturer’s full range.

D. Concealed Plywood: HPVA HP-1 hardwood plywood, made with adhesive containing no urea formaldehyde, or DOC PS 1 softwood plywood, as standard with manufacturer.

E. Hardwood Lumber and Veneer Faces: Red oak selected to be free of visible defects.
   1. Stain and Finish: As selected by Architect from manufacturer’s full range.
   1. Color and Pattern: Custom color as indicated on Drawings or as approved by Architect.

G. Upholstery Padding: Flexible, cellular, molded or slab polyurethane foam.

H. Molded Plastic: High-density polyethylene or polypropylene, blow or injection molded, with smooth or textured surface that is mar and dent resistant.
   1. Provide with UV inhibitors to retard fading where exposed to sunlight.
   2. Color and Texture: As selected by Architect from manufacturer's full range.

2.03 FIXED AUDIENCE SEATING

A. Fixed Audience Seating: Interior assembly-space seating in permanent arrangement as shown on Drawings.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide "Marquee" as manufactured by Irwin Seating, www.irwinseating.com, or comparable product by one of the following:

B. Chair Mounting Standards: Floor attached, of one of the following materials:
   1. Steel: One-piece heavy-tube or reinforced sheet with welded mounting plate and welded connections for seat pivots, backs, armrests, and end panels.
   2. Cast Iron: One-piece castings with integral mounting points and attachment anchoring points for seat pivots, backs, and armrests.

C. End Panels:
   1. Material: Steel.
   2. Style: Rectangular with rounded corners.

D. Fabric Upholstered Chairs:
   1. Backs:
      a. Padding Thickness: 3 inches.
      b. Rear Panel: Molded plastic.
      c. Top Corners: Rounded.
   2. Seats: Two part and as follows:
      a. Padding Thickness: Minimum 3 inches at front and rear edge.
      b. Seat Underside: Molded-plastic shell.

E. Chair Width: Vary chair widths to accommodate sightlines and row lengths, with minimum chair width of 22 inches from center to center of armrests.

F. Back Height: Standard-style backs, 36-inches high.

G. Back Pitch: Fixed.
H. Chair Seat Hinges: Self-lubricating, compensating type with noiseless self-rising seat mechanism passing ASTM F 851 and with positive internal stops cushioned with rubber or neoprene.

I. Self-Rising Seat Mechanism: Spring-actuated, full fold.

J. Armrests: Hardwood with rounded edges, concealed mounting. Species: Oak.

K. Aisle Lighting Fixtures: Manufacturer’s standard rectangular louvered fixtures.
   1. Bulb: LED.
   2. Power: 24 V.
   3. For low-voltage lighting, provide manufacturer’s voltage-reduction device housed in safety enclosure equipped with fuses, terminal blocks, and safety disconnect.

L. Row-Letter and Chair-Number Plates: Manufacturer’s standard.
   1. Material: Bronze with black embossed characters.
   2. Attachment: Manufacturer’s standard method.

M. Tablet Arms: Manufacturer’s standard-size, foldaway tablet arm with plastic-laminate writing surface over medium-density fiberboard or plywood core and with rounded, matching PVC edges.
   1. Mounting: Right-hand mounted unless otherwise indicated.
   2. Fold-Away Mechanism: Cast-iron or steel hinge and swivel mechanism that gives positive support in open position and semiautomatic return to stored position below arm block and parallel to chair.

N. Accessible Seating:
   1. Provide removable or rollaway chairs where wheelchair spaces are indicated.
   2. Provide chairs with retractable or foldup arm on aisle side in locations indicated, but not less than 5 percent of aisle seats. Identify these seats with a sign or marker.

2.04 FABRICATION

A. Floor Attachments: Fabricate to conform to floor slope, if any, so that standards and pedestals are plumb and chairs are maintained at same angular relationship to vertical throughout Project.

B. Upholstery: Fabricate fabric-covered cushions with molded padding beneath fabric and with fabric covering free of welts, creases, stretch lines, and wrinkles. For each upholstered component, install pile and pattern run in a consistent direction.
C. Upholstered Chairs: Fabricate as follows:
   1. Two-Part Upholstered Back: In length required to protect seat in raised position, with padded cushion glued to a curved steel, plywood, or molded-plastic support panel covered with easily replaceable fabric, and with curved rear shell that fully encloses upholstery edges.
   2. Two-Part Seats: Upper part, an upholstered cushion with formed padding over a five-ply plywood panel with fabric cover conforming to shape of cushion to conceal inner seat structure and hinge mechanism. Lower part, molded-plastic shell.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine floors, risers, and other adjacent work and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

B. Examine locations of electrical connections.

C. Examine locations of HVAC supply ducts.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install seating in locations indicated and fastened securely to substrates according to manufacturer's written installation instructions.
   1. Use installation methods and fasteners that produce fixed audience seating assemblies with individual chairs capable of supporting an evenly distributed 600-lb static load without failure or other conditions that might impair the chair's usefulness.
   2. Install standards and pedestals plumb.

B. Install seating with chair end standards aligned from first to last row to optimize sightlines.

C. Install riser-mounted attachments to maintain uniform chair heights above floor.

D. Install chairs in curved rows at a smooth radius.

E. Install seating so moving components operate smoothly and quietly.

F. Install wiring conductors and cables concealed in components of seating and accessible for servicing.
3.03 FIELD QUALITY CONTROL

A. Perform tests and inspections.
   1. Manufacturer’s Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
   2. Tests for Power Receptacles: As specified in Division 26 Sections.

B. Prepare test and inspection reports.

3.04 ADJUSTING

A. Adjust chair backs so that they are aligned with each other in uniformly curved rows.

B. Adjust self-rising seat mechanisms so seats in each row are aligned when in upright position.

C. Verify that all components and devices are operating properly.

D. Verify that seating returns to correct at-rest position.

E. Repair minor abrasions and imperfections in finishes with coating that matches factory-applied finish.

F. Replace upholstery fabric damaged during installation.

END OF SECTION
SECTION 12 93 00
SITE FURNISHINGS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Bicycle racks.

1.02 SUBMITTALS

A. See Division 01 Section – Administrative Requirements for submittal procedures.

B. Submit technical data and installation methods for bike racks and trash receptacles.

C. Submit color samples for color selection by Architect.

1.03 QUALITY ASSURANCE

A. Material and craftsmanship for site furnishings shall conform to recognized association standards.

1.04 WARRANTY

A. Provide twenty year manufacturer’s warranty against defects in workmanship and materials.

PART 2 - PRODUCTS

2.01 BICYCLE RACKS

A. Shall accept all types of bicycles, tandems, tricycles, and trailers. Bike racks shall be designed to lock both the frame and wheel(s) of the bicycle.

1. Capacity:
   a. (1) 9-stall
   b. (1) 11 stall.

2. Height: 35-1/2- inches.

3. Length: 7’-2-3/8” (RB09) and 9’-2-3/8” (RB11).

4. Mounting: In-ground anchor mount.

5. Construction:
   a. Type 304 Stainless Steel.
   b. Mainframe: 2-3/8 inch OD.

B. Subject to compliance with requirements, provide “Ribbon Rack RB09 and RB11” as manufactured by AAA Ribbon Rack Co., Division of Brandir International, Inc. www.ribbonrack.net, or equal.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Locate each item as shown on Drawings.

B. Install in accordance with manufacturer’s instructions.

END OF SECTION
SECTION 14 21 00
ELECTRIC TRACTION ELEVATORS

PART 1 - GENERAL

1.01 SUMMARY
A. This Section includes electric traction passenger and service elevators.

B. Related Sections include the following:
   1. Division 05 Section "Metal Fabrications" for the following:
      a. Attachment plates and angle brackets for supporting guide-rail brackets.
      b. Machine beams.
      c. Weld plates for anchoring elevator machine to machine room floor slab.
      d. Hoist beams.
      e. Structural-steel shapes for subsills.
      f. Pit ladders.
   2. Division 26 Sections for electrical service for elevators to and including disconnect switches at machine room door and standby power source, transfer switch, and connection from auxiliary contacts in transfer switch to controller.
   3. Division 27 Section "Telecommunications Raceways and Accessories" for telephone service for elevators.
   4. Division 28 Section "Fire Alarm and Detection Systems" for smoke detectors in elevator lobbies to initiate emergency recall operation and heat detectors in shafts and machine rooms to disconnect power from elevator equipment before sprinkler activation and for connection to elevator controllers.

1.02 DEFINITIONS
A. Definitions in ASME A17.1 apply to work of this Section.

B. Defective Elevator Work: Operation or control system failure, including excessive malfunctions; performances below specified ratings; excessive wear; unusual deterioration or aging of materials or finishes; unsafe conditions; need for excessive maintenance; abnormal noise or vibration; and similar unusual, unexpected, and unsatisfactory conditions.

C. Service Elevator: A passenger elevator that is also used to carry freight.

1.03 SUBMITTALS
A. Product Data: Include capacities, sizes, performances, operations, safety features, finishes, and similar information. Include product data for the following:
   1. Car enclosures and hoistway entrances.
   2. Operation, control, and signal systems.
B. Shop Drawings: Show plans, elevations, sections, and large-scale details indicating service at each landing, machine room layout, coordination with building structure, relationships with other construction, and locations of equipment and signals. Include large-scale layout of car control station and standby power operation control panel. Indicate variations from specified requirements, maximum dynamic and static loads imposed on building structure at points of support, and maximum and average power demands.

C. Samples for Initial Selection: For finishes involving color selection.

D. Samples for Verification: For exposed finishes of cars, hoistway doors and frames, and signal equipment; 3-inch-square Samples of sheet materials; and 4-inch lengths of running trim members.

E. Manufacturer Certificates: Signed by elevator manufacturer certifying that hoistway, pit, and machine room layout and dimensions, as shown on Drawings, and electrical service, as shown and specified, are adequate for elevator system being provided.

F. Qualification Data: For Installer.

G. Operation and Maintenance Data: For elevators to include in emergency, operation, and maintenance manuals.
   1. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include diagnostic and repair information available to manufacturer's and Installer's maintenance personnel.

H. Inspection and Acceptance Certificates and Operating Permits: As required by authorities having jurisdiction for normal, unrestricted elevator use.

I. Warranty: Special warranty specified in this Section.

J. Continuing Maintenance Proposal: Service agreement specified in this Section.

1.04 QUALITY ASSURANCE

A. Manufacturer: Elevator manufacturer shall be ISO 9002 certified.

B. Installer: Elevators shall be installed by the manufacturer.

C. Source Limitations: Obtain elevators through one source from a single manufacturer.
   1. Provide major elevator components, including driving machines, controllers, signal fixtures, door operators, car frames, cabs, and entrances, manufactured by a single manufacturer.

D. Regulatory Requirements: Comply with ASME A17.1 and elevator design requirements for earthquake loads in ASCE 7.
   1. Provide earthquake equipment required by ASME A17.1.
   2. See Drawings for project's seismic design category and elevator importance factor.

F. Fire-Rated Hoistway Entrance Assemblies: Door and frame assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing at as close to neutral pressure as possible according to NFPA 252 or UL 10B.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle materials, components, and equipment in manufacturer’s protective packaging.

B. Store materials, components, and equipment off of ground, under cover, and in a dry location. Handle according to manufacturer’s written recommendations to prevent damage, deterioration, or soiling.

1.06 COORDINATION

A. Coordinate installation of sleeves, block outs, elevator equipment with integral anchors, and other items that are embedded in concrete or masonry for elevator equipment. Furnish templates, sleeves, elevator equipment with integral anchors, and installation instructions and deliver to Project site in time for installation.

B. Coordinate sequence of elevator installation with other work to avoid delaying the Work.

C. Coordinate locations and dimensions of other work relating to electric traction elevators including pit ladders, sumps, and floor drains in pits; entrance subsills; machine beams; and electrical service, electrical outlets, lights, and switches in pits, machine rooms, and hoistways.

1.07 WARRANTY

A. Special Manufacturer's Warranty: Manufacturer's standard form in which manufacturer agrees to repair, restore, or replace defective elevator work within specified warranty period.

1. Warranty Period: One year from date of Substantial Completion.

1.08 MAINTENANCE AND SERVICE

A. Initial Maintenance Service: Beginning at Substantial Completion, provide one year’s full maintenance service by skilled employees of elevator Installer. Include monthly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper elevator operation at rated speed and capacity. Provide parts and supplies same as those used in the manufacture and installation of original equipment.

1. Perform maintenance, including emergency callback service, during normal working hours.

2. Include 24-hour-per-day, 7-day-per-week emergency callback service.
a. Response Time: Two hours or less.

B. Continuing Maintenance Proposal: Provide a continuing maintenance proposal from Installer to Owner, in the form of a standard two-year maintenance agreement, starting on date initial maintenance service is concluded. State services, obligations, conditions, and terms for agreement period and for future renewal options.

C. The elevator control system must:
   1. Provide in the controller the necessary devices to run the elevator in inspection operation.
   2. Provide on top of the car the necessary devices to run the elevator in inspection operation.
   3. Provide in the controller an emergency stop switch. This emergency stop switch when opened disconnects power from the brake and prevents the motor from running.
   4. Provide in the event of a power outage, means from the controller to electrically lift and control the elevator brake to safely bring the elevator to the nearest available landing.
   5. Provide the means from the controller to reset the governor over speed switch and also trip the governor.
   6. Provide the means from the controller to reset the emergency brake when set because of an unintended car movement or ascending car over speed.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design: Hoistway and elevator design is based on “Gen2 Traction Passenger Elevators” as manufactured by Otis Elevator Co. [www.otisworldwide.com](http://www.otisworldwide.com). Specifically, the system shall consist of the following components:
   1. An AC gearless machine using embedded permanent magnets mounted at the top of the hoistway.
   2. Polyurethane Coated Steel Belts (CSB’s) for elevator hoisting purposes.

B. Subject to compliance with requirements, provide products by listed manufacturer or by one of the following:
   1. KONE Inc. [www.kone.com](http://www.kone.com).

2.02 EQUIPMENT - CONTROL ROOM COMPONENTS

A. Controller: A microcomputer based control system shall be provided to perform all of the functions of safe elevator operation. The system shall also perform car and group operational control.
   1. All high voltage (110V or above) contact points inside the controller cabinet shall be protected from accidental contact in a situation where the controller doors are open.
   2. Controller shall be separated into two distinct halves; Motor Drive side and Control side. High voltage motor power conductors shall be routed so as to be physically segregated from the rest of the controller.
3. Field conductor terminations points shall be segregated; high voltage (>30 volts DC and 110 VAC,) and low voltage (< 30 volts DC)
4. Controllers shall be designed and tested for Electromagnetic Interference (EMI) immunity according to the EN 12016 (May 1998): "EMC Product Family Standards for lifts, escalators, and passenger conveyors Part 2 – immunity"

B. Drive: A Variable Voltage Variable Frequency AC regenerative drive system shall be provided. The drive shall be set up for regeneration of AC power back to the building grid.

2.03 EQUIPMENT - MACHINE AND GOVERNOR

A. Machine: AC gearless machine, with a synchronous permanent-magnet motor, dual solenoid service and emergency disc brakes, mounted at the top of the hoistway.

B. Governor: The governor shall be a tension type governor.

C. Hoistway Operating Devices:
   1. Emergency stop switch in the pit.
   2. Terminal stopping switches.

D. Positioning System: Consists of an encoder, reader box, and door zone vanes.
   A. Guide Rails and Attachments: Guide rails shall be Tee-section steel rails with brackets and fasteners. Side counterweight arrangements shall have a dual-purpose bracket that combines both counterweight guide rails, and one of the car guide rails to building fastening.
   B. Coated Steel Belts: Polyurethane coated belts with high-tensile-grade, zinc-plated steel cords.
   C. Governor Rope: Governor rope shall be steel and shall consist of at least eight strands wound about a sisal core center.
   D. Inserts: Furnish required concrete and masonry inserts and similar anchorage devices for installing guide rails, machinery, and other components of elevator work where installation of devices is specified in another Section.

E. Machine Beams: Provide framing to support elevator hoisting machine and deflector sheaves from the building structure. Comply with Division 05 Section "Metal Fabrications" for materials and fabrication.

F. Car Frame and Platform: Welded steel units.

G. Guides: Provide roller guides or polymer-coated, non-lubricated sliding guides at top and bottom of car and counterweight frames.

2.04 OPERATION SYSTEMS

A. General: Provide manufacturer’s standard microprocessor operation system for each elevator as required to provide type of operation system indicated.
B. Single-Car Auxiliary Operations: In addition to primary operation system features, provide the following operational features for elevators where indicated:

1. Standby Power Operation: On activation of standby power, car is returned to a designated floor and parked with doors open. Car can be manually put in service on standby power, either for return operation or for regular operation, by switches in control panel located at First Floor. Manual operation causes automatic operation to cease.

2. Standby Powered Lowering: On activation of standby power, if car is at a floor, it remains at that floor, opens its doors, and shuts down. If car is between floors, it is lowered to the next floor below, opens its doors, and shuts down.

3. Automatic Dispatching of Loaded Car: When car load exceeds 80 percent of rated capacity, doors will begin closing.

4. Nuisance Call Cancel: When car calls exceed a preset number while car load is less than a predetermined weight, all car calls are canceled. Preset number of calls and predetermined weight can be adjusted.

C. Security Features: Provide the following security features, where indicated. Security features shall not affect emergency firefighters' service.

1. Keyswitch Operation: Push buttons are activated and deactivated by security keyswitches at car control stations. Key is removable only in deactivated position.

2.05 DOOR REOPENING DEVICES

A. Infrared Array: Provide door reopening devices with uniform array of 36 or more microprocessor-controlled, infrared light beams projecting across car entrance. Interruption of one or more of the light beams shall cause doors to stop and reopen.

B. Nudging Feature: After car doors are prevented from closing for predetermined adjustable time, through activating door reopening device, a loud buzzer shall sound and doors shall begin to close at reduced kinetic energy.

2.06 FINISH MATERIALS

A. General: Provide the following materials for exposed parts of elevator car enclosures, car doors, hoistway entrance doors and frames, and signal equipment as indicated.

B. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, commercial steel, Type B, exposed, matte finish.

C. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, commercial steel, Type B, pickled.

D. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304.

E. Stainless-Steel Bars: ASTM A 276, Type 304.

F. Stainless-Steel Tubing: ASTM A 554, Grade MT 304.
G. Plastic Laminate: High-pressure type complying with NEMA LD 3, Type HGS or HGL for flat applications, and Type BKV for panel backing.

2.07 CAR ENCLOSURES

A. General: Provide enameled-steel car enclosures to receive removable wall panels, with removable car roof, access doors, power door operators, and ventilation.
   1. Provide standard railings complying with ASME A17.1 on car tops where required by ASME A17.1.
   2. Provide finished car including materials and finishes specified below.

B. Materials and Finishes: Provide manufacturer's standards, but not less than the following:
   1. Floor Finish: As shown on Drawings.
   2. Stainless-Steel Wall Panels: Flush, hollow-metal construction; fabricated from stainless-steel sheet.
   3. Plastic-Laminate Wall Panels: Plastic laminate adhesively applied to 1/2-inch fire-retardant-treated particleboard or manufacturer's standard honeycomb core with plastic-laminate panel backing and manufacturer's standard protective edge trim. Panels have a flame-spread index of 25 or less, when tested according to ASTM E 84. Plastic-laminate color, texture, and pattern as shown on drawings, or as selected by Architect from plastic-laminate manufacturer's full range.
   4. Fabricate car with recesses and cutouts for signal equipment.
   5. Fabricate car door frame integrally with front wall of car.
   6. Stainless-Steel Doors: Flush, hollow-metal construction; fabricated from stainless-steel sheet or by laminating stainless-steel sheet to exposed faces and edges of enameled cold-rolled steel doors using adhesive that fully bonds metal to metal without telegraphing or oil-canning.
   7. Sight Guards: Provide sight guards on car doors.
   8. Sills: Extruded metal, with grooved surface, 1/4 inch thick.
   9. Luminous Ceiling: Fluorescent light fixtures and ceiling panels of translucent acrylic or other permanent rigid plastic.
  10. Handrails: Manufacturer's standard handrails, of shape, metal, and finish indicated.

2.08 HOISTWAY ENTRANCES

A. General: Provide manufacturer's standard horizontal-sliding, door-and-frame hoistway entrances complete with track systems, hardware, sills, and accessories. Provide frame size and profile to coordinate with hoistway wall construction.
   1. Where gypsum board wall construction is indicated, provide self-supporting frames with reinforced head sections.
B. Materials and Fabrication: Provide manufacturer's standards, but not less than the following:

2. Stainless-Steel Doors: Flush, hollow-metal construction; fabricated from stainless-steel sheet or by laminating stainless-steel sheet to exposed faces and edges of enameled cold-rolled steel doors using adhesive that fully bonds metal to metal without telegraphing or oil-canning.
4. Sills: Extruded metal, with grooved surface, 1/4 inch thick.

2.09 SIGNAL EQUIPMENT

A. General: Provide hall-call and car-call buttons that light when activated and remain lit until call has been fulfilled. Fabricate lighted elements with long-life incandescent lamps and acrylic or other permanent, non-yellowing translucent plastic diffusers or LEDs.

B. Car Control Stations: Provide manufacturer's standard recessed or semi-recessed car control stations. Mount in return panel adjacent to car door, unless otherwise indicated.

1. Mark buttons and switches with standard identification for required use or function that complies with ASME A17.1. Use both tactile symbols and Braille.
2. Provide "No Smoking" sign matching car control station, either integral with car control station or mounted adjacent to it, with text and graphics as required by authorities having jurisdiction.

C. Emergency Communication System: Provide system that complies with ASME A17.1 and the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)." On activation, system dials preprogrammed number of monitoring station and identifies elevator location to monitoring station. System provides two-way voice communication without using a handset and provides visible signals that indicate when system has been activated and when monitoring station has responded. System is contained in flush-mounted cabinet, with identification, instructions for use, and battery backup power supply.

D. Firefighters' Two-Way Telephone Communication Service: Provide flush-mounted cabinet and telephone jack in each car and required conductors in traveling cable for firefighters' two-way telephone communication service specified in Division 28 Section "Fire Detection and Alarm."

E. Car Position Indicator: Provide illuminated, digital-type car position indicator, located above car door or above car control station. Also provide audible signal to indicate to passengers that car is either stopping at or passing each of the floors served.

1. Include travel direction arrows if not provided in car control station.

F. Hall Push-Button Stations: Provide one hall push-button station at each landing.

1. Provide manufacturer's standard wall-mounted units.
2. Provide units with flat faceplate for mounting with body of unit recessed in wall.
3. Equip units with buttons for calling elevator and for indicating desired direction of travel.
   a. Provide a means for passengers to indicate that they have disabilities so control system can allow extra room in assigned car.
   b. Provide for connecting units that require destination registration to building security access system so a card reader can be used to register calls.

4. Provide telephone jack in each unit for firefighters' two-way telephone communication service specified in Division 28 Section "Fire Detection and Alarm."

G. Hall Lanterns: Units with illuminated arrows; but provide single arrow at terminal landings. Provide one of the following:
   1. Manufacturer’s standard wall-mounted units, for mounting above entrance frames.
   2. Units with flat faceplate for mounting with body of unit recessed in wall and with illuminated elements projecting from faceplate for ease of angular viewing.
   3. Units mounted in both jambs of entrance frame.

H. Hall Annunciator: With each hall lantern, provide audible signals indicating car arrival and direction of travel. Signals sound once for up and twice for down.
   1. At manufacturer’s option, audible signals may be placed on car.

I. Standby Power Elevator Selector Switches: Provide switches, as required by ASME A17.1, where indicated. Adjacent to switches, provide illuminated signal that indicates when normal power supply has failed. For each elevator, provide illuminated signals that indicate when they are operational and when they are at the designated emergency return level with doors open.

J. Fire Command Center Annunciator Panel: Provide panel containing illuminated position indicators for each elevator, clearly labeled with elevator designation; include illuminated signal that indicates when elevator is operational and when it is at the designated emergency return level with doors open. Provide standby power elevator selector switch(es), as required by ASME A17.1, adjacent to position indicators. Provide illuminated signal that indicates when normal power supply has failed.

K. Corridor Call Station Pictograph Signs: Provide signs matching hall push-button stations, with text and graphics as required by authorities having jurisdiction, indicating that in case of fire elevators are out of service and exits should be used instead. Provide one sign at each hall push-button station, unless otherwise indicated.

2.10 ELEVATORS

A. Elevator Description: Elevator #1.
   1. Type: Gearless traction, machine room-less.
   3. Rated Load: 4000 lb.
   6. Auxiliary Operations:
a. Standby power operation.
c. Automatic dispatching of loaded car.
d. Nuisance call cancel.

7. Security Features: Keyswitch operation.
8. Car Enclosures:
   a. Inside Width: 92 inches from side wall to side wall.
   b. Inside Depth: 65 inches from back wall to front wall (return panels).
   c. Inside Height: 94 inches to underside of ceiling.
   d. Front Walls (Return Panels): Satin stainless steel, No. 4 finish.
   e. Car Fixtures: Satin stainless steel, No. 4 finish.
   f. Side and Rear Wall Panels: Plastic laminate.
   g. Reveals: Satin stainless steel, No. 4 finish.
   h. Door Faces (Interior): Satin stainless steel, No. 4 finish.
   i. Door Sills: Aluminum, mill finish.
   j. Ceiling: Luminous ceiling.
   k. Handrails: 1/2 by 2 inches rectangular satin stainless steel, No. 4 finish, at sides and rear of car.
   l. Floor prepared to receive porcelain tile flooring, as shown on Drawings.

9. Hoistway Entrances: As follows:
   a. Width: 48 inches.
   b. Height: 84 inches.
   c. Type: Single-speed center opening.
   d. Frames at All Floors: Satin stainless steel, No. 4 finish.
   e. Doors at All Floors: Satin stainless steel, No. 4 finish.
   f. Sills at All Floors: Aluminum, mill finish.

10. Hall Fixtures at All Floors: Satin stainless steel, No. 4 finish.
11. Additional Requirements:
    a. Provide inspection certificate in each car, mounted under acrylic cover with frame made from satin stainless steel, No. 4 finish.
    b. Provide blanket hooks and one complete set of full-height protective blankets.
B. Elevator Description: Elevator #2.
   1. Type: Gearless traction, machine room-less.
   2. Control Room Location: Remote.
   3. Rated Load: 2500 lb.
   6. Auxiliary Operations:
      a. Standby powered lowering.
      c. Automatic dispatching of loaded car.
      d. Nuisance call cancel.
      e. Independent service for service elevator.
      f. Loaded-car bypass.
   7. Security Features: Keyswitch operation.
   8. Car Enclosures:
      a. Inside Width: 80 inches from side wall to side wall.
      b. Inside Depth: 51 inches from back wall to front wall (return panels).
      c. Inside Height: 94 inches to underside of ceiling.
      d. Front Walls (Return Panels): Satin stainless steel, No. 4 finish.
      e. Car Fixtures: Satin stainless steel, No. 4 finish.
      f. Side and Rear Wall Panels: Plastic laminate.
      g. Reveals: Satin stainless steel, No. 4 finish.
      h. Door Faces (Interior): Satin stainless steel, No. 4 finish.
      i. Door Sills: Aluminum, mill finish.
      j. Ceiling: Luminous ceiling.
      k. Handrails: 1/2 by 2 inches rectangular satin stainless steel, No. 4 finish, at sides and rear of car.
      l. Floor prepared to receive porcelain tile flooring, as shown on Drawings.
   9. Hoistway Entrances: As follows:
      a. Width: 42 inches.
      b. Height: 84 inches.
      c. Type: Single-speed center opening.
      d. Frames at All Floors: Satin stainless steel, No. 4 finish.
      e. Doors at All Floors: Satin stainless steel, No. 4 finish.
      f. Sills at All Floors: Aluminum, mill finish.
   10. Hall Fixtures at All Floors: Satin stainless steel, No. 4 finish.
   11. Additional Requirements:
      a. Provide inspection certificate in each car, mounted under acrylic cover with frame made from satin stainless steel, No. 4 finish.
      b. Provide blanket hooks and one complete set of full-height protective blankets.
PART 3 - EXECUTION

3.01  EXAMINATION

A. Examine elevator areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance. Examine hoistways, hoistway openings, pits, and machine rooms as constructed; verify critical dimensions; and examine supporting structure and other conditions under which elevator work is to be installed.

1. For the record, prepare a written report, endorsed by Installer, listing dimensional discrepancies and conditions detrimental to performance or indicating that dimensions and conditions were found to be satisfactory.
2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02  INSTALLATION

A. Comply with manufacturer's written instructions.

B. Welded Construction: Provide welded connections for installing elevator work where bolted connections are not required for subsequent removal or for normal operation, adjustment, inspection, maintenance, and replacement of worn parts. Comply with AWS standards for workmanship and for qualifications of welding operators.

C. Sound Isolation: Mount rotating and vibrating equipment on vibration-isolating mounts designed to minimize transmission of vibrations to structure and thereby minimize structure-borne noise from elevator system.

D. Lubricate operating parts of systems, including ropes, as recommended by manufacturers.

E. Alignment: Coordinate installation of hoistway entrances with installation of elevator guide rails for accurate alignment of entrances with car. Where possible, delay final adjustment of sills and doors until car is operable in shaft. Reduce clearances to minimum, safe, workable dimension at each landing.

F. Leveling Tolerance: 1/8 inch, up or down, regardless of load and direction of travel.

G. Set sills flush with finished floor surface at landing. Fill space under sill solidly with nonshrink, nonmetallic grout.

H. Locate hall signal equipment for elevators as follows, unless otherwise indicated:

1. For groups of elevators, locate hall push-button stations between two elevators at center of group or at location most convenient for approaching passengers.
2. Place hall lanterns either above or beside each hoistway entrance.
3. Mount hall lanterns at a minimum of 72 inches above finished floor.
3.03 FIELD QUALITY CONTROL

A. Acceptance Testing: On completion of elevator installation and before permitting use (either temporary or permanent) of elevators, perform acceptance tests as required and recommended by ASME A17.1 and by governing regulations and agencies.

B. Operating Test: Load each elevator to rated capacity and operate continuously for 30 minutes over full travel distance, stopping at each level and proceeding immediately to the next. Record temperature rise of elevator machine during 30-minute test period. Record failure to perform as required.

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

3.04 PROTECTION

A. Temporary Use: Comply with the following requirements for elevator used for construction purposes:
   1. Provide car with temporary enclosure, either within finished car or in place of finished car, to protect finishes from damage.
   2. Provide strippable protective film on entrance and car doors and frames.
   3. Provide padded wood bumpers on entrance door frames covering jambs and frame faces.
   4. Provide other protective coverings, barriers, devices, signs, and procedures as needed to protect elevator and elevator equipment.
   5. Do not load elevators beyond their rated weight capacity.
   6. Engage elevator Installer to provide full maintenance service. Include preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as necessary for proper elevator operation at rated speed and capacity. Provide parts and supplies same as those used in the manufacture and installation of original equipment.
   7. Engage elevator Installer to restore damaged work, if any, so no evidence remains of correction. Return items that cannot be refinished in the field to the shop, make required repairs and refinish entire unit, or provide new units as required.
3.05 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to operate, adjust, and maintain elevator(s). Refer to Division 01 Section "Demonstration and Training."

B. Check operation of each elevator with Owner's personnel present and before date of Substantial Completion. Determine that operation systems and devices are functioning properly.

C. Check operation of each elevator with Owner's personnel present not more than one month before end of warranty period. Determine that operation systems and devices are functioning properly.

END OF SECTION
ELECTRIC SIDEWALK VERTICAL RECIPROCATING CONVEYOR

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Electric drum machine operated sidewalk VRC system designed per ANSI/ASME B20.1 Safety Standard for Conveyors and Related Equipment, complete with drum machine, all safety devices, car frame and platform, car sides 48-inches high, bow irons, guide rails, rail brackets, pit bumpers, shaftway switches, control station, deflecting sheaves, cable equalizer, roping and attachment hardware, hardware and accessories as required.
   2. Sidewalk door designed per code for 300 PSF loading.
   3. Provide lower landing door including frames, sill, electro-mechanical interlock, and all required hardware.
   4. Furnish all items necessary for a complete operational sidewalk VRC system and not provided elsewhere.

B. Related Sections:
   1. Hoistway construction: As shown on Drawings.
   2. Division 22 Sections for pit drainage, if required.
   3. Division 27 Sections for electrical power to Machine Room, including main switch, breaker and lighting.

C. References:

1.02 QUALITY ASSURANCE

A. Installer Qualifications: VRC manufacturer or manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

1.03 SUBMITTALS

A. Shop Drawings: Indicate space requirements, general arrangement of equipment, and material being supplied.

B. Product Data: Submit descriptive brochures, literature, or approved drawings from past jobs of similar design.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver items and materials to site only after area in which they are to be installed is ready to receive them in their place of final installation.
B. Store materials in storage area allotted.

C. Fully protect movable and operating equipment from weather.

1.05 COORDINATION

A. Coordinate installation of sleeves, block outs, and items that are embedded in concrete or masonry for VRC equipment. Furnish templates and installation instructions and deliver to Project site in time for installation.

B. Coordinate sequence of VRC installation with other work to avoid delaying the Work.

C. Coordinate locations and dimensions of other work relating to VRC including pit ladder, sump, and floor drain in pit; entrance subsills; and electrical service, electrical outlets, lights, and switches in pit and machines.

1.06 WARRANTY

A. Provide coincidental product warranties, where available, for major components of sidewalk VRC work.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design Manufacturer: Provide sidewalk VRCs as manufactured by the Gillespie Corporation: www.gillespiecorp.com.
   1. Subject to approval by Architect, other manufacturers whose products may be incorporated into the Work include:

2.02 MATERIALS

A. VRC frame, hardware, and sidewalk door to be built from structural A36 steel.

B. Electrical controls, switches, and wiring must meet all referenced codes and local and national building codes.

2.03 SIDEWALK VRC

A. Sidewalk VRC Design Requirements: Provide complete operational drum machine operated sidewalk VRC conforming with applicable codes and standards, and the following:
   1. Basis of Design Product: "Model PS1E VRC" as manufactured by Gillespie Corporation,
   2. Net Capacity: 1,500 lbs., Class A loading (hand truck with load).
   3. Speed: 20 FPM.
   4. Stops: Two opposite.
   5. Travel: Nominal: 13'-0".
   6. Platform Size: 5'-0" x 5'-0" (working clear area of 4'-11" x 4'-10").
   7. Hoistway size: 6'-0" x 5'-2", pit depth 2'-0" (existing).
8. Lower Landing Door Size: 4'-0" x 6'-8" nominal.
9. Operation: Constant pressure key switch from upper sidewalk landing, with an in-use light.

2.04 FABRICATION

A. Electric Sidewalk VRC: Design electric sidewalk VRC for Class A freight loading, conforming to requirements of ANSI/ASME A17.1. Frame and platform to be constructed of structural A36 steel.

B. Lifting Machine: Machine to be comprised of electric motor, electric or mechanical brake, gear reducer, double grooved drum with flanges, steel keyed shaft, shaft end support bearing, slack cable device with reset switch, screw limit switch, structural steel base, and steel pit strap. Double grooved drum for two wire ropes of minimum 3/8-inch diameter. Drum to have at least two dead wraps remaining when VRC is at lowest landing.
   1. HP: Minimum 3 horsepower, voltage 208/3/60 minimum.

C. Suspension: Two 3/8-inch diameter steel wire ropes properly connected to drum, with overhead double grooved shaftway deflecting sheaves securely fastened to top of guide rails and sidewalk door frame, and overhead mechanical cable equalizer securely fastened to top of guide rails and sidewalk door frame, with reset slack cable switch.

D. Frame and Safeties: Structural steel car frame with channel stiles, properly braced to car platform. Two double grooved undercar deflecting sheaves for 2:1 roped underslung frame design, with sintered bronze oilite bushings. Instantaneous Type A safeties to be activated by a lack of suspension means.

E. Cab and Platform: Manufacturer’s standard structural steel construction: minimum 3/16-inch diamond plate platform floor. Provide 4'-0" high 16 ga. steel wall panels reinforced with steel angles.

F. Sidewalk Doors: Complete weather resistant assembly with recessed preformed gutters, non-ferrous bronze hinges, and pipe connections for piping to drain. Door plates to be designed for 300 PSF per Code. Finish to be 1/4-inch non-slip diamond plate.

G. Lower Landing Door: 1-1/2 hour UL "B" labeled fire rated steel hollow metal single-swing door prefitted with latch, closer, vision panel, and electro-mechanical interlock or wire mesh enclosure with interlocked swing gate.

H. Operating Controller and Shaftway Switches: Manufacturer’s standard relay logic controller with steel enclosure, and weather resistant normal and final shaftway limit switches conforming with referenced codes.

I. Miscellaneous Items: Rails, rail brackets, bumpers, anchors, pit ladder, pit switch, and items as required by applicable codes and as required for complete operational system.
2.05 FINISHES

A. Non-exposed-to-view Surfaces:
   1. Structural and non-exposed Ferrous Metal Surfaces: Clean surfaces of rust, oil or grease and prime with structural steel primer.
   2. Field Welds: Remove oxidation, flux or residue, wire brush clean, apply two coats of primer.

B. Exposed-to-view Surfaces: Clean, degrease metal surface; apply black primer; semi-gloss enamel applied in field; color as approved by Architect.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine work of other trades on which sidewalk VRC work depends. Report defects to Architect in writing which may affect VRC work or equipment operation.

B. Ensure shafts and openings for moving equipment are plumb, level, and in line and that pit is to proper depth, waterproofed and drained, with ladder and guards.

C. Ensure machine room is properly illuminated, heated, and ventilated. Provide hoistway access in machine room wall for drum machine placement, per contract drawings.

3.02 PREPARATION

A. Before fabrication, take necessary job site measurements and verify where work is governed by other trades; check measurement of space for equipment and means of access for installation and operation.
   1. Obtain dimensions from site for preparation of shop drawings.

B. Ensure preparatory work has been properly completed to receive VRC work, including such work as:
   1. Electrical feeder wires are provided to fused disconnect switch in machine room.
   2. Hoistway outlets and power are provided for car light and for light in pit and light and outlets in machine room.
   3. Electric power is available for testing and adjusting equipment.
   4. Machine room is enclosed and protected from moisture, with lockable door.

C. Supply in ample time for installation by other trades, inserts, anchors, bearing plates, brackets, supports and bracing, including setting templates and diagrams for placement.

3.03 INSTALLATION

A. Perform work with mechanics skilled in this work and under direct control and supervision of VRC installer’s experienced foreman. Installer to be approved by manufacturer, and have experience in installing sidewalk VRCs.
B. Set door in alignment with car opening and true with plumb sill lines; sidewalk doors set flush when closed.

C. Install in accordance with manufacturer’s instructions, applicable codes, and standards to provide a quiet, smoothly operating installation, free from side-sway, oscillation, or vibration.

D. Mount machine in accordance with approved shop drawings; isolate and dampen machine vibration with properly sized sound-reducing anti-vibration rubber pads. Connect terminal rope sockets using approved techniques.

E. Grout sills and sidewalk door frames per manufacturer’s instructions.

F. Locate and mount sidewalk level control station per manufacturer’s instructions.

G. Supply all equipment necessary for installation not provided by VRC manufacturer; including hoistway wiring and waterproof conduit, rail bracket wall anchors or inserts, and finish painting. Some work, such as casting of inserts should be done by contractor or subcontractor.

3.04 INSPECTION

A. Obtain and pay for necessary inspections and permits and make such tests as are required by regulations and authorities.

B. Final inspection shall be after VRC installation, hoisting enclosure and machine room are complete.

C. Inspect installation in accordance with ANSI A17.2.

D. Deliver test certificates and permits to Architect.

3.05 MAINTENANCE

A. Maintain entire sidewalk VRC installation 12 months after date of Substantial Completion of Work.

B. Include systematic examination, adjustment and lubrication of VRC equipment.

C. Extended Maintenance Proposal: Submit proposal for maintenance of installed VRC work for a period of three years after termination of regular maintenance required at end of this section.
   1. Proposal shall include stipulated sum for time period stated, with premiums due annually.
   2. Extended maintenance proposal shall include requirements specified at end of section for first year maintenance agreement.
   3. Repair or replace worn electrical and mechanical parts of VRC equipment, using parts produced by manufacturer of equipment.

D. Provide 24 hour emergency call-back service during maintenance period.
E. Ensure competent personnel handle maintenance service; maintain locally an adequate stock of parts for replacement or emergency purposes.

3.06 CONSTRUCTION WASTE MANAGEMENT

A. Construction waste shall be managed in accordance with provisions of Division 01 Section “Construction Waste Management and Disposal”. Documentation shall be submitted to satisfy the requirements of that section.

END OF SECTION