University of Colorado at Boulder
Systems Biotechnology Building
CP007722

PROJECT SPECIFICATIONS

Academic Classroom Build-Out
September 23, 2013

HDR
ROBERT A.M.
STERN
ARCHITECTS
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PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 DESCRIPTION OF WORK

A. The work to be done under this Contract is the construction in a workmanlike manner, to the satisfaction of the Architect, of the Work as shown, documented, and set forth in the Contract Documents. If these documents or job conditions make it impossible to produce first class work or to warranty the work or its performance, or should discrepancies appear among the Contract Documents, request interpretation, correction or clarification from the Architect prior to beginning construction. If the Contractor fails to make such request, work must be performed in a satisfactory manner and no request for added cost or extension of time will be considered. If conflict occur in or between Drawings and Specifications, Contractor is deemed to have estimated on the more expensive way of doing work unless he shall have asked for and obtained written decision before submission of Bid as to which method or materials will be required.

B. The Contractor represents that he fully understands the nature and extent of the Work, all factors and conditions affecting or which may be affected by it and characteristics of its various parts and elements and their fitting together and functioning.

1.3 BID PACKAGE PURPOSE AND REQUIREMENTS

1. To bid, award, and construct:
   a. All Mechanical, Plumbing, and Electrical Systems.
   b. All Technology Systems.
   c. Interior doors, frames, and hardware.
   d. Non-load bearing metal stud framing.
   e. Gypsum wallboard.
   f. Ornamental railings.
   g. Finish Carpentry.
   h. Tile.
   i. Floor coverings.
   j. Interior Painting.
   k. Tackboards
   l. Signage.
   m. Wall protection.
   n. Fire Protection Specialties.
   o. Projection Screens.
   p. Window Treatments.
   q. Auditorium Seating and Tables.
   r. Laboratory Casework and Equipment.

1.4 SITE CONDITIONS

A. Site Investigation: The Contractor acknowledges satisfaction as to the nature and location of the Work, Soils Report, the general and local conditions, particularly those bearing upon availability of transportation, access to the site, disposal, handling and storage of materials, availability of labor, water, power, and uncertainties of weather, or similar physical conditions at the site, the conformation and conditions of the ground, the character or equipment and facilities needed preliminary to and during work, and all other matters that can in any way affect the work or the cost thereof under this contract.
1.5 PROJECT DESCRIPTION

A. Briefly and without force and effect upon the Contract Documents, the Work of the Contract can be summarized as follows: Academic Classroom Build-Out

1. Project Identification: The University of Colorado at Boulder’s Systems Biotechnology Building houses the school’s Department of Biochemistry, scientists from the Colorado Initiative in Molecular Biotechnology, and the department of Chemical & Biological Engineering. The existing building where the Academic Classroom Build-out occurs, is located on the university’s East Research Campus on the northwest corner of Colorado Avenue and Innovation Drive in Boulder, Colorado.

2. Project Description: The Academic Classroom Build-Out consists of the construction of interior wall partitions and interior finish for two separate areas. Area AW consists of a 122 seat classroom and a 65 seat classroom and associated support spaces. Area B consists of three teaching laboratories, a 24 seat teaching classroom and associated support spaces.

3. Approximate Gross Floor Area of Build-Out: The Academic Classroom Build-Out is approximately 14,500 gross square feet with Area AW consisting of approximately 6,600 square feet and Area B consisting of approximately 7,900 square feet.

4. Occupancy: Mixed Use – Non-separated occupancy building to include Occupancies B for Area B Laboratory Classrooms and A3 for Area AW Auditorium Classrooms.

5. Construction Type: I-B.


7. Structure: Cast-in-place Concrete Super-Structure with select Structural Steel Framing.

1.6 WORK COVERED BY CONTRACT DOCUMENTS

A. The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all; performance by the Contractor shall be required to the extent consistent with the Contract Documents, reasonable inferable from them and reasonably foreseeable, using the means, methods and procedures necessary to produce the intended results. In the event of question or ambiguity, request clarification from the Architect.

1. Work not particularly detailed, noted, or specified, shall be the same as similar parts that are detailed, noted or specified.

2. In the event of inconsistencies among the Contract Documents, the Architect shall interpret them when asked to do so by the Owner or Contractor. The Architect shall not be responsible for the results of such interpretations made by others.

3. The general character of detail work is shown on the Contract Drawings, but subsequent clarifications may be made by additional layouts or large scale or full size details.

4. When the Architect furnishes miscellaneous large scale and full size details, to further clarify the Work, such details shall be considered a part of the Contract.

5. Drawing and diagrams for mechanical and electrical work shall be considered as diagrammatic only, not to be used for any structural guidance or physical layout. In case of conflict, and unless otherwise noted, the Architect’s Drawings showing locations for mechanical and electrical items such as sprinkler heads; supply, return or exhaust grilles; electrical fixtures, and similar appurtenances shall take precedence.

6. Unless specifically noted to the contrary, it is the intention of the Drawings and Specifications that all Work, equipment, casework, mechanical, electrical and similar devices of whatever nature, be completely installed, hooked-up, made operational and made functional for the purposes such are intended, and that all costs therefore be included in the Contractor’s Proposal.

B. Titles and headings to Divisions, Sections, and Paragraphs in these Specifications are introduced for convenience and shall not be taken as a correct or compete segregation of the several units of materials and labor. No responsibility, direct or implied, is assumed by the Architect or Owner for omissions or duplications by the Contractor or his subcontractors, due to real or alleged error in arrangement of matter in the Contract Documents.

C. Items listed under “WORK INCLUDED” or “RELATED WORK” for each Section of the Specifications are not necessarily all inclusive but listed for convenience. The Contractor shall be responsible for the complete work as shown or indicated by the Contract Documents.
D. The Drawings contain General Notes on the Title Sheet which also describe requirements for the use of the documents as well as requirements for performing this work.

1.7 SPECIAL REQUIREMENTS
A. Owner Furnished and Installed Equipment:
   1. The Owner will furnish certain items as listed on the Responsibility List. Contractor will be responsible for coordinating his work to accommodate these items including, but not limited to, physical space fit, utility connections and rough-in, power wiring and electrical characteristics.
   2. Contractor will include in his scheduling the latest times when information, especially physical dimension, piping, electrical rough-ins, for such items is required and so notify the Owner in writing.
B. Owner Furnished, Contractor Installed Equipment:
   1. The Owner will furnish certain items delivered to the jobsite as listed on the Responsibility List. Contractor will receive, unload, move, set in position, anchor and connect such items and put them into operating condition.
   2. Contractor will be responsible for coordinating his work to accommodate these items including, but not limited to, physical space fit, utility connections and rough-in, power wiring and electrical characteristics.
   3. Contractor will include in his scheduling the latest times when information for such items is required and so notify the Owner in writing. He will cooperate with the Owner in scheduling the delivery of these items and be responsible for accommodating their storage and protection in the building and their replacement or repair due to damage as a result of his operations.

1.8 OCCUPANCY
A. Occupancy for Equipment Installation:
   1. The Owner or his separate contractors will be afforded access to spaces in the building in order to install equipment in such areas provided those areas or appropriate portion thereof are enclosed, roofed, and ready to receive such equipment. The Contractor shall cooperate with such installers or contractors to the fullest extent possible without delaying his overall completion schedule.
   2. Temporary power for power tools and lights (115V single phase) and temporary water will be provided in the same manner as required for Subcontractors.

1.9 ADVERTISING
   1. Contractor and Subcontractors, dealers, suppliers, manufacturers or agents shall not use their dealing with the Owner in any promotion, advertising, selling campaign, or other similar endeavor without obtaining their express written permission.

PART 2 - PRODUCTS
A. Products are not used in this Section.

PART 3 - EXECUTION
3.1 CONTRACTOR’S DUTIES
A. Except as otherwise specified, furnish the following to the full extent required by the Contract.
   1. Labor, superintendence, and products.
   2. Construction equipment, tools, machinery, and materials.
   3. Utilities required for construction and related activities.
   4. Other facilities and services necessary to properly execute and complete the work, including security for Worksite and storage and protection of all materials awaiting incorporation into the Work.

END OF SECTION
SECTION 00 11 10
SUMMARY OF WORK (PART B)

PART 1 - GENERAL

1.01 SCHEDULE OF DRAWINGS, SPECIFICATIONS AND ADDENDA

The following Drawings, Project Manual, and Addenda from the Contract Documents.

A. Set(s) of Drawings & project manuals dated September 23, 2013. Drawing list is as follows:

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C. Addenda: All Addenda issued prior to bidding. [NONE]

D. Related Section:
   1. Division 01 Section "TEMPORARY FACILITIES AND CONTROLS" for limitations and procedures governing temporary use of Owner's Facilities.

1.02 WORK COVERED BY CONTRACT DOCUMENTS
A. Work covered: Work under this contract includes all materials, equipment and labor necessary to complete the work indicated on the drawings, described in specifications, addenda or reasonably inferred.

1.03 CONTRACTORS

All work will be executed under one prime construction contract between the Owner and the Contractor.

Except as indicated otherwise, all work under this contract will be under the direction of the prime contractor.

A. Owner Provided Contractor Installed Items: Provide labor and additional parts for (2) Owner Provided Contractor Installed fume hoods. Fume hoods shall be turned over to Owner at project completion as fully operational and functional in accordance with all applicable codes and standards.

B. Refer to Drawings for any other specific items to be Owner Furnished, to be installed by Contractor

1.04 JOB CONDITIONS

A. Limit construction operations to those methods and procedures which will not adversely and unduly affect the Owner's occupied spaces inclusive of parking facilities.

B. Do not interrupt building access and use, except as permitted by the Owner.

Provide eight (8) work days notice to the Owner of construction activities which will severely impact the occupancy and use of adjacent areas.

C. Provide temporary barriers and/or partitions as required to protect the occupants of the building and the general public from injury due to the work of this project; and/or to protect adjacent areas of the building from the spread of dust and dirt caused by the work or this project.

Remove temporary barriers and partitions upon completion of the Project.

1. Temporary partitions shall be constructed of 1/2" plywood on the construction face nominal 2" X 4" wood studs and 1/2" gypsum wallboard on the public occupied face.

D. Do not interrupt power, lighting, plumbing, telephone and HVAC services to occupied areas without Owner's approval. Such interruptions must be scheduled at least eight (8) work days in advance and have Owner's approval.

1.05 PROTECTION OF WORK AND ADJACENT PROPERTY

A. Buildings and property adjacent to work included in this project may be subject to damage due to construction operations.

Prior to the start of the work included in this Contract engage the services of a photographer to record the existing condition of adjacent finishes and property, including all travel paths which will be utilized by the contractor into and out of the building from areas of work. Contractor shall provide one set set on disk to the Owner and retain one set for their records. Sufficient photos with adequate detail to thoroughly document the conditions surrounding the work shall be provided.
B. At the completion of the project, Contractor shall restore existing building, all interior finishes adjacent to areas of work and along travel paths associated with areas of work, landscaping, parking facilities and property to same condition as prior to the start of the work.

C. In addition to the requirements of the General Conditions of the Contract for Construction, the Contractor shall:
   1. Notify, in writing, the Owner of University or private property which interferes with the work and arrange with them for disposition of such property.
   2. Provide temporary protection around openings through and at floors, roofs, and other openings.
   3. Weather Protection: Provide protection against rain, snow, wind, ice, storms, or heat so as to maintain work, materials, apparatus, and fixtures free from injury or damage. At the end of each day's work, cover new work likely to be damaged.
   4. Provide and maintain adequate protection of the work from damage due to freezing, especially freezing earth and soils. Risk of proceeding with the work on or with freezing or frozen materials will be the sole responsibility of the Contractor.
   5. Water Protection: Provide protection from damage at all times from rain water, ground water, backing up of drains or sewers, and other water. Provide pumps and equipment enclosures to provide this protection.
   6. The Contractor will maintain free of obstructions and debris, all designated corridors and emergency exits, handicap access ramps and sidewalks to building. Provide temporary directional handicapped signage for routing to the nearest accessible facilities.

1.06 EXISTING FURNITURE AND EQUIPMENT

The Owner will remove or relocate existing movable furniture and equipment from the areas in which the Contractor is working. Notify the Owner not less than three days prior to starting work in areas where furniture and equipment require moving.

1.07 CONTRACTOR'S ACCESS PARKING AND STAGING AREAS

A. Work included in this project will need to be performed within the limitations of available access at the site. The University shall limit the area available for staging and parking during the execution of this contract. Contractor shall adjust the means and methods of construction to allow for the restrictions surrounding the site, as well as availability of space. Specific parking and staging area options shall be coordinated through UCB Project Manager and Parking and Transportation Services (PTS) of the University.

B. All parking on campus except for some one-hour zones on city streets and a few metered spaces is under control and authority of the Parking and Transportation Services (PTS) of the University. All University parking is by permit only.

C. Types of parking and staging are defined as follows:

General Staging Areas are approved areas adjacent to the site when available or in University designated group staging yards. General Staging Areas may be used for any purpose, including employee parking, on a space available basis, but must be coordinated through the UCB Project Manager and PTS. Vehicles may not park outside of general staging areas except in areas coordinated and approved by PTS.
Restricted Staging Areas are approved areas near the site for the construction dumpster, off-loading of equipment, contractor's work trailer, and materials that are soon to be incorporated into the work. No vehicles shall park in a restricted staging area for more than 20 minutes between the hours of 8:00 a.m. and 5:00 p.m. weekdays.

Contractor Employee Parking are areas for workers needing parking on campus. Coordinate through UCB Project Manager and PTS.

Prohibited Parking are areas designated in the Contract Documents as No Parking areas. The contractor shall not allow any parking in areas so designated under any circumstance.

D. The restrictions in this Section are in addition to any other restrictions or rules provided by PTS. Fees shall be assessed for the use of any PTS facility for staging and construction activities.

E. The designated staging area for this project shall be determined by UCB Project Manager and PTS.

F. Vehicles parked on sidewalks or in landscape areas outside the designated staging areas cause damage to University property. The contractor shall reimburse the University $25.00 per vehicle per occurrence for vehicles parked outside the designated staging areas. This amount shall be in addition to any fines which might be levied by PTS.

1.08 OCCUPANCY REQUIREMENTS

A. Owner may occupy designated areas for the purpose of storage of furnishings and equipment and installation of equipment.

B. Execute Certificate of Substantial Completion for each designated portion of work prior to Owner occupancy. Contractor shall allow:
   1. Access for Owner personnel.
   2. Use of parking facilities.
   3. Operation of HVAC and electrical systems.

C. On occupancy, Owner will provide, for occupied areas:
   1. Operation of HVAC and electrical systems.

1.09 CONSTRUCTION AND SEQUENCE SCHEDULE:

A. In order to accommodate the uninterrupted operation of the existing building during the various phases of construction, the sequence of construction operations shall be as follows:
   1. The sequence concept is to: (1) prepare the existing facility to function during renovation through completion; (2) hence occupy the newly remodeled portion; and (3) upon completion, finally reoccupy the remodeled portions.
   2. Utilizing this concept break down the Schedule into broad scope categories augmented by “Owner Action” and “Contractor action” columns that indicate coordination tasks which define the various phases of the work.
   3. The intent of the categorization is to generally summarize the nature and extent of work to be performed without in any way limiting specific requirements of the Contract Documents.
4. Some overlapping between the several construction operations will occur, and where possible, permission may be granted to start certain portions of the work before the previous operations were completed in their entirety. Such detail scheduling shall be done as the work progresses, provided that the Owner's operations remains uninterrupted, but in all cases must receive Owner approval.

5. Where it may not be possible to complete certain mechanical and electrical services in connection with making the work complete and ready for occupancy, temporary services as directed and as approved shall be installed to permit occupancy by the Owner at the earliest possible date.

6. The construction sequence schedule and related drawings are intended to aid the Contractor in bidding and in the preparation of a specific construction schedule. Deviations of sequence may be made upon approval of the Owner and the Architect. The preparation of a specific construction schedule remains the responsibility of the Contractor.

1.10 TEMPORARY ELECTRIC SERVICE

A. Connect to existing power service. Power consumption shall not disrupt owners need for continuous service. Owner to pay for power consumed. Provide power outlets for construction operations, branch wiring, distribution boxes, and flexible power cords as required.

END OF SECTION
PART 1 - GENERAL

1.1 DEFINITION

A. Acceptable Manufacturers and Products: See Section 01 61 00.

B. Section includes administrative and procedural requirements for handling requests for substitutions made prior to bid.

C. Any product proposed by Contractor which does not meet requirements of Contract Documents, whether in product characteristics, performance, quality, manufacturer, or brand name is considered a substitution.

D. In case of non-availability of materials contact Architect for review and action.

E. For bidding purposes, base all bids on materials, equipment, and procedures specified, or approved by Addenda.

1.2 SUBSTITUTION PRIOR TO BIDDING REQUEST

A. Submit complete data substantiating compliance of proposed substitution with Contract Documents.

B. For products and systems:

1. Product identification, including manufacturer’s name.

2. Manufacturer’s literature marked to indicate specific model, type, size, and options to be considered:
   a. Product description.
   b. Performance and test data.
   c. Reference standards.
   d. Difference in power demand, air quantities, etc.
   e. Dimensional differences from specified unit.

3. Samples:
   a. Architect reserves right to retain sample until physical units are installed on project for comparison purposes.
   b. Requester pay all costs of furnishing and return of samples.
   c. Architect is not responsible for loss of, or damage to samples.

4. Name and address of at least five similar projects that proposed product has been in use on for at least four years, and name and phone number of owner’s and architect’s or engineer’s representative, which Owner or Architect can contact to discuss product, installation, and field performance data.

5. Environmental Criteria: Provide the following additional information where environmental requirements are specified and when they apply to proposed substitutions, or where Contractor is proposing alternative products or systems which due to environmental aspects will improve project.
   a. VOC Content: Comply with specified requirements for VOCs and indicate VOC content. Owner, in consultation with architect reserve right to reject proposed substitutions where data for VOCs is not provided or where emissions of individual VOCs are higher than for specified materials.
   b. Recycled Content: Indicate recycled content for specified product and proposed substitution.
   c. Local/Regional: Indicate final point of manufacture for specified product and proposed substitution.
d. Energy Efficiency: Indicate energy efficiency for specified equipment and proposed substitution.
e. Life-Cycle Cost: Include life cycle cost savings by product, system or assembly recommended if applicable.

C. For construction methods:
1. Detailed description of proposed method.
2. Illustrate with drawings.

D. Itemized comparison of proposed substitute to specified item; indicate variations.

E. Effect and changes required on other trades, subcontractors or contracts.

F. Data related to change in construction time.

G. Cost of proposed substitution in comparison with product, system or method specified.

H. Availability of maintenance and repair services, and sources of repair or replacement items.

I. Warranty comparison with specified product or system.

1.3 PRODUCT SELECTION - GENERAL

A. Certain types of products are described in Project Manual by means of trade names, catalog numbers or manufacturer’s names, or both. This is not intended to exclude other products from consideration which may be capable of accomplishing purpose indicated.

B. Other types of products may be considered acceptable to Owner and Architect in place of those specified.

C. Listing of a manufacturer implies acceptance of them only as supplier of a product which complies with specified item.
   1. See Section 01 61 00 for definition of Base and Optional manufacturers.

D. No substitution permitted after execution of contract, unless allowed by Contract Documents.

E. Conditional bids and voluntary alternates will not be considered unless allowed by Instructions to Bidders.

1.4 SUBSTITUTION REQUESTS

A. Only written requests with complete data for evaluation will be considered.
   1. Request must be received at least 10 calendar days prior to bid date.
   2. Requests received late will not be considered.
   3. Submit evaluation data with attached form to Architect.

B. In making request for substitution, supplier and Contractor represent:
   1. has personally investigated proposed product, system or method, and has determined that it is equal or superior in all respects to that specified, and that it will perform intended function;
   2. is in full compliance with applicable code;
   3. will provide same warranty for substitute item as for product, system or method specified;
   4. if a finish product, complies color wise and pattern wise with base specified items;
   5. will coordinate installation of accepted substitution into Work, to include building modifications if necessary, and be responsible for such modifications as may be required for Work to be complete and functional in all respects;
   6. certifies cost data presented is complete and includes all related costs, excluding Architect’s review and redesign cost;
   7. waive all claims for additional costs or time extensions related to substitution which subsequently become apparent or are caused by substitution;
   8. will pay additional costs to other trades, subcontractors or contracts caused by substitution;
9. will pay all Architect’s review and redesign cost, special inspections, and other costs caused by substitutions or revisions made necessary by the acts or omissions of Contractor, due to product submittal or product not being ordered in a timely manor, due to ease of construction progress or Work, or which are in interest of or are for convenience of supplier, subcontractor or Contractor;
10. acknowledge acceptance of these provisions.

C. Supplier sign substitution request in space provided on form acknowledging acceptance of terms.

D. Contractor sign request in space provided on form acknowledging it’s acceptance of terms.

1.5 APPROVAL OF SUBSTITUTION REQUEST

A. No verbal or written approvals other than by Addenda will be valid.
   1. Addendum listing approved substitutions will be published prior to Bid date.

1.6 REJECTION OF SUBSTITUTION REQUESTS

A. Substitutions may not be considered if:
   1. Submitted after stipulated date or time period.
   2. Not submitted in accord with this Section.
   3. Acceptance will require substantial revision of Contract Documents, building or system.
   4. Substitution request does not indicate specific item for which request is submitted.
   5. Substitution Request form is not properly executed and signed.
   6. Substitution request for manufacturer acceptance only.
   7. Insufficient information submitted.
   8. Substitution color or pattern wise does not comply with base specified item.
   9. Substitution does not appear to comply with requirements of specifications for base item.

END OF SECTION
SUBSTITUTION REQUEST

PROJECT:
PROJECT NUMBER:

TO: Office of Architect:

HDR Architecture, Inc.
303 E 17th Avenue, Suite 1000
Denver, CO 80203-1256
Attention:________________

SPECIFIED PRODUCT:
Substitution request for:
Specification Section number: ______________________
Article(s)/paragraph(s): ______________________________

REASON FOR SUBSTITUTION REQUEST:
☐ Fails to comply with building code requirements ☐ Not available
☐ Unavailable to meet Project schedule ☐ Reduce Project construction time
☐ No qualified installer for specified item ☐ Project cost savings
☐ Supplier refuses to warrant item or installation ☐ Unsuitable for application
☐ Supplier, Subcontractor or Contractor convenience ☐ Constructability issue
☐ Other:

Explanation in Detail: ☐ See attached: __________________________

SUPPORTING DATA:
Attach product description, specifications, drawings, photographs, performance data, test data, environmental criteria, and any additional data or information for evaluation of the proposed substitution in accord with requirements of Section 01 25 13.

Sample is included: ☐ Yes ☐ No ☐
Sample will be sent if requested: ☐ Yes ☐ No ☐
Maintenance Service Available: ☐ Yes ☐ No ☐

If yes, location: __________________________

Spare Parts Source: __________________________
**PRODUCT/SYSTEM COMPARISON:**
Provide a one-to-one comparison of proposed substitution with ALL specified attributes and qualities of specified item(s)

<table>
<thead>
<tr>
<th>SPECIFIED PRODUCT</th>
<th>PROPOSED SUBSTITUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manufacturer:</td>
<td></td>
</tr>
<tr>
<td>Name, brand:</td>
<td></td>
</tr>
<tr>
<td>Catalog No.:</td>
<td></td>
</tr>
<tr>
<td>Unit Cost:</td>
<td></td>
</tr>
<tr>
<td>Attributes / Qualities / Variations / Warrantee / etc:</td>
<td></td>
</tr>
</tbody>
</table>
**REFERENCES:**
LIST MINIMUM OF FIVE PREVIOUS INSTALLATIONS, WHICH PROPOSED PRODUCT HAS BEEN INSTALLED FOR AT LEAST FOUR YEARS:

<table>
<thead>
<tr>
<th>Project:</th>
<th>Address:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Architect (name &amp; phone):</td>
<td></td>
</tr>
<tr>
<td>Owner (name &amp; phone):</td>
<td></td>
</tr>
<tr>
<td>Contractor:</td>
<td></td>
</tr>
<tr>
<td>Date Installed:</td>
<td></td>
</tr>
<tr>
<td>Dollar Value this Work: $</td>
<td></td>
</tr>
</tbody>
</table>
**EFFECT OF SUBSTITUTION:**

Substitution affects other parts of Work: No [ ] Yes [ ] (If yes, explain below)
Substitution requires dimensional revision or redesign of structure or mechanical and electrical Work: No [ ] Yes [ ] (If yes, explain below)
Same warrantee provided as specified base product: No [ ] Yes [ ] (If yes, explain below)

Explanation: ________________________________________________________________________________________________

Cost difference: $ ___________ (add / deduct).
Total cost implications of substitution on Project: $ ___________ (add / deduct).
Total time implications: $ ___________ (add / deduct) calendar days.

**STATEMENT OF CONFORMANCE OF REQUEST TO CONTRACT REQUIREMENTS:**

Supplier, Subcontractor and Contractor in making substitution request or in using an approved substitution represent:
- [ ] Has personally investigated the proposed substitution and determined it is equal or superior in all respects to specified product or system and will perform intended function, except as stated above.
- [ ] Is in full compliance with applicable code requirements.
- [ ] Will provide same warranty for substitute item as for product, system or method specified.
- [ ] Will coordinate installation of accepted substitution into Work, to include building modifications if necessary, making such changes as may be required for Work to be complete in all respects.
- [ ] Waive all claims for additional costs or time extensions related to substitution that subsequently become apparent or are caused by substitution.
- [ ] If a finish product, color wise and pattern wise complies with base specified items.
- [ ] Certifies cost data presented is complete and includes all related costs under this Contract, excluding Architect’s review and redesign cost.
- [ ] Will pay Architect’s review and redesign cost, special inspections, and other costs caused by substitution.
- [ ] Will pay additional costs to other contractors caused by substitution.
- [ ] Will modify other parts of Work as may be needed, to make all parts of Work complete and functioning.
- [ ] Acknowledge acceptance of these provisions.

List of Attachments: ________________________________________________________________________________________________

**ACKNOWLEDGEMENTS:**

FOLLOWING FIRM HEREBY REQUESTS CONSIDERATION OF FOLLOWING PRODUCT OR SYSTEMS AS A SUBSTITUTION IN ACCORD WITH PROVISIONS OF CONTRACT DOCUMENTS:

**Supplier/Vendor:**
Acknowledged by (print & sign): _____________________________ Date: ____________
Position: _____________________________ Phone ____________

**Subcontractor:**
Acknowledged by (print & sign): _____________________________ Date: ____________
Position: _____________________________ Phone ____________

**Contractor:**
Acknowledged by (print & sign): _____________________________ Date: ____________
Position: _____________________________ Phone ____________
SECTION 01 00 00
GENERAL

PART 1 - GENERAL

1.01 CONDITIONS AND REQUIREMENTS

Division 1 - General Requirements shall govern work under all Divisions of the Specifications.

1.02 SPECIFICATION LANGUAGE EXPLANATION

Specifications are of abbreviated, simplified or streamlined type and include incomplete sentences. Omissions of words or phrases such as "the Contractor shall," "in conformity therewith," "shall be," "as noted on the Drawings," "a," "the" are intentional. Supply omitted words or phrases by inference in same manner as they are when "NOTE" occurs on Drawings. Supply words "shall be" or "shall" by inference when colon is used within sentences or phrases. Supply words "on the Drawings" by inference when "as indicated" is used with sentences or phrases.

Where reference is made to specifications, societies, institutes, or associations or manufacturer's directions, they are, except as may be inconsistent herewith, made part of specifications, to same extent as if written out in full herein. Use latest edition, at time of bidding, if a date is not given.

1.03 SUBMITTALS

A. Prepare data for use by the University of Colorado, Facilities Management personnel.

B. Format:
   1. Submit electronically in Portable Document Format (PDF) format as one document, OCR (Optical Character Recognition) searchable, bookmarked according to the Construction Specifications Institute (CSI) standards.

   2. Title shall be “SPECIFICATIONS”, and shall include:
      a. Name of project and submittal stage and date of submittal (month, day, and year).
      b. University of Colorado Project number (Include on cover and in header or footer of each page)

1.04 CONTENT OF MANUAL

A. An electronically-written table of contents shall be provided for each volume, arranged according to CSI standards. Include the following:
   1. Name of responsible installing principal contractor, address, and telephone number.

1.05 ABBREVIATIONS

Refer to Division 01 “References” for references in Contract Documents to trade associations, technical societies, recognized authorities and other institutions, which are sometimes referred to only by corresponding abbreviations.

1.04 LAYING OUT WORK
The Contractor will furnish reference bench mark and maintain bench mark and all other grades, lines, and levels and dimensions as indicated in the Contract Documents. Report any errors or inconsistencies in above to Owner before commencing work.

Except as delegated by subcontract or normal trade practice, the Contractor will be responsible for all lines, elevations, and measurements of work indicated.

1.05 EXAMINATION OF SITE

Failure to visit the site will in no way relieve any Contractor from the necessity of furnishing materials or performing work that may be required to complete work in accordance with the Contract Documents without additional cost to Owner.

END OF SECTION
SECTION 01 11 13
SPECIFICATION SYSTEM

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included:
   1. Specification system format.
   2. Grammar (syntax) description.

1.02 DESCRIPTION

A. These specifications have been derived from automated specification systems, and include minor deviations from format and traditional writing forms. Such deviations must be recognized as a normal result of this production technique, and no other meaning will be implied or permitted.

B. Imperative language of the technical sections is directed to the Contractor. The term "provide" used repeatedly in the text is defined to mean..."furnish and install, complete, in place and ready for operation and use unless specifically indicated otherwise."

C. Specifications are of abbreviated, simplified or streamlined type and include incomplete sentences. Omissions of work or phrases such as "the Contractor shall", "in conformity therewith," "shall be," "as noted on the Drawings", "A", "The", are intentional. Supply omitted words or phrases by inference in same manner as they are when "Note" occurs on Drawings. Supply words "on the Drawings" by inference when "as indicated" is used with sentences or phrases.

PART 2 - PRODUCTS

Not used

PART 3 - EXECUTION

Not used

END OF SECTION
SECTION 01 14 16
COORDINATION WITH OCCUPANTS AND WORK RESTRICTIONS

PART 1 - GENERAL

1.1 SECTION INCLUDES
   A. Contractor use of site and premises.
   B. Working days and hours
   C. Directed premium time
   D. Owner occupancy.
   E. Disruption of existing services.

1.2 CONTRACTOR USE OF SITE AND PREMISES
   A. Use of site: Limit use and operation at site to “Limits of Construction,” indicated and required to perform Work.
   B. Portions of site beyond area of required Work shall not be disturbed without written approval of Owner.
      1. Portions of site beyond area of required Work shall not be disturbed without written approval of Owner.
      2. Obtain written approval from Owner at least seven (7) working days in advance when scheduling Work outside limits of construction. Provide Owner an estimate of time needed to perform Work outside limits of construction.
      3. Cutting, capping, and reconnecting utility systems outside limits of construction shall be performed by Contractor, unless otherwise noted.
      4. Conform to all laws, ordinances, permits and regulations affecting Work on site.
      5. Existing roads, streets, drives, parking lots, entrances and required fire exit ways shall be kept clear and available at all times for their intended use.
         a. Do not use these areas for parking, staging or storage without Owner’s written approval.
         b. Coordinate with Owner, and provide alternate routes for public and Owner access if normal routes are affected.
      6. Do not unreasonably encumber site with equipment, materials or vehicles.
      7. Return all improvements on or about site and adjacent property which are not shown to be altered, removed or otherwise changed; to conditions which existed previous to starting performance under Contract.
   C. Use of facilities:
      1. Limit use and operation within existing facilities to areas indicated for construction and as required to perform Work. Other areas within facility shall not be disturbed or disrupted.
      2. Perform Work so as not to interfere or inconvenience public, staff and Owner’s operation.
      3. Maintain and keep clear all required fire exit ways throughout facility within and in vicinity of construction areas. Coordinate alternate temporary egress routes with Owner and local fire authority.
      4. Do not load structure with weights that will endanger structure.
      5. Smoking is prohibited within facilities or on Owner’s property.
      6. Audio devices and radios are prohibited, except two-way radios needed for Contractor’s operations. Use of two-way radios within occupied facilities shall be limited, so not to disrupt occupants.
7. Use of toilet facilities, washrooms, and telephones within existing facility or occupied areas is not allowed.
8. Elevators in existing facility or within occupied areas of addition may not be used during normal business hours without Owner’s consent and such use shall meet following conditions:
   a. Protect and maintain entire system and finishes during use.
   b. Repair or replace any damaged components of system and finishes.
   c. Clean all finishes.
9. Cafeteria and dining areas may not be used by construction personnel without Owner’s consent.
10. Clothing with derogatory depictions, language, and/or slogans regarding alcohol, drugs, race or sexual in nature, shall not be worn on premises.
11. Coordinate construction operations to assure that operations are carried out with consideration given to conservation of energy, water, and materials.
12. Maintain existing building in a weather tight condition throughout construction period.
13. Repair damage and leaks caused by construction operations.
14. Take all precautions necessary to protect building and its occupants during construction period.
15. Make every effort to keep noise to a minimum in construction operation.
16. Jack hammer will not be permitted to be used within the existing building without Owner’s consent.
17. Derogatory language regarding race, sexual or religious in nature, shall not be used on premises.

A. Limit Use of Site and Premises to Allow:
   1. Owner occupancy.
   2. Work by Others.
   3. Work by Owner.
   4. Use of site and premises by public.

1.3 WORKING DAYS AND HOURS

A. Days: Monday – Friday.
B. Hours: 8 AM to 5 PM.
C. Work performed during weekends, Holidays or other than normal working days or hours shall be scheduled in advance with, and approved by Owner.

1.4 OWNER OCCUPANCY

A. Owner intends to occupy Academic Classroom Build-out Project by November 1, 2015.
B. Work is required to be performed within existing building. Each Contractor will have access to areas in which this work occurs, subject to rights of Owner.
C. Owner will occupy existing building during life of this contract.
D. Schedule all work at such time and in such a manner to minimize interference and inconvenience to public, staff and Owner’s operations.
E. Contractor must obtain approval of Owner before starting any work within any existing area of building.
F. Area immediately surrounding all areas of Work shall be protected from danger of materials being dropped or dislodged.
G. Work shall be carried out in a manner that will not impose avoidable hardship, danger, or inconvenience to public or staff.
H. Prior to commencement of Work, Contractor and Owner shall jointly survey construction site and surrounding areas, making permanent record of such existing damage as cracks, malfunctioning utility equipment and fixtures, or other similar damage.
   1. This record shall serve as a basis for determination of subsequent damage to these structures and adjacent areas due to Contractor’s operations.
I. Any damage of any nature to these structures and adjacent areas not noted in original survey but subsequently noted, shall be reported immediately to Owner.
J. Cooperate with Owner to minimize conflict and to facilitate Owner’s operations.
K. Schedule work to accommodate this requirement.

1.5 DISRUPTION OF EXISTING SERVICES

A. Work shall be planned so as to minimize shutdown time of any service.
   1. Request approval of a utility or equipment shutdown in writing to Owner not less than eight (8) working days before time shutdown is desired.
   2. Provide Owner an estimate of duration of shutdown and how facility is going to be affected.
   3. Coordinate with Owner’s building engineering staff in advance of any shut down.
   4. Begin work only after engineering staff is fully informed and has agreed to schedule of shut offs.
   5. Do not cut into existing services without first verifying with Owner that service has been correctly identified and shut off.
   6. Operation of existing valves, switches, etc., to affect service shutdown will be completed by Owner, unless arranged otherwise.
B. Limit duration of each such disruption of service to maximum of 4 hours or as approved by Owner.
C. Fabricate and install interconnecting portions of these systems prior to shut down for final connections.
D. Maintain utilities or other service, indicated to be abandoned, in service or provide alternate means of service until new facilities are provided, tested, and put in operation.
E. Maintain fire protection and fire alarm systems at all times within existing facilities.
F. Review all existing conditions, drawings and other documents for proper coordination between new and existing construction.
G. Active utilities whose locations are unknown to Owner are suspected to exist. Contractor shall be cautious of their existence. If they are encountered, immediately report to Owner for direction.
H. Damages to existing structures, utilities and other items which are caused by Contractor’s operations shall be repaired or replaced to their original conditions by Contractor at Contractor’s expense.

1.6 EXCESSIVE NOISE

A. Limit activities which may produce excessive noise or vibration to hours outside of normal working days and hours. Owner will have discretion on what constitutes “excessive noise”.

END OF SECTION
SECTION 01 21 13
ALLOWANCES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Schedule of allowances.
   2. Selection of products.
   3. Adjustment of costs.

1.02 ALLOWANCES FOR PRODUCTS

A. The amount of each allowance shall include:
   1. The cost of the Product to the Contractor.
   2. Delivery to the site.
   3. Applicable taxes.
   4. Handling at the site.
   5. Protection.
   7. Contractor's and Subcontractor's overhead and profit.
   8. Other expenses required to complete the installation.

1.03 SELECTION OF PRODUCTS UNDER ALLOWANCES

A. Contractor's Duties:
   1. Assist Owner in determining qualified suppliers or installers.
   2. Obtain proposals from suppliers and installers.
   3. Make appropriate recommendations.

1.04 ADJUSTMENT OF COSTS

A. Should the net cost be more or less than the specified amount of the allowance, the Contract Sum will be adjusted accordingly by Change Order.
   1. The amount of the Change Order will recognize:
      a. Any changes in handling costs at the site.
      b. Labor.
      c. Installation costs.
      d. Overhead and profit.
      e. Other expenses caused by the selection under the allowance.

B. Submit any claims for anticipated additional costs at the site.

C. At contract close-out, reflect all approved changes in contract amounts in the final statement of accounting.

PART 2 - PRODUCTS

CP007722  September 23, 2013
Systems Biotechnology Building – Academic Classroom Build-Out
CASH ALLOWANCES
01 21 13- 1
PART 3 - EXECUTION

3.01 SCHEDULE OF ALLOWANCES

A. Include the sum of $5,000.00 to provide labor and additional parts for (2) Owner Provided Contractor Installed fume hoods where indicated by the Lab drawings. Fume hoods shall be turned over to Owner at project completion as fully operational and functional in accordance with all applicable codes and standards.

END OF SECTION
PART 1 - GENERAL

1.1 SUMMARY

A. This Section specifies administrative and procedural requirements for handling and processing Changes in Work.

1.2 DEFINITIONS

A. Term Contractor in this section shall mean Construction Manager, which holds a contract with Owner. Term Subcontractor shall mean Contractors which have agreements or contracts with Construction Manager or other Contractors.

1.3 DESCRIPTION

A. Changes in Work may be accomplished after execution of Contract, and without invalidating Contract, by Change Order (CO), Change Proposal Request (CPR), Construction Change Directive (CCD) or order for a minor change in Work, subject to the limitations stated in this Section and elsewhere in Contract Documents. *

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

C. Changes in Work shall be performed under this Section and other applicable provisions of Contract Documents, and Contractor shall proceed promptly, unless otherwise provided in a Change Order, Change Proposal Request, Construction Change Directive or order for a minor change in Work. *

D. Contractor shall manage in a timely manner all changes issued so not to adversely affect Project Schedule.

E. Neither Owner nor Architect recognizes any “reservation of rights” or similar language from Contractor that would purport to preserve ability to make additional claims or demands related to a change, but not in conformance with terms and provisions provided by Contract Documents. All Claims or other demands for changes, compensation or an extension of time must be made in strict conformance with the provisions of Contract Documents. Agreement on any Change Order, Construction Change Directive or Change Proposal Request shall constitute a final settlement of the event and all matters related thereto. Contractor waives and releases Owner and Architect of all direct material costs, labor costs, equipment costs, overhead and profit, costs or losses due to productivity loss, morale, attitude, staffing changes, supervision, acceleration, delay, interference, logistics, fatigue, ripple effect, overtime, time extensions related to costs, and other costs related to any change that are not expressly included in an agreement on any Change Order, Change Proposal Request or Construction Change Directive.
F. Any verbal or other informal orders provided by Owner or Architect should only be considered as temporary or emergency instructions. All verbal or other informal orders shall be formally documented, using one of procedures indicated in this section. Should Contractor choose to proceed with any verbal or informal instructions, Contractor does so at their own risk. Should Contractor not receive written verification of verbal or informal instructions in a timely manner, Contractor should request verification using Request for Information (RFI) process. Under no circumstances should Contractor proceed with any verbal or informal instructions which might result in a change to Contract Sum or Contract Time until an approved Change Order is received.

G. Approved changes shall be promptly reflected by Contractor in Project Record Documents and Construction Schedules for Project. Contractor shall promptly submit revised schedules for Project to Owner and Architect.

PART 2 - PRODUCTION (NOT USED)

PART 3 - EXECUTION

3.1 CHANGE ORDERS *

A. A Change Order (CO) is a written instrument prepared by Architect and signed by Owner, Contractor and Architect, stating their agreement upon all of following:
   1. Change in Work;
   2. Amount of adjustment, if any, in Contract Sum; and

3.2 CHANGE PROPOSAL REQUEST

A. Change Proposal Request (CPR) is prepared and initiated by Architect at Owner’s request or may be issued in response to an Request for Information which has a cost or time impact, or some other required or desired change in the Work that may require an adjustment to Contract Sum or Contract Time.
   1. Change Proposal Requests will include a detailed description of proposed change and may include supplemental or revised Drawings and Specifications, or written instruments prepared by Architect.
   2. Initiation and issuance of a Change Proposal Request is not direction to either stop Work in progress or to proceed with change.
   3. Upon receipt, Contractor and Subcontractors shall review and evaluate the scope of change, and if any potential impact on Project is determined, Contractor shall initiate and forward a Change Proposal Impact Evaluation to Owner immediately for processing.
      a. If there is a potential impact, Owner may direct Contractor to stop Work in area affected by change to minimize cost impact, or may issue a Construction Change Directive directing Contractor to proceed with change.
   4. Contractor shall evaluate Subcontractor's cost proposals, make recommendations and submit proposal to Architect on CPR form issued by Architect within twenty-one (21) days of receipt so not to delay progress of Project.
      a. Proposals shall include Contractor’s Cost Summary form from both Contractor and each Subcontractor with complete itemized accounting, together with appropriate supporting data to substantiate adjustments in Contract Sum and Contract Time, including labor, materials and equipment.

B. Method used to determine an adjustment in Contract Sum shall be limited to following:
   1. As defined under the provisions of the General Conditions.
2. Labor Wages: Itemized by each craft involved, indicating hourly rate for each and hours required, excluding premium pay, paid to employees directly engaged in Work. Rates shall be the actual rate paid the workman in accordance with established management labor agreements. Labor rates indicated in Contractor Agreement or Subcontractor Agreements are not applicable if they cannot be substantiated in writing as direct labor burden when requested by Owner or Architect.

3. Labor Burden: Percent of actual wages for each craft includes: Mandatory fringe benefits required by established agreements; Health and Welfare, Pension, Apprenticeship and other required programs, Social Security, and Unemployment Insurance.

4. Subsistence and/or Mileage: If in union agreements.

5. Materials and Equipment: Materials incorporated in Work at Contractor’s actual invoice cost, including freight.

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

7. Sub-subcontractor overhead and profit markup is not allowed on their Subcontractor’s Work.

8. Bond and Insurance: Actual amount based on net increase or deduct to be paid to surety and insurance carrier.

C. Only delay impacting critical path of Work shall be considered when determining if Contractor is entitled to additional time. If proposals include a change in time, Contractor shall substantiate number of days proposed.

1. An estimate of cost and of probable effect of delay of the Work progress and Project schedule shall be included to substantiate potential delay, including a comparison of Project Construction Schedule and schedules prepared to substantiate a change in time, indicated in CPM format both critical and non-critical path activities affected, and show Project Construction Schedule and change sequences, durations and float.

D. Owner shall have right within its sole discretion to require Contractor to commence performance of changes to Work prior to the submission by Contractor of proposal, or Owner’s approval of proposal. In such case, Contractor shall proceed with Work upon receipt of a Construction Change Directive from Owner, and thereafter submit to Owner and Architect as soon as possible any cost proposal required for approval.

E. A Change Proposal Request signed by Contractor and Owner indicates agreement therewith, and shall be considered a Change Order. Contractor is authorized to proceed with the change after Owner approval thereof.

F. If Contractor’s proposal is not acceptable or change needs to be expedited so not to impact project, a Construction Change Directive may be prepared.

3.3 CONSTRUCTION CHANGE DIRECTIVES

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

B. A Construction Change Directive may be used in absence of total agreement on the terms of a Change Order or Change Proposal Request.

C. If Construction Change Directive provides for an adjustment to Contract Sum, the adjustment shall be based on one of following methods:

1. mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;
2. unit prices stated in the Contract Documents or subsequently agreed upon;
3. cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or

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

E. Failure of Contractor and Owner to agree on an adjustment of Contract Sum or Contract Time shall not excuse Contractor from proceeding with prosecution and performance of Work. Contractor and Subcontractors, Sub-subcontractors and Suppliers shall administer all disputes in a manner that will permit Work to proceed on schedule while the matter in dispute is being resolved.

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

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

H. When Owner and Contractor reach agreement upon the adjustments, such agreement shall be effective immediately and shall be recorded by preparation and execution of an appropriate Change Order.

I. For any portion of such cost that remains in dispute, Owner shall hire independent professional estimator to make determination. That determination of cost shall adjust Contract Sum, subject to right of either party to disagree and assert a claim.

J. When Owner and Contractor agree with determination made by independent professional estimator concerning the adjustments in Contract Sum and Contract Time, or otherwise reach agreement upon the adjustments, such agreement shall be effective immediately and shall be recorded by preparation and execution of an appropriate Change Order.

3.4 MINOR CHANGES IN THE WORK

A. Architect will have authority to order minor changes in Work not involving adjustment in Contract Sum or extension of Contract Time and not inconsistent with the intent of Contract Documents.

B. Such changes shall be effected by written order and shall be binding on Owner and Contractor.

C. Following may be used as a written order to order minor changes in the Work:
   1. Clarification-Interpretation (C-I) or Architect’s Supplemental Instruction (ASI) issued by Architect;
   2. Response to a Request for Information by Architect;
   3. Architect’s comments or direction on a Contractor’s Submittal, or
   4. Minor changes indicated in Architect’s project visit report.

D. Contractor shall carry out such written orders promptly.

E. If Contractor feels that any direction in a written order will require adjustment to Contract Time or Contract Sum, Contractor shall not execute such direction, and shall submit a claim to Architect along with substantiation within twenty-one (21) working days of receipt of such written order.
3.5 CONTRACTOR’S PROPOSED CHANGES TO THE WORK

A. Architect and Owner may consider properly prepared, timely Contractor Proposed Changes (CPC) to Work, if requested by Owner or Architect, or at any time Contractor believes unforeseen conditions may require modifications to the Contract Sum or Contract Time.

1. A Contractor Proposed Change shall be properly prepared, accompanied by proposed cost, sufficient supporting data and information to permit Architect to make a reasonable determination without extensive investigation to determine if change may be considered warranted.
   a. Include a statement outlining reasons for change and effect of change on Work.
   b. Provide a complete description of proposed change.
   c. Indicate effect of proposed change on Contract Sum and the Contract Time.
   d. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. Indicate separately any credit due Owner for products eliminated. If requested, furnish survey data to substantiate quantities.
   e. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
   f. Include costs of labor and supervision directly attributable to change and identify separately any credit for work previously bid but now eliminated.
   g. In event proposed change effects construction schedule, include an updated Contractor’s Construction Schedule that indicates effect of change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of Contract Time. Document use of float or proposed alternate methods to maintain original schedule or both.

2. Contractor Proposed Change shall be submitted to Architect in such format and on such form included herein or as Architect may require.

B. Architect will take an appropriate action on Contractor Proposed Changes.

1. Architect may issue an order for a minor change in Work if it is determined that proposed change is not materially different from requirements of Contract Documents.

2. Architect may incorporate proposed change into a change document and issue for Owner’s consideration.

3. If Architect determines that implementation of proposed change would result in a material change to Contract that may cause an adjustment in Contract Time or Contract Sum, Architect may make a recommendation to Owner who may authorize further evaluation of proposed change or may authorize issuance of such change.

4. Architect may reject such proposed change if it will require substantial revisions to Contract Documents, building or systems or if Architect determines they are not appropriate or substantiated.

* Some or all of provision taken from AIA Document A201-1997, General Conditions of the Contract for Construction.

END OF SECTION
CHANGE PROPOSAL IMPACT EVALUATION

PROJECT:  
CPR NO.:  
HDR PROJECT NO.:  

TO OWNER:

We have reviewed and evaluated the scope of above referenced change and potential impact on Project. If the change is required or desired we recommend following in order to expedite Work and avoid or minimize delays in the Work which may affect cost of the change or impact to the schedule:

☐ Recommend Work stop in area affected by this change for ________ calendar days so change can be priced and processed. Contract Sum or Contract Time due to stopping Work will not increase.

☐ Recommend proceeding with change immediately:

1. Proposed basis of adjustment to Contract Sum or Guaranteed Maximum Price is:
   ☐ No additional cost.
   ☐ GMP amount will not change. Cost indicated will be taken from GMP Contingency.
   ☐ Lump Sum (increase) (decrease) of $________________
   ☐ Unit Price of $____________ per ___________________
   ☐ Time & Materials, not to exceed $________________
   (Daily time, material, and equipment documentation required for above)

   ☐ As follows:
   (Method used in determining above adjustments shall be as defined in Contract Documents)

2. Contract Time is proposed to (be adjusted) (remain unchanged), by an (increase) (decrease) of _________ calendar days.

FROM: CM or CONTRACTOR:  
BY: ___________________________ DATE: __________________

DISTRIBUTION: ☐ OWNER  ☐ ARCHITECT  ☐ ______________________

CONSTRUCTION CHANGE DIRECTIVE

TO CM / CONTRACTOR:  

You are hereby directed to:

☐ Stop work in area affected by above referenced change until it has been processed and appropriate action taken.

☐ Proceed with above referenced change immediately.

When signed by Owner and received by CM/Contractor, this document becomes effective IMMEDIATELY as a Construction Change Directive (CCD), and CM/Contractor shall proceed based per above.

FROM OWNER:  
BY: ___________________________ DATE: __________________

DISTRIBUTION: ☐ CONTRACTOR  ☐ ARCHITECT  ☐ ______________________
CONTRACTOR'S COST SUMMARY

PROJECT:  

CHANGE DOCUMENT:  

PROJECT NO.:  

CONTRACTOR:  

DATE:  

SUBCONTRACTOR:  

DATE:  

This form, itemized accountings and appropriate supporting data must be attached to any change documents or claim.

(Only fill in applicable line items)

1. Labor * (including benefits) $ (Attach Cost Summaries and breakdowns)
2. Materials and Products * $ (Attach Cost Summaries and breakdowns)
3. (Subtotal of lines 1 and 2) $ 
4. Overhead and Profit (15% of line 3) $ 
5. Premium Time on Contract Work $ 
6. Major Construction Equipment Rental * $ (Shall not exceed A.E.D. Schedules)
7. Subcontractor's name and cost: (Attach Cost Summaries and breakdowns)
   a $ 
   b $ 
   c $ 
   d $ 
   e $ 
   f $ 
   g $ 
   h $ 
   i $ 
   j $ 
   k $ 
   l $ 
   m $ 
   n $ 
   o $ 
   p $ 
   q $ 
   (Subtotal of lines 7a through 7q) $ 
8. Contractor’s O & P on Sub’s. Work (5% of line 8) $ 
9. (Subtotal of lines 3, 4, 5, 6, 8 and 9) $ 
10. Bond ____% and Insurance ____% (if required) = ____% of line 10 $ 
11. TOTAL PROPOSED COST ADJUSTMENT (total of lines 10 and 11): $ 
12. PROPOSED CONTRACT TIME ADJUSTMENT: _____ □ADD □DEDUCT (calendar days)
   (Provide supportive data substantiating claim for additional days in accordance with Contract Documents)

* Attach complete breakdown of itemized accounting and supporting data, sufficient to permit evaluation.
CONTRACTOR PROPOSED CHANGE

PROJECT: 

HDR PROJECT NUMBER: 

TO: HDR Architecture, Inc.

REASON FOR PROPOSAL:

☐ Design to comply with building code requirements
☐ Product / material unavailable to meet Project schedule
☐ No qualified installer for specified item
☐ Supplier refuses to warrant product or installation
☐ Project cost cutting / cost reduction
☐ Supplier, Subcontractor or Contractor convenience
☐ Value Engineering (may be used for "Value Engineering Change Proposal" govern by Federal Acquisition Regulations)
☐ Other:

Explanation in Detail: ☐ See attached: 

REASON FOR NOT GIVING PRIORITY TO SPECIFIED METHOD, ITEMS OR SYSTEM: ☐ See attached:

REFERENCES:
Specification Section number: Article(s)/paragraph(s):
Drawings / Sections / Details:

DESCRIPTION OF PROPOSAL:

SUPPORTING DATA:
Attach description, specifications, drawings, photographs, performance data, test data, environmental criteria, and any additional data or information for evaluation.

Sample is attached: Yes ☐ No ☐
Sample will be sent if requested: Yes ☐ No ☐
Maintenance Service Available: Yes ☐ No ☐

If yes, location:
Spare Parts Source:
### PRODUCT / SYSTEM COMPARISON:

Provide a one-to-one comparison of proposed item with ALL specified attributes and qualities of specified item(s)

<table>
<thead>
<tr>
<th>SPECIFIED PRODUCT</th>
<th>PROPOSED SUBSTITUTION</th>
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<td>Manufacturer:</td>
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REFERENCES:
LIST MINIMUM OF FIVE PREVIOUS INSTALLATIONS, WHICH PROPOSED METHOD / SYSTEM / PRODUCT HAS BEEN INSTALLED FOR AT LEAST FOUR YEARS:

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EFFECT OF PROPOSAL:

Affects on other parts of Work: No □ Yes □ (If yes, explain below)
Proposal requires dimensional revision or redesign of structure or mechanical and electrical Work: No □ Yes □ (If yes, explain below)
Same warranty provided as specified item: No □ Yes □ (If yes, explain below)

Explanation:

Cost difference: $ (increase / decrease)
Total Contract Sum implications of proposal on Project: $ (increase / decrease)
Total Contract Time implications: (increase / decrease) calendar days.

STATEMENT OF CONFORMANCE OF PROPOSAL TO CONTRACT REQUIREMENTS:

Supplier, Subcontractor, Contractor, (CM) in making substitution request or in using an approved substitution represent:
- Has personally investigated the proposal and determined it is equal or superior in all respects to specified product, system or method and will perform intended function, except as stated above.
- Has same quality and life-cycle cost as design in the Contract Documents, except as stated above.
- Is in full compliance with applicable code requirements.
- Will provide same warranty for substitute item as for product, system or method specified.
- Will coordinate installation of proposal into Work, to include building modifications if necessary, making such changes as may be required for Work to be complete in all respects.
- Waive all claims for additional costs or time extensions related to proposal that subsequently become apparent or are caused by proposal.
- If a finish product, color wise and pattern wise complies with base specified items.
- Certifies cost data presented is complete and includes all related costs under this Contract, excluding Architect’s review and redesign cost.
- Will pay Architect’s review and redesign cost, special inspections, and other costs caused by proposal.
- Will pay additional costs to other contractors caused by proposal.
- Will modify other parts of Work as may be needed, to make all parts of Work complete and functioning.
- Acknowledge acceptance of these provisions.

List of Attachments:

ACKNOWLEDGEMENTS:

FOLLOWING FIRM HEREBY REQUESTS CONSIDERATION OF PROPOSAL:

Requested by (firm):
Acknowledged by (print & sign): ____________________________ Date: ________________
Position: ____________________________ Phone: ____________________________

Subcontractor:
Acknowledged by (print & sign): ____________________________ Date: ________________
Position: ____________________________ Phone: ____________________________

Contractor:
Acknowledged by (print & sign): ____________________________ Date: ________________
Position: ____________________________ Phone: ____________________________

CONSTRUCTION MANAGER’S ACKNOWLEDGMENT AND RECOMMENDATION:

- Recommend approval for following reasons:
- Do not recommend approval for following reasons:
- Returned to requester - Need more information:
ARCHITECT’S ACTION / RECOMMENDATION:

☐ Recommend Owner’s approval.
☐ Submitted to Owner for authorization for Architect’s as Change in Service to further evaluate and make recommendation.
☐ Submitted to Owner for authorization for Architect’s as Change in Service to revised Contract Documents to incorporate proposal, and issue change document to the contractor for submitting a complete cost proposal for Owner’s consideration.

☐ Do not recommend (see comments below).
☐ Rejected:
    ☐ Acceptance will require substantial revision of Contract Documents, building or systems.
    ☐ Request does not indicate specific item, system or method which is being proposed.
    ☐ Requested for manufacturer acceptance only.
    ☐ Request form is not properly executed and signed.
    ☐ Subcontractor or supplier requested directly.
    ☐ Insufficient information submitted.
    ☐ Does not comply color wise or pattern wise with base specified items.
    ☐ Insufficient information submitted to evaluate.
    ☐ Does not appear to comply with requirements of specifications for base specified product.
    ☐ Other:
    ☐ Additional information needed - Returned to CM/Contractor for providing following:

Comments:

Architect:
By (print & sign): Date:
Position:
Distribution: ☐ Owner ☐ CM/Contractor ☐ file

OWNER ACTION:

☐ Reject - Do not want to consider.
☐ Product substitution approved - Contractor may proceed with request as submitted.
☐ Approved – Architect directed as Change in Services to issue change document to incorporate substitution into contract Documents, and adjust Contract Sum and/or Contract time.
☐ Architect authorized as Change in Services to further evaluate and make recommendation.
☐ Architect authorized as Change in Services to revised Contract Documents to incorporate proposal, and issue change document to the contractor for submitting a complete cost proposal for Owner’s consideration.

☐ Additional information needed - Returned for providing following:

Comments:

Owner:
By: (print & sign) Date:
Position:
Distribution: ☐ Architect ☐ CM/Contractor

CP007722 University of Colorado at Boulder Systems Biotechnology Building – Academic Classroom Build-Out CHANGES IN WORK 01 23 04 - 15
ARCHITECT FURTHER ACTION / RECOMMENDATION (if needed):
- Incorporating into change document as directed by Owner. Change document __________ will be used.
- Recommend Owner’s approval.
- Submitted to Owner for authorization for Architect’s as Change in Service to revised Contract Documents to incorporate proposal, and issue change document to the contractor for submitting a complete cost proposal for Owner’s consideration.
- Do not recommend (see comments below).
- Rejected:
  - Acceptance will require substantial revision of Contract Documents, building or systems.
  - Request does not indicate specific item, system or method which is being proposed.
  - Requested for manufacturer acceptance only.
  - Request form is not properly executed and signed.
  - Subcontractor or supplier requested directly.
  - Insufficient information submitted.
  - Does not comply color wise or pattern wise with base specified items.
  - Insufficient information submitted to evaluate.
  - Does not appear to comply with requirements of specifications for base specified product.
  - Other:
- Additional information needed - Returned to CM/Contractor for providing following:
- Recommend Owner’s approval.
- Do not recommend.

Comments:

Architect:
By: (print & sign) Date:
Position:
Distribution: [ ] Owner [ ] CM/Contractor [ ] file

OWNER FURTHER ACTION (if needed):
- Reject - Do not want to consider.
- Product substitution approved - Contractor may proceed with request as a submitted.
- Approved – Architect directed as Change in Services to issue change document to incorporate substitution into contract Documents, and adjust Contract Sum and/or Contract time.
  - Architect authorized as Change in Services to revised Contract Documents to incorporate proposal, and issue change document to the contractor for submitting a complete cost proposal for Owner’s consideration.
- Additional information needed - Returned for providing following:

Comments:

Owner:
By: (print & sign) Date:
Position:
Distribution: [ ] Architect [ ] CM/Contractor [ ] file

END OF FORMS
SECTION 01 25 13
SUBSTITUTION PROCEDURES AFTER EXECUTION OF CONTRACT

PART 1 - GENERAL

1.1 DEFINITION

A. Acceptable Manufacturers and Products: See Section 01 61 00.
B. Any product proposed by Contractor that does not meet requirements of the Contract Documents, whether in product characteristics, performance, quality, or manufacturer or brand names, is considered a substitution.
C. No substitutions will be considered:
   1. In case of non-availability of materials contact Architect for review and action.
D. For all products other than those specified as “Base” or “Optional”, the Contractor shall request a substitution prior to the date of execution of the Contract.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION
SECTION 01 26 13
REQUESTS FOR INFORMATION (RFI)

PART 1 - GENERAL

1.1 SUMMARY

A. Section specifies administrative and procedural requirements for handling and processing Requests for Information (RFI).

B. RFI is intended for requesting clarifications and interpretations of Contract Documents due to apparent inconsistencies, errors or omissions in Contract Documents, and due to unanticipated existing conditions.

C. RFI is not intended for requesting substitutions, Contractor’s proposed changes, resolution of nonconforming work or for general questions not related to Contract Documents.

D. RFI process is intended to be a cooperative effort between Architect and Contractor to expedite responses to RFIs and maintain progress of Work without utilizing other lengthy procedures.

E. Any other proposed method of processing RFI’s other than indicated within this Section, such as project collaboration systems, shall be evaluated by Architect for potential impact on Architect’s services.

1. If Architect agrees to utilize another proposed method, Architect will be reimbursed for any special training, usage fees, extra time required to implement, maintain, utilize and administer such a system.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 REQUESTS FOR INFORMATION

A. Review of Contract Documents and Field Conditions:

1. Contract Documents are complementary; therefore, before starting each portion of Work, carefully study and compare various Drawings, Specifications and any other Contract Documents, coordination drawings, shop drawings, prior correspondence or documentation relative to that portion of Work, as well as information furnished by Owner.

2. Contractor and Subcontractors shall evaluate and take field measurements of any existing conditions related to that portion of Work and shall observe any conditions at site affecting Work.

3. These obligations are for purpose of facilitating and coordinating construction and are not for purpose of discovering errors, omissions, or inconsistencies in Contract Documents.

4. Contractor and subcontractors acknowledge that all documents pertaining to Work has been examined, have examined character of site and any existing conditions, and are satisfied with nature of Work, and all other matters which can in any way affect Work.

5. In event of inconsistency between portions of Contract Documents or within Contract Documents; provide better quality or greater quantity of Work, and comply with more stringent requirement, either or both in accordance with Architect’s interpretation.

6. Any errors, inconsistencies or omissions discovered in Contract Documents shall be reported promptly to Architect as a properly prepared and timely RFI.
7. Contractor and Subcontractors are not required to ascertain Contract Documents are in accordance with applicable laws, statutes, ordinances, codes, and rules and regulations, unless they bear upon construction means, methods, techniques or safety and health precautions, but the Contractor shall promptly report to Architect any nonconformity discovered by or made known to Contractor as a RFI.

8. If Contractor or Subcontractor fail to give such notice, and knowingly proceeds with Work affected by errors or omissions in Contract Documents, Contractor shall correct any such errors, inconsistencies, or omissions at no additional cost.

B. Contractor’s and Subcontractor’s Responsibilities:

1. When interpretation, clarification or explanation of portion of Construction Documents is needed by Contractor, Subcontractor, Vendor or Supplier, the request shall be processed through Contractor.
   a. Review request for completeness, quality, proper referencing to drawing or specification section and reason submitted.
   b. If request is not acceptable it shall be sent back to submitter with comments regarding reason for being returned.
   c. Make every attempt to validate, resolve or respond to RFI by thoroughly researching and reviewing Contract Documents and field conditions.
   d. Respond to RFI accordingly if review of RFI discloses a response or is related to coordination of construction or other issue not related to Contract Documents.
   e. If unable to respond to request, it shall be restated in clear, concise, correct, complete and easily understood manner, and rewritten if necessary, additional information included if necessary, and only then submitted to Architect for response.

2. Request for interpretation, clarification or explanation of Contract Documents shall be submitted to Architect through Contractor.
   a. List specific Contract Documents researched when seeking information being requested.
   b. Reference all applicable Contract Drawings by sheet number, section, detail, room number, door number, etc., Specifications by section and paragraph number, and reference any other relevant documents.
   c. The field titled "Regarding" on attached RFI form must be clear for future reference in reports or correspondence.
   d. Clearly state request and provide Contract Document references and any additional information needed so request can be fully understood, including sketches, photos or other reference material.
   e. Fully assess issues, suggest any reasonable solutions and include various factors, including potential costs, schedule impacts, if any, and recommendations which will aid in determining a solution or response. If a reasonable solution can not be suggested, a statement to that effect should be so stated.
   f. Indicate reason request is being submitted.
   g. Any critical RFI’s requiring a rapid response shall clearly indicate such with an explanation as to why RFI is critical.
   h. Priority for responses shall be indicated when multiple RFI’s are submitted within short period of time.
   i. The RFI shall indicate schedule or cost impact, if any. Contractor shall be required to submit cost or schedule impact within seven days of receipt of the RFI response.

3. Copies of responses to RFI’s shall be distributed to all parties affected.

4. A response to RFI shall not be considered a notice to proceed with a change that may revise the Contract Sum or Contract Time, unless authorized by Owner in writing.

5. If response to RFI is determined incomplete, it shall be resubmitted with reason response is unacceptable and any necessary additional information within five (5) days of time of receipt of response to RFI.
6. If determined or believed that additional cost or time is involved because of clarifications, interpretations or instructions issued by Architect in response to a RFI, resubmit RFI within five (5) days of receipt of response with reason and alternate solution or suggestion for performing work at no additional cost. If no other solution is possible or desirable, submit Claim in accordance with the Contract Documents within twenty-one (21) days of receipt of response to the RFI.

C. RFI Submittal Format:
1. Request for information shall be submitted to Architect on RFI form provided at end of this section, or form provided by Architect in electronic text file format, or in similar format acceptable to Architect.
   a. RFI’s shall be assigned unique numbers in sequential order (1, 2, 3, 4, etc.).
   b. A resubmitted RFI or a previously answered RFI requiring revising or further clarification shall be submitted using original RFI number proceeded by “.1” to indicate revision one of RFI (i.e.: RFI No. 34.1 for revision 1 to RFI No. 34).
   c. RFI form shall be electronically filled out and emailed to Architect’s designated representative in text file format. Attachments shall be in electronic text or PDF file format. Photo attachments may be in JPG format.

D. Architect’s Response to Request for Information (RFI):
1. Clarifications, interpretations and decisions of Architect in response to RFI will be consistent with intent of and reasonably inferable from Contract Documents, and will be in writing, and if determined to be necessary by Architect, will be provided in form of drawings and other attachments or both.
2. When making such interpretations and initial decisions, Architect will endeavor to secure faithful performance by both Owner and Contractor, will not show partiality to either and will not be liable for results of interpretations or decisions so rendered in good faith.
3. Architect’s decisions on matters related to aesthetic effects will be final if consistent with intent expressed in Contract Documents.
4. Architect will not undertake to settle differences between Contractor, Subcontractors, trades suppliers, fabricator or manufacturer, or act as arbiter as to which Subcontractor, trade, supplier or manufacturer is to furnish or install various items indicated or required.
5. Architect shall provide responses to RFI’s with reasonable promptness, but will endeavor to respond within seven (7) days from date of receipt.
   a. If multiple RFI’s are submitted on same day or within a five (5) day period, review time may be extended by mutual agreement of parties.
   b. Architect will provide a written response to RFI if Architect believes response only involves an interpretation, clarification, supplemental information or orders a minor change in Work not involving an adjustment in Contract Sum or extension of Contract Time, and is not inconsistent with intent of Contract Documents, and shall be binding.
   c. If Architect believes response may result in a change to Contract Sum or Contract Time, response will indicate that a change document will be issued for the response, and appropriate change document will be issued indicating changes to Contract Documents.
   d. Architect will provide any additional or supplemental drawings, specifications or other information as Architect may deem necessary to facilitate response.
6. Architect may return RFI without response for following reasons:
   a. Unclear.
   b. Incomplete.
   c. Detailed information not provided.
   d. Is related to construction means, methods or techniques.
   e. Is related to health or safety measures.
   f. Is due to Contractor’s lack of adequate coordination.
   g. Is considered a “Substitution Request.”
   h. Is due to non-conformance.
   i. Response is required by another party.
E. If requested information is available from careful study and comparison of Contract Documents, field conditions, other Owner-provided information, coordination drawings, or prior Project correspondence or documentation, Architect may invoice Owner as a change in services for costs involved in Architect's review, analysis, responding and processing of such RFI.

1. Contractor shall reimburse Owner for such costs.

END OF SECTION
# REQUEST FOR INFORMATION

**Project:** University of Colorado at Boulder  
**Systems Biotechnology Building**

**RFI Number:** PR 00 1857

**To:**  
- ☐ (Architect)  
- ☐ (consultant?)  
- ☐ (other?)

**Regarding:**

**References:** (List specific Contract Documents researched when seeking the information being requested)

**Spec. No.:**  
**Dwg. No.:**

**Request:** (Provide complete description of request with document references and sketches or photos if necessary, and present status of work)

**Requester’s Recommended Solution:** (If RFI concerns a site or construction condition, provide a recommended solution, including cost & schedule considerations)

**Response Priority:**  
- ☐ Normal  
- ☐ Rush (Work in progress)

**Reason For Request:**  
- ☐ Existing Condition  
- ☐ Non-conformance  
- ☐ Clarification / Interpretation  
- ☐ Agency Generated  
- ☐ Other

**Subcontractor:**  
**CM/Contractor:**  
**Date:**

**By:**  
**Date:**

**Response:**

- ☐ Above is considered a change. Following document will be used for processing: __________
- ☐ Above is consistent with intent of and reasonably inferable from Contract Documents, or makes minor changes in Work without change in Contract Sum or Contract Time. If Contractor does not agree, submit written notice substantiating claim in accordance with Contract Documents.
- ☐ This RFI is related to one of following and may be returned without response:  
  - ☐ Incomplete or lack of detailed information  
  - ☐ Related to “means and methods”  
  - ☐ Lack of adequate Coordination Drawings  
  - ☐ Is a “Substitution Request”

**From:** HDR Architecture, Inc.

**By:**  
**Date:**

**END OF FORM**
SECTION 01 29 00
APPLICATIONS FOR PAYMENT AND SCHEDULE OF VALUES (GC)

PART 1 - GENERAL

1.1 SUBMITTALS

A. Project information:
   1. Submittals, prior to first application for payment:
      a. Schedule of Values.
   B. Contract Closeout Information: (See Section 01 77 00).

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.1 SCHEDULE OF VALUES

A. Prior to first Application for Payment, submit to Architect a Schedule of Values allocated to various portions of Work, prepared in such form and supported by such data to substantiate its accuracy as Owner and Architect may require.

B. At a minimum, subdivide into following allocated items:
   1. Bond.
   2. Insurance.
   3. General condition items: mobilization, temporary facilities, temporary utilities, submittals, demobilization, and other similar general condition items.
   4. Phases or areas or both of building.
   5. Specification sections.
   6. Individual components of Work, and major pieces of equipment.
   7. Labor amount and material or equipment amount, listed separately.
   8. Contract closeout items: manuals, spare parts, maintenance material, system demonstrations, record documents, operation and maintenance data, and other similar contract closeout items.
   9. Individually approved changes.

C. Labor amount shall include all on site installation costs including labor, applicable taxes, insurance, fringe benefits, erection equipment, tools, overhead and profit.

D. Material and equipment shall include all material and manufactured equipment costs including delivery costs, taxes, insurance, overhead and profit.

E. The schedule, unless objected to by Owner or Architect, shall be used as a basis for reviewing percent complete of line items on Contractor’s Applications for Payments.

3.2 APPLICATION FOR PAYMENT

A. On or before 25th day of month, Contractor submit to Architect itemized Application for Payment for work completed during previous calendar month, in accordance with schedule of values.
   1. Submit on AIA Document G702 - Application and Certificate for Payment, and AIA Document G703 - Continuation Sheet, or similar format acceptable to Architect.
a. Itemize in accordance with approved Schedule of Values, and as indicated in AIA documents.
b. Bond and insurance costs may be requested for payment on first application.
c. Equal monthly payments may be made for general conditions based upon number of months Contractor is scheduled to be on site.
d. May include amounts for changes in work that have been authorized by Construction Change Directives, or by Change Proposal Requests approved by Owner.
e. Furnish in triplicate.
f. Signed by duly authorized agent of Contractor.
g. Notarize Application for Payment.

2. Furnish copies of requisitions from Subcontractors and suppliers to substantiate values.
3. Shall not include request for payments for portions of Work for which Contractor does not intend to pay to a Subcontractor or supplier, unless such Work has been performed by others whom Contractor intends to pay.
4. Provide additional supporting data substantiating Contractor’s right to payment, as Owner or Architect may require.

B. Application for Payment serves as certification of status by Contractor of Project.
C. Contractor warrants that title to all Work covered by an Application for Payment will pass to Owner upon receipt of payment.
D. Contractor further warrants that upon submittal of an Application for Payment all Work for which Certificates for Payment have been previously issued and payments received from Owner shall, to the best of Contractor’s knowledge, information and belief, be free and clear of liens, claims, security interests or encumbrances in favor of Contractor, Subcontractors, material suppliers, or other persons or entities making a claim by reason of having provided labor, materials and equipment relating to Work.

3.3 PAYMENT FOR STORED MATERIAL AND EQUIPMENT

A. Application for Payment may include materials and equipment ready, but not yet incorporated in Work, delivered, and suitably stored at site.
B. Warranty and guarantee period does not commence until Substantial Completion of work.
C. Payment will be treated same as “work-in-place,” with evidence of delivery to job site, except that payments will not include value of labor and mark-up.
D. Each subsequent Application for Payment will restate prior month’s materials and equipment not incorporated in Work, and current month additions and deletions for materials and equipment incorporated into work. Inventory must be updated and included with each subsequent application to indicate current status.
E. Upon making of partial payments by Owner, all materials and equipment covered thereby become sole property of Owner. Partial payments, however, do not constitute Owner’s acceptance of material, equipment or work, nor be construed as waiver of any right or claim by Owner.
F. Contractor shall be deemed as having care, custody, and control of items.

3.4 RETAINAGE

A. Until Substantial Completion, 10 percent retainage will be withheld from value of Work completed and material stored.
B. Any reduction of retainage beyond that allowable by Contract Documents, and including adjustments at Substantial Completion requires Consent of Surety, recommendation of Architect, and approval of Owner prior to incorporating into an Application for Payment.
1. Provide Request for Reduction of Retainage on form furnished by Architect and Consent of Surety; AIA Document G707A.
2. If approved by Architect and Owner, Contractor may incorporate reduction in next Application for Payment.
3. Include copy of approved form with Application for Payment.

END OF SECTION
PORTED MATERIAL AND EQUIPMENT AFFIDAVIT

PROJECT: ____________________________ PROJECT NO: ____________________________

<table>
<thead>
<tr>
<th>ITEM NO.</th>
<th>QUANTITY</th>
<th>UNIT</th>
<th>MATERIAL OR EQUIPMENT DESCRIPTION</th>
<th>VALUE</th>
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LOCATION STORED: ___________________________________________________________

IDENTIFICATION METHOD: ______________________________________________________

AFFIDAVIT:

Items listed above have been purchased exclusively for use on above referenced Project and have been received in good condition, and items are identified as property for use only on above referenced Project. Owner may enter upon premises for verification, inspection, or for any other purpose considered necessary. It is expressly understood and agreed that this affidavit is furnished to the Owner for purpose of obtaining approval for payment for said items, and that storage thereof at location indicated and payment by Owner shall not relieve Contractor of full responsibility for the protection, safeguarding, insurance, transporting, and proper installation at Project referenced above, and will warrant and defend against claims and demands of all persons. Upon making of partial payment by Owner, said items covered thereby become sole property of Owner.

Attached are receipted invoice(s), bills of sale(s), and/or other documents as evidence that Contractor is unconditional owner of said items, and they are free from all encumbrance, security agreements, mortgages or liens.

FROM CONTRACTOR: __________________________________________________________

BY: ___________________________________________ DATE: __________

SUBSCRIBED AND SWORN TO BEFORE ME THIS _______ DAY OF _____, ________.

NOTARY PUBLIC: _________________________ MY COMMISSION EXPIRES: ____________________________

Owner (APPROVES) (DISAPPROVES) location of off site storage, and Contractor’s inclusion of cost for above items in an Application for Payment.

OWNER’S APPROVAL:

BY: ___________________________________________ DATE: __________

Contractor shall include this affidavit and other required documents with Application for Payment and shall maintain an inventory of all stored materials for submittal with future applications.

END OF FORM
The following inventory represents our accounting of the current status of material and equipment in storage which we have received payment for:

<table>
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<tr>
<th>ITEM NO.</th>
<th>MATERIAL OR EQUIPMENT DESCRIPTION</th>
<th>QUANTITY</th>
<th>VALUE</th>
<th>APPL. NO.</th>
<th>INCORPORATED DATE /QUANTITY</th>
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</table>

FROM CONTRACTOR: ________________________________
BY: ________________________________ DATE: __________

This form shall be updated and submitted with each application for payment.

END OF FORM
REQUEST FOR REDUCTION OF RETAINAGE

PROJECT: PROJECT NO.:

CONTRACT FOR:

Contractor hereby requests that the percentage of partial payment retained by Owner under provision of contract be REDUCED to _____% for following reasons:

CONTRACTOR:

BY: ________________________________ DATE: ________________

Power of Attorney and AIA Document G707A must be attached.

Architect (RECOMMENDS) (DOES NOT RECOMMEND) the reduction of retainage to _____%. Percentage of completion as of _________________, ____ is _____%.

ARCHITECT:

BY: ________________________________ DATE: ________________

Owner hereby (APPROVES) (DISAPPROVES) reduction of retainage to _____%, and authorizes Architect to certify the reduction in an Application for Payment.

OWNER:

BY: ________________________________ DATE: ________________

If approved, Contractor may incorporate reduction in next Application for Payment, and shall include copy of this document with it.

DISTRIBUTION: OWNER ARCHITECT CONTRACTOR

END OF FORM
SECTION 01 30 00
ADMINISTRATION AND SUPERVISION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SURVEYS, LAYOUTS, AND LEVELS

A. General: Working from lines and levels established by the existing building, and as shown in relation to the work, establish and maintain bench marks and other dependable markers to set the lines and levels for the work of construction as needed to properly locate every element of the work of the entire project. Calculate and measure required dimensions as shown (within recognized tolerances if not otherwise indicated); do not scale the drawings to determine dimensions. Continuously advise tradesmen performing the work of the marked lines and levels provided for use in the layout of work.

1.3 PROJECT RECORD DOCUMENTS – ELECTRONIC

A. Maintain at job site, one copy of:

2. Specifications.
3. Addenda.
4. Reviewed Shop Drawings.
5. Change Orders.
6. Other Modifications to Contract.
7. Field Test Records.
8. As-Built Drawings.

B. Maintain documents in electronic format to be turned over to the Consultant and Owner at Project Closeout. Update electronically in Portable Document Format (PDF) format as one document, OCR (Optical Character Recognition) searchable, Make documents available at all times for inspection by the Consultant and Owner.

C. Label each document "Project Record".

D. Record all drawing change information for the various systems..

E. Record drawings and specifications shall include the following:

1. Location of internal utilities and appurtenances concealed in construction referenced to visible and accessible features of structure. Location of concealed valves, dampers, controls, balancing devices, junction boxes, clean-outs, and other items requiring access or maintenance.
2. Field changes of dimension and detail, changes made by Change Order or Field Order and details not on original contract drawings.
3. Fire protection and alarm systems shop drawings.
F. Submit all record drawings to the Consultant at the completion of the project.

1.4 CLEANING

A. Cleaning and Protection Work: At the time each unit of work or element of the construction is completed (substantially) in each area of the Project, clean the unit or element to a condition suitable for occupancy and use (as intended), and restore minor or superficial damage. Replace units and elements which are damaged beyond successful restoration. Clean and restore adjoining surfaces and other work which was soiled or damaged (superficially) during the installation; replace other work damaged beyond successful restoration. Where the performance of subsequent work could possibly result in damage to the complete unit or element, provide protective covering or other provisions to minimize possible damage. Repeat cleaning and protection operations during remainder of construction period, wherever work might otherwise be damaged by sustained soiling or exposure.

B. During Construction: Oversee cleaning and ensure that building, grounds, and public properties are maintained free from accumulation of waste materials and rubbish. At reasonable intervals during daily progress of work, clean up site and access and dispose of waste materials, rubbish, and debris. Vacuum clean interior building areas when ready and continue vacuum cleaning on an as-needed basis until building is ready for acceptance or occupancy.

1.5 PROJECT SIGN

A. Erect no project sign or job-site sign of any kind, except warning signs as specified in Section 01500, without written authorization of the Owner.

1.6 COORDINATION

A. The Contractor shall coordinate the work so as not to interfere with the building custodian's normal cleanup activities.

B. The Contractor shall be responsible for coordinating all the work of the project. The Contractor shall coordinate the efforts of all subcontractor(s) and the deliveries of suppliers so that the work progresses in an orderly fashion without delay towards timely completion of a complete project in accordance with the drawings and specifications.

C. The Contractor shall note that concurrent with his work, other contractors, suppliers, and the Owner's facilities and maintenance personnel may be working in relatively close proximity. The Contractor will be solely responsible for coordinating his work with that of other contractors and will make no claims for failure to do so.

1.7 METHODS OF CONSTRUCTION

A. The procedure and method of construction is the prerogative and the responsibility of the Contractor. If professional assistance is required to safely implement method of construction, the Contractor shall, on his own, employ professional help.

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY

A. General Contractor is responsible for all of the work of this contract.
   1. Assign and subcontract portions of the work as required to assure that all work is con-
      structed in compliance with these documents.
   2. Coordinate the work of the several subcontractors for the project.
   3. Coordinate work of this contract with work by separate contractors.

B. Each subcontractor shall:
   1. Coordinate work of his own employees and subcontractors.
   2. Expedite his work to assure compliance with schedules.
   3. Coordinate his work with that of other subcontractors and work by separate contractor.
   4. Comply with orders and instructions of owner.

C. Related Requirements
   1. All Division 1 Sections.

1.02 CONSTRUCTION ORGANIZATION AND START-UP

A. Establish on-site lines of authority and communications.
   1. Attend pre-construction meeting with subcontractors upon commencement of the project.
   2. Establish procedures for intra-project communications.
      a. Submittals.
      b. Reports and records.
      c. Recommendations.
      d. Coordination Drawings.
      e. Schedules.
      f. Resolution of conflicts.
      a. Consult with Architect to obtain interpretation.
      b. Assist in resolution of questions or conflicts which may arise.
      c. Transmit written interpretations to subcontractors, and to other concerned parties.
   4. Assist in obtaining permits and approvals.
      a. Obtain building permits and special permits required for work or for temporary
         facilities.
      b. Verify that subcontractors have obtained inspections for work and for temporary
         facilities.
   5. Control the use of site.
      a. Supervise field engineering and site layout.
      b. Allocate space for each subcontractor's use for field offices, sheds, work and
         storage areas.
      c. Establish access, traffic and parking allocations and regulations.
      d. Monitor use of site during construction.
1.03 CONTRACTOR DUTIES

A. Construction Schedules.
   1. Coordinate schedules with several subcontractors.
   2. Monitor schedules as work progresses.
      a. Identify potential variances between schedules and probable completion dates for each phase.
      b. Recommend adjustments in schedule to meet required completion dates.
      c. Adjust schedules of subcontractors as required.
      d. Document changes in schedule.
   3. Observe work of each subcontractor to monitor compliance with schedule.
      a. Verify that labor and equipment are adequate for the work and the schedule.
      b. Verify that product procurement schedules are adequate.
      c. Verify that product deliveries are adequate to maintain schedule.

B. Process Shop Drawings, Product Data and Samples.
   1. Review for compliance with Contract Documents.
      a. Field dimensions and clearance dimensions.
      b. Relation to available space.
      c. Relation to other trades, equipment and systems.
      d. Submit to Architect.

C. Monitor the use of temporary utilities.
   1. Verify that adequate services are provided and maintained.

D. Inspection and Testing.
   1. Inspection work to assure performance in accord with requirements of Contract Documents.
   2. Administer special testing and inspections of suspected work.
   3. Reject work which does not comply with requirements of Contract Documents.
   4. Coordinate testing laboratory services.
      a. Verify that required laboratory personnel are present.
      b. Verify that tests are made in accordance with specified standards.
      c. Review test reports for compliance with specified criteria.
      d. Recommend and administer required retesting.

E. Monitor contractor's periodic cleaning.
   1. Enforce compliance with specifications.
   2. Resolve any conflicts.

F. Coordinate changes.
   1. Recommend necessary or desirable changes.
   2. Assist owner in negotiating change orders.
   3. Promptly notify all subcontractors of pending changes.

G. Maintain Reports and Records at Job Site available to Architect and Subcontractors.
   1. Log progress of work of each subcontractor.
   2. Records
      a. Contracts.
      b. Purchase orders.
      c. Materials and equipment records.
      d. Applicable handbooks, codes and standards.
   3. Obtain information from subcontractors and maintain file of Project Record Documents.
4. Assemble documentation for handling of claims and disputes.

1.04 CONTRACT CLOSEOUT

A. Coordinate equipment start-up.
   1. Provide seven days notification prior to start-up of each item.
   2. Ensure that each piece of equipment or system is ready for operation.
   3. Execute start-up under supervision of responsible persons in accordance with manufacturer's instructions.
   4. Perform required testing and balancing.
   5. Record dates of start of operation of systems and equipment. Submit written report that equipment or system has been properly installed and is functioning correctly.
   6. Provide written notice of beginning of warranty period for equipment put into service.

B. Demonstration and Instructions
   1. Demonstrate operation and maintenance of products to Owner's personnel two weeks prior to Substantial Completion.
   2. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, seasonal operation, and shutdown of each item of equipment.

C. At completion of work of each Section, conduct an inspection to assure that
   1. Specified cleaning has been accomplished.
   2. Temporary facilities have been removed from site.

D. At completion
   1. Conduct an inspection to list work to be completed or corrected.
   2. Supervise correction and completion of work as established in Certificate of Completion.

E. When a portion of the Project is occupied prior to final completion, coordinate established responsibilities of each subcontractor.

F. Final completion.
   1. When each Subcontractor determines that work is finally complete, conduct an inspection to verify completion of work.
   2. Assist owner and architect in inspection.

G. Administer contract closeout.
   1. Receive and review Subcontractor's final submittals.
   2. Transmit to architect with recommendation for action.

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY

A. Carefully coordinate the interface between Division 15 (Mechanical) and Division 16 (Electrical) before submitting any equipment for review or commencing installation.

B. Responsibility: Unless otherwise indicated, all motor and controls for Division 15 equipment shall be furnished, set in place and wired in accordance with the following schedule:

<table>
<thead>
<tr>
<th>ITEM</th>
<th>FURNISHED UNDER</th>
<th>SET IN PLACE UNDER</th>
<th>POWER WIRING UNDER</th>
<th>CONTROL WIRING UNDER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equipment Motor</td>
<td>15</td>
<td>15</td>
<td>16</td>
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<td>In Motor Control Centers</td>
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<td>Disconnect (Note 1) Switches</td>
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<td>Switches</td>
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<td>ITEM</td>
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<td>POWER WIRING UNDER</td>
<td>CONTROL WIRING UNDER</td>
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<td>Control Transformers</td>
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<td>Control Circuit Outlets</td>
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<td>Thermostats (Note 2)</td>
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<td>Time Switches (Note 2) Not in Control Panel</td>
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<td>Push Button Stations, Pilot Lights</td>
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<td>Thermostats (Note 2) Controls: Integral with Equipment or Directly Applied to Ducts, Pipes, etc.</td>
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<td>Valve Motors, Damper Motors, Solenoid Valves, etc.</td>
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<td>EP Valves or Switches, P.E. Switches, etc.</td>
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<td>Fire Sprinkler Alarm</td>
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<td>Firestats</td>
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<td>Control Air Compressor</td>
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<td>Equipment Interlocks</td>
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<td>Boiler and Water Heaters</td>
<td>15</td>
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</table>

NOTES:
1. If furnished as part of factory wired equipment furnished and set in place under Division 15, wiring and connections under Division 16.
2. If float switches, line thermostats, P.E. switches, time switches, or other controls carry the FULL LOAD CURRENT to any motor, they shall be furnished under Division 15, but they shall be set in place and connected under Division 16 except that where such items are an integral part of the mechanical equipment, or directly attached to ducts, piping, or other mechanical equipment, they shall be set in place under Division 15 and connected under Division 16. If they do not carry the FULL LOAD CURRENT to any motor, they shall be furnished, set in place and wired under Division 15.

C. Control Wiring: Consists of wiring in pilot circuits of contact or starters, sensors, controllers, and relays, and wiring for valve and damper operators.
1. Connections: Connections to all controls directly attached to ducts, piping and mechanical equipment shall be made with flexible connections.

D. Starters: Provide magnetic starters for all three phase motors and equipment complete with:
1. Control transformers.
2. 120V holding coils.
3. Integral hand-off-auto switch.
4. Auxiliary contacts required for system operation plus one (1) spare.

E. Remote Switches and Push Button Stations: Provide all remote switches and/or push button stations required for manually operated equipment (if no automatic controls have been provided) complete with pilot lights of an approved type lighted by current from load side of starter.

F. Special Requirements: Motors, starters and other electrical equipment installed in moist areas or areas of special conditions, such as explosion proof, shall be designed and approved for installation in such areas with appropriate enclosure.

G. Identification: Provide identification of purpose for each switch and/or push button station furnished. Identification may be either engraved plastic sign or permanent mounting to wall below switch, or stamping on switch cover proper. All such identification signs and/or switch covers in finished areas shall match other hardware in the immediate areas.

H. Control Voltage:
1. Maximum allowable control voltage 120V. Fully protect control circuit conductors in accordance with National Electrical Code.
2. Provide 20A breakers in emergency panels under Division 16 as required for Building Management System Air Temperature Controls (BMS/ATC). Provide all control transformers, control wiring and connections to circuits under Section 15950 of Division 15.

I. Related Requirements
1. Electric Motors - Coordinate with efficiency requirements.

J. Contractor must review all concrete embedded items (including conduit) with owner prior to placement.

PART 2 - PRODUCTS

2.01 MOTOR HORSEPOWER

A. In general, all motors 1/2 HP and above shall be three phase, all motors less than 1/2 HP shall be single phase.
B. Voltage and phase of motors as scheduled on the electrical drawings shall take precedence in the case of a conflict between the mechanical and electrical drawings or General Condition 2.01 A., above.

C. Work under Division 15 includes coordinating the electrical requirements of all mechanical equipment with the requirements of the work under Division 16, before ordering the equipment.

1. If motor horsepower is changed under the work of Division 15, without a change in duty of the motor's driven device, coordination of additional electrical work (if any) and additional payment for the work (if any) shall be provided under the section of Division 15 initiating the change. Increases or decreases in motor horsepower from that specified shall not be made without written approval from the Engineer.

PART 3 - EXECUTION

NOT USED.

END OF SECTION
SECTION 01 31 19
PROJECT MEETINGS

PART 1 - GENERAL

1.1 REQUIREMENTS

A. The types and minimum requirements for project meetings are included but are not necessarily limited to the following categories:
   1. Pre-construction meeting.
   2. Progress and Coordination meetings.
   3. Specially called meetings.

B. The pre-construction meeting will be scheduled within fifteen days after date of Notice to Proceed, at a central site location designated by the Owner and convenient for all parties.
   1. Attendance:
      a. Owner's Representative.
      b. Consultant and his sub-consultants, as applicable.
      c. Contractor's Superintendent.
      d. Major Subcontractor(s).
      e. Others as appropriate.
   2. Suggested Agenda:
      a. Distribution and discussion of:
         1) List of major subcontractors and suppliers.
         2) Projected construction schedules.
         3) Critical work sequencing.
         4) Major equipment deliveries and priorities.
         5) Project Coordination.
         6) Designation of responsible personnel.
      b. Procedures and processing of:
         1) Field decisions.
         2) Proposal requests.
         3) Submittals.
         4) Change Orders.
         5) Applications for Payment.
      d. Procedure for Maintaining Record Documents.
      e. Inspections.
      f. Stormwater Management Plan (SWMP).

C. The Architect/Engineer will: Record the minutes; including significant proceedings and decisions.

D. The Contractor shall schedule and administer subcontractor and vendor pre-construction meetings throughout progress of the work. He will:
   1. Prepare agenda for meetings.
   2. Distribute written notice of each meeting four days in advance of meeting date.
   3. Make physical arrangements for meetings.
   4. Preside at meeting.
   5. Record the minutes; including significant proceedings and decisions.
   6. Representatives of Contractors, Subcontractors, and Suppliers attending meetings shall be qualified and authorized to act on behalf of the entity each represents.
   7. Use of Premises:
      a. Office, work, staging and storage areas.
      b. Owner's requirements.
10. Administrative Procedures and Documents as Required by Owner.

1.2 PROGRESS AND COORDINATION MEETING

A. The Contractor will schedule and administer job progress and coordination meetings at the site.
   1. Attendance:
      a. Owner as needed.
      b. Consultant and his sub-consultants as needed.
      c. Subcontractor as appropriate to the agenda.
      d. Suppliers as appropriate to the agenda.
      e. Others.
   2. Suggested Agenda:
      a. Review of work progress since previous meeting.
      b. Field observations, problems and conflicts.
      c. Problems which impede Construction Schedule.
      d. Review of off-site fabrication and delivery schedules.
      e. Corrective measures and procedures to regain projected schedule.
      f. Revisions to Construction Schedule.
      g. Coordination of schedules.
      h. Progress and schedule during succeeding work period.
      i. Review submittal schedules and expedite as required.
      j. Maintenance of quality standards.
      k. Pending changes and substitutions.
      l. Review proposed changes for:
         1) Effect on Construction Schedule and on completion date.
         2) Effect on other contracts of the Project.

B. The Architect/Engineers shall record and distribute the minutes of all progress meetings throughout the construction period and shall visit the site a minimum of once every two weeks.

END OF SECTION
SECTION 01 32 16
CONSTRUCTION SCHEDULES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work includes:
   1. Contractor, promptly after being awarded the Contract, shall prepare and submit for
      Owner’s and Architect’s information a Contractor’s construction schedule for the Work. Schedule
      shall not exceed time limits current under Contract Documents, shall be revised at
      appropriate intervals as required by the conditions of the Work and Project, shall be related
      to entire Project to extent required by Contract Documents, and shall provide for
      expeditious and practicable execution of Work.

B. Coordinate Subcontractors’ schedules for entire project:
   1. Secure time commitments for performing critical elements of Work from parties involved.
   2. Coordinate each element on the schedule with other construction activities; include minor
      elements involved in sequence of Work.
   3. Show each activity in proper sequence.
   4. Indicate graphically the sequences necessary for completion of related portions of Work.
   5. Resolve conflicts among schedules of Subcontractors.
   6. Revise as required by conditions and progress of work.
   7. Furnish copy of schedules for entire project to each Subcontractor.
   8. Coordinate with Section 01 50 00; Construction Facilities and Controls.

1.2 SUBMITTALS

A. Project information:
   1. Preliminary Construction Schedule:
      a. Provide to Owner and Architect prior to start of Work, but not later than date set for
         preconstruction conference.
   2. Project Schedules:
      a. Provide to Owner and Architect within 60 days of start of construction.
   3. Updated Project Schedules:
      a. Provide to Owner and Architect quarterly.
      b. Provide if completion date is revised or sequence of Work is revised.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.1 FORM OF SCHEDULES

A. Horizontal bar chart:
   1. Provide separate horizontal bar column for each line item of the approved Schedule of
      Values.
   2. Indicate each bar with start and completion date of each item, its total dollar value percent to
      be completed for each month.
   3. Identify each bar column:
      a. By specification section number, Work element and major component.
      b. By distinct graphic delineation.
   4. Horizontal time scale: Identify first week day of each week.
5. Scale and spacing: To allow space for updating.
6. As Work progresses, place contrasting mark in each bar to indicate actual progress and completion.

B. Sheet size: Maximum 280 x 430 mm 11 x 17 IN.

C. CPM Schedule option (in addition to bar chart):
   1. Furnish a CPM schedule covering items of construction with, as a minimum, early/late start and early/late finish and normal float.
   2. Schedule may be manually or computer produced and updated.

3.2 CONTENT OF SCHEDULES

A. Provide complete sequence of construction by activity.
   1. Shop drawings, product data and samples:
      a. Submittal dates as indicated in approved Submittal Schedule.
      b. Dates reviewed copies will be required.
   2. Decision dates for:
      a. Selection of finishes.
   3. Product procurement and delivery dates.
   4. Dates product information and delivery of Owner furnished, installed equipment and materials is needed.

B. Dates for early and late beginning, and completion of each element of construction.

C. Identify Work of separate floors, or separate phases, or other logically grouped activities.

D. Show how requirements for phased completion and partial occupancy by Owner affect sequence of Work.

E. Indicate important stages of construction for each major portion of Work, including submittal review, testing, and installation.

F. Identify punch list preparation and completion durations, agencies inspections, and Owner occupancy dates.

G. Show projected percentage of completion for each item of Work as of last day of every month.

H. Identify restraints and constraints.

I. Identify critical path and critical portions of entire schedule. There shall be only one critical path and it shall be clearly identified.

3.3 UPDATING

A. Show changes occurring since previous submission of updated schedules.

B. Indicate progress of each activity, actual verses scheduled start and completion dates, and actual verses scheduled percent complete by month.

C. Include:
   1. Major changes in scope.
   2. Activities modified since previous updating.
   3. Review projections due to changes.
   4. Other identifiable changes.

D. Provide narrative report including:
   1. Discussion of problem areas including current and anticipated delay factors and their impact.
   2. Corrective action taken or proposed and its effect.
   3. Effect of change in schedule.
   4. Description of revisions.
      a. Effect on schedule due to changes to Contract.
b. Revisions in duration of activities.
c. Other changes that may affect schedule.

3.4 DISTRIBUTION

A. Distribute copies of revised schedules to:
   1. Owner.
   3. Contractors/Subcontractors.
   4. Other concerned parties.

B. Instruct recipients to report inability to comply and provide detailed requirements and schedule, with suggested remedies.

END OF SECTION
PART 1 - GENERAL

1.1 DESCRIPTION

A. Work includes:
   1. Compilation and submission of progress reports.
   2. Taking and submission of progress photographs.

1.2 SUBMITTALS

A. Project information:
   1. Progress report:
      a. Submit copy with Application for Payment.
   2. Progress Photos:
      a. Submit digital photographs on compact disk (CD) with progress report showing current progress of Work. The photos should demonstrate the work in place and be dated with a short description of the photographed item.
      1) E-Mail files are not acceptable.
   3. Contract Closeout:
      a. Provide two compact disks (CD) of all digital progress photographs, and an index.

1.3 PROGRESS REPORTS

A. Each Subcontractor prepare comprehensive Daily Log and maintain it during entire project period.

B. Each Subcontractor submit copy of Daily Log to Contractor for compilation into monthly Progress Reports.

C. Contractor submit copies of Progress Reports and photos with each Application for Payment.

D. Progress report to include following:
   1. Summary narrative for entire month.
   2. Current total percent complete.
   3. Current percent complete of major work activities.
   4. Percent of work completed during past month.
   5. Main work activities completed during prior month.
   6. Main work activities in process and scheduled for next month, including major equipment deliveries, system tie-ins and system start-ups.
   7. Overall status of project compared with project schedule.
   8. Delays or potential delays, if any.

Sustainable Progress Reports: As specified in Division 01 Section “Environmental Requirements”

E. Daily logs to include following data for each day of prior month.
   1. Manpower, by trade.
   2. Work performed, with location.
   3. Weather.
   4. Inspections.
   5. Equipment on site.
   6. Situations or circumstances which could delay work or give cause for claims for extension of time or added cost.
   7. List of visitors names, to include officials, Owner’s representatives, and other authorities.
F. Progress reports to include progress photographs.
   1. General:
      a. Include digital progress photographs on compact disk (CD) with progress report.
      b. Digital camera requirement: Minimum 4 megapixels resolution.
      c. Photograph format: JPEG format and file extension with 1600 by 1200 pixels, minimum.
      d. Digitally date photographs.
   2. Identify photographs with project name, date, direction, and view or vantage point.
   3. Photograph/file naming: Include date (YRMODY), Building or Area, Direction photo taken (N.S.E.W.), and Description of Subject.
      a. File name example: 070412_Area-A1_NE_AHU-6.jpeg.
   4. Provide index of submitted digital photos.
   5. Minimum 12 digital photos monthly until project exterior is finished, taken from different view points of interest, and related to current progress.
   6. Minimum 12 digital photos monthly until project interior is finished, taken from different view points of interest, and related to current progress.
   7. Contract Closeout: Provide to two compact disks (CD) of all digital progress photographs and an index.

END OF SECTION
PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. Submit shop drawings, product data and samples as required by various sections of the specifications.

1.02 QUALITY ASSURANCE

A. Shop Drawings:
   1. Drawings shall be presented in a clear and thorough manner.
   2. Details shall be identified by reference to sheet, detail, schedule, or room numbers shown on drawings.

B. Product Data:
   1. Preparation:
      a. Clearly mark each copy to identify pertinent products or models.
      b. Show performance characteristics and capabilities.
      c. Show dimensions and clearances required.
      d. Show wiring or piping diagrams and controls.
   2. Manufacturer's standard schematic drawings and diagrams:
      a. Modify drawings and diagrams to delete information that is not applicable to the work.
      b. Supplement Standard information to provide information specifically applicable to the work.

C. Samples:
   1. Office samples shall be of sufficient size and quantity to clearly illustrate:
      a. Functional characteristics of the product with integrally related parts and attachment devices.
      b. Full range of color, texture and pattern

D. Responsibilities of the Contractor:
   1. Review shop drawings, product data, samples and project record drawings for specification performance prior to submission.
   2. Determine and Verify:
      a. Field measurements
      b. Field construction criteria
      c. Catalog numbers and similar data
      d. Conformance with specifications
   3. Coordinate each submittal with requirements of the work and of the Contract Documents.
   4. Notify the Consultant in writing, at the time of submission, of any deviations in the submittals for requirements of the Contract Documents.
   5. Begin no fabrication or work that requires submittals until return of submittals with Consultant's acceptance.
   6. Contractor's responsibility for deviations in submittals from requirements of Contract Documents is not relieved by Consultant's review of submittals.
7. Contractor shall stamp, sign or initial, and date each submittal to show compliance with the Contract Documents prior to submittal to the Consultant.

1.03 SUBMITTALS

A. Make submittals promptly in accordance with approved schedule and in such sequence as to cause no delay in the work.

B. Number of Submittals Required:

1. Shop Drawings: PDF email submittals, cover page, submittal #; and division section # - CSI format
2. Product Data: PDF email submittals, cover page, submittal #; and division section # - CSI format
3. Samples: Submit the number stated in each specification section.

C. Submittals shall contain:

1. Date of the submission and dates of any previous submissions.
2. Project title and number.
4. Names of:
   a. Contractor and Subcontractor(s), if applicable.
   b. Supplier
   c. Manufacturer
5. Identification of product with the specification section number.
6. Field dimensions, clearly identified as such.
7. Relation to adjacent or critical features of the work or materials.
8. Applicable standards, such as ASTM or Federal specification numbers.
10. Identification of revisions on resubmittals.
11. An 8"x3" blank space in lower right-hand corner for review stamps.

D. Resubmission Requirements:

1. Make any corrections or changes in the submittals required by the Consultant and resubmit until accepted.
2. Shop drawings and product data:
   a. Revise initial drawings or data and resubmit as specified for initial submittal.
   b. Indicate any changes that have been made, other than those requested by the Consultant.
3. Samples: Submit new samples as required for initial submittal.

E. Distribution:

1. Distribute reproductions of approved shop drawings and copies of product data to affected subcontractors and retain one copy for use at the job-site.
2. Distribute approved samples as directed.

F. Consultant's Duties:

1. Review submittals with reasonable promptness and in accordance with schedule.
2. Review of separate item does not constitute review of an assembly in which item functions.
3. Affix stamp and initials or signature, and indicate requirements for resubmittal or acceptance of submittal.
4. Return submittals to the Contractor for distribution or for resubmission.

G. Schedule of Values and pay applications:
1. Submit typed schedule on State Form SC7.2; Contractor's standard form or media-driven printout will be considered on request.
2. Format: Table of Contents of this Project Manual.
3. Include in each line item a directly proportional amount of Contractor's overhead and profit.

H. Schedule of Submittals: The Contractor shall submit the submittals required by the specifications. The Contractor shall develop a submittal schedule that confirms the submittals and the time frame for review by the consultants.

I. Construction Schedule:
1. The Contractor shall submit a critical-path method (CPM) construction schedule prior to start of construction activities. The CPM schedule shall include notice to proceed, submittal activities, construction activities, change order work (when applicable), close-out, testing, demonstration, and acceptance. The CPM shall correlate specifically to the schedule of values line items and be cost loaded.

Float, slack time, or contingency within the schedule (i.e., the difference in time between the project's early completion date and the required contract completion date), and total float within the overall schedule, is not for the exclusive use of either the principal representative or the Contractor, but is jointly owned by both and is a resource available to and shared by both parties as needed to meet contract milestones and the contract completion date.

The Contractor will be required to submit an as-built progress CPM schedule with each progress billing. This CPM schedule will be the basis for making progress payments. The level of detail and quantity of work activities in the CPM schedule should be negotiated with the principal representative prior to starting construction.

J. Progress Photos
1. The Contractor shall submit up to 12 - 3x4 inch progress photos with each progress payment. The photos should demonstrate the work in place and be dated with a short description of the photographed item.

K. Coordination Drawings:
1. The Contractor shall submit coordination drawings with all mechanical, electrical, fire protection, and building monitoring systems prior to the Consultant review of any shop drawings or submittals for work in those trades. Approval of required shops and submittals must be obtained prior to starting work, and must be obtained prior to approval of pay applications of the work. The drawings shall be created to include all trades on a particular level of the building on one drawing. Identify conflicts between the systems or between the systems and architectural elements such as ceiling heights, ceiling types, or walls. Conduit routing for electrical, mechanical, energy management system, and security trades shall be included. Identify potential solutions to the conflicts for the Consultant and Owner to review during the submittal process. Revise the coordination drawings
to show any comments made during the submittal review process, and reissue for use by all affected trades, Owner and Consultant.

2. The Coordination drawings shall include sectional coordination documents. Identify elevations of systems A.F.F. (above finish floor) and component dimensions. Show elevations whenever component changes height.

L. Daily Reports
   1. The contractor shall submit daily reports, due by 5 p.m. the following day. The report should include weather, equipment, manpower count, subcontractors on site, short description of work for that day, inspections, visitors, items that may affect progress or quality of project.

M. Request for Information (RFI):
   1. The Contractor will be responsible for submitting RFIs on AIA form G716 or similar. The RFI should identify in writing any unclear, inconsistent, or conflicting item in the documents that could not be answered by thorough review by the Contractor or subcontractors. The RFI should include a description of the item and a proposed solution. The RFI should indicate schedule or cost impact, if any. Contractor shall be required to submit cost or schedule impact within seven days of receipt of the RFI response. Each RFI shall be numbered in sequence.

N. Weekly Logs:
   1. The Contractor shall provide an updated RFI, change request, and submittal logs at weekly construction meetings. Contractor shall provide a 2-week detailed construction schedule at the bi-weekly construction meeting.

PART 2 - MATERIALS

Not used.

PART 3 - EXECUTION

Not used.

END OF SECTION
SUBMITTAL TRANSMITTAL

PROJECT: 

ARCH PROJ. NO.: 

SPECIFICATION TITLE: 

MANUFACTURER: 

RE-SUBMITTAL CHARACTER

ARCH PROJ. NO.: SPECIFICATION TITLE: MANUFACTURER:

”Base” Manufacturer  "Optional” Manufacturer (Do not submit on manufacturers not listed in specifications)

(Complete attached Optional Product/System Comparison form if manufacturer is an "Optional” manufacturer)

DESCRIPTION OF SUBMITTED ITEM:

TYPE: [ ] Shop Drawing  [ ] Product Data  [ ] Sample  [ ] Project Information  [ ] Project Closeout

NOTE 1: Submittal transmittal to Architect indicates Contractor, and subcontractor have reviewed for compliance with Contract Documents and have approved submittal.

NOTE 2: THIS TRANSMITTAL FORM SHALL STAY WITH SUBMITTAL THROUGHOUT ROUTING. COPY FOR FILE.

<table>
<thead>
<tr>
<th>ROUTING SEQUENCE</th>
<th>ACTION TAKEN BY</th>
<th>DATE REC’D</th>
<th>DATE SENT</th>
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<td>SUBCONTRACTOR / SUPPLIER:</td>
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<td>OWNER:</td>
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<td>N.A.</td>
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ACTION LEGEND: (Indicate in ACTION TAKEN column above)

A  APPROVED  B  APPROVED AS NOTED  C  REVISE AND RESUBMIT  D  NOT APPROVED  E  NO ACTION REQUIRED BY ARCHITECT

E1  Submittal not required  E2  Project Information or Contract Closeout Information Submittal

COMMENTS:

[ ] SEE ATTACHED COMMENTS  [ ] SEE ENCLOSED SUBMITTAL FOR COMMENTS  [ ] SUPPLEMENTAL INFORMATION REQUIRED

END OF SUBMITTAL TRANSMITTAL

CP007722 University of Colorado at Boulder September 23, 2013 Systems Biotechnology Building – Academic Classroom Build-Out SUBMITTALS, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES 01 13 00- 5
OPTIONAL PRODUCT / SYSTEM COMPARISON

IF SUBMITTING ON A MANUFACTURER LISTED AS "OPTIONAL" IN TECHNICAL SPECIFICATIONS, COMPLETE THIS FORM, AND SUBMIT WITH FIRST SUBMITTAL TRANSMITTAL FOR PRODUCT
(Note: Form not required if "Optional" manufacturer product name, product number or model number or both are specifically listed in technical specification sections)

PROJECT: ________________________________ SUBMITTAL NO: __ __ __ __ __ - __ __
SECTION NUMBER ------------------------| |
SEQUENCE NUMBER ------------------------| |
RE-SUBMITTAL CHARACTER ____________|

Specification Section No.: __________________ Article(s)/paragraph(s): __________________

PRODUCT / SYSTEM COMPARISON:
Provide a one-to-one comparison with ALL specified product(s)

<table>
<thead>
<tr>
<th>SPEC DESIGNATION (IF ANY)</th>
<th>BASE MANUFACTURER’S PRODUCT/SYSTEM</th>
<th>SUBMITTED MANUFACTURER’S PRODUCT/SYSTEM</th>
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<td>Name, brand:</td>
<td></td>
</tr>
<tr>
<td>Catalog No.:</td>
<td>etc.:</td>
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</tbody>
</table>

EFFECT OF PRODUCT:
Optional affects other parts of Work: No ☐ Yes ☐ (If yes, explain below)
Optional requires dimensional revision or redesign of structure or mechanical and electrical Work:
No ☐ Yes ☐ (If yes, explain below)
Same warrantee provided as specified base product:
No ☐ Yes ☐ (If yes, explain below)

Explanation: ____________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

STATEMENT OF CONFORMANCE OF PRODUCT OR SYSTEM TO CONTRACT REQUIREMENTS:
Supplier, Subcontractor and Contractor in making submittal of Optional manufacturer’s product or system, or in using an Optional manufacturer’s product or system represent:

☐ They will coordinate installation of proposed product or system into Work, to include necessary changes or modifications or both to the Work, including additional costs to other contractors, when such changes result solely from the use of an Optional Manufacturer.
ACKNOWLEDGEMENTS:

FOLLOWING FIRM HEREBY REQUESTS CONSIDERATION OF OPTIONAL PRODUCT OR SYSTEMS:

Requested by (firm):
Acknowledged by (print & sign): ___________________________ Date: ____________
Position: ___________________________________________ Phone

Subcontractor:
Acknowledged by (print & sign): ___________________________ Date: ____________
Position: ___________________________________________ Phone

Contractor:
Acknowledged by (print & sign): ___________________________ Date: ____________
Position: ___________________________________________ Phone

END OF OPTIONAL PRODUCT / SYSTEM COMPARISON
PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Remodel Work scheduling.
   2. Construction sequence scheduling.

B. Related Sections:
   1. Section 01500 - Temporary Facilities and Controls.

1.02 SYSTEM DESCRIPTION

A. An essential condition of this Contract shall be the scheduling and conduct of all phases of construction operations in such a manner that the Owner's operations and use of the existing buildings and campus shall be uninterrupted at all times, except for such limited interruption as is required and approved by the owner.

B. Contractor shall repair at his own expense all damage done to Owner's property, unknown utilities and adjoining public property as a result of Contractor's construction activities.

1.03 PROJECT/SITE CONDITIONS

A. Access and use of site:
   1. Contractor shall use the designated site access for construction offices and material storage in such a manner that access to existing buildings and campus remain accessible at all times for use.
   2. Confine operations to as limited a use of the existing building and campus as possible. A route of access to and from the work for employees shall be agreed upon and it shall be the Contractor's responsibility to see that the agreed route is maintained in order to prevent unwarranted or unnecessary traffic through the existing buildings or site.

B. Owner notice and approval:
   1. All arrangements and scheduling in connection with the work of this Contract shall be made with and subject to the approval of the Consultant and the Owner.
   2. All work under this Contract which will require interruption of service of the existing building shall be scheduled to suit the need and convenience of the Owner's operation, and arrangements shall be made with the Owner and the Architect at least eight (8) working days in advance of the start of such work.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

3.01 REMODELING
A. Construction activities of all areas to be constructed in existing facilities shall be completely separated from the rest of the building by dust-proof enclosures erected by Contractor.

B. All surfaces in existing facilities not indicated to be remodeled, or removal of existing items by any Contractor, shall be repaired by the responsible Contractor to match existing adjoining similar surfaces.

3.02 CLEAN-UP

A. All areas within existing facilities, which are not within enclosed areas to be constructed used for access to work areas shall be completely cleaned of all debris and made “broom-clean” at the end of each day's work.

B. Dust, which permeates areas of existing facilities because of improperly constructed dust-proof barriers, shall be the responsibility of the Contractor. The Contractor shall employ the services of a professional cleaning company to clean any area outside of the designated construction dust barriers that are contaminated by Contractor’s operations. Completely clean all such areas to the satisfaction of the Owner at no additional cost.

END OF SECTION
SECTION 01 35 30
CONSTRUCTION IAQ MANAGEMENT PLANS

PART 1 - GENERAL

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

1.2 SUMMARY
A. Section includes administrative and procedural requirements governing protection of indoor air quality (IAQ), absorbent materials, and mechanical system from contamination during construction and building flush out along with baseline indoor air quality testing prior to Owner occupancy.
B. Related Sections:
   1. Division 01 Section "Environmental Requirements" for environmental requirements overview, including US Green Building Council LEED requirements.

1.3 DESCRIPTION, GENERAL
A. IAQ Management During Construction: Minimize contaminants generated during construction. Methods to include, but not limited to:
   1. Practices which minimize the amount of dust generated.
   2. Reduction of solvent fumes and volatile organic compound (VOC) emissions.
   3. Maintaining good housekeeping practices including sweeping and periodic dust and debris removal.
   4. No visible haze in the air.
B. IAQ Management Plan Before Occupancy: Minimize indoor pollutant concentrations to required levels prior to Owner occupancy. Provide building flush out and/or baseline testing of targeted pollutants.

1.4 SUBMITTALS
A. Environmental Information: Comply with submittal requirements specified in Division 01 Section “Environmental Requirements” for LEED Credits EQ 3.1 and 3.2, Construction IAQ Management Plan, During Construction and Before Occupancy.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION
3.1 CONSTRUCTION IAQ MANAGEMENT DURING CONSTRUCTION

A. LEED Credit EQc3.1, Construction IAQ Management Plan, During Construction: General IAQ Plan requirements during construction include:

2. Provide solid physical barriers to isolate areas of construction. Securely attach and seal at floor and structure above.
3. Schedule adequate time for product installation.
4. Maintain negative pressure in construction area.
5. Do not recirculate air prior to occupancy.
6. Seal return air ducts and use direct exhaust to outside.
8. Comply with manufacturer’s instructions for appropriate drying times.
9. Protect installed absorbent materials with recycled or recyclable materials.
10. Use MERV 8 filtration at all return air inlets if permanent HVAC system is used during construction.

B. The IAQ Plan shall meet or exceed the five SMACNA requirements and shall include the following measures:

1. HVAC Protection.
2. Source Control.
3. Pathway Interruption.
4. Housekeeping.
5. Scheduling.

C. HVAC Protection:

1. Protect air handling and distribution equipment, and air supply and return ducting during construction.
2. Adequately cover and protect exposed air inlets and outlets, openings, grilles, ducts, plenums, as required to prevent water, moisture, and other contaminant intrusion.
3. Apply protection immediately after installation of equipment and ducting.
4. Ducting runs that require more than a single day to install shall be protected at the end of each day’s Work.
5. During dust producing activities, (e.g., drywall installation and finishing), turn the ventilation system off, and protect HVAC supply and return openings from dust infiltration. Provide temporary ventilation as required.

D. Source Control:

1. Protect stored on-site or installed absorptive or porous materials such as batt insulation and drywall from exposure to moisture.
2. Do not use wet, damaged porous materials in the building. Materials with evidence of moisture damage, including stains, are not acceptable, including both stored and installed materials. Immediately remove them from the site and properly dispose.
3. Preconditioning:
   a. Prior to delivery to the construction site allow products that have odors and significant volatile organic compound (VOC) emissions to off-gas in dry, well ventilated space for 14 calendar days to allow for reasonable dissipation of odors and emissions.
   b. Condition products, without containers and packaging, to maximize off-gassing of VOCs.
c. Condition products in a ventilated warehouse or other building. Provide a temperature range of 60 degrees F minimum to 90 degrees F maximum continuously during the ventilation period.
d. Do not ventilate within limits of Work unless otherwise accepted by Architect.
e. Comply with substitution requirements for consideration of other locations.

4. Take special care to prevent accumulation of moisture on installed materials and within packaging during delivery, storage, and handling to prevent development of molds and mildew, including materials with moisture stains.

5. Replace moldy materials with new, undamaged materials.

6. Provide sufficient ventilation, air circulation and air changes to dissipate excess humidity when present.

E. Pathway Interruption:

1. All openings within the designated work area shall be sealed.
2. Adequate exhaust ventilation equipment shall be installed to maintain a negative pressure differential between the work area and adjacent areas of the building.
3. Ventilation units shall be exhausted to the outside of the building.

F. Housekeeping:

1. Provide temporary ventilation during construction to minimize accumulation of dust, fumes, vapors, or gases in the building.
2. Continuously ventilate during and after installation of materials that emit VOCs until emissions dissipate:
   a. Period after installation shall be sufficient to dissipate odors and elevated levels of VOCs. Where no specific period is stated in these Specifications, a period of 72 hours shall be used.
   b. Ventilate areas directly to outside, do not ventilate to other enclosed spaces.
   c. If continuous ventilation is not possible via the building’s HVAC system(s), then ventilate via open windows and temporary fans that sufficiently provide no less than three air changes per hour.
3. Suppress dust with wetting agents or sweeping compounds.
4. Clean-up dust using a wet rag or damp mop.
5. Increase the cleaning frequency when dust build-up is noted.
6. Remove spills or excess applications of solvent-containing products as soon as possible.
7. Remove accumulated water and keep work areas as dry as possible.
8. Store volatile liquid containers closed when the container is inside of the building and not in use.
9. Keep volatile liquid containers closed when the container is inside of the building and not in use.
10. HEPA vacuuming and duct cleaning.
   a. Vacuum carpeted and soft surfaces with a high efficiency particulate arrester (HEPA) vacuum.
   b. If ducts contain dust and dirt, clean them using a HEPA vacuum immediately before substantial completion and prior to using the ducts to circulate air.
   c. Oil film on sheet metal should be removed before shipment to site. However, ducts will be inspected to confirm that no oil film is present. Remove any oil.
11. Use nontoxic cleaning materials and procedures.
a. Alternatives to toxic cleaning agents include:

1) Vinegar.
2) Citrus.
3) Borax.
4) Cornstarch.
5) Baking Soda.

b. Examples of nontoxic alternatives for several cleaning methods are listed below:

1) Abrasive Cleaners: Substitute half lemon dipped in borax.
2) Ammonia Cleaners: Substitute vinegar, salt, and water mixture; or baking soda and water.
3) Disinfectants: Substitute half cup borax in a gallon of water.
4) Drain Cleaners: Substitute one forth cup baking soda and one forth cup vinegar in boiling water.
5) Upholstery Cleaners: Substitute dry cornstarch.

G. Scheduling:

1. Where odorous and/or high VOC-emitting products are applied on site, apply them before installation of porous and fibrous materials. Where this is not possible, protect porous materials with polyethylene vapor retarders.
2. Insure that wet applied interior finish materials, such as paints, adhesives, sealants, coatings, finishes, and spray-applied materials, such as structural fireproofing, are properly and fully cured before installing other finish materials over them.
3. Install carpets and furnishings after all other interior finish materials have been applied and fully cured.
4. Provide adequate ventilation of packaged dry products prior to installation. Remove from packaging and ventilate in a secure, dry, well-ventilated space free from strong contaminant sources and residues.
5. Complete interior finish material installation no less than 14 days prior to Substantial Completion to allow for building flush-out and testing prior to occupancy.

3.2 CONSTRUCTION IAQ MANAGEMENT PRIOR TO OCCUPANCY

A. LEED Credit EQc3.2, Construction IAQ Management Plan, Prior to Occupancy: General IAQ Plan requirements prior to occupancy include completion of one of the following approaches:

1. Whole Building Flushout:
   a. After construction ends, prior to occupancy and with all interior finishes installed, perform a building flush-out by supplying a total volume of 14000 cu. ft. of outdoor air per sq. ft. of floor area while maintaining an internal temperature of at least 60 deg F and a relative humidity of no higher than 60 percent.

2. Air Quality Testing:
   a. Conduct baseline indoor air quality testing, after construction ends and prior to occupancy, using testing protocols consistent with the EPA’s “Compendium of Methods for the Determination of Air Pollutants in Indoor Air and as additionally detailed in the USGBC’s “LEED-NC Reference Guide.”
   b. Demonstrate that the contaminant maximum concentrations listed below are not exceeded:
1) Formaldehyde: 50 ppb.
2) Particulates (PM10): 50 micrograms/cu. m.
3) Total Volatile Organic Compounds (TVOC): 500 micrograms/cu. m.
4) 4-Phenylcyclohexene (4-PH): 6.5 micrograms/cu. m.
5) Carbon Monoxide: 9 ppm and no greater than 2 ppm above outdoor levels.

c. For each sampling point where the maximum concentration limits are exceeded, conduct additional flush out with outside air and retest the specific parameter(s) exceeded to indicate the requirements are achieved. Repeat procedure until all requirements have been met. When retesting noncomplying building areas, take samples from same locations as in the first test.

d. Air sample testing shall be conducted as follows:

1) All measurements shall be conducted prior to occupancy but during normal occupied hours and with building ventilation system starting at the normal daily start time and operated at the minimum outside air flow rate for the occupied mode throughout the duration of the air testing.
2) Building shall have all interior finishes installed including, but not limited to, millwork, doors, paint, carpet, and acoustic tiles. Nonfixed furnishings such as workstations and partitions are encouraged, but not required, to be in place for the testing.
3) Number of sampling locations will vary depending on the size of building and number of ventilation systems. For each portion of building served by a separate ventilation system, the number of sampling points shall not be less than one per 25,000 sq. ft. or for each contiguous floor area, whichever is larger, and shall include areas with the least ventilation and greatest presumed source strength.

PART 1 - AIR SAMPLES SHALL BE COLLECTED BETWEEN 3 AND 6 FEET FROM THE FLOOR TO REPRESENT THE BREATHING ZONE OF OCCUPANTS, AND OVER A MINIMUM FOUR HOUR PERIOD.

END OF SECTION
SECTION 01 35 36
ENVIRONMENTAL REQUIREMENTS (SDS)

PART 1 - GENERAL

1.1 SUMMARY

A. This is an overview of the special environmental requirements of this project. Work includes environmental, sustainable, and “green” building practice requirements related to energy conservation and efficiency, indoor air quality, and resource efficiency. It is the goal of this project, as much as is feasible and practical, to construct a “green” building that meets the US Green Building Council’s LEED™ Green Building Rating System Version as follows:
   1. LEED-NC Version 2.2.
   2. Rating: Gold.

B. General environmental goals for this project include:
   1. Design and construction practices to obtain healthy indoor air quality (IAQ) in final Project.
   3. Maximum use of products that are easy to maintain, repair, and that can be cleaned using non-toxic substances.
   4. Maximum use of recycled content in materials, products, and systems.
   5. Use of wood from Forest Stewardship Council certified sustainable harvested sources.
   6. Reusable and recyclable packaging.
   7. Use of products with low embodied energy

C. Additional LEED prerequisites and credits needed to obtain the indicated LEED certification depend on Architect’s design and other aspects of Project that are not part of the Work of the Contract.

D. Related Sections:
   1. Divisions 1 through 33 Sections for LEED requirements specific to the work of each of these Sections. Requirements may or may not include reference to LEED.

E. Construction team is required to comply with sustainable building practices during construction and when considering materials for substitutions.

1.2 DEFINITIONS

A. General: Following is partial list of definitions of sustainable terms:
   1. Chain-of-Custody: Tracking procedure to document status of product from point of harvest or extraction to ultimate consumer end use.
   2. Chlorofluorocarbons (CFCs): Hydrocarbons used as refrigerants that deplete stratospheric ozone layer.
   3. Construction IAQ Management Plan: Document specific to building project that outlines measures to minimize contamination in building during construction and to flush building of contaminants prior to occupancy.
   4. Construction Waste Management: Diversion of construction, demolition, and land clearing debris from landfill disposal; redirection of recyclable material back to manufacturing process.
   5. Daylighting: Controlled admission of natural light into space through glazing with intent of eliminating electric lighting.
   6. Ecosystem: Basic unit of nature that includes community of organisms and their nonliving environment linked by biological, chemical, and physical process.
8. Energy Conservation: Strategies that maximize energy efficiency in order to reduce life-cycle requirements and costs.
9. Heat Island Effect: Effect that occurs when warmer temperatures are experienced in urban landscapes as result of solar energy retention on constructed surfaces.
10. Hydrochlorofluorocarbons (HCFCs): Refrigerants that deplete stratospheric ozone layer.
11. Hydrofluorocarbons (HFCs): Refrigerants that do not deplete stratospheric ozone layer, but do contribute to global warming and are not environmentally benign.
12. Impervious Surfaces: Surfaces that promote runoff of precipitation volumes instead of infiltration into subsurface.
14. Indoor Environmental Quality (IEQ) Strategies: Strategies that include issues related to indoor air quality (IAQ) such as ventilation effectiveness and control of contaminants.
15. Industrial Scrap: By-product of industrial process that can easily be reused as feedstock.
16. Life-Cycle Assessment (LCA): Informed process that considers initial capital cost in addition to ownership and maintenance costs over specified lifetime of building component, design strategy, or other measure associated with building alternatives.
17. Light Pollution: Waste light from building sites that produces glare, compromises astronomical research, and adversely affects environment.
18. Local/Regional Products: Products that are manufactured locally, within 500 miles of Project site. Manufacturing refers to final assembly of components of building product.
19. Post-Consumer Recycled Content: Percentage of waste material by weight available from consumer use incorporated into building material.
20. Pre-Consumer Recycled Content: Percentage of waste material by weight available from industrial use incorporated into building material.
21. Rapidly Renewable Resources: Those materials that substantially replenish themselves faster than traditional extraction demand (i.e., planted and harvested in less than 10 year cycle) and do not result in significant biodiversity loss, increase erosion, air quality impacts, and that are sustainably managed.
22. Recycling: Collection, reprocessing, marketing and use of materials that were diverted or recovered from solid waste stream.
23. Reduction: Strategy to minimize material use or to use materials more efficiently.
24. Reuse: Strategy to return materials to active use in same or related capacity.
26. Stormwater Runoff: Water volumes that are created during precipitation events and flow over surfaces into sewer systems or receiving waters.
27. Sustainable Forestry: Practice of managing forest resources to meet long-term forest product needs of humans while maintaining biodiversity of forested landscapes.
30. Volatile Organic Compounds (VOCs): Carbon compounds that participate in atmospheric photochemical reactions and have high enough vapor pressure to vaporize from material surfaces into indoor air at normal room temperatures (off-gassing).

1.3 SUBMITTALS

A. General: Submit additional LEED submittals required by other Specification Sections.

B. LEED submittals are in addition to other submittals. If submitted item is identical to that submitted to comply with other requirements, submit duplicate copies as a separate submittal to verify compliance with indicated LEED requirements. Identify Section number and LEED Credit on each LEED submittal.
1. LEED submittals shall include completed submittal forms as seen at the end of this section in addition to other required documentation.
   a. LEED EQ Submittal Form for Low Emitting Materials.
   b. LEED MR Submittal Form for Materials and Resources.

C. Project Materials Cost Data: Provide statement indicating total cost of materials for Project. Materials costs must exclude labor, overhead, and profit. Include breakout of costs for the following categories of items:

   1. Furniture.
   2. Plumbing.
   3. Mechanical.
   4. Electrical.
   5. Specialty items such as elevators and equipment.

D. Materials Log Book: A materials log book is required that includes Material Safety Data Sheets (MSDS) sheets and additional information on chemical content of selected materials, including Volatile Organic Compounds (VOC) in terms of grams per liter (g/L). This log book shall be maintained by contractor throughout life of project, shall be updated monthly to include any newly approved products, shall be available at all times to Architect and Owner’s Representative, and shall be submitted at conclusion of construction as part of LEED documentation.

E. LEED Action Plans: Provide preliminary submittals within 21 days of date established for commencement of the Work indicating how the following requirements will be met:

   1. LEED Credits MRc2.1 and MRC2.2, Construction Waste Management: Waste management plan complying with Division 1 Section 01 74 19 Construction Waste Management.
   2. LEED Credit MRc4.1 and Credit MRc4.2, Recycled Content: List of proposed materials with recycled content. Indicate separate percentages, by weight, of pre-consumer and post-consumer recycled content per unit of product. Also include material costs, excluding cost of installation.
   3. LEED Credits MRc5.1 and MRC5.2, Local/Regional Materials: List of proposed regional materials. Indicate location of manufacturing facility including name, address and distance 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. LEED Credit MRc7, Certified Wood: List of proposed certified wood products. Provide documentation from the manufacturer certifying that wood based product is made from wood obtained from forests certified by an FSC accredited certification body to comply with the Forest Stewardship Councils "Principles and Criteria." Include cost of material and chain-of-custody certification number obtained from manufacturer. Vendor's invoices must be included with chain-of-custody certificate number listed.
   5. LEED Credit EQc3.1, Construction IAQ Management Plan, During Construction: Construction indoor air quality management plan.

F. LEED Progress Reports: Concurrent with each Application for Payment, submit reports comparing actual construction and purchasing activities with LEED action plans for the following:

   1. LEED Credits MRc2.1 and MRC2.2, Construction Waste Management: Waste reduction progress reports complying with Division 1 Section “Construction Waste Management.”
2. **LEED Credits MRc4.1 and MRc4.2, Recycled Content**: Recycled content progress reports.
3. **LEED Credits MRc5.1 and MRc5.2, Local/Regional Materials**: Regional materials progress reports.
4. **LEED Credit MRc7, Certified Wood**: Certified wood products progress reports.

G. **LEED Documentation Submittals**:

1. **LEED Credit EA5c, Measurement and Verification**: Product data and wiring diagrams for sensors and data collection system used to provide continuous metering of building energy-consumption performance over a period of not less than one year of post-construction occupancy.
2. **LEED Credit MRc4.1 and Credit MRc4.2, Recycled Content**: Provide list of proposed materials with recycled content. Indicate separate percentages, by weight, of pre-consumer and post-consumer recycled content per unit of product. Also include material costs, excluding cost of installation.
3. **LEED Credit MRc5.1 and Credit MRc5.2, Regional Materials**: Provide list of proposed regional materials. Indicate location of manufacturing facility including name, address and distance 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. **LEED Credit MRc7, Certified Wood**: Provide list of proposed certified wood products. Provide documentation from the manufacturer certifying that wood based product is made from wood obtained from forests certified by an FSC accredited certification body to comply with the Forest Stewardship Councils "Principles and Criteria." Include cost of material and chain-of-custody certification number obtained from manufacturer. Vendor's invoices must be included with chain-of-custody certificate number listed.
5. **LEED Credit EQc3.1, Construction Indoor Air Quality Plan During Construction**:
   a. Construction indoor-air-quality management plan.
   b. Product data for temporary filtration media.
   c. Product data for filtration media used during occupancy.
   d. Construction Documentation: Six photographs at three different times during the construction period, along with a brief description of the SMACNA approach employed, documenting implementation of the indoor-air-quality management measures, such as protection of ducts and on-site stored or installed absorptive materials.
6. **LEED Credit EQc.2, Construction Indoor Air Quality Plan Before Occupancy**:
   a. Signed statement describing the building air flush out procedures including dates when flush out was begun and completed and statement that filtration media was replaced after flush out.
   b. Product data for filtration media used during flush out and during occupancy.
   c. Report from testing and inspecting agency indicating results of indoor air quality testing and documentation showing compliance with indoor air quality testing procedures and requirements.
7. **LEED Credit EQc4.1, Low-Emitting Materials, Adhesives and Sealants**: Provide product data and material safety data sheets (MSDS) for adhesives and sealants used inside the building indicating VOC content of each product used. Indicate VOC content in g/L calculated according to 40 CFR 59, Subpart D.
8. **LEED Credit EQc4.2, Low-Emitting Materials, Paints and Coatings**: Provide product data and material safety data sheets (MSDS) for paints and coatings used inside the weatherproofing system indicating VOC content of each product used. Indicate VOC content in g/L calculated according to 40 CFR 59, Subpart D.
9. **LEED Credit EQc4.3, Low-Emitting Materials, Carpet Systems**: Provide product data and material safety data sheets (MSDS) for carpeting and carpet adhesives indicating
certification from the Carpet and Rug Institute Green Label Plus program for carpet and adherence with VOC limits for carpet adhesives.

10. **LEED Credit EQc4.4, Low-Emitting Materials, Composite Wood and Agrifiber Products:** Provide product data indicating the type of binder used, and confirming the product does not contain urea-formaldehyde resin binders.

### 1.4 QUALITY ASSURANCE

A. **Environmental Project Management and Coordination:** Prior to the pre-construction meeting, Contractor shall identify and assign one person on Contractor’s staff to be the Environmental Project Manager who shall be responsible for environmental issues compliance and coordination.

1. **Experience:** Similar responsibilities and successful performance for previous sustainable building construction project(s).

2. **Responsibilities:** Carefully review Contract Documents for environmental issues, coordinate work of trades, subcontractors, and suppliers; instruct workers relating to environmental issues; and oversee Project Environmental Goals.
   a. Assemble and retain approved Environmental Submittals, tabulation charts and other records to document progress toward meeting environmental requirements.
   b. Provide records in secure jobsite location, available for review by Architect or Owner.
   c. Provide Action Plans, Progress Reports and final documentation according to specified requirements and schedule.
   d. Assist Owner in preparing submission to US Green Building Council.

3. **Meetings:** Lead discussion of Environmental Goals at following meetings:
   a. Pre-construction meetings.
   b. Waste management conference.
   c. Pre-installation meetings.
   d. Regularly scheduled job-site meetings.
   e. Special sustainability issues meetings.

B. **Environmental Issues Criteria:** Comply with requirements listed in specification Sections.

### 1.5 ENVIRONMENTAL CONSIDERATIONS FOR DELIVERY, STORAGE, AND HANDLING

A. **Packaging:** Deliver materials in recyclable or in reusable packaging such as cardboard, wood, paper, or reusable blankets, which shall be reclaimed by supplier or manufacturer for recycling.

B. **Minimize packaging materials to maximum extent possible while still ensuring protection of materials during delivery, storage, and handling.**

1. **Unacceptable Packaging Materials:** Polyurethane, polyisocyanurate, polystyrene, polyethylene, and similar plastic materials such as foam plastics and shrink-fit plastics.

2. **Reusable Blankets:** Deliver and store materials in reusable blankets and mats reclaimed by manufacturers or suppliers for reuse where program exists or where program can be developed for such reuse.

3. **Pallets:** Where pallets are used, suppliers shall be responsible to ensure pallets are removed from site for reuse or for recycling.

4. **Corrugated Cardboard and Paper:** Where paper products are used, recycle as part of construction waste management recycling program, or return to material’s manufacturer for use by manufacturer or supplier.

5. **Sealants, Paint, Primers, Adhesives, and Coating Containers:** Return to supplier or manufacturer for reuse where such program is available.

### 1.6 PROJECT CONDITIONS

A. **Provide and maintain controlled interior environment in accordance with following requirements before beginning installation of interior finish materials in order to dilute and exhaust vapors produced by solvents and other carriers from liquid materials, and particulate matter from residual manufacturing chemicals contained in solid product.**
B. No smoking will be permitted in indoor Project site locations.

C. Construction Ventilation and Preconditioning, General:
1. Comply with product emission testing procedures specified in Division 1 Section 01 35 30 - Indoor Air Quality Protection During Construction and additional testing requirements specified in Mechanical Specification Divisions.

1.7 CLEANING AND PROTECTION, ENVIRONMENTAL ISSUES

A. Final Cleaning, Environmental Issues:
1. Clean interior and exterior surfaces exposed to view; remove temporary labels, stains, and foreign substances; polish transparent and glossy surfaces using cleaning and maintenance products as described in Section 01 77 00 Closeout Procedures.
2. Clean equipment and fixtures to sanitary condition using cleaning and maintenance products as described in Section 01 77 00 Closeout Procedures.
3. Vacuum carpeted and soft surfaces with high efficiency particulate arrestor (HEPA) vacuum.
4. Duct Cleaning: Comply with requirements indicated in National Air Duct Cleaning Association (NADCA) standards in NADCA’s Assessment, Cleaning and Restoration 2002 Standard and related NADCA documents, and the following:
   a. Clean ducts using HEPA vacuum immediately prior to Substantial Completion and prior to shipment to site. However, ducts shall be inspected to confirm that no oil film is present. Remove oil.
5. Replace air filters (i.e., pre and final filters) just prior to Substantial Completion with filters having a MERV 13 rating or higher.
6. Remove and properly dispose of recyclable materials using construction waste management program specified in Section 01 74 19 Construction Waste Management.

B. Protection, Environmental Issues:
1. Moisture Damage: Materials with evidence of moisture damage, including stains, are not acceptable, including both stored and installed materials. Take special care to prevent accumulation of moisture on installed materials and within packaging during delivery, storage, and handling to prevent development of molds and mildew on packaging and on products.
   a. Immediately remove from site and properly dispose of materials showing signs of mold and signs of mildew, including materials with moisture stains.
   b. Replace moldy and mildewed materials with new, undamaged materials.
2. Protect interior materials from water intrusion or penetration; where interior products are not intended for wet applications are exposed to moisture.
3. Protect installed products using methods that do not support growth of molds and mildews.

1.8 SEQUENCING

A. Environmental Issues:
1. On-Site Application: Where odorous and/or high VOC emitting products are applied on-site, apply prior to installation of porous and fibrous materials. Where this is not possible, protect porous materials with polyethylene vapor retarders.
2. Complete interior finish material installation no less than fourteen days prior to Substantial Completion to allow for building flush out.

PART 2 - PRODUCTS

2.1 ENVIRONMENTAL PRODUCTS, GENERAL

A. Comply with specified requirements for environmental characteristics of products, systems and assemblies. The following Articles contain product requirements of LEED Green Building Rating System Credits, as indicated.
### 2.2 Recycled Content of Materials

A. **LEED Credit MRc4.1 and Credit MRc4.2, Recycled Content:**
   1. Provide building materials with recycled content such that post-consumer recycled content plus one-half of pre-consumer recycled content constitutes a minimum of 20 percent of cost of materials used for Project.
      a. Cost of post-consumer recycled content of an item shall be determined by dividing weight of post-consumer recycled content in the item by total weight of the item and multiplying by cost of the item.
      b. Cost of pre-consumer recycled content of an item shall be determined by dividing weight of pre-consumer recycled content in the item by total weight of the item and multiplying by cost of the item.
      c. Do not include plumbing, mechanical and electrical components, and specialty items such as elevators and equipment in the calculation.
      d. Recycled content of materials shall be defined according to the International Organization for Standardization document ISO 14021, “Environmental Labels and Declarations – Self Declared Environmental Claims (Type II Environmental Labeling).”

### 2.3 Regional Materials

A. **LEED Credit MRc5.1 and MRc5.2, Local/Regional Materials:**
   1. Provide a minimum of 20 percent of building materials (by cost) that are extracted, processed, and manufactured within a 500 mile radius of the project site. If only a fraction of a product or material is extracted, harvested, recovered, and manufactured regionally, then only that percentage (by weight) shall contribute to the regional value.

### 2.4 Certified Wood

A. **LEED Credit MRc7.0, Certified Wood:**
   1. Provide a minimum of 50 percent (by cost) of wood-based materials that are produced from wood obtained from forests certified by a Forest Stewardship Council (FSC) accredited certification body to comply with FSC 1.2, “Principles and Criteria.”

### 2.5 Low-Emitting Materials

A. **LEED Credit EQc4.1, Low-Emitting Materials, Adhesives and Sealants:**
   1. For field applications that are inside the weatherproofing system, use adhesives and sealants that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D:
      a. Wood Glues: 30 g/L.
      b. Metal to Metal Adhesives: 30 g/L.
      c. Adhesives for Porous Materials (Except Wood): 50 g/L.
      d. Subfloor Adhesives: 50 g/L.
      e. Plastic Foam Adhesives: 50 g/L.
      f. Carpet Adhesives: 50 g/L.
      g. Carpet Pad Adhesives: 50 g/L.
      h. VCT and Asphalt Tile Adhesives: 50 g/L.
      i. Cove Base Adhesives: 50 g/L.
      j. Gypsum Board and Panel Adhesives: 50 g/L.
      k. Rubber Floor Adhesives: 60 g/L.
      l. Ceramic Tile Adhesives: 65 g/L.
      m. Multipurpose Construction Adhesives: 70 g/L.
      n. Fiberglass Adhesives: 80 g/L.
      o. Contact Adhesive: 80 g/L.
      p. Structural Glazing Adhesives: 100 g/L.
      q. Wood Flooring Adhesive: 100 g/L.
      r. Structural Wood Member Adhesive: 140 g/L.
s. Special Purpose Contact Adhesive (contact adhesive that is used to bond melamine covered board, metal, unsupported vinyl, Teflon, ultra-high molecular weight polyethylene, rubber or wood veneer 1/16 inch or less in thickness to any surface): 250 g/L.
t. Top and Trim Adhesive: 250 g/L.
u. Plastic Cement Welding Compounds: 250 g/L.
v. ABS Welding Compounds: 325 g/L.
w. CPVC Welding Compounds: 490 g/L.
x. PVC Welding Compounds: 510 g/L.
y. Adhesive Primer for Plastic: 550 g/L.
z. Sheet Applied Rubber Lining Adhesive: 850 g/L.
aa. Aerosol Adhesive, General Purpose Mist Spray: 65 percent by weight.
bb. Aerosol Adhesive, General Purpose Web Spray: 55 percent by weight.
c. Special Purpose Aerosol Adhesive (All Types): 70 percent by weight.
dd. Other Adhesives: 250 g/L.
ee. Architectural Sealants: 250 g/L.
ff. Nonmembrane Roof Sealants: 300 g/L.
gg. Single-Ply Roof Membrane Sealants: 450 g/L.
hh. Other Sealants: 420 g/L.
i. Sealant Primers for Nonporous Substrates: 250 g/L.
jj. Sealant Primers for Porous Substrates: 775 g/L.
kk. Modified Bituminous Sealant Primers: 500 g/L.
ll. Other Sealant Primers: 750 g/L.

B. LEED Credit EQc4.2, Low-Emitting Materials, Paints and Coatings:
1. For interior applications use paints and coatings that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA method 24) and the following chemical restrictions:
a. Flat Paints, Coatings, and Primers: VOC not more than 50 g/L.
b. Nonflat Paints, Coatings, and Primers: VOC not more than 150 g/L.
c. Anticorrosive and Antirust Paints Applied to Ferrous Metals: VOC not more than 250 g/L.
d. Clear Wood Finishes, Varnishes: VOC not more than 350 g/L.
e. Clear Wood Finishes, Lacquers: VOC not more than 550 g/L.
f. Floor Coatings: VOC not more than 100 g/L.
g. Shellacs, Clear: VOC not more than 730 g/L.
h. Shellacs, Pigmented: VOC not more than 550 g/L.
i. Stains: VOC not more than 250 g/L.
j. Aromatic Compounds: Paints and coatings not contain more than 1.0 percent by weight total aromatic compounds (hydrocarbon compounds containing one or more benzene rings).
k. Restricted Components: Paints and coatings shall not contain any of the following:
   1) Acrolein.
   2) Acrylonitrile.
   3) Antimony.
   4) Benzene.
   5) Butyl benzyl phthalate.
   6) Cadmium.
   7) Di (2-ethylhexyl) phthalate.
   8) Di-n-butyl phthalate.
   9) Di-n-octyl phthalate.
   10) 1,2-dichlorobenzene.
   11) Diethyl phthalate.
   12) Dimethyl phthalate.
   13) Ethylbenzene.
   14) Formaldehyde.
15) Hexavalent chromium.
16) Isophorone.
17) Lead.
18) Mercury.
19) Methyl ethyl ketone.
20) Methyl isobutyl ketone.
21) Methylene chloride.
22) Naphthalene.
23) Toluene (methylbenzene).
24) 1,1,1-trichloroethane.
25) Vinyl chloride.

C. LEED Credit EQc4.4, Low-Emitting Materials, Composite Wood and Agrifiber Products:
   1. Do not use composite wood and agrifiber products that contain urea-formaldehyde resin
      binders.

PART 3 - EXECUTION

3.1 ENVIRONMENTAL ISSUES, GENERAL

   A. Comply with specified requirements for environmental construction practice. The following
      Articles contain execution requirements of LEED Green Building Rating System Credits
      [Project sustainable requirements], as indicated.

3.2 SITE DISTURBANCE

   A. LEED Credit SSc5.1, Reduced Site Disturbance:
      1. Comply with requirements specified for site clearing.

3.3 CONSTRUCTION WASTE MANAGEMENT

   A. LEED Credit MRc2.1 and MRc2.2, Construction Waste Management:
      1. Comply with Division 1 Section 01 74 19 - Construction Waste Management. Achieve a
         minimum landfill diversion rate of 75 percent.

3.4 CONSTRUCTION INDOOR AIR QUALITY MANAGEMENT

   A. LEED Credit EQc3.1, Construction IAQ Management Plan:
      1. Comply with SMACNA IAQ Guideline for Occupied Buildings Under Construction and
         comply with requirements specified in Division 1 – Section 01 35 30 – Construction IAQ
         Management Plans.

   B. LEED Credit EQc3.2, Construction IAQ Management Plan:
      1. Comply with requirements specified in Division 1 – Section 01 35 30 – Construction IAQ
         Management Plans.

END OF SECTION
SECTION 01 41 00
REGULATORY REQUIREMENTS

PART 1 - GENERAL

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

1.2 SUMMARY
A. Section Includes:

1. General administrative requirements and procedures and related applicable codes.

1.3 APPROVAL AND RECOMMENDATION AGENCIES
A. The University of Colorado at Boulder has jurisdiction for the interpretation and enforcement of Code requirements for construction of projects.

1.4 CODES
A. All Contractors shall comply with all applicable codes, ordinances and regulations in effect at the time of bid openings.


1. The following approved building codes and standards have been adopted by State Buildings Programs (SBP) as the minimum requirements to be applied to all state-owned buildings and physical facilities including capital construction and controlled maintenance construction projects:

a. The 2006 edition of the International Building Code (IBC); (as adopted by the Colorado State Buildings and Real Estate Programs as follows: Chapters 2-35 and Appendices C and I).

b. The 2006 edition of the International Mechanical Code (IMC); (as adopted by the Colorado State Buildings and Real Estate Programs as follows: Chapters 2-15 and Appendix A).


d. The 2005 edition of the National Electrical Code (NEC); (National Fire Protection Association Standard 70) (as adopted by the Colorado State Electrical Board).

e. The 2006 edition of the International Plumbing Code (IPC); (as adopted by the Colorado Examining Board of Plumbers as follows: Chapter 1 Section 101.2,102, Chapters 2-13 and Appendices B, D, E, F and G).
f. The 2006 edition of the International Fuel Gas Code (IFGC); (as adopted by the Colorado Examining Board of Plumbers as follows: Chapter 1 Section 101,102, Chapters 2-8 and Appendices A, B, C and D).


h. The 2004 edition of the ASME Boiler and Pressure Vessel Code; (as adopted by the Department of Labor and Employment/Boiler Inspection Section as follows: sections I, IV, VIII-Divisions 1 and 2 and 3, X and B31.1).

i. The 2004 edition of the National Boiler Inspection Code (NBIC); (as adopted by the Department of Labor and Employment/Boiler Inspection Section).

j. The 2004 edition of the Controls and Safety Devices for Automatically Fired Boilers CSD-1; (as adopted by the Department of Labor and Employment/Boiler Inspection Section).

k. The 2004 edition of the Boiler and Combustion Systems Hazards Code, NFPA 85; (as adopted by the Department of Labor and Employment/Boiler Inspection Section).

l. The current edition of the Rules and Regulations Governing the Sanitation of Food Service Establishments; (as adopted by the Department of Public Health and Environment/Colorado State Board of Health).

m. The 2003 edition of ICC/ANSI A117.1, Accessible and Usable Buildings and Facilities; (as adopted by the Colorado General Assembly as follows: CRS 9-5-101, as amended, for accessible housing).


C. In case of a conflict between references applicable codes, the one having the more stringent requirements shall govern. Where governing codes indicate that the drawings or specifications do not comply with the minimum requirements of the codes, the Contractor shall be responsible for providing an installation, which will comply with code requirements. Drawings and specifications shall be followed where they are superior to code requirements.

1.5 OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA):

A. The Contractor shall have sole responsibility for compliance on the job site to all applicable portions of the Occupational Safety and Health Act. The Contractor is responsible for other regulatory requirements as they relate to occupational Health and Safety requirements. For example, NIOSH, ANSI, and MSA.

B. Protection of life, health and public welfare as it relates to the execution of the construction contract is the responsibility of the Contractor. The Owner's Representative may, at their discretion, observe, inspect, or comment on plans, procedures, or actions employed at the project as they relate to safety of life, health or public welfare. If conditions are imposed by the Owner which interfere with, or imply actions detrimental to safety, written notice shall be returned to the Owner for action prior to affecting any unsafe conditions.
C. Contractors shall use OSHA Lock Out / Tag Out procedures when working with energized equipment.

D. All contractors entering confined spaces owned by CU or while conducting work under contract with CU shall develop a written program and utilize procedures that, at a minimum, comply with all federal, state and local confined space standards and all applicable regulatory requirements. Contractors shall, independent of the University, monitor the space to obtain their own data to ensure a safe entry and exit. Any data generated by a contractor’s confined space entry, should be provided to the Facilities Management confined Space Program Manager.

E. When contractors perform work that may involve Facilities Management controlled permit required confined spaces, Facilities Management will:
   1. Inform contractors of permit required confined spaces and that entry is allowed only after compliance with the confined space entry standard;
   2. Require contractors planning to enter a confined space to provide the Facilities Management Confined Space Program Manager in charge of that space, 48-hour advance notice of such planned entry. The contractors entry will be in accordance with the current Occupational Safety and Health Administration confined space entry standard and a signed document stating such, shall be provided to the FM Confined Space Program Manager prior to entry.

F. The FM Confined Space Program Manager, following receipt of notice of contractor planned entry, will:
   1. Apprise contractor of the hazards identified in the confined space and of any prior experience that is documented on the space;
   2. Appraise the contractor of any precautions or procedures that CU has implemented for the protection of workers in or near the confined space;
   3. Coordinate entry operations with the contractor when both Facilities Management and contractor personnel are working in or around the confined space;
   4. Debrief the contractor at the end of the entry operations regarding hazards confronted or created.

1.6 HOT WORK PERMITS

A. All contractors shall be required to obtained a Hot Work Permit, three (3) working days in advance, for work that involves welding, heat treating, grinding, thawing pipe, hot riveting, soldering and brazing, power driven fasteners and similar activities involving spark, flame or heat. Compliance with the requirements of the applicable fire code, the International Building Code, and NFPA Standard 51B are mandatory and all contractors performing hot work activities shall read and understand these code requirements. To obtain a current Hot Work Permit, go to website:
   http://fm.colorado.edu/firesafety/hotwork.html

B. Contractors shall read and comply with the procedures and requirements for Fire Watch, Fire Alarm Interruption and Fire Suppression Interruption as found on the following websites:

   Fire Watch Procedures: http://fm.colorado.edu/firesafety/firewatch.html

   Fire Alarm and Detection System Interruption/Outage: http://fm.colorado.edu/firesafety/firealarmdetectsys.html

   Fire Suppression System Interruption/Outage: http://fm.colorado.edu/firesafety/firesuppressionsystems.html
C. No hot work shall be conducted in any campus facility without a hot work permit. Any person or firm who conducts hot work without a permit shall be fined one thousand dollars ($1,000) for each occurrence and their non-permitted activities shall be stopped immediately until they obtain a hot work permit. Contractor shall be responsible for any damages caused as a result of improper hot work activities or the work stoppage.

D. Individuals or firms who obtain a permit shall fully read, understand and implement the requirements of the permit. Any person or firm who conducts hot work without the full implementation of the permit requirements shall be fined five hundred dollars ($500) the first time and one thousand dollars ($1,000) for subsequent occurrences. When the requirements of the hot work permit are not being implemented, the improper activities shall be stopped immediately until a hot work permit is obtained. Contractor shall be responsible for any damages caused as a result of improper hot work activities or the work stoppage. Any contractor who is found to be in non-compliance a third time, will not be allowed to work on campus until further notice by Facilities Management.

E. The campus inspectors, project managers and fire marshal shall have the authority to stop improper or non-permitted hot work activities.

F. The Contractor shall notify the CU Fire Alarm Supervisor to deactivate all smoke alarms in the vicinity of the work prior to any demolition and construction work activity. Failure of the Contractor to comply with the smoke alarm deactivation requirement and cause a false alarm and arrival of the Boulder Fire Department shall be a $400 fine per occurrence.

1.7 PERMITS

A. The contractor must obtain a no fee building permit prior to starting work from Office Manager, Facilities Management at (303) 492-2904 in the Planning, Design and Construction Office, Research Laboratory No. 2, 1540 30th Street, Boulder, Colorado. Building permits are required on all projects except those work items specifically exempted by Section 105 of IBC.

B. The contractor must post the permit(s) in a prominent location at the jobsite including all inspection reports. The contractor shall have an updated set of contract documents available at the jobsite for all inspections.

1.8 INSPECTIONS

A. The Contractor must schedule all required inspections 48 hours in advance by calling (303) 492-2922. CU or their designated inspectors will complete these inspections within 48 hours with the exception of weekends and state holidays.

B. The contractor is required to arrange for the following inspections:

1. Required inspections: General. Reinforcing steel or structural framework of any part of any building of structure shall not be covered or concealed without first obtaining the approval of the building official.

2. Lath or gypsum board inspection: To be made after lathing and gypsum board, interior and exterior, is in place, but before any plastering is applied or before gypsum board joints and fasteners are taped and finished.

3. Final inspection: To be made after finish grading and the building is completed and ready for occupancy.

4. Special inspection: Special inspection may be required on special projects and special types of construction.
5. Re-inspections: A re-inspection fee may be assessed for each inspection or reinspection when such portion of work for which inspection is called is not complete or when corrections called for are not made.

C. The Contractor will be responsible for all cost related to re-inspections and will be billed at a rate of $50.00 per hour for CU re-inspections and at the testing agency bill-out rate for other re-inspections.

1.9 UNIVERSITY OF COLORADO SEXUAL HARASSMENT POLICY

A. Contractors should be aware of and review the University of Colorado at Boulder’s policies that prohibit discrimination and harassment on the basis of race, color, national origin, sex, age, disability, creed, religion, sexual orientation or veteran status. These policies are located on the web at: http://www.colorado.edu/odh/ Contractor personnel must adhere to these policies and conduct themselves in a manner that does not discriminate or harass as a result of interacting with students and visitors.

1.10 FIRE ALARM INTERRUPTION

A. Contractor shall contact CU Fire Alarm Systems Supervisor at 303-492-0633 prior to all interruptions or shutdowns of fire alarm systems. Interruptions or shutdowns shall be scheduled three (3) working days in advance with CU Fire Alarm Systems Shop, CU Project Manager and building proctor. Contractor shall provide a fire watch as directed by CU Fire Alarm Systems Shop during interruption or shutdown.

B. The Contractor shall be responsible for preventing nuisance alarm due to activities at their work site. Common sources of nuisance alarms are:

1. Smoke (soldering, welding, cooking, etc.)
2. Grinding
3. Dust (drilling, sweeping, canister vacuums, sand blasting, etc.)
4. Water leaking (plumbing leaks, overflows)
5. Water sprayed on or near detectors (pressure washing or cleaning with water)
6. Popcorn or other food burning in microwaves
7. Static electricity (covering or uncovering detectors)
8. Changing filters on air handling units (dust)
9. Steam (leaks, pressure pop-offs)
10. Broken or frozen sprinkler heads
11. Sprinkler drain valves turned by mistake
12. Vandalism

Precautions to prevent nuisance alarms are:

1. During construction projects, treat all buildings, except totally new construction, as though they were occupied buildings with live systems.
2. Do not assume that all detectors are in plain sight. Contact University personnel for verification.
3. Maintain dust control measures per UCB Standards:
   a. Maintaining barriers
   b. Covering air returns
   c. Asking CU personnel to cap or disable smoke detectors (Note any capping or disabling of fire safety devices is to be done ONLY by CU personnel, not contractors.)
   d. Avoiding recirculation of dust or smoke through the building air handling system.
4. Follow campus hot work procedures. Refer to specification Section 01060, paragraph 1.06.
5. Do not expose fire alarm devices to water or extreme temperatures.
4. Contact Fire Systems Group for any actions that affect fire detection, alarm, and suppression systems.

1.11 STORMWATER MANAGEMENT PLAN (SWMP)

A. Stormwater Management Plan (SWMP): Prior to any construction activity disturbing one acre of land or more, an approved SWMP and a Stormwater Permit for Construction Activity application from the Colorado Department of Public Health and Environment (CDPHE) are required. The SWMP shall be prepared in accordance with the CDPHE requirements for “Contents of the Stormwater Management Plan” and the UDFCD’s Urban Storm Drainage Criteria Manual, Volume 3, “Best Management Practices” (UDFCD Drainage Criteria Manual). Stormwater quality management and erosion control measures are to be constructed and maintained in accordance with the SWMP and the UDFCD Drainage Criteria Manual.

1.12 ENVIRONMENTAL/STORMWATER POLLUTION PREVENTION

A. Contractors working on the UCB campus must comply with all applicable University, City, State and Federal environmental regulations and standards. The contractor shall keep material such as saw-cut slurry, drywall mud, grout and mortar, paint, sediment, and all other wastes and process water out of gutters, streets, storm drains and parking lots. The contractor shall also be responsible for proper disposal of all waste materials. Immediately notify 911, EH&S 303-492-6025 and project manager of accidental hazardous materials releases.

B. Contractors are required to locate drains or other water discharge points in the area of the project and provide measures to protect from illicit discharges, prior to construction activities. For assistance with determining where a drain leads to (storm vs. sanitary, especially floor drains), contact the Facilities Management service center at 303-492-5522.

C. The contractor shall be responsible for all costs associated with damages and clean-up as a result of contractor caused illicit discharges of process water or other materials into the storm water system. Also, in addition to any penalties or fines imposed by the City, State or Federal agencies, the contractor shall be fined one thousand dollars ($1,000) by UCB for the first time an incident occurs and may be put on probation from working on campus. The contractor will be prohibited from working on campus, until further notice by UCB, if they are found to be responsible for an illicit discharge a second time.

D. For the purpose of eliminating storm water pollution, the contractor shall implement effective Best Management Practices (BMPs). BMPs include general good housekeeping practices, appropriate scheduling of activities, operational practices, maintenance procedures and other measures to prevent the discharge of pollutants directly or indirectly to the storm water system. These BMPs shall be maintained for the duration of the contractor's work. Contractors are required to visit website: [http://www.bouldercolorado.gov/www/pace/government/index.html](http://www.bouldercolorado.gov/www/pace/government/index.html) for examples of BMP's that are applicable to project activities. The Contractor shall ensure that all applicable employees and sub-contractors who work on site are trained and comply with storm water pollution prevention methods and proper BMP’s.

E. In addition to the BMP’s the contractor will be required to sign an Environmental Responsibilities form for all projects. The contractor shall post a copy of this form on site, throughout the duration of the project, in a visible area for all workers to see. Also, the contractor will be required to fill out a Pre-Construction Water Quality Certification form indicating any/all potential discharges of process water, chemicals, de-watering, or other materials to sewer systems or landscape areas that are expected to result from project activities.

1.13 UTILITY LOCATES
Contractor **MUST CALL 811** (or 1-800-922-1987) for utility locates **BEFORE DIGGING** on any project at the University of Colorado at Boulder. This includes even small projects such as, but not limited to, planting trees or shrubs, sidewalk removal/installation or fence post installation. Digging without calling can disrupt service to the campus or surrounding neighborhoods and potentially result in fines and repair costs.

**END OF SECTION**
SECTION 01 42 00
REFERENCES

PART 1 - GENERAL

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

1.2 DEFINITIONS
A. General: Basic Contract definitions are included in the Conditions of the Contract.
B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.
C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."
D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."
E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.
F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
G. "Install": Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.
H. "Provide": Furnish and install, complete and ready for the intended use.
I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.3 INDUSTRY STANDARDS
A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.
B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.

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

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

1.4 ABBREVIATIONS AND ACRONYMS

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

AA Aluminum Association, Inc. (The) (703) 358-2960
www.aluminum.org

AAADM American Association of Automatic Door Manufacturers (216) 241-7333
www.aaadm.com

AABC Associated Air Balance Council (202) 737-0202
www.aabchq.com

AAMA American Architectural Manufacturers Association (847) 303-5664
www.aamanet.org

AASHTO American Association of State Highway and Transportation Officials (202) 624-5800
www.transportation.org

AATCC American Association of Textile Chemists and Colorists (919) 549-8141
www.aatcc.org

ABAA Air Barrier Association of America (866) 956-5888
www.airbarrier.org

ABMA American Bearing Manufacturers Association (202) 367-1155
www.abma-dc.org

ACI American Concrete Institute (248) 848-3700
www.concrete.org

ACPA American Concrete Pipe Association (972) 506-7216
www.concrete-pipe.org

AEIC Association of Edison Illuminating Companies, Inc. (The) (205) 257-2530
www.aeic.org

AF&PA American Forest & Paper Association (800) 878-8878 (202) 463-2700
www.afandpa.org

AGA American Gas Association (202) 824-7000
REFERENCES

AGC  Associated General Contractors of America (The)  
www.agc.org  
(703) 548-3118

AHAM  Association of Home Appliance Manufacturers  
www.aham.org  
(202) 872-5955

AHRI  Air-Conditioning, Heating, and Refrigeration Institute  
www.ahrinet.org  
(703) 524-8800

AI  Asphalt Institute  
www.asphaltinstitute.org  
(859) 288-4960

AIA  American Institute of Architects (The)  
www.aia.org  
(800) 242-3837  
(202) 626-7300

AISC  American Institute of Steel Construction  
www.aisc.org  
(800) 644-2400  
(312) 670-2400

AISI  American Iron and Steel Institute  
www.steel.org  
(202) 452-7100

AITC  American Institute of Timber Construction  
www.aite-glulam.org  
(303) 792-9559

ALSC  American Lumber Standard Committee, Incorporated  
www.alsc.org  
(301) 972-1700

AMCA  Air Movement and Control Association International, Inc.  
www.amca.org  
(847) 394-0150

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

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

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

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

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

ARI  Air-Conditioning & Refrigeration Institute  
(Now AHRI)

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

ASCE  American Society of Civil Engineers  
www.asce.org  
(800) 548-2723  
(703) 295-6300
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<th>Organization</th>
<th>Full Name</th>
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<td>ASCE/SEI</td>
<td>American Society of Civil Engineers/Structural Engineering Institute</td>
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<tr>
<td>ASHRAE</td>
<td>American Society of Heating, Refrigerating and Air-Conditioning Engineers</td>
<td>(800) 527-4723, (404) 636-8400</td>
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<td>ASME</td>
<td>ASME International (American Society of Mechanical Engineers International)</td>
<td>(800) 843-2763, (973) 882-1170</td>
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<td>ASSE</td>
<td>American Society of Safety Engineers</td>
<td>(847) 699-2929</td>
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<td>American Society of Sanitary Engineering</td>
<td>(440) 835-3040</td>
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<td>ASTM</td>
<td>ASTM International (American Society for Testing and Materials International)</td>
<td>(610) 832-9500</td>
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<td>ATIS</td>
<td>Alliance for Telecommunications Industry Solutions</td>
<td>(202) 628-6380</td>
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<td>AWCI</td>
<td>Association of the Wall and Ceiling Industry</td>
<td>(703) 534-8300</td>
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<td>AWCMA</td>
<td>American Window Covering Manufacturers Association (Now WCMA)</td>
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<td>AWI</td>
<td>Architectural Woodwork Institute</td>
<td>(571) 323-3636</td>
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<td>AWPA</td>
<td>American Wood Protection Association (Formerly: American Wood Preservers' Association)</td>
<td>(205) 733-4077</td>
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<td>AWS</td>
<td>American Welding Society</td>
<td>(800) 443-9353, (305) 443-9353</td>
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<td>AWWA</td>
<td>American Water Works Association</td>
<td>(800) 926-7337, (303) 794-7711</td>
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<td>BHMA</td>
<td>Builders Hardware Manufacturers Association</td>
<td>(212) 297-2122</td>
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<td>BIA</td>
<td>Brick Industry Association (The)</td>
<td>(703) 620-0010</td>
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<td>BICSI</td>
<td>BICSI, Inc.</td>
<td>(800) 242-7405, (813) 979-1991</td>
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<td>BIFMA</td>
<td>BIFMA International (Business and Institutional Furniture Manufacturer's Association International)</td>
<td>(616) 285-3963</td>
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CCC  Carpet Cushion Council  
   www.carpetcushion.org  
   (610) 527-3880

CDA  Copper Development Association  
   www.copper.org  
   (212) 251-7200

CEA  Canadian Electricity Association  
   www.canelect.ca  
   (613) 230-9263

CEA  Consumer Electronics Association  
   www.ce.org  
   (866) 858-1555
   (703) 907-7600

CFFA  Chemical Fabrics & Film Association, Inc.  
   www.chemicalfabricsandfilm.com  
   (216) 241-7333

CGA  Compressed Gas Association  
   www.cganet.com  
   (703) 788-2700

CIMA  Cellulose Insulation Manufacturers Association  
   www.cellulose.org  
   (888) 881-2462
   (937) 222-2462

CISCA  Ceilings & Interior Systems Construction Association  
   www.cisca.org  
   (630) 584-1919

CISPI  Cast Iron Soil Pipe Institute  
   www.cispi.org  
   (423) 892-0137

CLFMI  Chain Link Fence Manufacturers Institute  
   www.chainlinkinfo.org  
   (301) 596-2583

CRRC  Cool Roof Rating Council  
   www.coolroofs.org  
   (866) 465-2523
   (510) 485-7175

CPA  Composite Panel Association  
   www.pbmdf.com  
   (703) 724-1128

CPPA  Corrugated Polyethylene Pipe Association  
   www.plasticpipe.org  
   (800) 510-2772
   (202) 462-9607

CRI  Carpet and Rug Institute (The)  
   www.carpet-rug.com  
   (706) 278-3176

CRSI  Concrete Reinforcing Steel Institute  
   www.crsi.org  
   (847) 517-1200

CSA  CSA International  
   (Formerly: IAS - International Approval Services)  
   www.csa-international.org  
   (866) 797-4272
   (416) 747-4000

CSI  Cast Stone Institute  
   www.caststone.org  
   (717) 272-3744

CSI  Construction Specifications Institute (The)  
   www.csinet.org  
   (800) 689-2900
   (703) 684-0300
CSSB  Cedar Shake & Shingle Bureau  
www.cedarbureau.org  
(604) 820-7700

CTI  Cooling Technology Institute  
(Formerly: Cooling Tower Institute)  
www.cti.org  
(281) 583-4087

DHI  Door and Hardware Institute  
www.dhi.org  
(703) 222-2010

ECA  Electronic Components Association  
www.ecentral.org  
(703) 907-8024

EIA  Electronic Industries Alliance  
www.eia.org  
(703) 907-7500

EIMA  EIFS Industry Members Association  
www.eima.com  
(800) 294-3462  
(770) 968-7945

EJCDC  Engineers Joint Contract Documents Committee  
www.ejdc.org  
(703) 295-5000

EJMA  Expansion Joint Manufacturers Association, Inc.  
www.ejma.org  
(914) 332-0040

ESD  ESD Association  
(Electrostatic Discharge Association)  
www.esda.org  
(315) 339-6937

ETL SEMCO  Intertek ETL SEMCO  
(Formerly: ITS - Intertek Testing Service NA)  
www.intertek-etlsemko.com  
(800) 967-5352

FM Approvals  FM Approvals LLC  
www.fmglobal.com  
(781) 762-4300

FM Global  FM Global  
(Formerly: FMG - FM Global)  
www.fmglobal.com  
(401) 275-3000

FRSA  Florida Roofing, Sheet Metal & Air Conditioning Contractors Association, Inc.  
www.floridaroof.com  
(407) 671-3772

FSA  Fluid Sealing Association  
www.fluidsealing.com  
(610) 971-4850

FSC  Forest Stewardship Council  
www.fsc.org  
49 228 367 66 0

GA  Gypsum Association  
www.gypsum.org  
(202) 289-5440

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

GRI  (Part of GSI)
GS  Green Seal
www.greenseal.org  (202) 872-6400
GSI  Geosynthetic Institute
www.geosynthetic-institute.org  (610) 522-8440
HI  Hydraulic Institute
www.pumps.org  (973) 267-9700
HI  Hydronics Institute
www.gamanet.org  (908) 464-8200
HMMA  Hollow Metal Manufacturers Association
(Part of NAAMM)
HPVA  Hardwood Plywood & Veneer Association
www.hpva.org  (703) 435-2900
HPW  H. P. White Laboratory, Inc.
www.hpwhite.com  (410) 838-6550
IAS  International Approval Services
(Now CSA International)
ICEA  Insulated Cable Engineers Association, Inc.
www.icea.net  (770) 830-0369
ICRI  International Concrete Repair Institute, Inc.
www.icri.org  (847) 827-0830
IEC  International Electrotechnical Commission
www.iec.ch  41 22 919 02 11
IEEE  Institute of Electrical and Electronics Engineers, Inc. (The)
www.ieee.org  (212) 419-7900
IES  Illuminating Engineering Society
www.ies.org  (212) 248-5000
IESNA  Illuminating Engineering Society of North America
(Now IES)
IEST  Institute of Environmental Sciences and Technology
www.iest.org  (847) 981-0100
IGCC  Insulating Glass Certification Council
www.igcc.org  (315) 646-2234
IGMA  Insulating Glass Manufacturers Alliance
www.igmaonline.org  (613) 233-1510
ILI  Indiana Limestone Institute of America, Inc.
www.iliai.com  (812) 275-4426
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<th>Organization</th>
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<tr>
<td>ISO</td>
<td>International Organization for Standardization</td>
<td>41 22 749 01 11</td>
<td><a href="http://www.iso.ch">www.iso.ch</a></td>
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<td></td>
<td>Available from ANSI</td>
<td>(202) 293-8020</td>
<td><a href="http://www.ansi.org">www.ansi.org</a></td>
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<td>ISSFA</td>
<td>International Solid Surface Fabricators Association</td>
<td>(877) 464-7732</td>
<td><a href="http://www.issfa.net">www.issfa.net</a></td>
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<tr>
<td></td>
<td>Intertek Testing Service NA</td>
<td>(702) 567-8150</td>
<td>(Now ETL SEMCO)</td>
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<tr>
<td>ITU</td>
<td>International Telecommunication Union</td>
<td>41 22 730 51 11</td>
<td><a href="http://www.itu.int/home">www.itu.int/home</a></td>
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<tr>
<td>KCMA</td>
<td>Kitchen Cabinet Manufacturers Association</td>
<td>(703) 264-1690</td>
<td><a href="http://www.kcma.org">www.kcma.org</a></td>
</tr>
<tr>
<td>LPI</td>
<td>Lightning Protection Institute</td>
<td>(800) 488-6864</td>
<td><a href="http://www.lightning.org">www.lightning.org</a></td>
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<tr>
<td>MBMA</td>
<td>Metal Building Manufacturers Association</td>
<td>(216) 241-7333</td>
<td><a href="http://www.mbma.com">www.mbma.com</a></td>
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<tr>
<td>MFMA</td>
<td>Maple Flooring Manufacturers Association, Inc.</td>
<td>(888) 480-9138</td>
<td><a href="http://www.maplefloor.org">www.maplefloor.org</a></td>
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<tr>
<td>MFMA</td>
<td>Metal Framing Manufacturers Association, Inc.</td>
<td>(312) 644-6610</td>
<td><a href="http://www.metalframingmfg.org">www.metalframingmfg.org</a></td>
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<td>MH</td>
<td>Material Handling</td>
<td>(Now MHIA)</td>
<td><a href="http://www.mhia.org">www.mhia.org</a></td>
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<tr>
<td>MHIA</td>
<td>Material Handling Industry of America</td>
<td>(800) 345-1815</td>
<td>(704) 676-1190</td>
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<tr>
<td>MIA</td>
<td>Marble Institute of America</td>
<td>(440) 250-9222</td>
<td><a href="http://www.marble-institute.com">www.marble-institute.com</a></td>
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<td>MPI</td>
<td>Master Painters Institute</td>
<td>(888) 674-8937</td>
<td>(604) 298-7578</td>
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<td>MSS</td>
<td>Manufacturers Standardization Society of The Valve and Fittings Industry Inc.</td>
<td>(703) 281-6613</td>
<td><a href="http://www.mss-hq.com">www.mss-hq.com</a></td>
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<tr>
<td>NAAMM</td>
<td>National Association of Architectural Metal Manufacturers</td>
<td>(630) 942-6591</td>
<td><a href="http://www.naamm.org">www.naamm.org</a></td>
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<tr>
<td>NACE</td>
<td>NACE International</td>
<td>(800) 797-6623</td>
<td>(Now MHIA)</td>
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<td></td>
<td>(National Association of Corrosion Engineers International)</td>
<td>(281) 228-6200</td>
<td><a href="http://www.nace.org">www.nace.org</a></td>
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<tr>
<td>NADCA</td>
<td>National Air Duct Cleaners Association</td>
<td>(202) 737-2926</td>
<td><a href="http://www.nadca.com">www.nadca.com</a></td>
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<td>NAIMA</td>
<td>North American Insulation Manufacturers Association</td>
<td>(703) 684-0084</td>
<td><a href="http://www.naima.org">www.naima.org</a></td>
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<tr>
<td>NBGQA</td>
<td>National Building Granite Quarries Association, Inc.</td>
<td>(800) 557-2848</td>
<td><a href="http://www.nbgqa.com">www.nbgqa.com</a></td>
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<td>NCMA</td>
<td>National Concrete Masonry Association</td>
<td>(703) 713-1900</td>
<td><a href="http://www.ncma.org">www.ncma.org</a></td>
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<td>NCPI</td>
<td>National Clay Pipe Institute</td>
<td>(262) 248-9094</td>
<td><a href="http://www.ncpi.org">www.ncpi.org</a></td>
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<td>NCTA</td>
<td>National Cable &amp; Telecommunications Association</td>
<td>(202) 775-2300</td>
<td><a href="http://www.ncta.com">www.ncta.com</a></td>
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<td>NEBB</td>
<td>National Environmental Balancing Bureau</td>
<td>(301) 977-3698</td>
<td><a href="http://www.nebb.org">www.nebb.org</a></td>
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<td>NECA</td>
<td>National Electrical Contractors Association</td>
<td>(301) 657-3110</td>
<td><a href="http://www.necanet.org">www.necanet.org</a></td>
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<td>NeLMA</td>
<td>Northeastern Lumber Manufacturers' Association</td>
<td>(207) 829-6901</td>
<td><a href="http://www.nelma.org">www.nelma.org</a></td>
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<td>NEMA</td>
<td>National Electrical Manufacturers Association</td>
<td>(703) 841-3200</td>
<td><a href="http://www.nema.org">www.nema.org</a></td>
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<td>NETA</td>
<td>InterNational Electrical Testing Association</td>
<td>(888) 300-6382</td>
<td><a href="http://www.netaworld.org">www.netaworld.org</a></td>
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<td>(869) 488-6382</td>
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<td>NFPA</td>
<td>NFPA (National Fire Protection Association)</td>
<td>(800) 344-3555</td>
<td><a href="http://www.nfpa.org">www.nfpa.org</a></td>
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<td>(617) 770-3000</td>
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<td>NFRC</td>
<td>National Fenestration Rating Council</td>
<td>(301) 589-1776</td>
<td><a href="http://www.nfrc.org">www.nfrc.org</a></td>
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<td>NGA</td>
<td>National Glass Association</td>
<td>(866) 342-5642</td>
<td><a href="http://www.glass.org">www.glass.org</a></td>
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<td>(703) 442-4890</td>
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<td>NHLA</td>
<td>National Hardwood Lumber Association</td>
<td>(800) 933-0318</td>
<td><a href="http://www.nathardwood.org">www.nathardwood.org</a></td>
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<td>(901) 377-1818</td>
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<td>NLGA</td>
<td>National Lumber Grades Authority</td>
<td>(604) 524-2393</td>
<td><a href="http://www.nlga.org">www.nlga.org</a></td>
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<td>NOFMA</td>
<td>NOFMA: The Wood Flooring Manufacturers Association</td>
<td>(901) 526-5016</td>
<td><a href="http://www.nofma.com">www.nofma.com</a></td>
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<td>(Formerly: National Oak Flooring Manufacturers Association)</td>
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<td>NOMMA</td>
<td>National Ornamental &amp; Miscellaneous Metals Association</td>
<td>(888) 516-8585</td>
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<td>NRCA</td>
<td>National Roofing Contractors Association</td>
<td>(800) 323-9545</td>
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<td>(847) 299-9070</td>
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<td>NRMCA</td>
<td>National Ready Mixed Concrete Association</td>
<td>(888) 846-7622</td>
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<td>(301) 587-1400</td>
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<td>NSF</td>
<td>NSF International (National Sanitation Foundation International)</td>
<td>(800) 673-6275</td>
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<td>NSSGA</td>
<td>National Stone, Sand &amp; Gravel Association</td>
<td>(800) 342-1415</td>
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<td>(703) 525-8788</td>
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<td>NTMA</td>
<td>National Terrazzo &amp; Mosaic Association, Inc. (The)</td>
<td>(800) 323-9736</td>
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<td>(540) 751-0930</td>
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<td>PCI</td>
<td>Precast/Prestressed Concrete Institute</td>
<td>(312) 786-0300</td>
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<td>PDCA</td>
<td>Painting &amp; Decorating Contractors of America</td>
<td>(800) 332-7322</td>
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<td>(314) 514-7322</td>
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<td>PDI</td>
<td>Plumbing &amp; Drainage Institute</td>
<td>(800) 589-8956</td>
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<td>(978) 557-0720</td>
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<td>PGI</td>
<td>PVC Geomembrane Institute</td>
<td>(217) 333-3929</td>
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<td><a href="http://pgi-tp.cee.uiuc.edu">http://pgi-tp.cee.uiuc.edu</a></td>
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<td>PLANET</td>
<td>Professional Landcare Network</td>
<td>(800) 395-2522</td>
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<td><a href="http://www.landcarenetwork.org">www.landcarenetwork.org</a></td>
<td>(703) 736-9666</td>
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<td>PTI</td>
<td>Post-Tensioning Institute</td>
<td>(602) 870-7540</td>
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<td>RCSC</td>
<td>Research Council on Structural Connections</td>
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<td><a href="http://www.boltcouncil.org">www.boltcouncil.org</a></td>
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<td>RFCI</td>
<td>Resilient Floor Covering Institute</td>
<td>(301) 340-8580</td>
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<td>RIS</td>
<td>Redwood Inspection Service</td>
<td>(925) 935-1499</td>
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<td><a href="http://www.redwoodinspection.com">www.redwoodinspection.com</a></td>
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<tr>
<td>SCTE</td>
<td>Society of Cable Telecommunications Engineers</td>
<td>(800) 542-5040</td>
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<td><a href="http://www.scte.org">www.scte.org</a></td>
<td>(610) 363-6888</td>
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<td>SDI</td>
<td>Steel Deck Institute</td>
<td>(847) 458-4647</td>
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<td>SDI</td>
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<td>(440) 899-0010</td>
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<td><a href="http://www.steeldoor.org">www.steeldoor.org</a></td>
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<td>SEFA</td>
<td>Scientific Equipment and Furniture Association</td>
<td>(877) 294-5424</td>
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<td><a href="http://www.sefalabs.com">www.sefalabs.com</a></td>
<td>(516) 294-5424</td>
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<td>SEI/ASCE</td>
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<td>SGCC</td>
<td>Safety Glazing Certification Council</td>
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REFERENCES

SIA Security Industry Association
www.sgcc.org
(866) 817-8888
(703) 683-2075

SJI Steel Joist Institute
www.steeljoist.org
(843) 626-1995

SMA Screen Manufacturers Association
www.smainfo.org
(561) 533-0991

SMACNA Sheet Metal and Air Conditioning Contractors’ National Association
www.smacna.org
(703) 803-2980

SPFA Spray Polyurethane Foam Alliance
www.sprayfoam.org
(800) 523-6154

SPIB Southern Pine Inspection Bureau
www.spib.org
(850) 434-2611

SPRI Single Ply Roofing Industry
www.spri.org
(781) 647-7026

SSPC SSPC: The Society for Protective Coatings
www.sspc.org
(877) 281-7772
(412) 281-2331

STI Steel Tank Institute
www.steeltank.com
(847) 438-8265

SWI Steel Window Institute
www.steelwindows.com
(216) 241-7333

SWRI Sealant, Waterproofing, & Restoration Institute
www.swrionline.org
(816) 472-7974

TCNA Tile Council of North America, Inc.
www.tileusa.com
(864) 646-8453

TIA/EIA Telecommunications Industry Association/Electronic Industries Alliance
www.tiaonline.org
(703) 907-7700

TMS The Masonry Society
www.masonrysociety.org
(303) 939-9700

TPI Turfgrass Producers International
www.turfgrasssod.org
(800) 405-8873
(847) 649-5555

TRI Tile Roofing Institute
www.tileroofing.org
(312) 670-4177

UL Underwriters Laboratories Inc.
www.ul.com
(877) 854-3577
(847) 272-8800

USGBC U.S. Green Building Council
(800) 795-1747
www.usgbc.org

USITT United States Institute for Theatre Technology, Inc. (800) 938-7488
www.usitt.org (315) 463-6463

WASTEC Waste Equipment Technology Association (800) 424-2869
www.wastec.org (202) 244-4700

WCMA Window Covering Manufacturers Association (212) 297-2122
www.wcmanet.org

WCSC Window Covering Safety Council (800) 506-4636
www.windowcoverings.org (212) 297-2109

WDMA Window & Door Manufacturers Association (800) 223-2301
www.wdma.com (847) 299-5200

WMMPA Wood Moulding & Millwork Producers Association (800) 550-7889
www.wmmpa.com (530) 661-9591

WSRCA Western States Roofing Contractors Association (800) 725-0333
www.wsrca.com (650) 570-5441

WWPA Western Wood Products Association (503) 224-3930
www.wwpa.org

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

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

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

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

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

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

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

DOC Department of Commerce (202) 482-2000
www.commerce.gov

DOD Department of Defense (215) 697-6257
D. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.
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<td>ADAAG</td>
<td>Americans with Disabilities Act (ADA)</td>
<td>(800) 872-2253</td>
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<td></td>
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<td>DOD</td>
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<td>UFAS</td>
<td>Uniform Federal Accessibility Standards</td>
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PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 42 00
SECTION 01 42 10
ABBREVIATIONS - TERMINOLOGY

& and
A astragal, acid, compressed air, ampere
@ at
AB anchor bolt, air blender, auger boring
A/C air condition, air conditioner
AC air compressor, alternating current, asphaltic concrete
ACB air circuit breaker
ACL across the line
ACLD air cooled
ACOUS acoustical
ACSR aluminum conduit or steel reinforced
ACU air conditioning unit
ACV air control valve
AD area drain, automatic damper
ADDL additional
ADH adhesive
ADJ adjust, adjustable
ADMIN administration
A/E Architect/Engineer
AF air filter, amps frame
AFD adjustable frequency drive
AFF above finished floor
AFG above finished grade
AFH air filter housing
AFM air flow meter
AGGR aggregate
AHC architectural hardware consultant
AHU air handling unit
AIC ampere interrupting capacity
ALUM aluminum
ALT alternate, altitude
AM amplitude modulation, ammeter, acoustical material
AMB ambient
ANCT acid neutralization tank
ANG angle
AMP amplifier
ANOD anodized
ANN annunciator
ANS automatic answer and recall switch
ANT antenna
AP access panel
APC acoustical plaster ceiling
APD air pressure drop
APPAR apparatus
APPROX approximate
APPX appendix
ARCH architectural
ARR arrester
ART article
ASPH asphalt
ASST Assistant
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<td>acoustical tile ceiling</td>
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<td>ATS</td>
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<td>D</td>
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<td>dry bulb, decibel, direct bury</td>
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FO fiber optic
FOBB fiber optic backbone
FOCC fiber optic cross connect
FODC fiber optic distribution cabinet
FOF fuel oil fill
FOR fuel oil return
FOS fuel oil supply
FOSE fiber optic service entrance
FOV fuel oil vent
FP full penetration
FR fire retardant
FRK foil reinforced kraft
FRP fiberglass reinforced plastic
FS far side, floor sink
FT finned tube
FTG footing
FURN furnish
FU furnace unit
FUT future
FV field verify, face velocity
FVC fire valve cabinet
FW flammable waste
FWC fabric wall covering
FXTR fixture

G gas, ground, grille
GA gauge, gage
GALV galvanize(d)
G.C. glazed coating
GCWR glycol chilled water return
GCWS glycol chilled water supply
GD grid (ceilings)
GEN generator
G.F. granular fill
GFI ground fault interrupter
GFP ground fault protection
GFCI ground fault circuit interrupter
GFRC glass fiber reinforced cement
GFRG glass fiber reinforced gypsum
GI galvanized iron
GL glass
GR grade
GRD/GND ground
GRF glass fiber reinforced fabrications
GSB gypsum sheathing board
GWB gypsum wallboard
GWS glycol water supply
GWR glycol water return
GYP gypsum

H humidifier, height
HA hot air
H2O water
HB hose bib
HBC high build glazed coating
HC handicapped, heating coil
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<td>hardwood</td>
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<td>hardware</td>
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<td>helium</td>
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<td>shielded twisted pair</td>
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<tr>
<td>STR</td>
<td>strainer</td>
</tr>
<tr>
<td>STRUCT</td>
<td>structural</td>
</tr>
<tr>
<td>SUP</td>
<td>support</td>
</tr>
<tr>
<td>SURF</td>
<td>surface</td>
</tr>
<tr>
<td>Abbreviation</td>
<td>Explanation</td>
</tr>
<tr>
<td>--------------</td>
<td>-------------</td>
</tr>
<tr>
<td>SUSP</td>
<td>suspend(ed)</td>
</tr>
<tr>
<td>SV</td>
<td>sheet vinyl, steam vent</td>
</tr>
<tr>
<td>SVD</td>
<td>switched voice and data</td>
</tr>
<tr>
<td>SV(N.S.)</td>
<td>sheet vinyl (non-slip)</td>
</tr>
<tr>
<td>SVWA</td>
<td>sheet vinyl wall covering</td>
</tr>
<tr>
<td>SW</td>
<td>supply wall grille, switch, soft water, southwest, sidewalk</td>
</tr>
<tr>
<td>SWBD</td>
<td>switchboard</td>
</tr>
<tr>
<td>SWC</td>
<td>soft wall covering</td>
</tr>
<tr>
<td>SWGR</td>
<td>switchgear</td>
</tr>
<tr>
<td>SX</td>
<td>steam exhaust</td>
</tr>
<tr>
<td>SYM</td>
<td>symbol, symmetrical</td>
</tr>
<tr>
<td>SYS</td>
<td>system</td>
</tr>
<tr>
<td>T</td>
<td>toilet, throw, top, tank, temperature, top bars, tile, tangent</td>
</tr>
<tr>
<td>T &amp; B</td>
<td>testing and balancing, top and bottom</td>
</tr>
<tr>
<td>T &amp; G</td>
<td>tongue and groove</td>
</tr>
<tr>
<td>TA</td>
<td>tempered air, transfer air, toilet accessories</td>
</tr>
<tr>
<td>TB</td>
<td>Tackboard</td>
</tr>
<tr>
<td>TBC</td>
<td>tackboards, natural cork</td>
</tr>
<tr>
<td>TBP</td>
<td>tackboards, plastic</td>
</tr>
<tr>
<td>TC</td>
<td>top of curb</td>
</tr>
<tr>
<td>TD</td>
<td>temperature differential</td>
</tr>
<tr>
<td>TDC</td>
<td>transverse duct connection</td>
</tr>
<tr>
<td>TEFC</td>
<td>totally enclosed fan-cooled</td>
</tr>
<tr>
<td>TEL</td>
<td>telephone</td>
</tr>
<tr>
<td>TEMP</td>
<td>temperature, temporary</td>
</tr>
<tr>
<td>TENV</td>
<td>totally enclosed non-ventilated</td>
</tr>
<tr>
<td>TRZ</td>
<td>terrazzo</td>
</tr>
<tr>
<td>TERM</td>
<td>terminal</td>
</tr>
<tr>
<td>TH</td>
<td>total heat, total head (pumps)</td>
</tr>
<tr>
<td>THD</td>
<td>Total Harmonic Distortion</td>
</tr>
<tr>
<td>THOUT</td>
<td>throughout</td>
</tr>
<tr>
<td>THRSLD</td>
<td>threshold</td>
</tr>
<tr>
<td>THRU</td>
<td>Through</td>
</tr>
<tr>
<td>TL</td>
<td>task light</td>
</tr>
<tr>
<td>TOC</td>
<td>top of caisson, top of concrete</td>
</tr>
<tr>
<td>TOF</td>
<td>top of footing</td>
</tr>
<tr>
<td>TONE</td>
<td>tone transfer</td>
</tr>
<tr>
<td>TOS</td>
<td>top of steel</td>
</tr>
<tr>
<td>TOW</td>
<td>top of wall</td>
</tr>
<tr>
<td>TP</td>
<td>toilet partition, total pressure, thumb piece, twisted pair</td>
</tr>
<tr>
<td>TPC</td>
<td>textured plastic coating</td>
</tr>
<tr>
<td>TR</td>
<td>top of register</td>
</tr>
<tr>
<td>TRAN</td>
<td>transverse</td>
</tr>
<tr>
<td>TRT</td>
<td>treat, treatment, treated</td>
</tr>
<tr>
<td>T-STAT</td>
<td>thermostat</td>
</tr>
<tr>
<td>TS</td>
<td>tube steel</td>
</tr>
<tr>
<td>TSP</td>
<td>total static pressure</td>
</tr>
<tr>
<td>TSU</td>
<td>thermal storage unit</td>
</tr>
<tr>
<td>TU</td>
<td>terminal unit</td>
</tr>
<tr>
<td>TV</td>
<td>television</td>
</tr>
<tr>
<td>TVSS</td>
<td>transient voltage surge suppressor</td>
</tr>
<tr>
<td>TX</td>
<td>transformer</td>
</tr>
<tr>
<td>TYP</td>
<td>typical</td>
</tr>
<tr>
<td>U</td>
<td>urinal</td>
</tr>
</tbody>
</table>
ABBREVIATIONS - TERMINOLOGY

UC undercut, undercounter, undercarpet
UD underdrain
UG underground
UGE underground electric
UGS underground signal
UGT underground telephone
UH unit heater
UHF ultra high frequency
UNEX Unexcavated
UNFIN unfinished
UNO unless noted otherwise
UPS uninterruptible power supply
UPW ultra pure water
UPWC ultra pure water circulating
UR urinal
URG’T urgent
US utility sink, ultrasound
UTIL utility
UV ultraviolet

V valve, vent, volume, velocity, vacuum, volt
VAC vacuum, volts alternating current
VAV variable air volume
VB vapor barrier, vacuum breaker
VC vitrified clay, vertical curve
VCP vitrified clay pipe
VCPX vitrified clay pipe, extra strength
VD volume damper
VEH vehicle
VENT ventilat(ion) (or)
VERT vertical
VEST vestibule
VF ventilation fan
VFD variable frequency drive
VHF very high frequency
VM voltmeter
VOL volume
VP vacuum pump, velocity pressure
VPI vertical point of intersection
VPOC vertical point on curve
VPT vertical point of tangent
VRI variable volume with reheat interior
VS venturi station, vacuum (canister) slide
VSI voltage source inverters
VT vinyl tile
VTR vent through roof
VV variable volume
VVR variable volume with reheat
VWC vinyl wall covering

W West, wide flange, wall mounted, width, waste (piping), water, watt, wire, waterline

W/ With
WA Wainscot
WB wet bulb, wall bumper
WBT wet bulb temperature
<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>WC</td>
<td>water closet</td>
</tr>
<tr>
<td>WCF</td>
<td>wood wallcovering - flexible veneer</td>
</tr>
<tr>
<td>WCT</td>
<td>wood wallcovering - tambour</td>
</tr>
<tr>
<td>WD</td>
<td>wood, window dimension</td>
</tr>
<tr>
<td>WDW</td>
<td>window</td>
</tr>
<tr>
<td>WF</td>
<td>wall fin, wood flooring</td>
</tr>
<tr>
<td>WG</td>
<td>water gauge, wallguard</td>
</tr>
<tr>
<td>WH</td>
<td>water heater, wall hydrant</td>
</tr>
<tr>
<td>WHA</td>
<td>water hammer arrester</td>
</tr>
<tr>
<td>WI</td>
<td>wrought iron</td>
</tr>
<tr>
<td>WL</td>
<td>wind load</td>
</tr>
<tr>
<td>WLD</td>
<td>welded</td>
</tr>
<tr>
<td>WM</td>
<td>wattmeter</td>
</tr>
<tr>
<td>WOA</td>
<td>width over all</td>
</tr>
<tr>
<td>WOF</td>
<td>walk off mat</td>
</tr>
<tr>
<td>W/O</td>
<td>without</td>
</tr>
<tr>
<td>WP</td>
<td>waterproof(ing), weatherproof (electrical), working point</td>
</tr>
<tr>
<td>WPD</td>
<td>water pressure drop</td>
</tr>
<tr>
<td>WS</td>
<td>wall switch, waterstop, water softener, waste stack, water surface</td>
</tr>
<tr>
<td>WT</td>
<td>weight</td>
</tr>
<tr>
<td>WWF</td>
<td>welded wire fabric</td>
</tr>
<tr>
<td>XFMR</td>
<td>transformer</td>
</tr>
<tr>
<td>XL</td>
<td>extra long</td>
</tr>
<tr>
<td>XLP</td>
<td>cross linked polyethylene</td>
</tr>
<tr>
<td>XP</td>
<td>explosion proof</td>
</tr>
<tr>
<td>X-STR</td>
<td>extra strength</td>
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<tr>
<td>YD</td>
<td>yard</td>
</tr>
<tr>
<td>YH</td>
<td>yard hydrant</td>
</tr>
<tr>
<td>YR</td>
<td>year</td>
</tr>
<tr>
<td>Y,W</td>
<td>wye</td>
</tr>
<tr>
<td>ZA</td>
<td>zone annunciator</td>
</tr>
<tr>
<td>ZN</td>
<td>zone</td>
</tr>
<tr>
<td>1P</td>
<td>one pole</td>
</tr>
<tr>
<td>2P</td>
<td>double pole</td>
</tr>
<tr>
<td>1S</td>
<td>single speed</td>
</tr>
<tr>
<td>2S</td>
<td>two speed</td>
</tr>
<tr>
<td>1W</td>
<td>one winding</td>
</tr>
<tr>
<td>2W</td>
<td>two winding</td>
</tr>
</tbody>
</table>

END OF SECTION
SECTION 01 42 16
DEFINITIONS

PART 1 - GENERAL

1.1 DESCRIPTION
A. General:
   1. Basic definitions are included to define terminology used throughout specifications.
   2. Source for some definitions in this section is THE AMERICAN INSTITUTE OF 
      ARCHITECTS DOCUMENT A201-1997, the GENERAL CONDITIONS OF THE 
      CONTRACT FOR CONSTRUCTION, Copyright ©1997.
      a. Some AIA definitions have been modified.

1.2 THE CONTRACT DOCUMENTS
A. The Contract Documents consist of the Agreement between Owner and Contractor (hereinafter 
   the Agreement), Conditions of the Contract (General, Supplementary and other Conditions), 
   Drawings, Project Manual, Specifications, Addenda issued prior to execution of the Contract, 
   other documents listed in the Agreement and Modifications issued after execution of the 
   Contract. A Modification is (1) a written amendment to the Contract signed by both parties, (2) 
   a Change Order or a Change Proposal Request, (3) a Construction Change Directive or (4) a 
   clarification, interpretation or a written order for a minor change in the Work issued by the 
   Architect. Unless specifically enumerated in the Agreement, the Contract Documents do not 
   include other documents such as bidding requirements (advertisement or invitation to bid, 
   Instructions to Bidders, sample forms, the Contractor’s bid or portions of Addenda relating to 
   bidding requirements).*

B. The Contract Documents shall be enumerated on attachment(s) to the Agreement, and 
   attachment(s) shall be signed by the Owner and Contractor.*
   1. These Documents shall prevail in case of an inconsistency with subsequent versions made 
      through manipulatable electronic operations involving computers.

C. The intent of the Contract Documents is to include all items necessary for the proper execution 
   and completion of the Work by the Contractor. The Contract Documents are complementary, 
   and what is required by one shall be as binding as if required by all; performance by the 
   Contractor shall be required only to the extent consistent with the Contract Documents and 
   reasonably inferable from them.*

D. Organization of the Specifications into divisions, sections and articles, and arrangement of 
   Drawings shall not control the Contractor in dividing the Work among Subcontractors or in 
   establishing the extent of Work to be performed, nor to limit the scope of work performed by 
   any trade or by any Subcontractor or supplier.*
   1. Conditions of the Contract, Supplementary Conditions, and General Requirements apply to 
      all specifications.

E. Unless otherwise stated in the Contract Documents, words which have well-known technical or 
   construction industry meanings are used in the Contract Documents in accordance with such 
   recognized meanings.*
F. The Drawings, Specifications and other documents, including those in electronic form, prepared by the Architect and/or Architect’s consultants are instruments of service through which the Work to be executed by the Contractor is described. The Contractor may retain one record set. Neither the Contractor nor any Subcontractor, Sub-subcontractor or material or equipment supplier shall own or claim a copyright in the Drawings, Specifications and other documents prepared by the Architect or the Architect’s consultants, and unless otherwise indicated the Architect and/or the Architect’s consultants shall be deemed the author of them and will retain all common law, statutory and other reserved rights, in addition to the copyrights, unless indicated differently in the Owner - Architect Agreement. The Drawings, Specifications and other documents prepared by the Architect and the Architect’s consultants, and copies thereof furnished to the Contractor, are for use solely with respect to this Project. They are not to be used by the Contractor or any Subcontractor, Sub-subcontractor or material or equipment supplier on other projects or for additions to this Project outside the scope of the Work without the specific written consent of the Owner, Architect and Architect’s consultants. The Contractor, Subcontractors, Sub-subcontractors and material or equipment suppliers are authorized to use and reproduce applicable portions of the Drawings, Specifications and other documents prepared by the Architect and/or the Architect’s consultants appropriate to and for use in the execution of their Work under the Contract Documents. All copies made under this license shall bear the statutory copyright notice, if any, shown on the Drawings, Specifications and other documents prepared by the Architect and/or the Architect’s consultants. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with this Project is not to be construed as publication in derogation of the Architect’s or Architect’s consultants’ copyrights or other reserved rights.

1.3 THE CONTRACT

A. The Contract Documents form the Contract for Construction. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations or agreements, either written or oral. The Contract may be amended or modified only by a Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind 1) between the Architect and Contractor, 2) between the Owner and a Subcontractor or Sub-subcontractor or 3) between any persons or entities other than the Owner and Contractor. The Architect shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of the Architect’s duties.

1.4 THE WORK

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

B. Although not indicated, Work includes providing supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation.

1.5 THE PROJECT

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

1.6 THE DRAWINGS

A. The Drawings are the graphic and pictorial portions of the Contract Documents, wherever located and whenever issued, showing the design, location and dimensions of the Work, generally including plans, elevations, sections, details, schedules and diagrams.
1.7 THE SPECIFICATIONS
A. The Specifications are that portion of the Contract Documents consisting of the written requirements for materials, equipment, construction systems, standards and workmanship for the Work, and performance of related services.*

1.8 THE PROJECT MANUAL
A. The Project Manual is the volume usually assembled for the Work which may include the bidding requirements, sample forms, Conditions of the Contract and Specifications.*

1.9 FURNISH
A. Unless specifically limited in context, means; furnishing to project site items specified, to include unpacking and assembly if necessary.

1.10 INSTALL
A. Means incorporating in the Work including all necessary labor, materials, equipment and connections to perform work indicated.

1.11 PROVIDE
A. Means furnish and install.

1.12 INDICATED AND SHOWN
A. The word “indicated” or “shown” and any derivative thereof shall mean; as detailed, scheduled, or stated in Contract Documents.

1.13 THE CONTRACTOR SHALL
A. In interest of conciseness; sentences, statements, and clauses may be verb phrases with expressed verbs such as “furnish,” “install,” “provide,” “perform,” “construct,” “erect,” “comply,” “apply,” “submit,” etc. Any such sentences, statements, and clauses are to be interpreted to include the applicable form of the phrase “the Contractor shall” preceding the expressed verb, with the requirements described interpreted as mandatory elements of Contract.

1.14 EVALUATION
A. “Evaluate” or “Evaluation” means, “to become generally familiar with the process and quality of the work and to determine if the work is preceding in general accordance with the Contract Documents based on what is plainly visible at the construction site, without the removal of materials or other construction that is in place”.

1.15 INSPECT
A. As used in these documents means: “The type of observation that a reasonably prudent architect, in the exercise of ordinary care, would make to determine if the work is in general compliance with the Contract Documents; they are not inspections as would necessarily disclose a defect.”

1.16 SEE
A. In interest of conciseness, references to specification sections and details are preceded by word “see.” Any such references are to be interpreted to include applicable form of phrase “, and comply with,”.

1.17 CAPITALIZATION
A. Terms capitalized in these General Conditions include those which are 1) specifically defined, 2) the titles of numbered articles and identified references to Paragraphs, Subparagraphs and Clauses in the document or 3) the titles of other documents published by the American Institute of Architects.*
1.18  OWNER
A. The Owner is the person or entity identified as such in the Agreement and is referred to
throughout the Contract Documents as if singular in number. The term “Owner” means the
Owner or the Owner’s authorized representative.*
B. Owner as referred to in these documents is: University of Colorado at Boulder.

1.19  CONTRACTOR
A. The Contractor is the person or entity identified as such in the Agreement and is referred to
throughout the Contract Documents as if singular in number. The term “Contractor” means the
Contractor or the Contractor’s authorized representative.*

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

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

1.22  ARCHITECT
A. The Architect is the person lawfully licensed to practice architecture or an entity lawfully
practicing architecture identified as such in the Agreement and is referred to throughout the
Contract Documents as if singular in number. The term “Architect” means the Architect or the
Architect’s authorized representative.*

1.23  ARCHITECT, ENGINEER, ARCHITECT/ENGINEER OR ENGINEER/ARCHITECT
A. Each of these terms mean HDR Architecture, Inc., or an affiliate as otherwise provided in
Contract Documents, or duly authorized representatives, such representatives acting severally
within scope of particular duties entrusted to them, unless otherwise provided in Contract
Documents.

1.24  BASE AND OPTIONAL
A. See Acceptable Manufacturers and Products, Section 01 61 00.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

NOTES

END OF SECTION
PART 1 - GENERAL

1.1 DESCRIPTION

A. General:
1. ASTM standards are documents developed and established by American Society for Testing and Materials (ASTM) and meet approval requirements of ASTM procedures and regulations.
2. ANSI standards are documents developed and established by American National Standards Institute, Inc. (ANSI) and meet approval requirements of ANSI procedures and regulations.
3. NFPA standards (National Fire Codes) are documents developed and established by National Fire Protection Association, (NFPA) and meet approval requirements of NFPA procedures and regulations.
4. Other Reference Standards as indicated.
5. Specification sections will indicate ASTM, ANSI, NFPA and other standards by number.
   a. Utilize the latest edition and amendments as published at the time of Contract Award.
      1) Exception: Where the locally adopted Codes or authorities having jurisdiction otherwise stipulate that a specific edition must be followed.
   b. Dates and titles of referenced standards appear on appropriate web sites:
      1) ASTM: www.astm.org
      2) ANSI: www.ansi.org/catalog/search.html
      3) NFPA: http://www.nfpa.org/
   c. Web site indexes generally include all standards published by the subject organization; and may contain standards that are not referenced for this project.
6. Parallel metric standards apply as required, but may not be identified in specification sections.

END OF SECTION
SECTION 01 43 44
COORDINATION DRAWINGS (CM)

PART 1 - GENERAL

1.1 DESCRIPTION - INTERIOR

A. Coordinate construction operations included in various Sections of Specifications to assure efficient and orderly installation of all parts of Work. Coordinate construction operations included under different Sections that depend on each other for proper installation, connection, and operation.

B. Coordination drawings: Reproducible overlay drawings showing work with horizontal and vertical dimensions to avoid interference with structural framing, ceilings, partitions, equipment, lights, mechanical, electrical, conveying systems, and other services:
   1. In and above ceilings.
   2. Within walls.
   3. Within chases.
   4. In mechanical spaces.
   5. In electrical spaces.

C. Sleeve, coredrill and blockout layout drawings: Drawings showing proposed locations and sizes of sleeves, coredrills, blockouts, and embedded items in concrete walls, columns, floors and beams.

D. Prepare coordination drawings where careful coordination is needed for installation of products and materials fabricated by separate entities.

E. Prepare coordination drawings where limited space availability necessitates maximum utilization of space for efficient installation of different components.

F. Coordinate installation of different components to assure maximum accessibility for required maintenance, service, and repair.

G. Work out all “tight” conditions involving Work of various Sections in advance of installation.

H. Prior to start of work in any given area, each Contractor approve, in writing, coordination drawings affecting Contractor’s work in that area.

I. Modifications required as result of failure to resolve interferences, provide correct coordination drawings, or call attention to changes required in other work as result of modifications shall be paid for by responsible Contractor.

J. Coordination meetings scheduled by Construction Manager with all affected Contractors.

1.2 PRODUCTION OF COORDINATION DRAWINGS

A. Construction Manager shall provide minimum 1/4 IN scale background drawings, showing:
   1. Partitions.
      a. Fire/smoke rated barriers.
   2. Ceiling heights.
   3. Structural framing locations and elevations.
   4. Column lines.
   5. Other work.

B. Contractors produce combined coordination layout drawings plan and sections of HVAC ductwork, hydronic, steam, condensate, fuel oil, fire protection piping, plumbing, special water systems, natural gas and medical gas systems electrical cable tray, conduit, conveying systems, equipment and other work.
C. Coordination Drawings shall be produced in CAD so they can be used for Shop Drawings and be updated at end of Project for Project Record Drawings.

1. Architect will furnish Contractor electronic drawing files of architectural plan backgrounds on CDR in AutoCAD DWG format.
   a. CAD drawings floor plan backgrounds will indicate wall layout, column lines and room name and numbering.
   b. Architect makes no representation as to accuracy or completeness of CAD files provided.

2. Have skilled CAD technician(s) produce following plans in same CAD program and version for Coordination Drawings and Shop Drawing submittals;
   a. Conveying systems.
   b. HVAC ductwork system.
   c. Piping systems.
   d. Plumbing systems.
   e. Fire protection system.
   f. Fire alarm system.
   g. Communication and security systems.
   h. Cable tray system.
   i. Lightning protection system.
   j. Building management system.

3. Indicate systems on separate CAD file with layers compliant with National CAD Standard to facilitate Coordination Drawings and Project Record Documents, using the background as an XREF to the coordination file.

4. Contractor may choose to create “paperspace views” and increase scale of plotted drawings to facilitate clarity of detail. Revised scale shall be indicated on plotted sheets.

5. Contractor shall provide plotted transparencies of individual systems so they can be overlaid on light table to facilitate coordination with other trades.

D. Resolve major interferences at initial coordination meeting prior to production of any drawings.

E. Produce initial coordination drawings within 30 days after initial meeting.

F. Construction Manager arrange for production of said drawings not provided by that time.

G. Meet as required to resolve interferences and correct coordination drawings.

1.3 AFTER APPROVAL

A. After Contractors’ written approval of coordination drawings, Construction Manager determine method used to resolve interferences not previously identified.

B. Construction Manager shall give written approval of changes to coordination drawings prior to start of work in affected area.

C. Maintain one copy of current approved Coordination Drawings at project site in Construction Manager’s office.

1.4 PRECEDENCE OF SERVICES FOR COORDINATION DRAWINGS

A. In event of conflicts involving location and layout of work; use following priority to resolve disputes:
   1. Structure and partitions have highest priority.
   2. Equipment location and access.
   3. Ceiling system and recessed light fixtures.
   4. Gravity drainage lines.
   5. High pressure ductwork and devices.
   6. Large pipe mains, valves and devices.
   7. Pneumatic tube and material conveying systems.
   8. Low pressure ductwork, diffusers, registers, grilles, HVAC equipment.
10. Small piping, tubing, electrical conduit, and devices.
   a. Conduits installed in corridors shall be maintained at least 9 IN above finished ceiling. Conduits shall be grouped within a 12 IN width.
   b. The space utilized for conduit shall be selected to allow access to all devices which normally require adjustment, repair, resetting, etc.
11. Sleeves through rated partitions.

1.5 PRODUCTION OF LAYOUT DRAWINGS

A. Construction Manager provide scale plan and elevation drawings.
B. Contractors indicate location and size of their required sleeves, blockouts and embedded items.
   1. At floor slabs and walls to be core drilled or cut, find and mark all reinforcing in both faces located by means of x-ray, pach-ometer, or prof-ometer.
   2. Submit sketch showing location of rebar and proposed cores for review.

1.6 SUBMITTALS

A. Project information:
   1. Contractor’s approved Coordination Drawings.
      a. Letter indicating one copy of approved Coordination Drawings available at project site.
      b. One copy of approved Coordination Drawings to Architect for information, if requested.
   2. Contractor’s proposed sleeve, coredrill and blockout layout drawings.
      a. One copy of drawing to Architect for information.

END OF SECTION
PART 1 - GENERAL

1.01 SUPPLEMENTAL TESTING

If required, the following testing shall be performed at the expense of the contractor installing the material being tested:

A. Material Substitution: Any tests of basic material or fabrication equipment offered as a substitute for specified item on which a test may be required in order to prove its compliance with the specifications.

B. Mechanical/Electrical: Tests on mechanical and electrical systems required to insure their proper installation and operation.

C. Any test that fails shall be paid for by the installing contractor subject to the following conditions:
   1. Quantity and nature of tests will be determined by the Consultant.
   2. All test shall be done in the presence of the Owner or his representative.
   3. Proof of noncompliance will make the installing contractor liable for any corrective action which the Owner feels is prudent including complete removal and replacement of defective material.

Nothing contained herein is intended to imply that the installing contractor does not have the right to have tests performed on any material at any time for his own information and job control so long as the Consultant or Owner does not assume responsibility for costs or for giving them consideration when appraising quality of materials.

D. The Consultant shall determine the type and number of tests to be performed on the project.

1.02 TEST REPORTS

Reports of all tests made by testing laboratories shall distributed by the testing laboratory as follows:
   1 copy - Contractor
   1 copy - Applicable supplier or subcontractor
   1 copy - Owner
   1 copy - Consultant
   Other copies - as directed

1.03 QUALITY CONTROL SYSTEM

A. General: The contractor shall establish a quality control system to perform sufficient inspection and tests of all items of work, including that of all subcontractors, to ensure conformance to the Contract Documents for materials, workmanship, construction, finish, functional performance and identification. This control shall be established for all construction except where the Contract Documents provide for specific compliance tests by testing laboratories or Consultants employed by the Owner.
The quality control system is the means by which the Contractor assures that construction complies with the requirements of the Contract Documents. Controls shall be adequate to cover all construction operations and should be keyed to the proposed construction schedule.

B. The Contractor shall designate a quality control representative on staff to review the work to insure compliance with the contract documents by weekly jobsite visits for observation. The designated employee shall not be involved in the performance of the work. The quality control representative shall review the work and make necessary corrections to bring the work into compliance prior to scheduling the Architect for the final punchlist review.

C. Records: The Contractor shall maintain correct records on an appropriate form for all inspections and tests performed, instruction received from the Owner and actions taken as a result of those instructions. These records shall include evidence that the required inspections or tests have been performed (including type and number of inspections or tests, nature of defects, causes for rejection, etc.) proposed or directed remedial action, and corrective action taken. The Contractor shall document inspections and tests as required by each Section of the Specifications.

1.04 INDEPENDENT TESTING AGENCY SERVICES

A. The Owner will employ and pay for the services of an independent Testing Agency to perform the Inspections, special inspections, tests and other services when required by sections of the specification. Services shall be performed in accordance with requirements of governing authorities and with specified standards.

1. Contractor shall cooperate with Testing Agency personnel and shall furnish tools, sample of materials, design mixes, equipment and assistance as requested.
2. Contractor shall provide and maintain, for the sole use of the Testing Agency, adequate facilities for the safe storage and proper curing of concrete testing cylinders on the project site for the first 24 hours after casting as required by ASTM C 31, Method of Making and Curing Concrete Test Specimens in the field.
3. Contractor shall notify Testing Agency sufficiently in advance of operations to allow for completion of initial tests and proper assignment of inspection personnel.
4. Contractor shall notify the testing agency sufficiently in advance of cancellation of required testing operations. The Contractor shall assume responsibility for costs incurred due to the failure to provide such notice.

END OF SECTION
PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification sections, apply to work of this section.

1.02 DESCRIPTION OF REQUIREMENTS

A. This section of the General Requirements outlines the basic requirements for temporary services, utilities, and facilities which will indirectly enable adequate construction progress and processes, and will accommodate other necessary activities at the project site except as otherwise indicated, the costs of providing and using temporary services are included in the Contract Sum.

1.03 QUALITY ASSURANCE

A. Comply with governing regulations and utility company regulations and recommendations for the construction of temporary facilities, including but not necessarily limited to, code compliance, permits, inspections, testing, and health and safety compliance.

1.04 SITE CONDITIONS

A. Provide Temporary facilities and services at the time first needed at the site and maintain, expand, and modify the facilities as needed throughout the construction period and do not remove until no longer needed.

PART 2 - EXECUTION

2.01 GENERAL

A. Use qualified tradesmen for the installation of temporary facilities. Locate facilities where they will serve the total project construction work adequately and result in minimum interference with performance of the work. Relocate, modify, and extend facilities as required during the course of the work to properly accommodate the entire work of the project.

2.02 TEMPORARY FACILITIES

A. Temporary Water: Connect to existing water source as designated by the Owner for construction operations.

B. Temporary Telephone: Provide, maintain and pay for telephone service to field office at time of project mobilization. If a mobile phone is designated as the field office phone then it shall be a local number.

C. Sanitary Facilities: Comply with governing regulations, including safety and health codes for the type, number, location, operation, and maintenance of fixtures and facilities. Install sanitary facilities in available locations which will best serve the needs of personnel at the project site. Toilet
rooms in existing buildings or in new construction may not be used without written approval of the Owner.

D. Temporary Heat and Ventilation: Provide such OSHA approved heat and fuel, heating units, equipment as necessary to provide the required environmental conditions and to protect the work from damage due to cold. Maintain equipment in a clean, safe condition.

E. Fire Extinguisher:
1. Except as otherwise indicated or required, comply with the applicable recommendations of NFPA No. 10 "Portable Fire Extinguisher" for each area of each construction activity whenever combustible materials, flammable liquids, and similar exposures to possible fires are present.
2. Locate extinguisher where most convenient and effective for the intended purposes. Store combustible materials in recognized fire-safe locations and containers.

F. Protection
1. Barricades, Warning Signs, and lights: Comply with recognized standards and code requirements for the erection of substantial and structurally adequate barricades wherever needed to prevent accidents and losses. Paint with appropriate colors, graphics and warning signs to inform personnel at the site and the general public where exposure exists of the hazard being protected. Provide lighting where appropriate and needed for the recognition of the facility, including flashing red lights where appropriate.

G. Temporary Enclosure: Wherever required, provide temporary enclosure of materials, equipment, work in progress, and completed portions of work, so as to afford protection for both the work and employees.

H. Miscellaneous Facilities:
1. Provide ladders, ramps, and temporary stairs for access to all levels of the construction for general access by all trades. Individual contractors and subcontractors shall furnish their own stepladders, scaffolds, staging, work platforms, and other facilities for use of their workmen and as necessary for safety of all personnel.

I. Field Office:
1. The Contractor shall provide and maintain a suitable temporary field office for his own use. Offices and all other temporary structures shall be removed from the site upon completion of the work.
2. Temporary structures or storage used for storage and offices for contractors shall be located on the site in an orderly manner as determined by the Owner.

2.03 OPERATIONS AND TERMINATIONS

A. Supervision: Enforce strict discipline in the use of temporary facilities at the project site. Limit availability of facilities to essential and intended uses, so as to minimize waste and possibility of abuses and the resulting unsanitary and hazardous or dangerous conditions.

B. Maintenance: Operate and maintain temporary facilities in good operating condition through the time of use and until removal is authorized. Protect from damage by freezing temperatures and similar elements at the site.

C. Termination and removal: At the time the need has ended for each temporary facility, or when it has been replaced by authorized use of a permanent facility, or at the time of Substantial completion, promptly remove the facility unless requested by the Consultant to be retained for a longer period of time. Complete or restore permanent work which may have been delayed or otherwise
affected by the temporary facility. Replace work which cannot be satisfactorily restored. Except as otherwise indicated, the materials and equipment of temporary facilities remain the property of the contractors.

END OF SECTION
PART 1 - GENERAL

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

1.2 SUMMARY
A. Section includes:
   1. Products.
   2. Transportation and Handling.
   4. Manufacturer's Instructions.
   5. Product Options.
   6. Products List.
   7. Substitutions.
B. Related Sections:
   1. Division 01 Section "Quality Control."
   2. Division 01 Section "Operations and Maintenance Data."

1.3 DEFINITIONS
A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
   1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.
   2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
   3. Comparable Product: Product that is demonstrated and approved through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
B. Basis-of-Design Product Specification: A specification in which a specific manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of additional manufacturers named in the specification.
1.4 QUALITY ASSURANCE

A. Conform to applicable specifications and standards.

B. Comply with size, make, type and quality specified, or as specifically approved in writing by the Consultant.

C. Manufactured and Fabricated Products:
   1. Two or more items of the same kind shall be identical, by the same manufacturer.
   2. Equipment capacities, sizes and dimensions shown or specified shall be adhered to unless variations are specifically approved in writing.

1.5 TRANSPORTATION AND HANDLING

A. Arrange deliveries of products in accord with construction schedules, coordinate to avoid conflict with work and conditions at the site.

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

1.6 STORAGE AND PROTECTION

A. Store products in accordance with manufacturer's instruction, with seals and labels intact and legible.

B. Arrange storage to provide access for inspection. Periodically inspect to assure products are undamaged, and are maintained under required conditions.

1.7 MANUFACTURER’S INSTRUCTIONS

A. When Contract Documents require that installation of work shall comply with manufacturer's printed instructions, obtain and distribute copies of such instructions to parties involved in the installation, including one copy to the Consultant and one copy to the Contractor.

B. Perform work in accord with manufacturer's instructions. Do not omit any preparatory step or installation procedure unless specifically modified or exempted by Contract Documents.

1.8 PRODUCT OPTIONS

A. Products Specified by Reference Standards or by Description Only: Any product meeting those standards.

B. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not specifically named.

C. Consultant will review requests for substitutions with reasonable promptness, and notify, by Addendum, of the decision to accept or reject the requested substitution.
1.9 PRODUCT LIST

A. Within 15 days after signing of agreement, submit complete list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.

1.10 SUBSTITUTIONS

A. Will only be considered prior to bid or in the event that Equipment is not available.

1.11 SYSTEMS DEMONSTRATION

A. Prior to final inspection, demonstrate operation of each system to Consultant and Owner.

B. Instruct Owner's personnel in operation, adjustment, and maintenance of equipment and systems, using the operation and maintenance data as the basis of instruction.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01 60 00
PART 1 - GENERAL

1.1 SUMMARY

A. The performance of product, material, or system is result of manufacturing, fabrication, installation procedures, use, and maintenance:
   1. Therefore, Architect endeavors to specify quality levels for products, materials, or systems that are advertised to conceptually meet performance goals and desired attributes for the project.
      a. For most conceptually equal systems and materials, Architect may specify multiple manufacturers.
      b. In some cases, based on quality and attribute goals for project, the number of manufacturers may be limited.

B. Product, material, or system substitutions:
   1. Prior to bid: See Section 00 26 00.

1.2 DEFINITIONS

A. Following definitions are applicable to acceptable manufacturers and products listed in technical specification sections:
   1. "Base" manufacturer:
      a. Manufacturer listed as "Base" in Part 2 of specification section.
      b. Manufacturer listed as "Base" is particular manufacturer of a specific product used as basis of design.
   2. "Optional" manufacturer:
      a. Manufacturer listed as "Optional" in Part 2 of specification section.
      b. More than one manufacturer may be listed as "Optional."
      c. Manufacturers listed as "Optional" are particular manufacturers of products similar to specific product used as basis of design.
      d. Listing manufacturer as "Optional" indicates acceptance of that manufacturer as supplier of a product, but only to the extent product complies with specified requirements, including salient qualities provided by "Base" manufacturer's product.
      1) Salient qualities include, but are not necessarily limited to following:
         a) Purpose and function.
         b) Material and finish.
         c) Strength, durability and other applicable physical properties.
         d) Compatibility and performance attributes for indicated application.
         e) Capacity and operating characteristics, where applicable.
         f) Size and configuration to extent required for fit with adjoining and adjacent conditions and within spatial limitations.
         g) Appearance, including exposed dimensions, profile, texture, pattern and color, where visible to personnel in finished space, or from exterior.
      e. Contractor is responsible for costs to provide dimensional, operational, structural, utility or any other related adjustments to fit an "Optional" manufacturer's product into the Work.
      f. See Section 01 33 00, “Optional Product/System Comparison Form”.
   3. "Base Product:"
      a. Term indicates specific product or system used as basis for design.
b. Manufactures listed as "Optional Manufactures" may submit their equivalent products, but only if product complies with specified requirements, including salient qualities of "Base Product."
   1) Products proposed by "Optional" manufactures must also comply with descriptive requirements listed in technical specification.
   2) Optional Products that obviously differ in appearance and quality of “Base Product” will be rejected.
c. Refer to preceding paragraph for additional requirements.

   END OF SECTION
SECTION 01 65 00
MATERIALS AND EQUIPMENT

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Products.
   2. Transportation and Handling.
   4. Manufacturer's Instructions.
   5. Product Options.
   6. Products List.
   7. Substitutions.

B. Related Sections:
   1. Section 01400 - Quality Control.
   2. Section 01730 - Operation and Maintenance Data.

1.02 QUALITY ASSURANCE

A. Conform to applicable specifications and standards.

B. Comply with size, make, type and quality specified, or as specifically approved in writing by the Consultant.

C. Manufactured and Fabricated Products:
   1. Two or more items of the same kind shall be identical, by the same manufacturer.
   2. Equipment capacities, sizes and dimensions shown or specified shall be adhered to unless variations are specifically approved in writing.

1.03 TRANSPORTATION AND HANDLING

A. Arrange deliveries of products in accord with construction schedules, coordinate to avoid conflict with work and conditions at the site.

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

1.04 STORAGE AND PROTECTION

A. Store products in accordance with manufacturer's instruction, with seals and labels intact and legible.

B. Arrange storage to provide access for inspection. Periodically inspect to assure products are undamaged, and are maintained under required conditions.

1.05 MANUFACTURER'S INSTRUCTIONS
A. When Contract Documents require that installation of work shall comply with manufacturer's printed instructions, obtain and distribute copies of such instructions to parties involved in the installation, including one copy to the Consultant and one copy to the Contractor.

B. Perform work in accord with manufacturer's instructions. Do not omit any preparatory step or installation procedure unless specifically modified or exempted by Contract Documents.

1.06 PRODUCT OPTIONS

A. Products Specified by Reference Standards or by Description Only: Any product meeting those standards.

B. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not specifically named.

C. Consultant will review requests for substitutions with reasonable promptness, and notify, by Addendum, of the decision to accept or reject the requested substitution.

1.07 PRODUCT LIST

A. Within 15 days after signing of agreement, submit complete list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.

1.08 SUBSTITUTIONS

A. Will only be considered prior to bid or in the event that Equipment is not available.

1.09 SYSTEMS DEMONSTRATION

A. Prior to final inspection, demonstrate operation of each system to Consultant and Owner.

B. Instruct Owner's personnel in operation, adjustment, and maintenance of equipment and systems, using the operation and maintenance data as the basis of instruction.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION
PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

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

B. Related Sections:

1. Division 01 Section "Submittal Procedures".
2. Division 01 Section "Closeout Procedures".

1.3 DEFINITIONS

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

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

1.4 QUALITY ASSURANCE

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

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

1. Structural Elements: When cutting and patching structural elements, notify Architect of locations and details of cutting and await directions from the Architect before proceeding. Shore, brace, and support structural element during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection.
2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.
   a. Primary operational systems and equipment.
   b. Fire separation assemblies.
   c. Air or smoke barriers.
   d. Fire-suppression systems.
   e. Mechanical systems piping and ducts.
   f. Control systems.
   g. Communication systems.
   h. Conveying systems.
   i. Electrical wiring systems.
   j. Operating systems of special construction.

3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety. Other construction elements include but are not limited to the following:
   a. Water, moisture, or vapor barriers.
   b. Membranes and flashings.
   c. Exterior curtain-wall construction.
   d. Equipment supports.
   e. Piping, ductwork, vessels, and equipment.
   f. Noise- and vibration-control elements and systems.

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

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

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

1.5 WARRANTY

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

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections.
1. For projects requiring compliance with sustainable design and construction practices and procedures, utilize products for patching that comply with requirements of Division 01 Section "Sustainable Design Requirements."

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

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

PART 3 - EXECUTION

3.1 EXAMINATION

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

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

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

1. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
   a. Description of the Work.
   b. List of detrimental conditions, including substrates.
   c. List of unacceptable installation tolerances.
   d. Recommended corrections.
2. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
3. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
4. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
5. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
1. Make vertical work plumb and make horizontal work level.
2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

E. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

F. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

G. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
2. Allow for building movement, including thermal expansion and contraction.
3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

H. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

I. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.3 CUTTING AND PATCHING

A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Temporary Support: Provide temporary support of work to be cut.

C. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
D. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching in accordance with requirements of Division 01 Section "Summary."

E. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to prevent interruption to occupied areas.

F. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
4. Excavating and Backfilling: Comply with requirements in applicable Division 31 Sections where required by cutting and patching operations.
5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
6. Proceed with patching after construction operations requiring cutting are complete.

G. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.
   a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
   b. Restore damaged pipe covering to its original condition.
3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
   a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.
H. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.4 OWNER-INSTALLED PRODUCTS

A. Site Access: Provide access to Project site for Owner's construction personnel.

B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction personnel.

1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.

2. Preinstallation Conferences: Include Owner's construction personnel at preinstallation conferences covering portions of the Work that are to receive Owner's work. Attend preinstallation conferences conducted by Owner's construction personnel if portions of the Work depend on Owner's construction.

3.5 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.


2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F.

3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

   a. Utilize containers intended for holding waste materials of type to be stored.

4. Coordinate progress cleaning for joint-use areas where more than one installer has worked.

B. Clean-up During Construction: Each contractor shall keep the building and premises free from all surplus material, waste material, dirt and rubbish caused by his employees or work, and at the completion of his work he shall remove all such surplus material, waste material, dirt and rubbish, as well as his tools, equipment and scaffolding, and shall leave his work clean and spotless, unless more exact requirements are specified. In case of dispute, the owner may remove all such items and charge the cost of such removal to the contractor.

1. Each sub-contractor shall perform his clean-up daily and shall transport his rubbish to an on-site location designated by the Contractor who will arrange for its removal.

C. Site: Maintain Project site free of waste materials and debris.

D. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.

1. Remove liquid spills promptly.

2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
E. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

F. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

G. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

H. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Division 01 Section "Construction Waste Management and Disposal."

I. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

J. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

K. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.6 STARTING AND ADJUSTING

A. Coordinate startup and adjusting of equipment and operating components with requirements in Division 01 Section "General Commissioning Requirements."

B. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

C. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.

D. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

E. Manufacturer's Field Service: Comply with qualification requirements in Division 01 Section "Quality Requirements."

3.7 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Comply with manufacturer's written instructions for temperature and relative humidity.
3.8 CORRECTION OF THE WORK

A. Repair or remove and replace defective construction. Restore damaged substrates and finishes.

1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.

B. Restore permanent facilities used during construction to their specified condition.

C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION 01 73 00
SECTION 01 73 29
CUTTING AND PATCHING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included: This section establishes general requirements in addition to those indicated in the General Conditions of the Contract for Construction pertaining to cutting, fitting, and patching of the work required to:
1. Make the several parts fit properly.
2. Uncover work to provide for installation, inspection, or both, of ill-timed work.
3. Remove and replace work not conforming to requirements of Contract Documents.
4. Patch new construction into existing construction.

B. Related Work:
1. In addition to requirements specified, upon the Consultant's request, uncover work to provide for inspection of covered work, and remove samples of installed materials for testing.
2. Do not cut or alter work performed under separate contract without the Consultant's written permission.

1.02 QUALITY ASSURANCE

A. Perform all cutting and patching in strict accordance with pertinent requirements of the Specifications and, in the event no such requirements are determined, in conformance with the Consultant's written direction.
1. Use skilled workmen to perform all cutting and patching work.
2. Use methods least likely to damage existing surfaces and materials to remain, while providing proper surfaces to receive installation of repair, patching, and/or new work.

B. Visual Quality:
1. Do not cut and patch work exposed to public view, and the exterior and/or interior of the building in a manner that will result in an unacceptable appearance as determined by the Consultant.
2. Do not cut and patch work in a manner that will result in obvious appearance that cutting and patching work was done.
3. When cutting existing structural concrete, do not extend saw cuts beyond the corners of the required opening on either side of the opening.

1.03 EXISTING CONSTRUCTION

A. Where cutting and patching of existing construction is required; prior to start of work, inform Owner of existing construction to be disturbed. Owner will determine if elements of existing construction contain asbestos. Do not proceed with work until afterOwner has examined areas to be disturbed.
1.04 SUBMITTALS

A. Submit proposed cutting and patching procedures in writing for the following categories of work prior to proceeding with this work:

1. Cutting new openings in existing structural concrete walls, parapets, and suspended slabs.
2. Cutting new openings in existing roofs and roofing materials.

B. Submittals shall comply with Section 01300.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Except as otherwise indicated in pertinent sections of these specifications, or as directed by the Consultant, use materials which are identical to existing materials in workmanship, appearance, and performance.

B. If identical materials are not available, match existing as closely as possible, especially existing visual characteristics.

PART 3 - EXECUTION

3.01 INSPECTION

A. Before proceeding, inspect existing conditions, including elements subject to movement or damage during cutting, excavating, backfilling, and patching.

B. After uncovering the work, inspect conditions affecting installation of new work.

C. If uncovered conditions are not as anticipated or if existing construction is not as indicated on the Drawings, immediately notify the Consultant for further instructions.

3.02 PREPARATION

A. Provide shoring, bracing, and support as required to maintain structured integrity of the project.

B. Take all necessary action required to protect adjacent existing surfaces from damage due to the work of this section.

C. Take all precautions necessary to protect existing surfaces and materials, new work, and the work of this section from damage due to adverse weather conditions.

D. Provide temporary support of work to cut and adjacent work to prevent failure or damage due to the work of this section.

E. Properly prepare substrate surfaces exposed during cutting as required to receive the work of this or other sections of these specifications in strict compliance with manufacturer's recommendations and these specifications.
3.03 EXECUTION

A. Perform all required cutting and patching as required or reasonably implied under pertinent sections of these specifications.

B. Perform cutting and demolition by methods which will prevent damage to other portions of the work and will provide proper finished installation complying with the specified tolerances and finishes.

3.04 PERFORMANCE

A. Execute cutting and demolition by methods which will prevent damage to other work, and will provide proper surfaces to receive installation of repairs and new work. Saw-cut and otherwise isolate areas to be demolished.

B. Repair or otherwise rebuild and/or construct all surfaces affected by cutting and demolition. Execute fitting and adjustment of products to provide totally finished installation to comply with tolerances, finishes, and profiles of adjacent surfaces, whether new or existing.

C. Restore work which has been cut or exposed by demolition; install new construction in compliance with specifications for type of new work to be done or as required to match existing adjacent surfaces. In no case shall any exposed existing surface be left in a raw, marred, or unfinished surface.

D. Refinish entire surfaces as necessary to provide an even finish.
   1. Continuous Surfaces: To nearest intersections.

END OF SECTION
PART 1 - GENERAL

1.1 DESCRIPTION

A. The Owner has established that this Project shall include proactive measures for waste management participation by all parties to the contract.
   1. The purpose of this program is to ensure that during the course of the Project all diligent means are employed to pursue practical and economically feasible waste management and recycling options.
   2. Upon award, each subcontractor shall be required to furnish documentation from suppliers or manufacturers regarding waste management and recycling options for those products and procedures furnished.
   3. Waste disposal to landfills shall be minimized.

B. Definitions:
   1. Waste: Any material that has reached the end of its intended use. Waste includes salvageable, returnable, recyclable and reusable construction materials that would otherwise be discarded or destroyed.
   2. Construction waste: Solid wastes including, but not limited to, building materials, packaging materials, debris and trash resulting from construction operations.
   3. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.
   4. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.
   5. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.
   6. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the work.
   7. Hazardous waste: Any material or byproduct of construction that is regulated by the Environmental Protection Agency and that may not be disposed in any landfill or other waste end-source without adherence to applicable laws.
   8. Trash: Any product or material unable to be returned, reused, recycled or salvaged.
   9. Landfill: Any public or private business involved in the practice of trash disposal.
  10. Waste Management Plan: A Project-related plan for the collection, transportation, and disposal of the waste generated at the construction site.

1.2 PERFORMANCE GOALS AND REQUIREMENTS

A. General: Develop waste management plan that results in End-of-Project rates for salvage/recycling of a minimum of 75 percent by weight of total waste generated by the Work.
   1. Hazardous waste and soil and land clearing debris (trees etc.) are specifically excluded for waste management calculations.

B. Salvage/Recycle: Owner’s goal is to salvage and recycle as much nonhazardous demolition and construction waste as possible including the following materials:
   1. Demolition Waste:
      a. Concrete.
   2. Recycle/Relocate Tree and Plant Material:
      a. Relocate and recycle tree and plant materials as indicated in Section 01 56 39 Temporary Tree and Plant Protection.
C. Construction Waste:
1. Masonry and CMU.
2. Lumber.
4. Wood trim.
5. Metals.
6. Roofing.
7. Insulation.
8. Carpet and pad.
11. Electrical conduit.
12. Packaging: Regardless of salvage/recycle goal indicated above, salvage and recycle 100 percent of the following uncontaminated packaging materials:
   a. Paper.
   b. Cardboard.
   c. Boxes.
   e. Polystyrene packaging.
   f. Wood crates.
   g. Plastic pails.

1.3 CONTRACTOR TO IDENTIFY OTHER MATERIALS IN THE CONSTRUCTION AND DEMOLITION WASTE MANAGEMENT PLAN SUBMITTALS:

A. Project Information:

B. Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit copies of report. Include separate report for demolition and construction waste. Include the following information:
1. Material category.
2. Generation point of waste.
3. Total quantity of waste in tons.
4. Quantity of waste salvaged, both estimated and actual in tons.
5. Quantity of waste recycled, both estimated and actual in tons.
6. Total quantity of waste recovered (salvaged plus recycled) in tons.
7. Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.

C. Waste Reduction Calculations: Before request for Substantial Completion, submit copies of calculated end of Project rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work.

D. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.

E. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.

F. Recycling and Processing Facility Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

G. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

H. LEED Submittal: LEED letter template for Credit MR 2.1 and 2.2, signed by Contractor, tabulating total waste material, quantities diverted and means by which it is diverted, and statement that requirements for the credit have been met.
I. Qualification Data: For refrigerant recovery technician.

J. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

1.4 QUALITY ASSURANCE

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

B. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.

C. Waste Management Conference: Environmental Project Manager shall conduct conference at Project site to review methods and procedures related to waste management including but not limited to, the following:
   1. Review and discuss Waste Management Plan.
   2. Review requirements for documenting quantities of each type of waste and its disposition.
   3. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.
   4. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
   5. Review waste management requirements for each trade.

1.5 CONSTRUCTION WASTE MANAGEMENT PLAN

A. General: Develop plan consisting of waste identification, waste reduction work plan, and cost/revenue analysis. Include separate sections in plan for demolition and construction waste. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.

B. Waste Identification: Indicate anticipated types and quantities of demolition and construction waste generated by the Work. Include estimated quantities and assumptions for estimates.

C. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed in landfill or incinerator. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.
   1. Salvaged Materials for Reuse: For materials that will be salvaged and reused in this Project, describe methods for preparing salvaged materials before incorporation into the Work.
   2. Salvaged Materials for Sale: For materials that will be sold to individuals and organizations, include list of their names, addresses, and telephone number.
   3. Salvaged Materials for Donation: For materials that will be donated to individuals and organizations, include list of their names, addresses, and telephone numbers.
   4. Recycled Materials: Assign recycling to recycling subcontractor, or list local receivers and processors, and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
   5. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility. List hazardous material waste and disposal separately.
   6. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location on Project site where materials separation will be located.

D. Waste Management Plan shall include locations of sorting and waste storage facilities on Site Plan of project.
PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION

3.1 CONSTRUCTION WASTE MANAGEMENT PLAN IMPLEMENTATION:

A. Implement waste management plan as approved by Owner. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract. Comply with the following procedures:
   1. Define specific areas to facilitate separation of materials for recycling, salvage, reuse or return.
   2. Separate construction waste by type at Project site to the maximum extent practical.
   3. Recycle and waste bin areas are to be maintained in an orderly manner and clearly marked to avoid contamination of materials. Inspect containers and bins weekly for contamination and remove contaminated materials if found.
   4. Do not mix recyclable materials.
   5. Stockpile processed materials on site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
   6. Store materials away from construction area. Do not store within drip line of remaining trees.
   7. Store components off the ground and protect from weather.
   8. Remove construction waste off Owner’s property and transport to appropriate receiver or processor.

B. Hazardous Wastes: Store in secure areas and comply with the following:
   1. Hazardous wastes shall be separated, stored and disposed of in accordance with local and EPA regulations and additional criteria listed below:
      a. Building products manufactured with PVC or containing chlorinated compounds shall not be incinerated.
      b. Disposal of fluorescent tubes to open containers is not permitted.

C. Unused fertilizers shall not be co-mingled with construction waste.

D. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work occurring at Project site.
   1. Distribute waste management plan to everyone concerned within seven days of submittal return.
   2. Distribute waste management plan to entities when they first begin work on site. Review plan procedures and locations established for salvage, recycling, and disposal.

E. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
   1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.
   2. Comply with environmental controls specified in Division 01 Section 01 50 00 Temporary Facilities, Construction Controls and Facilities.

F. Submit “Waste Reduction Progress Reports” each month as part of Application For Payment.
   a. Materials identified in the Report shall be reported by weight.
   b. Where weight is not applicable, Contractor shall report materials by units applicable to material recipient.
   c. Procure receipts or other validation of waste management procedures and include them as part of the submittal.
3.2 SALVAGING DEMOLITION WASTE

A. Salvaged Items for Reuse in the Work:
   1. Clean Salvaged items.
   2. Pack or crate items after cleaning. Identify contents of containers.
   3. Store items in a secure area until installation.
   4. Protect items from damage during transport and storage.
   5. Install salvaged items to comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make items functional for use indicated.

B. Salvaged Items for Sale and Donation: Not permitted on Project site.

C. Salvaged Items for Owner’s Use:
   1. Clean Salvaged items.
   2. Pack or create 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. Doors and Hardware: Brace open end of door frames. Except for removing door closers, leave door hardware attached to doors.

3.3 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

A. General: Recycle paper, cardboard, and beverage containers used by on-site workers.

B. Recycling Receivers and Processors: List below is provided for information only. Available recycling receivers and processors include, but are not limited to, the following:
   1. Eco-Cycle 303-444-6634.
   4. Western Disposal Services 303-444-2037.

C. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall accrue to Contractor.

3.4 DISPOSAL OF WASTE

A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill for incinerator acceptable to authorities having jurisdiction.
   1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
   2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Do not burn waste materials on site.

C. Burning: Burning of waste materials will be permitted only at designated areas on Owner’s property, provided required permits are obtained. Provide full-time monitoring for burning materials until fires are fully extinguished.

D. Disposal: Transport waste materials and dispose of at designated spoil areas on Owner’s property.

E. Disposal: Transport waste materials off Owner’s property and legally dispose of them.

END OF SECTION
PART 1 - GENERAL

1.01 SUBSTANTIAL COMPLETION AND FINAL INSPECTION

A. The Contractor shall comply with procedures stated in the General Conditions of the Contract for Notice of Completion, Final Inspection, Notice of Substantial Completion and Notice of Acceptance.

B. Should the Architect/Engineer or the Principle Representative determine that the work is not substantially complete, or the punch list items exceed 25, he will immediately notify the Contractor, in writing, stating reasons. After Contractor completes work, he shall resubmit certification and request for final inspection. The Contractor will be responsible for all costs beyond two Architect/Engineer walk-throughs.

C. Owner may occupy designated portions of the Project under provisions stated in the General Conditions of the Contract.

1.02 CLOSE-OUT FORMS

The Architect/Engineer will complete the Notice of Approval of Beneficial Occupancy, Closing-out Checklist and Contract Close-out forms and forward them to the Contractor. Comply with procedures stated in General Conditions of the Contract.

1.03 FINAL SETTLEMENT AND PAYMENT

A. Contractor shall comply with procedures stated in the General Conditions of the Contract before final settlement and payment are made.

B. The Contractor shall also submit the following prior to the final application for payment:
   1. Contractor’s Affidavit of Payment of Debit and Claims: AIA G706.
   2. Contractor’s Affidavit of Release of Liens (claims): AIA G706A, with:
      a. Consent of Surety to final payment: AIA G707
      b. Contractor’s release of waivers of claims.
      c. Separate release of waivers of claims for subcontractors, suppliers and others with claim rights, against property of owner, together with list of those parties.

1.04 GUARANTEE INSPECTION

A. The Contractor shall comply with procedures stated in the General Conditions of the Contract for Guarantee Inspections after completion of the work.

1.05 WARRANTIES AND SPECIAL GUARANTEES

The Contractor shall comply with procedures and criteria outlined in the General Conditions of the Contract for all warranties and special guarantees of the work.

1.06 OPERATING AND MAINTENANCE DATA
A. Refer to Section 01 78 23 - Operating and Maintenance.

B. Mechanical - By Mechanical Contractor: See Division 15.

C. Electrical - By Electrical Contractor: See Division 16.

1.07 DEMONSTRATIONS

A. Refer to Section 01 78 23 - Operating and Maintenance

B. Mechanical - By Mechanical Contractor: See Division 15

C. Electrical - By Electrical Contractor: See Division 16.

1.08 SPARE PARTS AND MAINTENANCE MATERIALS

A. Provide products, spare parts, and maintenance materials in quantities specified in each Section, in addition to that used for construction of work. Coordinate with Owner, deliver to Project site and obtain receipt prior to final payment.

B. At the completion of the project, all loose keys for hose bibs; adjustment keys and wrenches for door closers and panic hardware; and keys for electric switches, electrical panels, etc., shall be accounted for by the Contractor and turned over to the Owner.

END OF SECTION
SECTION 01 77 10
CLEANING

PART 1 - GENERAL

1.01 CLEANING

A. Clean-up During Construction: Each contractor shall keep the building and premises free from all surplus material, waste material, dirt and rubbish caused by his employees or work, and at the completion of his work he shall remove all such surplus material, waste material, dirt and rubbish, as well as his tools, equipment and scaffolding, and shall leave his work clean and spotless, unless more exact requirements are specified. In case of dispute, the owner may remove all such items and charge the cost of such removal to the contractor.

Each sub-contractor shall perform his clean-up daily and shall transport his rubbish to an on-site location designated by the Contractor who will arrange for its removal.

B. Cleaners: With the exception of clean-up of the site and cleaning specifically assigned to Contractors under various sections of the specifications, all final clean-up of exterior and interior of the building shall be done by professional cleaners.

C. Final Clean-up:
1. Exterior: In addition to items specified below, any new surfaces on exterior, concrete, metal, etc., shall be carefully and thoroughly cleaned.
2. Glass: Both sides of all glass in work areas shall be carefully and thoroughly cleaned by professional window cleaners and left absolutely clean and free from paint, grease, dirt, etc.
3. Hardware: Clean and polish all hardware and leave clean and free from paint, grease, dirt, etc.
4. Plumbing: Clean and polish all plumbing fixtures, fittings, and exposed plated piping. Leave clean and free from paint, grease, dirt, etc. Remove all labels.
5. Electrical: Clean and polish all electric fixtures, including glassware, switch plates, etc. and leave clean and free from paint, grease, dirt, etc.
6. Equipment: Carefully and thoroughly clean all items of equipment, mechanical, electrical, cabinets, ductwork, etc.
7. Floors: Thoroughly clean all floors. Vacuum and clean carpeting. Shampooing of pre-existing carpet is required once project is complete. Contractor is responsible for this.
   a. Contractors are responsible for cleaning (stripping floors if necessary) then applying the required two coats of sealer and three coats of finish before releasing the building for occupancy. Facilities Management will provide a contact person for help concerning campus standards free of charge. Or Custodial floor care services may be sub-contracted out through Facilities Management's work order system.
   b. Facilities Management Approved Sealers and Finishes for Vinyl Tile Flooring:

CU requires floor care products to be from the same product line. (Different brands may interact disastrously).

All of these products may be ordered through Construction Stores, but these products not stocked at Stores, please place orders at least two weeks in advance.
Campus safety standards require at least TWO (2) coats of Sealer be applied to a cleaned floor, and at least THREE (3) coats of Finish must be applied on top of the sealer.

c. Floor Cleaning Procedures:
1. Sweep floor clean of debris
2. Cord off area if necessary
3. Put up Caution signs
4. Mix Stripper or Cleaning solution according to label
5. Apply solution to floor
6. Start setting up equipment
7. Place RED abrasive pad on buffer (buffer less than 300 rpms)
8. Begin stripping or cleaning floor working with buffer moving it side to side across the floor.
9. Use HEPA filtered water vacuum to begin to suck up slurry*
   *use of HEPA filtered water vacuum is required on existing floor tile which contains asbestos.
10. Apply additional coats of water and re-vacuum up floor
11. Mop floor with clean water, change rinse water often
12. Mop floor a second time
13. Mop floor to dry completely
14. Clean up equipment
15. Wash red pad with clean water.

d. Sealing Procedures:
1. Using a new mop head or clean wax mop and clean bucket, apply first coat of approved sealer to floor
2. Allow floor to dry completely (at least 20 minutes)
3. Apply second coat of sealer
4. Allow floor to dry

e. Finishing (Waxing) Procedures:
1. Using a clean wax mop and bucket apply first coat of approved finish (wax)
2. Allow floor to dry completely (at least 20 minutes)
3. Apply second coat of finish (wax)
4. Allow floor to dry completely (at least 20 minutes)
5. Apply third coat of finish (wax)
6. Allow floor to dry completely (at least 30 minutes)
7. Wash mop and bucket with clean water
8. If floor is dry - remove caution signs and open area up

f. Burnishing Procedures:
The next working day
1. Sweep floor clean of debris
2. Spot mop floor to remove spots and dirt
3. Set up High Speed Burnisher to make for a safe environment
4. Start Burnishing. Walk forward in a straight line
5. At end of row, turn around and start forward again
6. Repeat steps 5 & 6 until finished
7. Clean up equipment and pad.

A. Completion: The entire work inside and out, and the entire premises shall be in first-class, clean condition upon completion before being accepted by the Owner.

END OF SECTION
SECTION 01 78 23
OPERATING AND MAINTENANCE

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. Compile product data and related information appropriate for the University of Colorado's maintenance and operation of products furnished.

B. Prepare operating and maintenance data as specified in this section and as referenced in other pertinent sections of specifications.

C. Instruct the University of Colorado, Facilities Management personnel in the maintenance of PRODUCTS and in the operation of equipment and systems.

1.02 QUALITY ASSURANCE

A. Preparation of data shall be done by personnel:
   1. Trained and experienced in maintenance and operation of the described products.
   2. Completely familiar with requirements of this section.
   3. Skilled as a technical writer to the extent required to communicate essential data.
   4. Skilled as a draftsman competent to prepare required drawings.

1.03 SUBMITTALS

A. Prepare data in the form of an instructional manual for use by the University of Colorado, Facilities Management personnel. Quantities are listed in Part 1.07.

B. Format:
   1. Submit electronically in Portable Document Format (PDF) format as one document, OCR (Optical Character Recognition) searchable, bookmarked according to the Construction Specifications Institute (CSI) standards.

   2. Title shall be "OPERATING AND MAINTENANCE INSTRUCTIONS", and shall include:
      a. Name of project and date of completion (month and year).
      b. Project number.
      c. Identify of general subject matter covered in the manual (e.g., Architectural, Mechanical, Electrical and/or Civil).

1.04 CONTENT OF MANUAL

A. An electronically-written table of contents shall be provided for each volume, arranged according to CSI standards.
   Include the following:
   1. Name of responsible installing principal contractor, address, and telephone number.
   2. A list of each product being included, indexed to the content of the volume.
   3. List with each product, the name, address, and telephone number of:
      a. Maintenance contractor, as appropriate.
      b. Identity of the area of responsibility of each.
   4. Identify each product by product name and other identifying symbols.
B. Product Data:
1. Local source of supply for parts and replacement.
2. Include only those sheets that are pertinent to the specific product, with the following information.
   a. Clearly identify the specific product or part installed.
   b. Clearly identify the data applicable to the installation.
   c. Delete references to inapplicable information.

C. Drawings:
1. Supplement product data with drawings as necessary to clearly illustrate:
   a. Relations of component parts of equipment and systems.
   b. Control and flow diagrams.
2. Coordinate drawings with information in project record drawings to ensure correct illustration of completed installation.
3. Do not use project record drawings as maintenance drawings.

D. Provide written text, as required, to supplement product data for the particular installation:
1. Organize in a consistent format under separate headings for different procedures.
2. Provide a logical sequence of instructions for each procedure.

E. Provide a copy of each warranty, bond, and service contract issued. Provide information sheets for the University of Colorado, Facilities Management's personnel and give:
1. Proper procedures in the event of failure.
2. Instances that might affect the validity of warranties or bonds.

1.05 MANUALS FOR ARCHITECTURAL MATERIAL AND FINISHES

A. Submit copies (per schedule shown in paragraph 1.07) of complete manual in final form.

B. Content for architectural products include applied materials and finishes.
1. Manufacturer's data, giving full information on products.
   a. Catalog number, size, and composition.
   b. Color and texture designations.
   c. Information required for reordering special manufactured products.
2. Instructions for care and maintenance:
   a. Manufacturer's recommendation for types of cleaning agents and methods.
   b. Cautions against cleaning agents and methods that are detrimental to the product.
   c. Recommended schedule for cleaning and maintenance.

C. Content for moisture-protection and weather-exposed products:
1. Provide manufacturer's data, giving fully information on products.
   a. Applicable standards
   b. Chemical composition
   c. Details of installation
2. Provide instructions for inspection, maintenance, and repair.
A. Submit copies (per schedule) of complete manual in final form.

B. Content for each unit of equipment and system, as appropriate shall contain:
   1. Description of unit and component parts (Consultant-approved submittals).
      a. Function, normal operating characteristics, and limiting conditions.
      b. Performance curves, engineering data, and tests.
      c. Complete nomenclature and Commercial number of all replaceable parts.
   2. Operating Procedures:
      a. Start-up, break-in, routine, and normal operating instructions.
      b. Regulation, control, stopping, shutdown, and emergency instructions.
      c. Summer and winter operating instructions.
      d. Special operating instructions.
   3. Maintenance Procedures:
      a. Routine operations.
      c. Disassembly, repair, and reassembly.
      d. Alignment, adjustment, and checking.
   4. Servicing and Lubrication Schedule, including a list of lubricants required.
   5. Manufacturer's operating and maintenance instructions.
   6. Description of sequence of operation by control manufacturer.
   7. Original manufacturer's parts list, illustrations, assembly drawings, and diagrams required
      for maintenance and replacement.
      a. Predicted life of parts subject to wear.
      b. Items recommended to be stocked as spare parts.
   8. List of original manufacturer's spare parts, manufacturer's current prices, and recom-
      mended quantities to be maintained in storage.

C. Content for each electric and electronic system, as appropriate, shall contain:
   1. Description of system and component parts:
      a. Function, normal operating characteristics, and limiting conditions.
      b. Performance curves, engineering data, and tests.
      c. Complete nomenclature and Commercial number of replaceable parts.
   2. Operating Procedures:
      a. Routing and normal operating instructions.
      b. Sequences required.
      c. Special operating instructions.
   3. Maintenance Procedures:
      a. Routing operations.
      c. Disassembly, repair, and reassembly.
      d. Adjustment and checking.
      e. Manufacturer's printed operating and maintenance instructions.
      f. List of original manufacturer's spare parts, manufacturer's current prices, and
         recommended quantities to be maintained in storage.

D. Prepare and include additional data when the need for such data becomes apparent during in-
   struction of the University of Colorado, Facilities Management's personnel.
1.07 OPERATION & MAINTENANCE MANUAL
   A. Operations and Maintenance Manuals – all disciplines – submit electronically in Portable Document
      Format (PDF) format as one document, OCR (Optical Character Recognition) searchable, bookmarked
      according to the Construction Specifications Institute (CSI) standards.

1.08 SUBMITTAL SCHEDULE
   A. Submit one electronic copy to the Consultants and one to the University of draft of proposed forms
      and outlines of contents upon completion of the submittal process. The Consultants and the University
      staff will review the draft and will submit comments through the consultants.
   B. Submit electronic copies of complete manual(s) in final form 15 days prior to final inspection or
      acceptance. Comments will be submitted after final inspection.
   C. Submit specified number of CDs or DVDs of approved data in final form prior to acceptance.

1.09 INSTRUCTION OF UNIVERSITY OF COLORADO, FACILITIES MANAGEMENT PERSONNEL
   A. Fully instruct the University of Colorado, Facilities Management personnel's designated operating
      and maintenance personnel in the operation, adjustment, and maintenance of all products, equipment,
      and systems as required elsewhere in the specification.
   B. Operating and Maintenance manual may be required as the basis of instruction.

PART 2 - MATERIAL
   Not Used.

PART 3 - EXECUTION
   Not Used.

END OF SECTION
SECTION 01 78 36
WARRANTIES AND GUARANTEES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Execute and provide notarized Project Warranty on form furnished at end of section.

B. Provide special written warranties or guarantees or both for products, equipment, systems and installations required by other sections of Contract Documents for duration indicated.

C. Provide manufacturer’s warranties or guarantees or both required by other sections of Contract Documents for products, equipment and systems for duration indicated.
   1. Where manufacturer’s standard warranties or guarantees or both expire before duration required by other sections of Contract Documents, obtain and pay for extensions as part of Contract Price.

D. Provide all warranties or guarantees or both prior to final payment.

E. Warranties or guarantees or both required by Contract Documents shall commence on date of Substantial Completion of Work, or designated portion thereof, unless otherwise indicated in Certificate of Substantial Completion.

1.2 SUBMITTALS

A. Contract Closeout Information:
   1. Full executed and notarized Project Warranty on included form.
   2. Transmittal letter indicating Owner’s receipt of 3-ring binder containing all product equipment and system warranties or guarantees or both required by other sections of Contract Documents.

1.3 JOB CONDITIONS

A. If for any reason, Contractor cannot warrant or guarantee or both, any portion of Work using products or construction methods indicated or required by other sections of Contract Documents, notify Architect in writing during bid period, and before contracts are awarded, indicating reasons and names of products and data on substitutions that can be warranted or guaranteed or both.
   1. Should Contractor fail to notify Architect, Contractor will be held to having agreed to warrant or guarantee or both, for the Work indicated.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 PROJECT WARRANTY

A. Execute and provide notarized Project Warranty on form furnished at end of section.
   1. Provide Contractor’s name, address, signature and date.
   2. Notarial Act and notarization: Warranty document is required to be signed, dated, and sealed with Notary Public seal or stamp in accordance with state and territorial notary laws.

B. The Contractor shall comply with procedures and criteria outlined in the General Conditions of the Contract for all warranties and special guarantees of the work.
3.2 PRODUCT, EQUIPMENT & SYSTEM WARRANTIES AND GUARANTEES

A. Compile approved warranties and guarantees or both required by other sections of Contract Documents.

B. Bind or assemble in 3-ring binders, completely indexed by specification section, with each warranty or guarantee or both clearly labeled.

C. Identify each warranty or guarantee or both in manner consistent with names and identification numbers used in Contract Documents.

D. Neatly type or draft all warranties or guarantees or both not furnished in printed form.

E. Organize warranties or guarantees or both for ease of reference.

F. Provide transmittal letter containing:
   1. Date.
   2. Project title.
   3. Contractor’s name and address.
   4. Title and number of warranties or guarantees or both.
   5. Indicating Owner’s receipt.

G. Deliver to Owner prior to final payment with copy of transmittal letter indicating Owner’s receipt.

END OF SECTION
PROJECT WARRANTY

PROJECT: PROJECT NO.: 

OWNER: 

DATE OF SUBSTANTIAL COMPLETION: As indicated on Certificate of Substantial Completion

Contractor, warrants to Owner that Work is free from defects not inherent in the quality required or permitted, and that Work conforms with requirements of Contract Documents. Work not conforming to these requirements, including substitutions not properly approved and authorized, may be considered defective. Contractor’s warranty excludes remedy for damage or defect caused by abuse, modifications not executed by Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear under normal usage.

If, within one-year after the date of Substantial Completion of Work or designated portion thereof, or by terms of an applicable special warranty required by Contract Documents, any of the Work is found to be not in accordance with requirements of Contract Documents, the Contractor shall correct it promptly after receipt of written notice from Owner to do so unless Owner has previously given Contractor a written acceptance of such condition. Owner shall give such notice promptly after discovery of the condition.

The above shall not be construed to establish a period of limitation with respect to other obligations which Contractor might have under Contract Documents. Establishment of one-year period for correction of Work relates only to specific obligation of Contractor to correct Work, and has no relationship to time within which obligation to comply with Contract Documents may be sought to be enforced, nor to time within which proceedings may be commenced to establish Contractor’s liability with respect to Contractor’s obligations other than specifically to correct Work.

CONTRACTOR: 
ADDRESS: 

BY: SIGNATURE: 
TITLE: DATE: 

Subscribed and sworn to me this ___ day of __________ in the year of _________ 

NOTARY PUBLIC: SIGNATURE: 
LOCATION: 

My Commission Expires:

END OF DOCUMENT
SECTION 01 78 39
PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.01 SUMMARY
A. This section describes the definitions, recording and maintenance requirements and the
submittal requirements for record documents.

1.02 DEFINITIONS
A. The Project Record Documents are intended to indicate all changes and deviations from
the original contract documents and permanently record the "as-built" condition of
material, equipment and structure. The project record documents shall include the
contract drawings, project manual, addenda, change orders, modifications and
clarifications, field directives, approved shop drawings, approved product data,
manufacturer’s certificates and project test results.

1.03 SUBMITTALS
A. Submit the project record documents in conformance with Section 01 77 00 and prior to
the final applications for payment. The final application for payment will not be approved
prior to the submittal of record documents.

1.04 QUALITY ASSURANCE
A. The project record documents shall be updated at a minimum on a weekly basis and
shall be readily available for inspection by the owner and consultants. Maintain a
separate set of complete documents for exclusive use of record documents, updating
electronically in Portable Document Format (PDF) format as one document, OCR
(Optical Character Recognition) searchable,. Note: Progress applications for payment
will not be approved if record documents are not current.

B. The record documents shall contain a clear, legible record of all detail and dimensional
changes and locate all concealed work including, but not limited to:
1. Interior and Exterior Utilities
2. Valves
3. Dampers
4. Controls
5. Junction Boxes
6. Clean-outs
7. Access Doors

C. The project manual (specifications) shall indicate all manufacturers’ products complete
with catalogue number and trade name of products installed. All changes and
corrections to the project manual shall be clearly indicated.

1.05 ENVIRONMENTAL RECORD DOCUMENTS
A. Comply with “Environmental Closeout Submittals” paragraph in Division 01 Section 01 33 00 Submittals.

B. Provide environmental submittals as specified, including USGBC LEED Green Building Rating System documentation documents.

C. Label each document “ENVIRONMENTAL.”

D. These documents will be used for documentation of specified sustainable construction practices.

E. In addition to specified environmental submittals, provide US Green Building Council LEED documentation according to specifications and requirements of LEED version used for the Project.

END OF SECTION
SECTION 01 91 13
COMMISSIONING REQUIREMENTS

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. Prepare commissioning process based on the Commissioning Checklists found in the UCB Standards website:

http://www.colorado.edu/facilitiesmanagement/pdc/construction/standards/index.html

B. Coordinate the requirements of Project Closeout and Operating and maintenance sections that are part of Division 1.

C. Schedule the required commissioning activities with the University of Colorado Facilities Department and their consultants at least 72 hours prior to conducting Commissioning activities.

PART 2 - MATERIALS

Not Used.

PART 3 - EXECUTION

NOT USED

END OF SECTION
SECTION 02 41 00  
DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. Furnish labor, materials, tools, equipment, and services for Demolition, as indicated, in accordance with provisions of Contract Documents.

B. Completely coordinate with work of other trades.

1.2 QUALITY ASSURANCE

A. Conduct work in accordance with OSHA and EPA requirements.

B. National Fire Protection Association (NFPA):

C. Use only firms or individual trades qualified to perform work required under this section.

1.3 DESCRIPTION

A. Work includes:
   1. Demolition of structures indicated.
   2. Removal of demolition debris.
   3. Protection of construction to remain, including:
      a. Utilities.
      b. Other items indicated.

B. Condition of existing structures to be demolished:
   1. Owner assumes no responsibility for actual condition of structures to be demolished.
   2. Owner will maintain building conditions existing at time of inspection for bidding purposes insofar as practicable.

1.4 JOB CONDITIONS

A. Perform preliminary investigations as required to ascertain extent of work.
   1. Conditions apparent by such investigation will not be allowed as cause for claims for extra costs.

B. Before start of work, obtain and pay for permits required by authorities having jurisdiction and notify interested utilities companies.

C. Obtain approval of authorities having jurisdiction for work which affects existing exitways, exit stairs, means of egress, or access to, or exit from areas.
   1. Review with and obtain approval of authorities for temporary construction which affects such areas.
   2. Obtain approval of fire authorities.

D. Separate, store and dispose of hazardous materials and toxic wastes in accordance with local and EPA regulations and additional criteria listed below:
   1. Disposal of fluorescent light tubes in open containers is not permitted.
   2. Disposal of ballasts and other building elements containing PCBs in open containers is not permitted.
   3. Disposal of building elements containing mercury in open containers is not permitted.
PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.1 POLLUTION CONTROLS

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by demolition operations.
B. Return adjacent areas to condition existing prior to start of work.

3.2 ITEMS TO BE SALVAGED FOR OWNER

A. Remove salvage items at appropriate stage of demolition, but early enough to prevent damage to them by demolition operations:
   1. Coordinate with Owner items Owner wishes to save.
B. Remove salvage items as a unit:
   1. Clean, list, and tag for storage.
   2. Protect from damage.
   3. Salvage each item with auxiliary or associated equipment required for operation.
   4. Store in an area designated within building.

3.3 ITEMS SALVAGED FOR CONTRACTOR

A. Items of salvage value to Contractor may be removed from structure as work progresses.
B. Transport salvaged items from site as they are removed.
C. Storage or sale of removed items not permitted on site.

3.4 ITEMS TO BE REMOVED FOR RE-INSTALLATION IN PROJECT

A. Remove items designated for re-use:
   1. Tag, protect from damage, store if required, and deliver to locations designated.
   2. Brace motors attached to flexible mountings until reinstallation.

3.5 GENERAL DEMOLITION PROCEDURES

A. Demolition of entire portions of structures:
   1. Demolish completely and remove from site.
   2. Use such methods as required to complete work within limitations of governing regulations.
   3. Coordinate with Owner and utility suppliers for shut-off of utilities serving each building.
   4. Disconnect and seal utilities before commencement of demolition.
B. Start and complete work as established by approved schedule.
C. Operational procedures and sequence of work are optional provided schedule is maintained.
D. Protect property to remain:
   1. Repair damage caused by demolition, at no cost to Owner.
   2. Conduct operations to prevent damage by falling debris or other cause to adjacent buildings, structures, and other facilities as well as persons.
   3. Provide interior and exterior shoring, bracing, or support to prevent movement, settlement or collapse of structures.
E. Conduct operations to insure minimum interference with roads, walks, entrances, exits, and other adjacent occupied facilities.
   1. Do not close or obstruct private drives, walks or other occupied or used facilities unless approved in writing.
2. Do not close or obstruct public thoroughfares or walks unless approved by authorities having jurisdiction.
3. Do not obstruct exits from existing facilities without approval of authorities having jurisdiction.
4. Provide alternate routes around closed or obstructed traffic ways.

F. Provide covered passageways where necessary to ensure safe passage of persons in or near areas of work.

G. Provide barricades and safety lights as required.

H. Maintain existing utilities that are indicated to remain.
   1. Keep in service and protect against damage during demolition.
   2. Do not interrupt existing utilities serving occupied or facilities in use, except as authorized by Owner.
   3. Provide temporary services during interruptions to existing utilities, as acceptable to Owner.

I. Structural demolition:
   1. Demolish concrete and masonry in small sections.
   2. Perform removal to avoid excessive loads on supporting walls, floors or framing.

3.6 PROTECTION OF OCCUPIED FACILITIES TO REMAIN

A. Protect occupants from injury and discomfort.

B. Provide temporary dustproof partitions between demolition areas and occupied areas.
   1. In public areas use clean, painted 1/2 IN thick plywood.
   2. Utilize fire rated construction where required by Authorities Having Jurisdiction.

C. Provide temporary weather protection and insulation to prevent damage to existing facilities and discomfort to persons in occupied areas.
   1. Insulation value: RSI 3.5 R 19.

3.7 CLEAN-UP AND DISPOSAL OF DEMOLITION MATERIALS

A. Remove debris, rubbish, and materials resulting from demolition operations.
   1. Remove and legally dispose of off site.
   2. Do not burn materials on site.

B. Dispose of items and materials not designated for Owner salvage or reuse.
   1. Promptly remove from site.
   2. Do not store or sell Contractor salvaged items or materials on site.

C. Clean up other debris resulting from this work.

END OF SECTION
PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

1. Drilled piers.
2. Foundation walls.
3. Slabs-on-grade.
4. Suspended slabs.
5. Concrete toppings.
7. Building walls.

B. Related Sections include the following:

1. Division 03 Section "Concrete Curing and Jointing" for vapor retarders, curing compounds, floor and slab treatments, and general building applications of specially finished formed concrete.
2. Division 05 Section "Structural Steel" for anchor rods and plates embedded into concrete.
3. Division 07 Section "Self-adhering Sheet Membrane Waterproofing" for waterproofing elevator pits.
4. Division 31 Section "Earth Moving" for drainage fill under slabs-on-grade.
5. Division 31 Section "Drilled Piers".
6. Division 32 Section "Concrete Paving" for concrete pavement and walks.

1.3 DEFINITIONS


1.4 SUBMITTALS

A. 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. Water/cementitious materials ratio.
e. Total air content.
f. Design slump.
g. Intended method of placement in field.


B. 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, joists, etc. framing into the element.
2. Provide one continuous elevation at 3/16” minimum scale for all beams, joists, or walls in a common line. Show pockets and openings in shear walls, structural slabs, beams, elevation at top of beams, walls, columns, sections through all beams, pilasters and columns, and placing sequence of reinforcing for items with more than one reinforcing layer.
3. Show locations of approved construction joints, locations of shrinkage pour strips, splices of reinforcing, type of splice used and splice location, grade of all reinforcement used and specifically identify all ASTM A706 reinforcing.

C. LEED Credit MRc4.1 and MRc4.2 Recycled Content:
1. Provide product data and certification letter indicating percentages by weight of post-consumer and pre-consumer recycled content for products having recycled content. Include statement indicating costs for each product having recycled content.

D. LEED Credit MRc5.1 and MRc5.2 Regional Materials:
1. Provide product data 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 of weight that is considered regional.

E. LEED Credit MRc7 Certified Wood:
1. Provide product data, certification letter and chain of custody documentation for all certified wood products coming from “FSC Certified Wood” sources certified by the Forest Stewardship council.

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. Samples: For waterstops.

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. Waterstops.
7. Curing compounds.
9. Vapor retarders.

I. Minutes of pre-installation conference.

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

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

1.5 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.

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 I, 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 Colorado.

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

H. Pre-installation 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 concrete procedures, curing procedures, construction contraction and isolation joints, and joint-filler strips, semi-rigid joint fillers, forms and form removal limitations, shoring and re-shoring 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. 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.

I. 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.

J. 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.

1.6 DELIVERY, STORAGE, AND HANDLING

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

B. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

PART 2 - PRODUCTS

2.1 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.
2.2 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 using either of the two following methods:

1. Panelized forming system with metal panel facing.
2. Site fabricated wood forming system using LEED Certified Wood panel facing. Use Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and originating from sources certified by the Forest Stewardship Council (FSC) for LEED MRc7: Certified Wood.

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 and originating from sources certified by the Forest Stewardship Council (FSC) for LEED MRc7: Certified Wood.

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. Pan-Type Forms: Glass-fiber-reinforced plastic or formed steel, stiffened to resist plastic concrete loads without detrimental deformation.

E. 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 piers. Curved face radius shall match drilled pier radius. 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. Chamfer Strips: As defined in the Architectural drawings.

G. Rustication Strips: As defined in the Architectural drawings.

H. 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.


I. 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 corrodbile 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 (25 mm) in diameter in concrete surface.
3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

2.3 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), 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 934/A 934M epoxy coated.

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

E. LEED MRc4: Recycled Content – Steel reinforcing material shall contain recycled content when feasible.

2.4 REINFORCEMENT ACCESSORIES

A. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), plain-steel bars, cut bars true to length with ends square and free of burrs.

B. Epoxy-Coated Joint Dowel Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), plain-steel bars, ASTM A 775/A 775M epoxy coated.

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

D. 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.
3. For zinc-coated reinforcement, use galvanized wire or dielectric-polymer-coated wire bar supports.

E. 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.

2.5 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project.

1. Portland Cement: ASTM C 150, Type I/II gray. Supplement with the following:
   a. Fly Ash: ASTM C 618, Class C or F.

B. Normal-Weight Aggregates: ASTM C 33, 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.

2.6 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.

2.7 FIBER REINFORCEMENT

A. Synthetic Fiber: fibrillated polypropylene fibers engineered and designed for use in concrete pavement, complying with ASTM C 1116, Type III, 1/2 to 1-1/2 inches (13 to 38 mm) long.

2.8 WATERSTOPS

A. Flexible PVC Waterstops: CE CRD-C 572, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.

1. Profile: Ribbed with center bulb

2.9 VAPOR RETARDERS: As defined in Division 03 Section “Concrete Jointing and Curing”.

2.10 FLOOR AND SLAB TREATMENTS: As defined in Division 03 Section “Concrete Jointing and Curing”.

2.11 CURING MATERIALS: As defined in Division 03 Section “Concrete Jointing and Curing”.

2.12 RELATED MATERIALS: As defined in Division 03 Section “Concrete Jointing and Curing”.

2.13 REPAIR MATERIALS

A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch (3.2 mm) 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 (3.2 to 6 mm) or coarse sand as recommended by underlayment manufacturer.

4. Compressive Strength: Not less than 5000 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 (3.2 mm) 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 (3.2 to 6 mm) 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.

2.14 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 0.06 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. Concrete Shrinkage Performance 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-grade cast directly on a vapor retarder: 0.046%.
   2) Concrete for columns, load bearing walls (except foundation walls): 0.046%.
   c. Concrete for beams, joists and structural slabs: 0.054%.

2.15 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.

2.16 FABRICATING REINFORCEMENT

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

2.17 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

3.1 FORMWORK

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117. 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 unless specifically noted on the Architectural drawings.

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.

3.2 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

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” of masonry thickness. Where concrete serves as backup, space slots at 16 inches on center.

3.3 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 (10 deg C) 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.

   1. Leave formwork for beam soffits, joists, slabs, and other structural elements that supports weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.
   2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.
   3. Leave formwork and shoring in place a minimum of 15 days after placing concrete unless reshoring is used.

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.

3.4 SHORES AND RESHORES

A. Comply with ACI 318 (ACI 318M) and ACI 301 for design, installation, and removal of shoring and reshoring.

   1. Do not remove shoring or reshoring until measurement of slab tolerances is complete.

B. In multistory construction, extend shoring or reshoring over a sufficient number of stories to distribute loads in such a manner that no floor or member will be excessively loaded or will induce tensile stress in concrete members without sufficient steel reinforcement.
C. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

D. Reshoring

1. Minimum Requirements:
   a. If original formwork and shoring are removed before concrete is 15 days old, reshoring shall remain in place a minimum of 15 days after placing concrete, regardless of compressive strength.
   b. For multistory construction, reshoring shall remain in place a minimum of 15 days after placing of concrete deck above, regardless of compressive strength.

3.5 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 specified 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.

3.6 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 (38 mm) into concrete.
3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
4. Locate horizontal joints in walls and columns 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. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch (3.2 mm). Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- (3.2-mm-) wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
3. Interior Slabs-on-Grade: Unless noted otherwise on the drawings, locate construction joints on column centerlines. Locate control joints where shown on the drawings. If not shown, provide control joints at column centerlines and at intervals not more than 12 feet each way.

D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface, unless otherwise indicated.
2. Terminate full-width joint-filler strips not less than 1/2 inch (13 mm) or more than 1 inch (25 mm) below finished concrete surface where joint sealants, specified in Division 07 Section "Joint Sealants," are indicated.
3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

E. Joints in Slabs-on-Metal Deck: Locate construction joints as noted on the drawings. For metal deck slabs with WWF, continue WWF through the construction joint and lap in the adjacent pour. Do not provide control joints.

F. Topping Slabs Exposed to View: Locate control joints where shown on the drawings. If not shown, locate topping slab control joints at column centerlines, over girders, and at intervals not exceeding 10’ each way.

3.7 WATERSTOPs

A. Flexible Waterstops: Install in construction joints and at other joints indicated to form a continuous diaphragm. Install in longest lengths practicable. Support and protect exposed waterstops during progress of the Work. Field fabricate joints in waterstops according to manufacturer's written instructions.
3.8 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 (150 mm) 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 (4.4 deg C) 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 (32 deg C) 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.

3.9 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces not exposed to public view.

B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces exposed to public view, to receive a rubbed finish, and other areas defined in the Architectural drawings.

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.

3.10 FINISHING FLOORS AND SLABS

A. General: Comply with ACI 302.1R recommendations for screeding, re-straightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch (6 mm) in 1 direction.

1. Apply scratch finish to surfaces indicated on the Architectural drawings and areas to receive concrete floor toppings or 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. Re-straighten, cut down high spots, and fill low spots. Repeat float passes and re-straightening until surface is left with a uniform, smooth, granular texture.

1. Apply float finish to surfaces indicated on the Architectural drawings and areas to receive trowel finish or covered with fluid-applied or sheet waterproofing, built-up or membrane roofing.

D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and re-straighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.

1. Apply a trowel finish to surfaces indicated on the Architectural drawings, and areas exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.

2. Finish troweled surfaces to the following tolerances, according to ASTM E 1155, for a randomly trafficked floor surface:
a. Slabs-on-grade: 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) 20.

b. Suspended slabs: specified overall values of flatness, F(F) 35; and of levelness, F(L) 20; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 15.

E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces indicated on the Architectural drawings or where ceramic or quarry tile is to be installed by either thickset or thin-set method. While concrete is still plastic, slightly scarify surface with a fine broom.

1. Comply with flatness and levelness tolerances for trowel finished floor surfaces.

F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.

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.

3.11 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.

D. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Cast-in inserts and accessories as shown on Drawings. Screed, tamp, and trowel-finish concrete surfaces.

3.12 CONCRETE CURING/PROTECTION: As defined in Division 03 Section “Concrete Jointing and Curing”

3.13 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 (1.18-mm) 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 (13 mm) in any dimension in solid concrete, but not less than 1 inch (25 mm) 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 (0.25 mm) 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 (6 mm) 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 (25 mm) 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 (19-mm) 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 (25 mm) 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.

3.14 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, embeddings, and mechanical connectors.
   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 embeddings 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 all field bent bars not bent in accordance with ACI 301 using visual and magnetic particle methods after bending is complete. Test rebar anchored into hardened concrete as specified in Section 051200 for adhesive anchors.

2. 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 ICBO test report.

3. Steel reinforcement welding.
4. Headed bolts and studs.
5. Verification of use of required design mixture.
6. Concrete placement, including conveying and depositing. Inspect the first concrete placement of footings, stemwalls/grade beams, 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.
7. Curing procedures and maintenance of curing temperature.
8. Verification of concrete strength before removal of shores and forms from beams and slabs.
9. Temperature of In-Place Concrete: Testing Agency shall measure and report maximum/minimum temperature of in-place concrete during curing period when concreting in cold weather.

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 50 cubic yards or fraction thereof of each concrete mixture placed each day. Obtain one sample for each 5000 square feet of shearwalls or slabs.
   
   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. Determine slump of concrete for each truck (at beginning of load) prior to placing drilled piers.

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 (4.4 deg C) and below and when 80 deg F (27 deg C) and above, and one test for each composite sample.

5. Unit Weight: ASTM C 567, fresh unit weight of structural 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 specimen 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 (3.4 MPa).

9. Test results shall be reported in writing by the Testing Agent to the Architect, Structural Engineer, concrete suppliers, 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 (ASTM E 1155M) within 24 hours of finishing.

END OF SECTION 033000
PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Roof deck.
2. 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.

1.3 SUBMITTALS

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

B. Shop Drawings: Show layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.

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

D. LEED Credit MRc4.1 and MRc4.2 Recycled Content:

1. Provide product data and certification letter indicating percentages by weight of post-consumer and pre-consumer recycled content for products having recycled content. Include statement indicating costs for each product having recycled content.

E. LEED Credit MRc5.1 and MRc5.2 Regional Materials:

1. Provide product data 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 of weight that is considered regional.
F. LEED Credit EQc4.2 Low-Emitting Materials, Paints and Coatings:
   1. Provide product data for paints and coatings used inside the waterproofing system indicating VOC content of each product used. Indicate VOC content in grams per liter calculated according to 40 CFR 59, Subpart D.

1.4 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to AWS D1.3, "Structural Welding Code - Sheet Steel."

B. 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."

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

   1. Steel Deck:
      a. ASC Profiles, Inc.
      c. Nucor Corp.; Vulcraft Division.

2.2 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. Galvanized Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade as indicated on drawings.
   2. Deck Profile, Depth, Design Uncoated-Steel Thickness, Span Condition and Side Laps: As indicated on drawings.
2.3 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.
2. Deck Profile, Depth, Design Uncoated-Steel Thickness, Span Condition and Side Laps: As indicated on drawings.

2.4 NONCOMPOSITE FORM DECK

A. Non-composite Steel Form Deck: Fabricate ribbed-steel sheet non-composite 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:

1. Galvanized Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade as indicated.
2. Deck Profile, Depth, Design Uncoated-Steel Thickness, Span Condition and Side Laps: As indicated on drawings.

2.5 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. Galvanizing Repair Paint: ASTM A 780.

I. Repair Paint: Manufacturer's standard rust-inhibitive primer of same color as primer.
PART 3 - EXECUTION

3.1 EXAMINATION

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

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

3.2 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.

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.

3.3 ROOF-DECK INSTALLATION

A. Fasten roof-deck panels to steel supporting members as noted on the drawings.

B. Fasten side laps and perimeter edges of panels between supports as noted on the drawings.

C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 2 inches.
D. Miscellaneous Roof-Deck Accessories: Install ridge and valley plates, finish strips, end closures, and reinforcing channels according to deck manufacturer's written instructions. Weld or mechanically fasten to substrate to provide a complete deck installation.

3.4 FLOOR-DECK INSTALLATION

A. Fasten floor-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated and as follows:
   1. Weld Diameter and Spacing: As indicated on the drawings.
   2. 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 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 of 2 inches.

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 are 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 pre-punched holes in the deck. Provide pre-punched 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.

3.5 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 sidelaps.
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. Testing agency will report inspection results promptly and in writing to Contractor and Architect.
G. Remove and replace work that does not comply with specified requirements.
H. Additional inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

3.6 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
B. Repair Painting: Wire brushing, cleaning, and repair painting of rust spots, welds, and abraded areas of both deck surfaces are included in Division 09 Section "Painting"
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.

END OF SECTION 05 31 00
1.1 SYSTEM DESCRIPTION

A. Design Responsibility:
   1. Engineering design submittal must be performed by, or under the direct supervision of, a registered Engineer, licensed to practice Structural Engineering in State of Colorado.
   2. Submittal must include calculations for all load-bearing components of stairs and landings.
      a. Note design live loads on submittal.
   3. Submittal to be reviewed by A/E for general conformance with design intent shown by Contract Documents
      a. Physical adequacy of Structural design and conformance with applicable building Codes are the responsibility of the stair fabricator.

1.2 QUALITY ASSURANCE

A. Materials and operations standards:
   1. AAMA, Architectural Aluminum Manufacturer’s Association.
   2. AISC, American Institute of Steel Construction.
   4. AWS, American Welding Society.

1.3 SUBMITTALS

A. Shop drawings.

B. Project Information:
   1. Engineering design calculations, sealed by registered Engineer, licensed to practice Structural Engineering in state where project is located.

C. LEED Credit MRc4.1 and Credit MRc4.2, Recycled Content:
   1. Provide list of proposed materials with recycled content. Indicate separate percentages, by weight, of pre-consumer and post-consumer recycled content per unit of product. Also include material costs, excluding cost of installation.

D. LEED Credit MRc5.1 and Credit MRc5.2, Local/Regional Materials:
   1. Provide list of proposed regional materials. Indicate location of manufacturing facility including name, address and distance 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.

1.4 JOB CONDITIONS

A. Provide sleeves, embedded anchors and other built in items in time for installation, or pay costs of cutting in items later, and grouting.

B. Verify field conditions prior to fabrication.
PART 2 - PRODUCTS

2.1 MATERIALS

A. Acceptable Manufacturers:
   1. Pre-manufactured Steel Stairs:
      a. Base:
         1) Sharon Stairs.
      b. Optional:
         1) American Stair Corporation.
         2) Pacific Stair Corporation.
   2. Galvanizing Repair Paint:
      a. Base:
         1) ZRC Worldwide.
      b. Optional:
         1) Tnemec.
   3. Shop Primer:
      a. Base:
         1) Sherwin-Williams.
      b. Optional:
         1) Tnemec.
   4. Coal Tar Epoxy (dissimilar material protection coating): For concealed materials only.
      a. Base:
         1) Tnemec.
      b. Optional:
         1) ICI Dulux Paint Centers.
   5. Non-shrink Grout:
      a. Base:
         1) Minwax.
      b. Optional:
         1) Sauereisen.
   6. Abrasive Warning Tape:
      a. Base:
         1) 3M.
   7. Other manufacturers desiring approval comply with Section 00 26 00.

2.2 COMPONENT MATERIALS

C. Steel forgings: ASTM A668.
E. Filler metal: AWS Standards.
F. Cast iron: ASTM A48, Class 30, minimum 30,000 PSI tensile.
G. Malleable iron: ASTM A47 and ASTM A197.
H. Steel pipe: ASTM A53.
I. Aluminum: ASTM B308 for particular alloy in standard shapes and extrusions, ASTM B26 for castings.
   1. Concealed: Type 302 or Type 304.
   2. Exposed: Type 304.
      a. Finish: ASTM A480 AISI finish #4, unless otherwise indicated.
K. Non-shrink Grout:
   1. Compressive strength: 8,475 PSI at 7 days.
   2. Base Product: “Super Por-Rok” by Minwax.

L. Anchorage devices - masonry:
   1. Standard manufactured items.
   2. Lead expansion shields for machine screws and bolts 1/4 IN and smaller: Head out embedded nut type.
   3. For machine screws and bolts larger than 1/4 IN: Manufacturers’ standard.
   5. Bolt anchor expansion shields for bolts: Closed end bottom bearing type.

M. Fasteners:
   1. Galvanized or stainless where built into exterior walls.
   2. Select fasteners for type, grade and class required.
   4. Lag Bolts: Square or octagonal head type.

2.3 STEEL STAIRS

A. General:
   1. Supply items required to complete construction and installation.
   2. Minimum Workmanship Standards (unless noted otherwise):
   3. Anchorage accessories:
      a. Items required to secure wood to metal, wood to masonry, metals to masonry or concrete, metal to metal or metal to other items.

B. Pre-manufactured Steel Stairs: Comply with following minimum requirements:
   1. General arrangement with rise, run, landing dimensions, etc., similar to stairs indicated.
   2. Design auxiliary framing not indicated and modifications to framing required for stairs.
   3. Fabricate and design stair and landing assembly in accordance with NAAMM Metal Stairs Manual and latest AISC Manual of steel construction.
   4. Fabricate and design stair and landing assembly to support the larger of the following loads, whichever results in stronger components:
      a. Design Concentrated Moving Load: 300 LBS.
      b. Design Uniform Load: 100 PSF.
   5. Stringers:
      a. Minimum Sheet Thickness: 3/16 IN steel plate.
   6. Treads:
      a. Minimum Sheet Thickness: 14 GA or greater, according to design loading.
      b. Type:
         1) Concrete-filled Steel Pans with self furring lath welded in pan, job-filled with concrete.
   7. Risers:
      a. Minimum Sheet Thickness: 14 GA or greater, according to design loading.
   8. Landings:
      a. Minimum Sheet Thickness: 10 GA or greater, according to design loading.
      b. Include steel stiffeners; shapes and sizes as appropriate to type specified.
      c. Type:
         1) Concrete-filled Steel Pans with angle stiffeners as required, and self furring lath welded in pan, job-filled with concrete.
9. Form surface of nosings with slip resistant materials.
10. Modify standard railings to meet code requirements and details.
11. Apply abrasive warning tape Type 1 to first and last nosing (at top and bottom) of all stair runs.
   a. Exception 1: Omit where terrazzo or carpet is scheduled.
   b. Exception 2: Omit where bar grating type treads are specified.

C. Shop-fabricated Steel Pan Stairs;
   1. Supports: Support stairs at locations indicated. Outside stringers shall span flight length plus landing. Intermediate supports are not allowed without prior approval.
      a. Hangers: Minimum 1/2 IN diameter.
         1) Connect hangers to structure with through-bolt type connections when in tension.
            Recess top plate and nut in slab and grout smooth. Expansion anchor type connections in tension are not allowed.
      b. Support brackets and posts: Attach to structure as required, use welded connections whenever possible. When required, expansion anchors in concrete shall only be used for shear type connections.
   2. Fabricate and design stair and landing assembly to support a 1000 LB concentrated, moving load or 100 PSF, whichever requires stronger component.
   3. Fabricate and design stair components in accordance with NAAMM Metal Stairs Manual.
   4. Design, fabricate, and install in compliance with applicable codes.
   5. Form surface with slip resistant materials: See Section 03 35 00.

2.4 HANDRAILS AND GUARDRAILS

A. General:
   1. Supply items required to complete construction and installation.
   2. Minimum Workmanship Standards (unless noted otherwise): Consistent with NAAMM Class specified for Stairs.
   3. Use galvanized steel for exterior use.
   4. Form to profiles indicated.
   5. Anchorage accessories:
      a. Items required to secure wood to metal, wood to masonry, metals to masonry or concrete, metal to metal or metal to other items.

B. Design Criteria - 2006 IBC:
   1. Handrails and top rail of Guardrails, Uniform Load: 50 LBS/LF applied in any direction.
   2. Handrails, Concentrated Load: 250 LBS applied in any direction at any point along the rail.
      (Note: A higher ADA loading requirement for Handrails supersedes that of Building Code).
   3. Guardrail, Concentrated Load: 200 LBS applied in any direction at any point along the rail.
   4. The Uniform and Concentrated Loads need not be concurrently applied.
   5. Intermediate rails, pickets, panels, balusters, and other infill materials: Design to withstand a horizontally applied normal load of 50 pounds on an area not to exceed 1 square foot including openings and space between rails.
   6. Utilize the above listed loads for the design of the indicated members and their direct or indirect connection to building superstructure.

C. Handrails and Guardrails:
   1. Minimum Clearance from wall: 3 IN.
   2. Maximum projection from wall: 4 1/2 IN.
   3. Set mounting brackets and posts maximum 8 FT O.C.
   4. Return ends of wall mounted rails to wall.
   5. Make rails smooth with no projections preventing a hand from sliding along entire length.
   6. Handrail Member Size:
      a. Round Tubing: HSS 1.50.x 0.083; ASTM A500.
   7. Guardrail Member Sizes (minimum):
      a. General:
         1) The following member sizes are “minimum.”
2) Sizes shall be increased where appropriate to resist Design Loads.
3) Refer to Drawings for depiction of Guardrails.

8. Posts:
   a. Round Tubing:
      1) HSS 1.66 x 0.140; ASTM A500.
      2) Schedule 40 Pipe: 1 1/4 IN STD; ASTM A53 is also acceptable.

9. Toprails and Bottomrails:
   a. Round Tubing:
      1) HSS 1.66 x 0.140; ASTM A500.
      2) Schedule 40 Pipe: 1 1/4 IN STD; ASTM A53 is also acceptable.

10. Pickets:
    a. Square Bar: 1/2 x 1/2 IN.

2.5 MISCELLANEOUS ITEMS

A. Abrasive warning tape:
   1. Self-adhering, tape with slip resistive mineral surface.
   2. Color: Safety Yellow.
   3. Width: 2 IN, except where noted otherwise.
   4. Tape Type 1:
      a. Base Product: “Safety-Walk 630 General Purpose Tread” by 3M.
      c. Thickness: 0.030 IN.
      d. Use Type 1 at first and last stair nosings (at top and bottom) of all stair runs.
         1) Exception 1: Omit where Rubber Stair Treads or Carpet is scheduled.
   5. Tape Type 2:
      a. Base Product: “Safety-Walk 530 Conformable” by 3M.
      b. Backing: Aluminum foil.
      c. Thickness: 0.035 IN.
      d. Use Type 2 at top and bottom rungs of all ladders.

2.6 SELF-CLOSING GATES – EGRESS CONTROL FOR STAIRS

A. Self-closing Gate:
   1. Configuration(s) indicated.
   2. Hardware:
      a. Spring butt hinges, Type 5: Specified in Section 08 71 00.
      b. Rubber bumper, utilize Wall-mounted Door Stop: Specified in Section 08 71 00.

2.7 FABRICATION

A. Form to shapes indicated with straight lines, sharp angles, smooth curves.
B. Drill or punch holes with smooth edges for temporary field connections and attachment of work by other trades.
C. Make permanent shop and field connections with continuous fillet type welds.
D. Grind exposed welds smooth.
E. Conceal fastenings where practicable.
F. Shop fabricate in as large assemblies as practicable.
G. Meet requirements specified under Structural Steel for fabricating items of structural nature or use.
H. Qualify welding processes and welding operators in accord with AWS.

2.8 SURFACE PREPARATION AND SHOP-APPLIED COATINGS

A. General:
1. All items in this section shall be shop finished by one of the methods described in this article.

B. Shop Primer for Interior (non-wet) Items:
   2. Apply primer for interior finish paint to following surfaces not receiving other coating:
      a. Surfaces exposed on interior.
   3. Clean thoroughly before priming; remove mill scale, rust, dirt, oil, and grease in accordance with SSPC-SP3.
   4. Apply in accordance with paint manufacturer’s instructions.
      a. Apply minimum 0.002 IN, dry film thickness.

C. Hot-dip Galvanized (HDG) Coating for Exterior items:
   1. Galvanize (HDG) the following items:
      a. Items to be installed on site, roof or other areas that are “outside” of building enclosure walls. This shall include items “attached to” exterior walls of building.
      b. Items to be installed in “wet” or humid (>70% RH) areas of building.
   2. Clean thoroughly before galvanizing.
   3. Galvanize in accordance with ASTM A123.

D. Shop-primer Coating for Exterior items:
   4. Apply primer for exterior finish paint to following surfaces:
      a. Steel exposed permanently to weather and not galvanized.
   5. Clean in accordance with SSPC-SP6, Commercial Blast Cleaning.
   6. Apply in accordance with paint manufacturer’s instructions.
      a. Apply minimum 0.0025 IN, dry film thickness.

2.9 PAINTING
   A. Paint exterior steel items (in field) as Specified in Section 09 91 13.
   B. Paint interior steel items (in field) as Specified in Section 09 91 23.

PART 3 - EXECUTION

3.1 INSPECTION
   A. Verify suitability of substrate to accept installation.
   B. Installation constitutes acceptance of responsibility for performance.
   C. Ensure that adequate Wall Backing (as specified in Section 09 22 16) has been installed where required for Handrails and similar wall-mounted items specified in this Section.

3.2 INSTALLATION
   A. General:
      1. Set work level, true to line, plumb.
      2. Shim and grout as necessary.
      3. Weld field connections and grind smooth.
      4. Where practical, conceal fastenings.
      5. Secure metal to wood with lag screws of adequate size with appropriate washers.
      6. Secure metal to concrete with embedded anchors, setting compounds, caulking and sleeves, or setting grout.
a. Use expansion bolts, toggle bolts, or screws for light duty service.
7. Meet structural requirements for erecting items of structural nature.
8. Do not field splice fabricated items unless size requires splicing.
9. Weld splices.
10. Provide fabricated items complete with attachment devices as required to install.

B. Galvanic Repair:
1. After galvanized units have been erected and anchored apply galvanizing repair paint in accordance with manufacturer’s recommendations.
2. Surface preparation: Remove contaminants in accord with SSPC SP-1.

C. Handrails:
1. Furnish handrails complete with brackets.
2. Coordinate locations and installation of backing specified in Section 09 22 16.
3. Wherever pickets or posts are indicated to be set in sleeves, provide galvanized steel sleeves having a minimum wall thickness of 1/8 IN.
4. Set pickets or posts in sleeves with non-shrink grout.
5. Where setting is required for exterior, hold non-shrink grout back 1/4 IN from surface.
6. Fill flush with sealant.

D. Abrasive warning tapes:
1. Apply where indicated near the end of the construction, after jobsite has been cleaned and nearly ready for occupancy.
2. Clean and prepare surfaces to receive tape prior to application.
3. Apply tape only when ambient temperature is within manufacturer’s recommended limits.
4. Where tape is damaged by construction activities, remove, re-clean, and re-apply.

3.3 FIELD PAINTING

A. All items in this section which are exposed to view:
2. Painting of interior items: Specified in Section 09 91 23.

END OF SECTION
PART 1 - GENERAL

1.1 QUALITY ASSURANCE

A. Lumber grading rules and species:
   2. Western Wood Products Association (WWPA).
   3. Southern Forest Products Association (SFPA).

B. Plywood grading rules and recommendations:
   1. For softwood plywood: US Department of Commerce DOC PS-1 – Construction and Industrial Plywood.
   2. For hardwood plywood: US Department of Commerce DOC PS-51-71.

C. Factory marking:
   1. Identify type, grade, moisture content, inspection service, producing mill, and other qualities.
   2. Mark each piece of fire retardant treated material with Underwriters Laboratory Classification mark, and fire-retardant treatment, pressure-applied blue stain color code for identification.

D. Preservative and fire retardant treatment standards: American Wood Preservers Association (AWPA):
   1. AWPA U1: Treated Wood.
   2. AWPA P5: Standard for Waterborne Preservatives.

E. Architectural Woodwork Institute (AWI) workmanship standards for Finish Carpentry:
   1. Premium Grade Standards.

1.2 SUBMITTALS

A. Shop drawings:
   1. Fabricated items.

B. Samples:
   1. Materials, color and finish.

C. LEED Credit MRc4.1 and Credit MRc4.2, Recycled Content:
   1. Provide list of proposed materials with recycled content. Indicate separate percentages, by weight, of pre-consumer and post-consumer recycled content per unit of product. Also include material costs, excluding cost of installation.

D. LEED Credit MRc5.1 and Credit MRc5.2, Local/Regional Materials:
1. Provide list of proposed regional materials. Indicate location of manufacturing facility including name, address and distance 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.

E. LEED Credit MRc7, Certified Wood:
1. Provide list of proposed certified wood products. Provide documentation from the manufacturer certifying that wood based product is made from wood obtained from forests certified by an FSC accredited certification body to comply with the Forest Stewardship Councils "Principles and Criteria." Include cost of material and chain-of-custody certification number obtained from manufacturer. Vendor's invoices must be included with chain-of-custody certificate number listed.

F. LEED Credit EQc4.1, Low-Emitting Materials, Adhesives and Sealants:
1. Provide product data and material safety data sheets (MSDS) for adhesives and sealants used inside the building indicating VOC content of each product used. Indicate VOC content in g/L calculated according to 40 CFR 59, Subpart D.

G. LEED Credit EQc4.4, Low-Emitting Materials, Composite Wood and Agrifiber Products:
1. Provide product data indicating the type of binder used, and confirming the product does not contain urea-formaldehyde resin binders.

1.3 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Store in dry, weathertight, ventilated spaces.

B. Do not bring items into building until receiving spaces have humidity controlled to between 25 percent and 65 percent.

C. Stack to provide air circulation.

D. Store and protect materials in areas where moisture content can be maintained.

E. Time delivery and installation to avoid delaying progress of other work.

F. Handle treated material and repair damage in accordance with AWPA-M-4.

1.4 JOB CONDITIONS

A. Drawings indicate type, arrangement, and location of items of finish carpentry and millwork.

B. If variations from arrangement or profile indicated are required, notify Architect.

C. Make such variations at no added expense to Owner.

D. Contractor is responsible for fitting to recesses, including trim pieces, fillers and closures.

PART 2 - PRODUCTS

2.1 MATERIALS — ROUGH CARPENTRY

A. Acceptable manufacturers:
1. Fire-retardant treated dimension lumber and plywood:
   a. Base:
      1) Hoover Wood Treated Products, Inc.
   b. Optional:
      1) Chemical Specialties.
      2) Arch Wood Protection (Dricon).

B. Fire-retardant Treated (FRT) Lumber & Plywood:
1. Fire-retardant-treated wood:
   a. ASTM E84:
1) Flame spread index of 25 or less and no evidence of significant progressive combustion when the test is continued for an additional 20-minute period.

2) Flame front shall not progress more than 10.5 FT beyond the centerline of the burners at any time during the test.

b. Free of halogens, sulfates, chlorides, arsenic, ammonium phosphate, formaldehyde, and urea formaldehyde.

c. Manufactured under the independent third party inspection of Underwriters Laboratories Inc. (UL).

d. Kiln dried after treatment to maximum moisture content of 19% for lumber and 15% for plywood. Label each piece kiln dried after treatment (KDAT).

e. Lumber Grading:
   1) Comply with dry size requirements of PS-20, Douglas fir WWPA No.3, or SFPA No.2.
   2) Thoroughly seasoned, well-fabricated materials of longest practical lengths and sizes.
   3) Free of non-correctable warp.
   4) Discard material which would impair quality of work.

f. Plywood Grading: PS1, A-C Grade.

2. FRT material for Interior, above-grade Locations (typical):
   b. Natural wood products treated to add fire-retardant qualities.
   c. Maximum equilibrium moisture content: Not more than 28% when tested in accordance with ASTM D3201 at 92% relative humidity.
   d. Usage (Interior above-grade FRT):
      1) Above-grade framing/blocking/sill plates within non-load bearing interior partitions that are rated 2 hours or less.
      2) Above-grade framing/blocking/sill plates within non-load bearing exterior walls that are not fire-rated.
      3) Platforms and Stages.
      4) Wood in concealed spaces.
      5) Framing, blocking, cants and nailers within roof covering and waterproofing systems.
      6) Interior sleepers and sill plates in contact with concrete slabs-on-grade.
      7) Interior wood items in direct contact with exterior concrete and exterior masonry walls.
      8) Window frame blocking within exterior walls.
      9) Plywood backing panels for electrical, tele-communication equipment.
      10) Similar locations where wood products are indicated and Building Code does not permit non-FRT products.
      11) Exception: Upgrade to Exterior grade where schedules in the following article.

3. FRT material for Exterior & Wet Locations:
   b. Natural wood products treated to add fire-retardant qualities plus decay and termite resistance.
   c. Treatment must be non-leaching under direct exposure to precipitation, sunlight and effects of weather; No deterioration of Flame Spread Rating after undergoing rain test (ASTM D2898).
   d. Usage (Exterior FRT):
      1) Fire-treated wood that is directly exposed to weather.
      2) Fire-treated wood in areas of high-humidity (>80% RH).
      3) Other areas where indicated.

C. LEED Credit MRc7 Certified Wood:
   1. Materials shall contain wood and agrifiber products as FSC certified.
2.2 FASTENERS

A. General:
   1. Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.
   2. Anchorage and fastening materials: Proper type, size, material and finish for application.
   3. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity:
      a. Use fasteners with hot-dip zinc coating complying with ASTM A153.
      b. Use fasteners of Type 304 stainless steel at treated wood.

B. Nails, Brads, and Staples: ASTM F1667.


F. Bolts: ASTM A307, Grade A steel bolts with ASTM A563 hex nuts and washers.

G. Expansion Anchors:
   1. Anchor bolt and sleeve assembly capable of sustaining a load equal to 6 times the load imposed when installed in unit masonry assemblies and 4 times the load imposed when installed in concrete as determined by testing per ASTM E488 conducted by a qualified independent testing and inspecting agency.
   2. Material:
      a. Interior Applications: Carbon-steel components, zinc plated to comply with ASTM B633, Class Fe/Zn 5.
      b. Exterior and Wet Applications: Stainless Steel components, ASTM F593 & F594 Alloy Group 1 or 2.
      c. Zinc plated to comply with ASTM B633, Class Fe/Zn 5.
         1) Do not use where exposed to weather.

2.3 MISCELLANEOUS MATERIALS

A. Sill-Sealer Gaskets:
   1. Closed-cell neoprene foam.
   2. Nominal Thickness: 1/4 IN.
   3. Widths: matching width of sill members indicated.

B. Adhesives for gluing furring, sleepers, and sills and similar items:
   1. ASTM D3498 product that is approved for use indicated by adhesive manufacturer.
   2. Use adhesives that have a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
   3. LEED Credit EQc4.1 Low-Emitting Materials, Adhesives, and Sealants:
      a. Material shall contain VOC content as certified.
   4. LEED Credit EQc4.4 Low-Emitting Materials, Composite Wood and Agrifiber Products:
      a. Material shall be free of urea-formaldehyde glues.

C. Water-Repellent Preservative:
   1. Usage: For treatment of exposed ends of posts and beams, Do not use for treating cuts in preservative-treated lumber or fire-retardant treated lumber.
   2. NWWDA-tested and -accepted formulation containing 3-iodo-2-propynyl butyl carbonate, combined with an insecticide containing chloropyrifos as its active ingredient.

2.4 MATERIALS — FINISH CARPENTRY

A. Acceptable manufacturers:
   1. Adjustable Shelf Hardware (not in cabinets):
      a. Base:
1) Knape & Vogt Manufacturing.

2. Shelf and Rod Hardware:
   a. Base:
      1) Knape & Vogt Manufacturing.

3. Other materials:
   a. Base: As noted.

4. Other manufacturers desiring approval comply with Section 00 26 00.

B. Shelves:
   1. Semi-exposed:
      a. Grade-NN, veneer core, Fir plywood.
      b. Minimum 1/4 IN thick solid hardwood edges.
   2. Exposed:
      a. Grade-AA Plywood.
      b. Species:
         1) Plain sliced White Oak plywood.
         c. Minimum 1/4 IN thick solid hardwood edges.

   1) Species:
      a) Plain sliced White Oak plywood.

C. Particleboard:
   1. Non-rated:
      a. ANSI A208.1, Grade M-3, made with formaldehyde free binder, like Fuller’s Phenol AP2403.
      b. Seal cuts.

D. Adjustable Shelf Hardware (not in cabinets):
   1. Standards:
      a. Material: 0.093 IN (12 GA) steel channels w/ slots spaded 2 IN.
      b. Minimum Size: 7/8 IN wide X 11/16 IN deep.
      c. Factory finished.
      d. Color:
         1) To be selected.
   2. Brackets:
      a. Material: 0.093 IN (12 GA) steel plate.
      b. Triple prongs that positively engage Standards.
      c. Nylon cam lock lever.
      d. Factory finished to match Standards.
      e. Bracket Length(s): As required for shelf widths indicated.
   3. Accessory Items:
      a. Include matching Screws and other necessary items.

E. Shelf and (clothes) Rod Hardware:
   1. Bracket:
      a. Heavy duty with factory painted finish.
      b. Color:
         1) To be selected.
   2. Chrome-plated Clothes Rod:
      b. Outside Diameter: 1-1/16 IN.
      c. Minimum Wall Thickness: 0.109 IN.
      d. Length(s): Full-length, and lengths as indicated.
3. Accessory Items:
   a. Include matching Endcaps, Tubing Flanges, Screws and other necessary items.

F. Laminate-Clad Paneling:
   1. Particleboard core paneling finished on exterior with high-pressure decorative laminate.
      a. Sizes and configurations as indicated.
      b. AWI Section 500.
      c. Fire rated: Class A.
      d. Premium Grade.
   2. Plastic laminate facing material and edges:
      a. Minimum 0.048 IN thick.
      c. Color:
         1) See Section 09 06 10.
         2) Wood Grained Finish.
            a) Grain direction: Vertical.
   3. Plastic laminate backer sheet:
      a. Minimum 0.048 IN thick.
      b. NEMA-LD3-2005, HGF, 15/25 when bonded to FR particleboard.
   4. Adhesive: Resorcinol, WDMA Type I.
   5. Particleboard core:
      a. Thickness: 3/4 IN.
      b. UL Class I.
         1) Fire rated: Flame spread 20, Smoke developed 450.
   6. LEED Credit EQc4.4 Low-Emitting Materials, Composite Wood and Agrifiber Products:
      a. Material shall be free of urea-formaldehyde glues.

PART 3 - EXECUTION

3.1 PREPARATION - ROUGH CARPENTRY
   A. Verify measurements, dimensions and drawing details before proceeding.
   B. Coordinate location of furring, nailers, blocking, grounds and similar supports for attached work.
   C. Examine conditions under which work is to be installed.
   D. Correct unsatisfactory conditions.

3.2 INSTALLATION - ROUGH CARPENTRY
   A. Attach work securely by anchoring and fastening as indicated or required to support applied loading.
      1. Provide washers under bolt heads and nuts.
      2. Nail plywood in accordance with APA recommendations.
      3. Countersink nail heads.
   B. Set work to required levels and lines, plumb, true.
   C. Cut and fit accurately.
   D. Make connections tight.
      1. Use common wire nails or screws for general work.
      2. Use finishing nails for finish work.
      3. Use fasteners of size that will not penetrate members where opposite side will be exposed to view or receive finish materials.
      4. Install fasteners without splitting wood; predrill as required.
      5. Do not drive threaded friction type fasteners.
      6. Tighten bolts and lag screws at installation and retighten as required.
7. Use galvanized nails and fasteners.

E. Provide wood grounds, nailers, or blocking as required for attachment of other work and surface applied items.

F. Form to shapes indicated.

G. Provide wood blocking between studs at height of door stop, behind stop, at every door opening.

H. Grounds: Dressed, key beveled lumber minimum 1 1/2 IN wide of thickness required to bring face of ground even with finish material.

I. Remove temporary grounds when no longer required.

J. Install wood furring plumb and level with closure strips at edges and openings.

K. Shim as required.

L. Field treat cuts and holes in preservative and fire retardant treated material in accordance with AWPA-M-4.

M. Use only fasteners approved by the manufacturer of fire-retardant-treated or preservative treated wood.

3.3 INSTALLATION OF BLOCKING/NAILERS FOR ROOFING AND PARAPETS

A. General:
   2. Minimum Member Size: 2 x 6 IN (nominal size).
   3. Fasteners:
      a. Corrosion resistant (long-term).
      b. Countersink heads of all fasteners.
      c. Fastener types as required for substrate conditions.
      d. Diameter and spacing as required to resist forces indicated.
   4. Fastener Spacing:
      a. Threaded Anchor Bolts; 3/8 IN or larger:
         1) Utilize 5/8 IN OD washers or larger.
         2) Maximum Spacing: 48 IN.
         3) Stagger 1/3 the nailer width.
      b. Other fastener types:
         1) Maximum Spacing:
            a) Typical: 12 IN O.C.
            b) Up to 16 IN O.C. where necessary to match spacing of structural members.
         2) Stagger 1/3 the nailer width.
         3) At ends of nailers lengths (including butt ends and terminal ends): Install 2 fasteners and within 6 IN of ends.
   5. Anchor nailers to resist minimum vertical force of 300 LBS/LF in any direction.
      a. Locate fasteners approximately 4 IN from ends but not less than 3 IN.
      b. Use minimum of 3 anchors for each nailer.
      c. Where members are wider than 6 IN, stage fasteners from side to side to avoid splitting of the wood member.
      d. Corner region enhancements:
         1) Double the above listed vertical force which must be resisted.
         2) Length and width of corners as prescribed by ANSI/SPRI RP-4:
            a) 40 percent of the building height, but not less than 8-1/2 FT.

B. Nailers used for perimeter securement of roofing membranes:
   1. Refer to “General Requirements” above.
   2. Install nailers where indicated and where required to secure perimeter of membrane roofing.
   3. Match height of nailers to adjacent insulation.
   4. Where multiple layers are required to match depth of insulation:
a. Attach base layer as indicated in “General Requirements” above.
b. Apply a bead of construction adhesive between laminations.
c. Attach subsequent layers using fastener type which is appropriate for wood to wood securement.
d. Size and locate fasteners as required to resist uplift loading indicated.

C. Blocking used for securement of sheet metal edge flashings, parapet copings, and similar items:
   1. Refer to “General Requirements” above.
   2. Install blocking as indicated.

D. Wall Backing and Blocking:
   1. Definition: In-wall reinforcements required where equipment and furnishings are to be wall-mounted (to stud-type walls).
      a. Metal studs: Metal backing, See Section 09 22 16.

3.4 INSPECTION

A. Examine areas to receive work.
B. Correct unsatisfactory conditions.
C. Start of work constitutes acceptance of responsibility for performance.

3.5 ADJUST AND CLEAN

A. Promptly remove debris, dirt and rubbish.
B. After installation, adjust operating parts.
C. Leave items in perfect operating condition.
D. Remove and replace rejected work.
E. Install temporary coverings to protect installed work.

END OF SECTION
SECTION 06 42 16
WOOD PANELING – FLUSH (WDP)

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work includes:
   1. Furnish labor, materials, tools, equipment, and services for architectural woodwork indicated, to include:
      a. Shop-finished, interior wood veneer-faced wall paneling, wainscots, and base.
      b. Perforated acoustical wood panels.
   2. Completely coordinate with work of other trades.
   3. Although such work is not specifically indicated, provide supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation.

1.2 RELATED WORK

A. Carpentry Work: Specified in Section 06 10 53.
B. Flush Wood Doors: Specified in Section 08 14 16.
   1. Veneers for doors and wall paneling specified herein shall match and be provided by a single source.

1.3 QUALITY ASSURANCE

A. Fabricator Qualifications:
   1. Firm shall be experienced in successfully producing millwork similar to that indicated for this Project, with sufficient production capacity to produce required units without causing delay in the work.
   2. Member of AWI, in good standing.
B. Lumber, Hardwood: FS MM-L-736.
C. AWI Quality Standard:
      a. Grade: Premium.

1.4 SUBMITTALS

A. Shop Drawings:
   1. Showing the fabrication and erection of each condition for architectural woodwork, including plans and elevations.
   2. Show flitch matching, jointing, grain direction, identification number for each leaf, anchorage and accessory items, finishes, framing and bracing members.
      a. Identification number shall include the flitch and the sequence within the flitch for each leaf.
B. Product Data.
C. Samples:
   1. Veneer Flitches: Minimum 3 full length and width veneer flitches, for selection by Architect prior to preparing fabricated samples.
2. Fabricated samples: Minimum 8 x 10 IN sample of veneered panel fabricated with a minimum of one veneer flitch match.
   a. Architect review shall establish and control criteria for graining, color, texture, workmanship and joint tolerances only.
   b. Submit additional samples as may be required for Architect’s approval.
3. Include shop-applied stains and transparent finishes, where applicable, on fabricated samples.
4. Mock-up Wall: See 1.5.

D. Project Information:
1. Certification of fire-retardant treatment including name of fire-retardant salts used, compliance with applicable building code requirements and with AWPA Spec C27B for plywood, and that treatment will not bleed through or attack final finish.

E. Contract Closeout Information.
1. Maintenance Data.

F. LEED Credit MRc4.1 and Credit MRc4.2, Recycled Content:
1. Provide list of proposed materials with recycled content. Indicate separate percentages, by weight, of pre-consumer and post-consumer recycled content per unit of product. Also include material costs, excluding cost of installation.

G. LEED Credit MRc5.1 and Credit MRc5.2, Local/Regional Materials:
1. Provide list of proposed regional materials. Indicate location of manufacturing facility including name, address and distance 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.

H. LEED Credit MRc7, Certified Wood:
1. Provide list of proposed certified wood products. Provide documentation from the manufacturer certifying that wood based product is made from wood obtained from forests certified by an FSC accredited certification body to comply with the Forest Stewardship Councils "Principles and Criteria." Include cost of material and chain-of-custody certification number obtained from manufacturer. Vendor's invoices must be included with chain-of-custody certificate number listed.

I. LEED Credit EQc4.1, Low-Emitting Materials, Adhesives and Sealants:
1. Provide product data and material safety data sheets (MSDS) for adhesives and sealants used inside the building indicating VOC content of each product used. Indicate VOC content in g/L calculated according to 40 CFR 59, Subpart D.

J. LEED Credit EQc4.4, Low-Emitting Materials, Composite Wood and Agrifiber Products:
1. Provide product data indicating the type of binder used, and confirming the product does not contain urea-formaldehyde resin binders.

1.5 MOCK-UP WALL

A. Prior to proceeding with work, erect mock-up typical of millwork, including paneled wall section.
   1. Based on Architect-approved Samples.
   2. Location to be determined by the Architect.
   3. Minimum size to be 48 IN wide by 120 IN tall.
   4. Mock-up shall be used to obtain Architect’s acceptance of visual qualities as well as materials and workmanship.
   5. Accepted mock-up shall be protected and maintained as a standard for the balance of the work, and may be part of the permanent installation.
1.6 JOB CONDITIONS
A. Verify dimensions by accurate field measurement before fabrication wherever work adjoins other work that precede it in construction.
   1. Allow for trimming and fitting of wood paneling and trim as may be required.
B. Do not erect or install paneling in areas until completion of work by other trades that might damage or disfigure the woodwork.
   1. Spaces to receive installed woodwork shall have been conditioned for a minimum of 48 hours within usage temperature and humidity ranges prior to commencing work and continuing to completion of installation.
C. Verify locations of items furnished in other sections.
D. If necessary to vary from arrangement indicated, make such variations only after approval of Architect.

1.7 DELIVERY AND STORAGE
A. Protect woodwork with appropriate heavy duty wrapping materials at the factory prior to shipment.
   1. Mark each unit with appropriate identification required for installation.
B. Protect woodwork during handling, transit and storage to prevent damage and deterioration.
   1. Store in a conditioned space complying with installation temperature and humidity requirements of this specification.
   2. Stack in accordance with manufacturer’s instructions.
   3. Maintain the same temperature and humidity conditions in building spaces as will occur after occupancy before, during, and after delivery and installation.
   4. Maintain relative humidity in storage and installation spaces between 25 and 55% (Relative Humidity) before, during, and after installation.

PART 2 - PRODUCTS

2.1 MATERIALS
A. Acceptable manufacturers:
   1. Wood Paneling and other wood items:
      a. Base: Materials as indicated.
   2. Acoustical, Perforated Wood Paneling:
      a. Base:
         1) “Quadrillo” by Decoustics, a division of CertainTeed Ceilings Company.
      b. Optional:
         1) Armstrong World Industries.
         2) Ceilings Plus.
   3. Mounting Clips:
      a. Base:
         1) Brooklyn Hardware, LLC.
      b. Optional:
         1) Monarch Manufacturing.
   4. Other manufacturers desiring approval comply with Section 00 26 00.

2.2 WOOD PRODUCTS
A. General:
   1. Use items from the following list, as applicable to project:
B. Wood Face Veneer of Panels:
1. Quarter sawn white oak stained to match Architect's sample.
2. Minimum Thickness: 0.025 IN.
3. Balance and slip match in sequence within panel across the extent of any wall of the installation.
4. Provide veneers to wood door manufacturers to achieve a blueprint match in walls with wood doors.
5. Grain Direction:
   a. Vertical.
6. LEED MRe7: Certified Wood:
   a. The source of wood based materials must be certified by the Forest Stewardship Council, and the wood must be classified as “certified wood.”

C. Acoustical Wood Paneling:
1. Fire treated acoustical core.
2. Panel Thickness:
   a. 1 IN absorptive core
3. Noise Reduction Coefficient:
   a. 0.75
4. Basis of Design:
   a. Model “QPP-25 Panel” Quadrillo Decoustics by CertainTeed.
5. Acoustical Wood Paneling shall be supplied unfinished for post application by others.
   a. Wood panel supplier to acquire material and coordinate finishes with other paneling material, trim pieces, grain matching, wood species, and finishes including toning and sheen.
   b. Exposed wood trim at acoustic panels shall be wood veneer clad to match panels.

D. MDF Core for Wood Veneers: Non-rated.
1. Formaldehyde-free, Medium Density Fiberboard (MDF) having a density of not less than 48 LBS/FT^3, and complying with ASTM D1037, except where indicated or specified as plywood.
2. Thickness: 3/4 IN.

E. Particleboard Core for Wood Veneers: Where Rated.
3. LEED EQc4: Low-Emitting Materials:
   a. Urea-Formaldehyde resin binders are unacceptable.

F. Solid Lumber Stock:
1. General:
   a. Hardwood and softwood solid stock for wood paneling and standing and running trim shall comply with AWI lumber grading rules, surfaced four sides (S4S) and worked to patterns shown or specified.
   b. Dimension and Profile: As indicated.
2. Exposed Hardwood:
   a. Premium grade, quarter sawn white oak.
   b. Includes wood base and chair rails.
3. Exposed Hardwood (where Opaque Finish is scheduled):
   a. Premium grade, Poplar.
4. Softwood (for concealed structures and supports):
   a. Custom grade, Western Pine.
5. LEED MRe7: Certified Wood:
   a. The source of wood based materials must be certified by the Forest Stewardship Council, and the wood must be classified as “certified wood.”

G. Plywood:
1. General:
   a. Thickness: 3/4 IN (unless otherwise noted). Exposed Hardwood Plywood:
   b. HPVA HP-1, AWI Premium grade, quarter sawn, white oak.

3. Softwood Plywood (for concealed structures and supports):
   a. AWI Section 200-2, custom grade.

H. Hardwood Lumber Edge Banding:
   1. Edges exposed to view shall be pressure glued with hardwood stock in accordance with the drawings.
   2. Thickness: 3/4 IN or as required to match panel. Minimum Width: As indicated.
   4. Dimension and Profile: As indicated.
   5. Edge banding to be premium grade and shall match the species of the face veneer.

I. Veneer Edge Banding:
   1. Edges exposed to view shall be pressure glued with matching veneer in accordance with the drawings.
   2. Minimum Thickness: 0.027 IN.
   3. Minimum Width: As required for conditions indicated.
   4. Edge banding to be premium grade and shall match the species of the face veneer.

J. Adhesive(s):
   1. FS MMM-A-130 contact adhesive or type to suit application.
   2. Plastic laminate application: Melamine, phenol-resin or resorcinol resin conforming to FS MM-A-181; type, grade and class best suited for the purpose.
   3. General interior use: Moisture resistant conforming to FS MMM-A-125, Type II, or FS MMM-A-188, Type I, II, or III.
   4. LEED Credit EQc4.1 Low-Emitting Materials, Adhesives, and Sealants:
      a. Material shall contain VOC content as certified.

2.3 HARDWARE

A. Mounting Clips:
   1. Fully concealed devices with mating edges; used to secure of panels to parent wall.
      a. Permits installation of panels from finished side without exposed fasteners.
      b. Capable of supporting panel’s full dead load.
      c. Limiting lateral movement in direction perpendicular to plane of parent wall.
      d. Permitting longitudinal movement (parallel to plane of wall) caused by normal, seasonal humidity and temperature fluctuations.
   2. Material: Type 6005A Aluminum, treated to T5 hardness.
   3. Maximum thickness: 1/4 IN.
   4. Lift-off clearance: 1/2 IN.
   5. Fasteners:
      a. No. 10, pan head screws, length as required.
      b. Quantity and spacing as required.
   6. Base Product: “PanelClip” by Brooklyn Hardware, LLC.

B. Fasteners:
   1. Wood Screws: FS FF-S-111, type, size, material and finish as required for the condition of use.
   2. Nails: FS FF-N-105, type, size and finish as required for the condition of use.
   3. Anchors: Type, size, material and finish as required for substrate condition and adequate anchorage for the work.

2.4 FIRE RETARDANT TREATMENT

A. Materials: Fire retardant materials shall meet code requirements for Class I Material, and shall comply with AWPA-P10.
B. Treatment: Pressure treat to meet code requirements and to comply with AWPA-C20B for lumber and AWPA-C27B for plywood.
   1. After fire retardant treatment, kiln dry to a maximum moisture content of 15%.
   2. Fire retardant treated wood shall not bleed through, bleach or otherwise attack final finish.

2.5 FABRICATION

A. Wood paneling shall be constructed in accordance with dimensions and design indicated.
   1. Drawing details indicate the desired type and quality of construction and may be modified to conform to manufacturer’s standards provided that other drawings and specification requirements are followed and that proposed alternate construction methods are approved by the Architect.
   2. Tolerances on overall assembly dimensions shall comply with the applicable AWI standards.

B. Workmanship:
   1. Work shall be fabricated and rigidly assembled.
   2. Reinforcing shall be provided to ensure a rigid and secure assembly.
   3. Exposed surfaces shall be free from dents, toll marks, warpage, buckle, glue and open joints.
   4. Joints, corners and miters shall be accurately fitted.
   5. Threaded connections shall be drawn tightly so that the threads are entirely concealed.

C. Fastening:
   1. Attachment of panels to walls: By concealed Mounting Clips.
   2. Except where otherwise indicated, the methods of assembly and joining shall be at the Contractor’s option provided the results are satisfactory.
   3. Manufacturer’s proven methods that produce the required standards of workmanship shall be used.
   4. Conceal fastenings wherever possible.

D. Veneered Surfaces:
   1. Face veneers shall be glued by the hot press method, and glued surfaces shall be in close contact throughout.
   2. Glue stains will not be permitted.
   3. Carefully match grain and pattern of wood veneers to receive transparent finish.
   4. Carefully distribute to overall advantage any allowable defects in specified premium grade materials and workmanship.

E. Assembly: Fit and assemble work in shop insofar as practicable.
   1. Mark and disassemble units that are too large for shipment to project site, retaining units in sizes that are appropriate for shipment and erection.

2.6 SHOP FINISHING - SCHEDULE

A. The following work shall be shop finished:
   1. Wood Paneling, Base and Wainscots:
      a. Stain:
         1) To be selected by Architect.
   2. Acoustical Wood Paneling:
      a. All materials shall be coordinated and finished to match project for finishes including toning and sheen.

B. Stains:
   1. Apply shop-applied stain in clean, dustproof environment.
   2. Color: Match approved sample.

C. Transparent Finish:
   1. Apply shop-applied transparent finish in clean, dustproof environment.
2. Sand lightly between coats to provide smooth, medium, rubbed effect finish.
3. Comply with requirements indicated for grade, finish system, staining, effect and sheen.
4. Grade: Premium.
5. Finish system: AWI System TR-6 (catalyzed polyurethane).
6. Sheen:
   a. Satin.

PART 3 - EXECUTION

3.1 PREPARATION

A. Examine parts of the supporting structure and the conditions under which the wood paneling is to be installed, and correct conditions detrimental to the timely and satisfactory completion of the work.
   1. Do not proceed with the installation until unsatisfactory conditions have been corrected.
   2. Examination of substrates shall include checking for excessive moisture content.

B. Verify dimensions before proceeding and obtain measurements at job site for work required to accurately fit with other construction.

C. Coordinate work with that of other trades affected by this installation, including timely provisions of supporting and attachment steel embedded in concrete, wood grounds, nailers, and blocking.

3.2 INSTALLATION

A. Prime paint or seal surfaces in contact with cementitious materials.

B. Install wood paneling in strict compliance with manufacturer’s recommendations and approved shop drawings.

C. Do not set or install any wood paneling until forms of wet work, such as concrete, tile work and general painting, have been completed.
   1. Comply with environmental requirements of this section.

D. Assemble, fit and attach unassembled sections with concealed connections.
   1. Scribe and cut to fit where necessary.

E. Firmly secure wood paneling to previously prepared ground, furring, framing, and other backings.
   1. Fit and scribe to adjacent materials accurately and without damage other materials.

F. Provide for protection of installed work.

3.3 WOOD PANELING

A. Install wood paneling over wall surfaces by concealed clips, and in accordance with the approved Shop Drawings.

B. Maintain the true, plumb, and level alignment of wood paneling throughout.
   1. Maintain reveals and exposed panel terminating edges in constant line and width.

3.4 FINISHES

A. Touch-up and restore shop-applied finishes after installation to eliminate any unsatisfactory appearance.

END OF SECTION
PART 1 - GENERAL

1.1 DESCRIPTION

A. Definition:
   1. Words “calk” and “caulking” mean sealant work.
   2. “Interior wet areas” means toilets, showers, kitchens and similar areas where sealant is subject to moisture.

B. Seal joints which would otherwise permit penetration of moisture or air, unless sealant work is specifically required under other sections.

C. Work included: Provide sealants as follows:
   1. Masonry control joints, and between masonry and other materials.
   2. Flooring joints.
   3. Isolation joints.
   4. Joints at penetrations of walls, floors and decks by piping and other services and equipment not requiring firestopping.
   5. Perimeters of door and window frames, louvers, grilles, etc.
   6. Between cabinets, casework, countertops and back splashes where adjacent to walls.
   7. Joints between dissimilar materials, to provide visually acceptable closures.
   8. Other joints where caulking, or sealant is indicated.

D. Related materials specified elsewhere:
   3. Firestopping: Specified in Section 07 84 00.

1.2 QUALITY ASSURANCE

A. Sealant materials:
   1. Sealant specification: ASTM C920 Type S or M, Grade-NS, minimum Class-25.
   2. Sealant testing: ASTM C510; ASTM C711; ASTM C719 Class-25, Grade-N; ASTM C792; ASTM C793; ASTM C910.
   4. Installer approved by manufacturer.

1.3 SUBMITTALS

A. Shop Drawings:
   1. Sealant Schedule with the following information:
      a. Generally describe locations requiring sealants.
      b. List type of sealant to be used and name of product proposed.
      c. Include a blank column on schedule for colors.
      d. Upon review, Architect to complete Color Column.
      e. Submit color samples with Sealant Schedule.

B. Samples:
   1. Cured sample of each color for color selection (submit with Sealant Schedule).

C. Contract Closeout Information:
   1. Warranty.
   2. Certifications.
D. LEED Credit EQc4.1, Low-Emitting Materials, Adhesives and Sealants:
   1. Provide product data and material safety data sheets (MSDS) for adhesives and sealants used inside the building indicating VOC content of each product used. Indicate VOC content in g/L calculated according to 40 CFR 59, Subpart D.

1.4 JOB CONDITIONS
   A. Perform sealant work only when ambient temperature is 40 DegF or higher.
   B. Cold Climates: Do not apply sealants late afternoons, late fall or early spring.
   C. Apply only to joints free of material which may inhibit bond.
   D. Apply to cementitious materials only when thoroughly cured and dry.

1.5 WARRANTY
   A. Provide written warranty that sealant work will remain free of defects for a period of 2 years:
      1. Failure of watertightness or air tightness constitutes defect.
      2. Remove defective work and materials and replace with new work and materials.
      3. Repair other work damaged as a result of defective sealant work at no additional expense to Owner.
      4. Warranty signed by installer and Contractor.

PART 2 - PRODUCTS

2.1 MATERIALS
   A. Acceptable manufacturers:
      1. Polyurethane sealants:
         a. Base:
            1) Tremco.
         b. Optional:
            1) Pecora.
            2) Sonneborn/ChemRex.
            3) Sika.
            4) Bondaflex Technologies.
      2. Silicone sealants:
         a. Base:
            1) Tremco.
            2) Dow Corning.
         b. Optional:
            1) Pecora.
            2) GE Silicones.
            3) Sonneborn/ChemRex.
            4) Bondaflex Technologies.
      3. Other Sealants:
         a. Base: As indicated.
      4. Other manufacturers desiring approval comply with Section 00 26 00.

2.2 SEALANTS - GENERAL
   A. General:
      1. Provide colors matching materials being sealed.
      2. Where sealant is not exposed to view, use manufacturer’s standard color which has best performance.
      3. Use non-sag sealant in vertical and horizontal joints.
      4. Use self-leveling in horizontal joints.
5. Before use of sealant, investigate its compatibility with surfaces, fillers and other materials in joint system.
6. Use only compatible materials.
7. Obtain sealants from manufacturers who will provide manufacturers’ field service representatives at project site for purpose of advising and instructing installers.
   a. Provide such services, at no expense to Owner.
8. LEED Credit EQc4.1 Low-Emitting Materials, Adhesives, and Sealants:
   a. Material shall contain VOC content as certified.

B. Polyurethane Sealants:
   1. Refer to Sealant Selection Guide for types required.
   2. Comply with VOC limits as required by local laws.

C. Silicone Sealants:
   1. Refer to Sealant Selection Guide for types required.
   2. Comply with VOC limits as required by local laws.

D. Other Sealant Types:
   1. Refer to Sealant Selection Guide for types required.
   2. Comply with VOC limits as required by local laws.

2.3 MISCELLANEOUS MATERIALS

A. Joint cleaner, primer, bond breaker:
   1. As recommended by sealant manufacturer.

B. Backer Rod:
   1. Rod stock of polyethylene, polyethylene jacketed polyurethane foam, or other flexible, non-absorbent, non-bituminous material recommended by sealant manufacturer to:
      a. Control joint depth.
      b. Break bond of sealant at bottom of joint.
      c. Provide proper shape of sealant.

PART 3 - EXECUTION

3.1 SEALANT USAGE GUIDELINES

<table>
<thead>
<tr>
<th>Location</th>
<th>Materials</th>
<th>Sealant Type</th>
<th>Base Product</th>
<th>Remarks / Exceptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interior (General)</td>
<td>Window Sills / Stools</td>
<td>Multi-part Polyurethane, chemically curing, epoxidized</td>
<td>Tremco “Dymeric 240”</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td>Cabinets and Casework to wall</td>
<td></td>
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<tr>
<td></td>
<td>Countertops and Backsplashes</td>
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<tr>
<td></td>
<td>Sinks in Countertops</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Interior Alum Doors and Window Frame Perimeters</td>
<td>Product specified in Section 12 34 00 (100% silicone by Color Rite)</td>
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</tr>
<tr>
<td></td>
<td>Hollow Metal Door and Window Frames</td>
<td>Siliconized Acrylic Latex (paintable)</td>
<td>Tremco “Tremflex 834”</td>
<td>Exception: Where sealant will not be subsequently painted, and white color will not be visually compatible with adjacent finishes: Use &quot;Dymeric 240&quot; of matching color.</td>
</tr>
<tr>
<td></td>
<td>Acoustical Sealant Joints at top and bottom terminations of Interior Walls</td>
<td>Specified In Section 09 29 00 (and in Section 07 84 00 where fire-rated)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interior Flatwork</td>
<td>Control Joints in Concrete Floors in Mechanical Rooms and other &quot;un-finished&quot; spaces</td>
<td>Multi-part Polyurethane</td>
<td>Tremco &quot;THC 900 / 901&quot;</td>
<td>Exception: Where subject to continual water emersion; use &quot;Vulkem 45 or 245&quot;</td>
</tr>
</tbody>
</table>
General Notes:
1. The above shall be used as a "guide" to selection of appropriate sealant types.
2. Optional sealant products shall offer same number of color choices as the Base Product listed.
3. All of the conditions and materials listed may not necessarily apply to subject project.
4. Not all project conditions may be addressed on above table; Refer also to other specification sections and install sealants where called for by other sections.
5. The above is intended to be an overall guide. Additional conditions and materials may be required on subject project. Notify Architect if additional Guidance is required to select unlisted items.
6. Materials and Conditions “conventionally” occur on Exterior but used on Interior of this project may not be listed on this Table. Refer to Exterior Guide (Section 07 92 13) for appropriate sealant type. i.e. If project calls for Brick Masonry on interior: Refer to Section 07 92 13 for type of Sealant to be used.

| Interior Wet Areas | Porcelain, Ceramic Tile, Metals, and surfaces with Epoxy Paints | Silicone; Air cure | Tremco "Tremsil 200" | -- |

3.2 PREPARATION

A. Clean joints.

B. Where finish coating or covering is to be applied to surface (e.g., paint, wall covering, glazed coating), wait until such coating or covering has been applied before installing sealant.

3.3 INSTALLATION - GENERAL

A. General:
1. Make joints water and air tight.
2. Make depth of sealant not more than one-half width of joint, but in no case less than 1/4 IN.
3. Install correctly sized backer rods.
4. Apply bond breaker as required or recommended by sealant manufacturer.

B. Prime joint surfaces as recommended by sealant manufacturer for conditions:
1. Limit application to surfaces to receive sealants.
2. Mask off adjacent surfaces.

C. Sub-caulk joints without suitable backstop, to proper depth.

D. Tool sealants using sufficient pressure to fill voids.

E. Upon completion, leave caulking smooth and even.

F. Hollow Metal Door Frames:
1. Seal frames to wall.
2. Seal frames to floor substrates and hard floor finishes (do not seal to previously installed carpet and similar finishes.)
3. Seal hairline gaps where stops and rabbets of frame members intersect.

END OF SECTION
SECTION 08 81 04
INTERIOR GLASS AND GLAZING

PART 1 - GENERAL

1.1 QUALITY ASSURANCE

A. Glass standards:
   1. Flat glass ASTM-C1036.
      a. Float glass: Type I, Quality q3; and Class 1 unless otherwise indicated.
      b. Figured glass: Type II, Quality q7, Form 3; and Class 1, Finish f1 and Pattern p2 unless other wise indicated.
      c. Mirror glass and one-way vision glass: Type I, Quality q1 or q2, Class 1, and coated for purpose.
   2. Flat glass, heat treated (coated/uncoated) ASTM-C1048.
      a. Heat strengthened glass: Kind HS, Type I, Quality q3; and Class 1 and Condition A unless otherwise indicated.
      b. Tempered glass: Kind FT, Type I, Quality q3; and Class 1 and Condition A unless otherwise indicated.
      a. Grade: Mirror cut size.
      b. Quality: Mirror select.
      c. Color: Clear.
      d. Thickness: 1/4 IN.
      e. Length and width: As indicated on drawings.
   5. ANSI Z97.1.

B. Glazing standards:

1.2 SUBMITTALS

A. Product Data:
   1. Red Laminated Glass (Vivarium doors):
      a. Provide product data and environmental characteristics, color of interlayer, special handling or installation requirements.
      b. Provide name of manufacturer’s approved laminator and safety glazing standard.
      c. Manufacturer’s certificate: Certify that glass meets or exceeds specified requirements.

B. Samples:
   1. 12 x 12 IN, of each specified type of glass.
      a. Include all product information adhered to each sample.

C. LEED Credit MRe4.1 and Credit MRe4.2, Recycled Content:
   1. Provide list of proposed materials with recycled content. Indicate separate percentages, by weight, of pre-consumer and post-consumer recycled content per unit of product. Also include material costs, excluding cost of installation.

D. LEED Credit MRe5.1 and Credit MRe5.2, Local/Regional Materials:
   1. Provide list of proposed regional materials. Indicate location of manufacturing facility including name, address and distance 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.
1.3 JOB CONDITIONS

A. Do not proceed with installation under adverse weather conditions, or when temperatures are below or above manufacturer's recommended limitations.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Acceptable manufacturers:
   1. Clear, heat strengthened, and tempered glass:
      a. Base:
         1) AGC Flat Glass North America, Inc.
      b. Optional:
         1) Guardian Industries.
         2) PPG Industries, Inc.
         3) Viracon.
   2. Fire-rated Glass Ceramic:
      a. Base:
         1) Technical Glass Products.
      b. Optional:
         1) Safti.
   3. Red Laminated Glass (Vivarium doors):
      a. Base:
         1) Vanceva Color Interlayers by Solutia Inc./Saflex.
   4. Mirror Glass:
      a. Base:
         1) Pilkington Building Products.
      b. Optional:
         1) Viracon.
         2) Oldecastle.
   5. Patterened Glass: See Section 10 22 19 for glazing at demountable partitions.
   6. Other manufacturers desiring approval comply with Section 00 26 00.

B. Glass materials:
   1. Comply with indicated standards.
   2. See Glass Types Schedule for listing of types.
   3. Materials specified in Glass Types Schedules are minimum acceptable products.
   4. Single manufacturer produce individual glass types used in fabrication of insulating units.
   5. Manufacturer or fabricator determine if materials should be heat strengthened or fully tempered at non-hazardous locations that do not require safety glazing and provide accordingly.

C. Glazing compounds:
   1. Nonsag, nonstain type.
   2. Pigmented to match frame units not requiring painting.
   3. Compatible with adjacent surfaces.
   4. For use in setting glass: Neutral-cure Silicone sealant.
   5. Sealant tape: Butyl rubber sealant tape or ribbon having a continuous neoprene shim.
   6. Gaskets:
      a. Polyvinyl chloride or neoprene.
      b. Extruded, flexible, of profile and hardness required to receive glass and provide a watertight installation.

D. Installation setting blocks and spacers:
   1. Neoprene, compatible with sealants used.
4. Compressible filler stock: Closed cell jacketed rod stock of synthetic rubber or plastic foam.

E. Shims, clips, springs, angles, beads, attachment screws and other miscellaneous items: As indicated or required.

2.2 GLASS TYPES SCHEDULE

A. Glass Type 1, Clear Float:
1. Clear float, 1/4 IN thick.

B. Glass Type 2, Clear Tempered:
1. Clear, tempered tongless float, 1/4 IN thick.

C. Glass Type 3, Laminated Ceramic Glass (Fire-rated and Safety-rated):
1. Laminated, wireless, UL labeled for assembly indicated.
3. Thickness: 5/16 IN thick, laminated.
5. Base Product:

D. Glass Type 4, Laminated Glass for Vivarium doors.
1. Laminated, wireless, UL labeled for assembly indicated.
3. Thickness: 1/4 IN clear, interlayer Vanceva films (4), 1/8 IN clear, laminated.
   a. Total thickness as required.
5. Base Product:
   a. Saflex Laminated Glass by Solutia with interlayer of Vanceva films.
6. Color:
   a. Red, reference number 5575.
7. Size: 12 IN wide by 24 IN tall.
   a. Coordinate with Section 08 11 13 Hollow Metal (HM) Doors and Frames.

E. Glass Type 5:
1. Float Glass Mirror; nominal 1/4 IN thick.
2. Color: Clear.
3. Sizes as indicated.

F. Glass Type 6:
1. One Way Viewing Panel:
   a. Grey float, 1/4” thick except as otherwise required to comply with applicable codes and regulating authorities.
      1) Heat strengthened or tempered as required for size of glazing unit.
   b. Durable, pyrolytically deposited coating.
   c. Visible Transmittance: 11%.
   d. Visible Reflectance on the coated side: 71%.
   e. Light Ratio: 8:1 Subject-side: Observer-side.
   f. Mirror coating toward Subject-side.

G. Glass Type 7:
1. Patterned Decorative Glass.
      1) 3/16” IN minimum thickness, except as otherwise required to comply with applicable codes and regulating authorities.
   2) Pattern Direction: As indicated.

H. Glass Type 8:
1. Patterned Decorative Glass.
   1) 3/16” IN minimum thickness, except as otherwise required to comply with applicable codes and regulating authorities.
   2) Pattern Direction: As indicated.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine framing or glazing channel surfaces, backing, stop design, and conditions under which glazing is to be installed.

3.2 INSTALLATION

A. Do not install glass with edge damage.
B. Contractor is responsible for correct glass size for each opening, within tolerances and dimensions established.
C. Comply with recommendations of manufacturers, except where more stringent requirements are indicated.
D. As a minimum, comply with GANA Glazing Manual and IGMA Glazing Guidelines for Sealed Insulating Glass Units.
E. Install sealants as recommended by sealant manufacturer.
F. Install setting blocks in adhesive or sealant.
G. Provide spacers inside and out, of proper size and spacing, for glass size, except where gaskets are used for glazing.
H. Minimum Bite:
   1. Monolithic, 1/4 IN, Glass: 3/8 IN.
   2. 1 IN Insulating units: 1/2 IN.
   3. For other sizes: Refer to Table C of AAMA’s Aluminum Curtain Wall Design Manual, Volume 6, Glass & Glazing.
I. Sealant Depth: Equal to sealant width.
J. Prevent sealant exudation from glazing channels.
   1. Leave void at heel (or install filler) at jambs and head.
   2. Do not leave void (or install filler) at sill.
K. Miter cut and bond gasket ends together at corners.
L. Immediately after installation, attach crossed streamers to framing held away from glass.
M. Do not apply anything to surfaces of glass.
N. Install spandrel units from exterior of building.
O. Remove and replace damaged glass.
P. Installation of Mirrors:
   1. Mastic Attachment: Install mirrors with mirror adhesive applied to back of mirror and pressed against substrate as recommended by mirror supplier.

3.3 CLEANING AND PROTECTION

A. Maintain glass reasonably clean during construction, so that it will not be damaged by corrosive action and will not contribute to deterioration of other materials.
B. Ensure that weep system in frames is not blocked by sealant.
C. Wash and polish glass on both faces not more than 7 days prior to final completion of work in each area.

D. Comply with glass manufacturer's recommendations and “GANA 01-0300”.

END OF SECTION
SECTION 09 06 10
ROOM FINISH AND COLOR SCHEDULE

PART 1 - GENERAL

1.1 DESCRIPTION

A. The ROOM FINISH SCHEDULE is included in the drawings. See A-670 Series Sheets.
B. See REFLECTED CEILING PLANS for ceiling heights. See AC-Series Sheets.
C. See INTERIOR FINISH PLANS for floor finishes. See IN-Series Sheets.
D. For Wall Protection - corner guards, wall guards, and crash rails. See A-Series Sheets.
E. See FURNITURE PLANS and SCHEDULE for types and locations of furniture. See IF-Series Sheets.
F. Casework:
   1. For Architectural Casework, see A-Series Sheets for plans, elevations, and casework types.
   2. For Laboratory Casework, see QL-Series Sheets for plans, elevations, and casework types.
G. See the following specification for LEGEND OF FINISHES AND COLORS and GENERAL NOTES.

END OF SECTION
LEGEND OF FINISHES AND COLORS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Schedule is for material location and color assignment only:
   1. Use in conjunction with the drawings and specifications.
   2. Bring any apparent error, inconsistency, or omission to the attention of the Architect before proceeding.

B. Abbreviations: See section indicated for description of material.

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<thead>
<tr>
<th>FLOOR/BASE</th>
<th>Description</th>
<th>Section</th>
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<tr>
<td>CPTT</td>
<td>Carpet Tile</td>
<td>09 68 13</td>
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<tr>
<td>RB</td>
<td>Resilient Base</td>
<td>09 65 13</td>
</tr>
<tr>
<td>RFT</td>
<td>Rubber Floor Tile</td>
<td>09 65 20</td>
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<td>SC</td>
<td>Sealed Concrete (SC)</td>
<td>09 67 81</td>
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<td>SVF</td>
<td>Sheet Vinyl Flooring</td>
<td>09 65 15</td>
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<td>WDB</td>
<td>Wood Base</td>
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<td>FPS</td>
<td>Stretched Fabric Panel System</td>
<td>09 77 13</td>
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<td>PNTA</td>
<td>Paint (Acrylic)</td>
<td>09 91 23</td>
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<tr>
<td>PNTL</td>
<td>Paint (Latex)</td>
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<td>PNTE</td>
<td>Paint (Epoxy)</td>
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<td>Hand Rail</td>
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<td>SSF</td>
<td>Solid Surface Fabrications</td>
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</table>
C. Color Schedule List of Colors:

### Wood Paneling (Flush) and Base (WDP & WDB)

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<thead>
<tr>
<th>Code</th>
<th>Species</th>
<th>Cut</th>
<th>Stain</th>
<th>Final Finish</th>
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<td>Plain Sliced</td>
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### Acountical Ceiling Tile (ACT)

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<td>24&quot; x 48&quot;</td>
<td>Ultima</td>
<td>Beveled Tegular White</td>
<td>CG-1</td>
<td>Main Street Corridors</td>
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<tr>
<td>ACT-02</td>
<td>Armstrong</td>
<td>1941</td>
<td>24&quot; x 24&quot;</td>
<td>Ultima</td>
<td>Beveled Tegular White</td>
<td>CG-1</td>
<td>Offices, Open spaces, conference rooms, Labs</td>
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</tr>
<tr>
<td>ACT-03</td>
<td>Armstrong</td>
<td>770</td>
<td>24&quot; x 24&quot;</td>
<td>Cortega Clean Room</td>
<td>Square Lay-In</td>
<td>White</td>
<td>CG-1</td>
<td>Server Room, Utility, Storage areas</td>
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<tr>
<td>ACT-04</td>
<td>Armstrong</td>
<td>1715</td>
<td>24&quot; x 24&quot;</td>
<td>Mylar</td>
<td>Square Lay-In</td>
<td>White</td>
<td>CG-1</td>
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### Resilient Base (RB)

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<th>Code</th>
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<tr>
<td>RB-1</td>
<td>Armstrong</td>
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<td>Black</td>
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<tr>
<td>RB-2</td>
<td>Armstrong</td>
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<td>Black</td>
<td>Coved At All Others</td>
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### Sheet Vinyl (SVF)

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<th>Weld Rod</th>
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<tr>
<td>Code</td>
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<td>RFT-1</td>
<td>Nora Systems</td>
<td>Environcare 2780</td>
<td>Phantom Mist</td>
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<td>RFT-2</td>
<td>Nora Systems</td>
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<td>RFT-3</td>
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<td>CPTT-1</td>
<td>Bentley Prince Street</td>
<td>0630R</td>
<td>TBD</td>
<td>Crawford</td>
<td>18 IN x 18 IN</td>
<td>Prestige Plus</td>
<td>1/4 Turn</td>
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<td>CPTT-2</td>
<td>Bentley Prince Street</td>
<td>8KR420630R</td>
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<td>Kings Road</td>
<td>18 IN x 18 IN</td>
<td>Prestige Plus</td>
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<tr>
<td>PNTA-1</td>
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<td>SW7570</td>
<td>Egret White</td>
<td>Eggshell</td>
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<td>PNTL-11</td>
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**Paint (PNTU)**

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**Wall Protections Specialties**

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<thead>
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<th>Model #</th>
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<tbody>
<tr>
<td>CG-1</td>
<td>CS Group</td>
<td>Match Wall</td>
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<tr>
<td>CG-2</td>
<td>CS Group</td>
<td>Clear</td>
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**Solid Surfacing Fabrications (SSF)**

<table>
<thead>
<tr>
<th>Code</th>
<th>Manufacturer</th>
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<th>Color/Pattern</th>
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<tr>
<td>SSF-1</td>
<td>DuPont Corian</td>
<td>TBD</td>
<td>TBD</td>
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<td>SSF-2</td>
<td>DuPont Corian</td>
<td>TBD</td>
<td>TBD</td>
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</tbody>
</table>
GENERAL NOTES

1. Submittals and shop drawings will be required as part of the submittal process as indicated in technical specifications.

2. In accordance with the construction documents, provide four samples of each color and material as required for approval. Resubmit samples as requested by architect until acceptable sheen, color and texture is achieved. Seaming/layout shop drawings will be required for all flooring materials. Re: Architectural specifications. If there is a product that requires material from more than one dye-lot a sample from each lot must be submitted for approval. Whenever possible all like products are to be procured from a single dye lot, including attic stock.

3. If there is a conflict in finishes between drawings, legend, and/or specifications, contact Architect for clarification.

4. Finish schedule is intended to show general finishes only. It is intended to be used in conjunction with all drawings (plans, elevations, and details), and specifications.

5. Where items or surfaces are not specifically mentioned, paint the same as similar adjacent materials or area. If color or finish is not designated, contact Architect who will select from standard colors or finishes listed in finish legend.

FLOOR FINISHES

1. Wherever there is a scheduled change in flooring material, it is to occur under the center of door when the door is in the closed position. Where no door exists, reference Finish plan for transition locations. Re: Door Sill/ Floor Transition Details.

2. Where rubber flooring is specified, never install less than 1/4 tile.

3. All seamless flooring to be heat welded/ sealed & glazed. Provide stainless steel corner forms on all integral base corners along with stainless steel top cap.

4. All welding rods to match the field sheet vinyl color indicated on the finish plan unless noted otherwise. Submit for review.

5. Contractor to provide shop drawing layout showing all floor pattern locations, grain direction, and seaming diagrams.

6. Moisture tests are required to be performed on all slabs where finish floor materials are scheduled. Re: Section 09 60 05.

7. Contractor should be advised that some finish items have long lead times. Items such as Porcelain tile and any semi-custom items are examples of such items.

8. Provide minimum one box overage on all tile products, all sizes, styles & colors. Refer to specifications for attic stock requirements.

BASE FINISHES

1. Resilient base shall be 4 IN high.

2. All rooms scheduled to receive integral coved base (Sheet Vinyl and Seamless Epoxy Flooring) are to receive 6 IN coved base, heat welded, glazed seams. Integral cove base to be the same color as adjacent floor 6 IN high with metal top edge cap and corner protectors on all corners.

3. Contractor shall provide all appropriate tile trim pieces, i.e. cove base inside and outside corners etc.

4. Wood trim shall be solid hardwood white oak, re: Architectural specifications.

5. All lab casework to receive 4 IN rubber base, all exposed sides. This applies to all areas, even those scheduled to receive seamless flooring.

WALL/ DOOR FINISHES

1. Where multiple finishes are called out on one wall of the finish schedule, refer to interior elevations. The number following the finish abbreviation indicates the height to which that finish extends AFF.
2. Contractor shall provide (4) 8 1/2 x 11 IN paint samples of all specified paint. Re: Architectural Specifications.
3. Contractor shall provide all appropriate tile trim pieces. Including cove base, inside and outside corners etc. All trim pieces that end on an outside corner shall be 45 degree miter cut for all tile.
4. Unless otherwise indicated, do not include painting when factory-finishing or installer finishing is specified for such items as, but not limited to, metal toilet enclosures, pre-finished partition systems, acoustic materials, architectural woodwork and casework, elevator entrance doors and frames, including light fixtures, switchgear and distribution cabinets. Grills, wall diffusers, electrical panels, wall mounted boxes, access panels, etc., which are exposed in finish spaces shall be painted to match the surface on which they occur. If the item is on a wall covering-covered wall, a custom paint color is to be used to match.
5. Hollow metal doors and frames shall be painted PNTA-1 unless noted otherwise.
6. Where items or surfaces are not specifically mentioned, paint the same as similar adjacent materials or area. If color or finish is not designated, contact architects who will select from standard colors or finishes available.
7. Phone and electrical closets are to receive FR plywood backer for all wall mounted panels. Plywood to have no added urea formaldehyde. Paint to match the surface on which they occur.
8. Provide and install matching J trim on all exposed edges of wall protection and wallcovering.
9. Epoxy adhesive is to be used at all locations where vinyl wallcovering has an exposed edge.
10. In janitor closets, use stainless steel sheet metal panels at sinks to 96” A.F.F.
11. At reveals on walls with multiply colors, paint the 3 inside surfaces of the reveal the color of the lower paint.
12. Unless otherwise indicated, metal surfaces of anodized aluminum, stainless steel, chromium plate, copper, bronze and similar finished materials will not require finish painting.
13. All walls in wet areas are to painted with epoxy paint, u.n.o. Including but not limited to: showers, locker rooms, etc.
14. All wall guards, corner guards, etc. shall be supplied from a single manufacturer.

**PAINT SHEENS**
1. All painted metal including but not limited to door and window frames, rails, etc. are to be painted semi-gloss finish. (paint gloss range between 30 and 55 when measured at a 60 deg. Meter.)
2. Typical unless noted otherwise, all Offices, Conference and Training Rooms use an Eggshell finish (paint gloss range between 6 and 12 when measured at a 60 deg meter.)
3. Typical unless noted otherwise, all labs use an epoxy paint. Re: Finish schedule.
4. All paints to be a low odor/ low VOC paint as possible.

**CEILING FINISHES**
1. Soffits are to be painted as noted on the elevations.
2. All ceilings scheduled for paint shall be painted as indicated on schedule and elevations.
3. Any discrepancies between finish schedule and reflected ceiling plans are to be brought to the attention of the Architect.
4. All wet areas scheduled to receive suspended ceiling are to receive vinyl faced tile.

**MILLWORK FINISHES** (These notes apply to casework provided under specification Section 12 34 13)
1. Caulk all wall locations where millwork/countertops adjoin wall surface with clear caulk or color match caulk.
2. All window sills are to receive 1 1/2 IN thick solid surface sills, SSF-1. Re: Architectural Specifications.
3. All non-lab vertical base cabinets and wall cabinets to be laminate unless otherwise noted.
4. All plastic laminate millwork to have 3mm pvc edge banding on all doors and drawers, unless noted otherwise, match plastic laminate or provide color as selected by designer. Color options to include full range of manufacturer’s premium colors.
5. Plastic laminate and solid surface colors shall be verified on all approved millwork shop drawings.
6. For submittals: on specified actual wood surfaces, provide three 4 IN x 8 IN samples of natural and stained wood finishes. Label and identify each as to location and application.
7. Stain millwork to match sample provided by Architect. Submit samples for Architect's approval before proceeding with fabrication.
8. All casework interiors concealed behind doors or drawers are to be white melamine unless noted otherwise.
10. Millwork finishes on shop drawings must be approved by architect prior to production.
11. Metal lockers color shall be selected from the manufacturer's premium colors. Re: Finish Legend.
12. All toilet partitions to be stainless steel metal.

**WINDOW TREATMENTS**

1. A full mock-up of each type of exterior shade will be required.
2. See reflected ceiling drawings (AC-Series) for roller shades.
3. All exterior windows receiving window shades that cannot be manually operated either because of size or mounting height to receive a mechanized motor for operation. Shop drawings required before fabrication.
4. All miniblinds/ window shades to be contractor furnished, contractor installed.

**MISCELLANEOUS FINISH NOTES**

1. All signage is to have an electronic proof provided for final approval by Architect.
2. All wood grain and wood grain laminate to run vertically.
3. All hollow metal door frames shall be painted PNTA-1 unless otherwise noted.
4. All hollow metal doors shall be painted PNTA-2 unless otherwise noted.
PART 1 - GENERAL

1.1 SCOPE

A. The extent of the work indicated on the drawings and specifications to include:
   1. Unglazed porcelain ceramic tile flooring (PFT) and base (PTB).
   2. Glazed ceramic wall tile (CWT).
   3. Quarry tile flooring (QFT) and base (QFB).

1.2 SUBMITTALS

A. Shop Drawings:
   1. Indicate tile layout, patterns, color arrangement, perimeter conditions, junctions with
dissimilar materials, movement joints, thresholds, ceramic accessories, and setting methods
and details.

B. Samples:
   1. Four full-size samples of each tile specified in Room Finish and Color Schedule.

C. Project Information:
   1. Installation methods.
   2. Manufacturer's Certificates:
      a. Certify that products furnished for this project are asbestos free.
      b. For each shipment, type and composition of tile provide a Master Grade Certificate
         signed by the manufacturer and the installer certifying that products meet or exceed the
         specified requirements of ANSI A137.1.
         1) State grade, kind of tile, identification marks for tile packages, and name and
            location of project.
         2) Issued and signed by manufacturer when tile is shipped.

D. Contract Closeout Information:
   1. Maintenance Data: Include recommended cleaning methods, cleaning materials, stain
      removal methods, and polishes and waxes.
   2. Letter stating extra material has been delivered.

E. LEED Credit MRc4.1 and Credit MRc4.2, Recycled Content:
   1. Provide list of proposed materials with recycled content. Indicate separate percentages, by
      weight, of pre-consumer and post-consumer recycled content per unit of product. Also
      include material costs, excluding cost of installation.

F. LEED Credit MRc5.1 and Credit MRc5.2, Local/Regional Materials:
   1. Provide list of proposed regional materials. Indicate location of manufacturing facility
      including name, address and distance 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.

G. LEED Credit EQc4.1, Low-Emitting Materials, Adhesives and Sealants:
   1. Provide product data and material safety data sheets (MSDS) for adhesives and sealants
      used inside the building indicating VOC content of each product used. Indicate VOC
      content in g/L calculated according to 40 CFR 59, Subpart D.

1.3 QUALITY ASSURANCE

A. ANSI A137.1, 2008 - Specifications for Ceramic Tile.
B. TCNA (HB) - Handbook for Ceramic Tile Installation; Tile Council of North America, Inc.
D. Maintain one copy each of applicable reference standards and specifications on site.
E. Installer Qualifications:
   1. Company specializing in performing the work of this section with minimum 5 years
      experience in ceramic tile installations similar in size, scope, and installation procedures
      required for this project.
   2. Submit list to Architect of five contracts recently completed with names of Architects and
      General Contractors involved.
F. Single Source Responsibility:
   1. Obtain each type and color of tile from a single source.
   2. Obtain each type and color of mortar, adhesive and grout from the same source.
G. Furnish tile conforming with Standard Grade requirements of ANSI A137.1 with manufacturer’s
   label attached to each carton of tile certifying that it is “Standard Grade” per ANSI A137.1.
H. Except where otherwise specified, conform to Tile Council of America “Handbook for Ceramic
   Tile Installation” and ANSI A108, A118, and A136 as applicable.
I. When using setting and grouting materials manufactured under TCA license, include
   identification together with ingredients on each container.

1.4 DELIVERY, STORAGE, AND HANDLING
A. Deliver and store products in manufacturer's unopened packaging until ready for installation.
B. Protect adhesives and liquid additives from freezing or overheating in accordance with
   manufacturer's instructions.
C. Store tile and setting materials on elevated platforms, under cover and in a dry location and
   protect from contamination, dampness, freezing or overheating.

1.5 ENVIRONMENTAL REQUIREMENTS
A. Do not install adhesives in an unventilated environment.
B. Maintain ambient and substrate temperature of 50 degrees F (10 degrees C) during installation of
   mortar materials.

1.6 EXTRA MATERIALS
A. Provide 5% of each size, color, and surface finish of tile specified but not less than 2 cartons;
   except in the case of accent colors, provide 10% more stock.

PART 2 - PRODUCTS

2.1 MANUFACTURERS
A. Acceptable manufacturers:
   1. Ceramic and Porcelain Tile:
      a. Base:
      1) Dal-Tile Corporation.
      b. Optional:
      1) American Olean Tile Co., Inc.
      2) United States Ceramic Tile Co.
      3) Monarch Tile Manufacturing, Inc.
      4) Buchtal Corp., USA.
   2. Quarry Tile:
a. Base:
   1) Dal-Tile Corporation.
b. Optional:
   1) Summitville Tiles, Inc.
   2) Metropolitan Ceramics.
3. Accessories:
a. Base:
   1) As scheduled matching floor tile.

2.2 TILE

A. General: Provide tile that complies with ANSI A137.1 for types, compositions and other characteristics indicated. Provide tile in the locations and of the types, colors, and pattern indicated on the Drawings and identified in the Schedule and the end of this Section. Tile shall also be provided in accordance with the following:
   1. Factory Blending: For tile exhibiting color variations within the ranges selected under Submittal of samples, blend tile in the factory and package so tile taken from one package shows the same range of colors as those taken from other packages.
   2. Mounting: For factory mounted tile, provide back or edge mounted tile assemblies as standard with the manufacturer, unless otherwise specified.
   3. Factory Applied Temporary Protective Coatings: Where indicated under tile type, protect exposed surfaces of tile against adherence of mortar and grout by precoating with a continuous film of petroleum paraffin wax applied hot. Do not coat unexposed tile surfaces.
   4. Trim Units: Matching bead, bull-nose, cove, and base shapes in sizes coordinated with field tile.
   5. Static Coefficient of Friction: Tile on walkway surfaces shall be provided with the following values as determined by testing in conformance with ASTM C 1028.
      a. Level Surfaces: Minimum of 0.6 (Wet).
      b. Step Treads: Minimum of 0.6 (Wet).
      c. Ramp Surfaces: Minimum of 0.8 (Wet).

B. LEED Credit MRc4.1 and MRc4.2 Recycled Content:
   1. Material shall contain recycled content as certified.

2.3 SETTING MATERIALS

A. Setting and grouting materials: As required by installation Method, See Part 3.
B. Tile backer board: See Section 09 29 00.
C. Shower liner:
   1. Listed in International Plumbing Code, 417.
   2. Approved by Authority Having Jurisdiction.
      a. Listed in International Association of Plumbing and Mechanical Officials Directory:

2.4 TRIM AND ACCESSORIES

A. Non-Ceramic Trim: Material and finish, style and dimensions to suit application, for setting using tile mortar or adhesive; use in the following locations:
   1. Transition between floor finishes of different heights.
   2. Thresholds at door openings.
B. Transition Joint Strips: Profile and height as indicated; with integral perforated anchoring leg for setting the strip into the setting material:
   1. Transition strip profile:
      a. Sloped, variable height: If adjacent flooring level is different than tile.
         1) Schluter-RENO-V.
      b. Flat, smooth profile. If adjacent flooring level is same as tile.
         1) Schluter-RENO-T.
   2. Height:
a. As required to suit application.
b. Maximum change in level: 0-1/2 IN.

   a. Finish: As selected by Architect from manufacturer’s standard finishes.

C. Joint Sealant: Two component polyurethane sealant, ASTM-C920, Type M (self-leveling) for horizontal joints, Type II (non-sag) for vertical joints as specified in Section 07 92 16.
   2. Ensure sealant is chemically compatible with tile, mortar, and grout.
   3. Ensure sealant can physically and chemically withstand environmental conditions normally expected at installation areas.
   5. LEED Credit EQc4.1 Low-Emitting Materials, Adhesives, and Sealants:
      a. Material shall contain VOC content as certified.

D. Setting Buttons: Plastic buttons of thickness required for joint size indicated to maintain uniform joint width.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that wall surfaces are free of substances which would impair bonding of setting materials, smooth and flat within tolerances specified in ANSI A137.1, and are ready to receive tile.

B. Verify that sub-floor surfaces are dust-free, and free of substances which would impair bonding of setting materials to sub-floor surfaces, and are smooth and flat within tolerances specified in ANSI A137.1.

C. Verify that concrete sub-floor surfaces are ready for tile installation by testing for moisture emission rate and alkalinity; obtain instructions if test results are not within limits recommended by tile manufacturer and setting materials manufacturer.

D. Verify that required floor-mounted utilities are in correct location.

3.2 PREPARATION

A. Protect surrounding work from damage.

B. Remove any curing compounds or other contaminates.

C. Vacuum clean surfaces and damp clean.

D. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances.

E. Install backer board in accordance with ANSI A108.11 and board manufacturer's instructions. Tape joints and corners, cover with skim coat of dry-set mortar to a feather edge.

F. Prepare substrate surfaces for adhesive installation in accordance with adhesive manufacturer's instructions.

3.3 INSTALLATION - GENERAL

A. Install tile and setting materials in accordance with applicable requirements of ANSI A108.1 through A108.13, manufacturer's instructions, and TCNA Handbook recommendations.

B. Install shower liner:
   1. Coordinate with shower drain, See Section 22 40 00.

C. Interior: Provide waterproofing method TCNA “wet” area:
1. “Tile surfaces that are soaked, saturated, or regularly and frequently subjected to moisture or liquids (usually water), such as gang showers, tub enclosures, showers, laundries, saunas, steam rooms, swimming pools, hot tubs, and exterior areas.”

D. Lay tile to pattern indicated. Arrange pattern so that a full tile or joint is centered on each wall and that no tile less than 1/2 width is used. Do not interrupt tile pattern through openings.

E. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align floor joints.

F. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make joints watertight, without voids, cracks, excess mortar, or excess grout.

G. Form internal angles square and external angles bullnosed.

H. Install ceramic accessories rigidly in prepared openings.

I. Install non-ceramic trim in accordance with manufacturer's instructions.

J. Where accent tiles (such as glass tiles) are of a lesser thickness than surrounding field tiles: Increase bedding thickness as required to achieve relatively flush alignment between finished faces of accent tiles and adjacent field tiles.

K. Install thresholds where indicated.

L. Sound test the tile after setting. Replace hollow sounding units.

M. Allow tile to set for a minimum of 48 hours prior to grouting.

N. Grout tile joints. Use standard grout unless otherwise indicated.

O. Movement Joints and Other Sealant Usage:

1. Comply with TCNA EJ171.

2. Locate movement joints where indicated.

3. Where not indicated: Locate movement joints directly over the following substrate conditions:
   a. Changes in substrate material.
   b. Over control joints, expansion joints and seismic joints in substrate.
   c. Over construction joints in substrate (cold joints).
   d. At junctures of floors meet and walls and other restraining elements such as curbs, columns, bases, and wall corners.
   e. At other locations recommended by TCNA EJ171 Movement Joint requirements.
4. Furthermore, locate additional Movement Joints in accordance with maximum spacing allowed by following table:

<table>
<thead>
<tr>
<th>Condition</th>
<th>Maximum Spacing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interior</td>
<td>25 FT</td>
</tr>
<tr>
<td>Interior where exposed to direct sunlight or moisture.</td>
<td>12 FT</td>
</tr>
<tr>
<td>Exterior</td>
<td></td>
</tr>
</tbody>
</table>

5. Joint Width: In accordance with TCNA EJ171.
6. Rake or cut control joints through setting bed to supporting slab or structure. Keep joints free of mortar.
7. Fill joints with self-leveling polyurethane sealant and backing material specified in Section 07 92 16.
8. Provide sealant material at items penetrating tile work, unless otherwise indicated.
9. Apply sealant to junction of tile and dissimilar materials and junction of dissimilar planes.
10. Fill joints around toilet fixtures with white silicone sanitary sealant. Refer to Section 07 92 16.
11. Use manufacturer’s expansion joint flashing when covering expansion joints with waterproof or crack isolation membranes.
12. Provide sealants and related materials in accordance with cited ANSI and TCNA requirements.

P. Penetrating Sealer:
1. General:
   a. Apply Penetrating Sealer to all tiled surfaces (unless otherwise noted).
      1) Exception: Application of Penetrating Sealer is not necessary where Epoxy Grouts are used.
   b. Apply in accordance with Manufacturer’s instructions.
2. LEED Credit EQc4.1 Low-Emitting Materials, Adhesives, and Sealants:
   a. Material shall contain VOC content as certified.
3. Surface Preparation:
   a. Ensure that surface is dry, clean and free of waxes, sealers or finishes.
   b. Utilize recommended cleaner/stripper as necessary.
   c. Ensure that tile and grout have been in place and are fully cured (48 - 72 hours depending on conditions).
   d. Test product in obscure area to ensure desirable results.
4. Application:
   a. Apply Penetrating Sealer using a clean new mop, lambswool applicator, sponge or brush.
   b. Allow it to penetrate for 10 - 15 minutes.
   c. Wipe off any excess.
   d. Apply a second coat (using same procedure) to ensure that Grout and porous tiles are well sealed.
   e. Test after 2 hours by applying drops of water on the surface.
      1) If it penetrates immediately, apply an additional coat.
5. Cleaning:
   a. If a residue is visible on the surface after drying, remove it with a sponge or white polishing pad 60 minutes after application.

3.4 CLEANING

A. Clean tile and grout surfaces.

3.5 PROTECTION OF FINISHED WORK
A. Do not permit traffic over finished floor surface for 72 hours after installation.
B. Cover floors with kraft paper and protect from dirt and residue from other trades.
C. Where floor will be exposed for prolonged periods cover with plywood or other similar type walkways.

### 3.6 INSTALLATION METHODS

#### INSTALLATION - FLOORS - THIN-SET METHODS

<table>
<thead>
<tr>
<th>Application/Substrate</th>
<th>TCNA</th>
<th>Bond/mortar</th>
<th>Grout</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exterior Concrete</td>
<td>F102</td>
<td>Dry set or latex Portland cement</td>
<td>Standard grout</td>
</tr>
<tr>
<td>Exterior Concrete/waterproof (above interior space)</td>
<td>F102</td>
<td>Waterproof membrane/ Dry set or latex Portland cement</td>
<td>Standard grout</td>
</tr>
<tr>
<td>Interior concrete</td>
<td>F113</td>
<td>Dry set or latex Portland cement</td>
<td>Standard grout</td>
</tr>
<tr>
<td>Interior concrete/waterproof (wet areas)</td>
<td>F122</td>
<td>Waterproof membrane/ Latex-Portland cement</td>
<td>Polymer modified</td>
</tr>
<tr>
<td>Interior epoxy</td>
<td>F131</td>
<td>Epoxy</td>
<td>Epoxy</td>
</tr>
</tbody>
</table>

#### INSTALLATION - SHOWERS AND BATHTUB WALLS

<table>
<thead>
<tr>
<th>Application/Substrate</th>
<th>TCNA</th>
<th>Bond/mortar</th>
<th>Grout</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shower receptor (mortar set with liner)</td>
<td>B420, Use with W245</td>
<td>Latex-Portland cement</td>
<td>Standard/polymer modified</td>
</tr>
<tr>
<td>Wall backer</td>
<td>W245</td>
<td>Latex-Portland cement</td>
<td>Standard/polymer modified</td>
</tr>
<tr>
<td>Shower receptor (mortar set with liner)</td>
<td>B431, Use with W247</td>
<td>Latex-Portland cement</td>
<td>Epoxy</td>
</tr>
<tr>
<td>Wall backer</td>
<td>W247</td>
<td>Latex-Portland cement</td>
<td>Epoxy</td>
</tr>
</tbody>
</table>

Seal joints between tile work and other work with sealant, see Section 07 92 16.

#### INSTALLATION - WALL TILE

<table>
<thead>
<tr>
<th>Application/Substrate</th>
<th>TCNA</th>
<th>Bond/mortar</th>
<th>Grout</th>
</tr>
</thead>
<tbody>
<tr>
<td>Backer</td>
<td>W223</td>
<td>Organic</td>
<td>Standard/polymer modified</td>
</tr>
<tr>
<td>Concrete or masonry</td>
<td>W202</td>
<td>Dry set or latex Portland cement</td>
<td>Standard/polymer modified</td>
</tr>
<tr>
<td>Interior epoxy</td>
<td>W245, W247, W244 E, C, F</td>
<td>Latex-Portland cement</td>
<td>Epoxy</td>
</tr>
</tbody>
</table>

END OF SECTION
SECTION 09 51 00
ACOUSTICAL CEILING TILE (ACT) MATERIALS

PART 1 - GENERAL

1.1 QUALITY ASSURANCE
A. Standard for suspension systems: ASTM C635
B. Standard for installation: ASTM C636.

1.2 DESIGN PARAMETERS
A. Suspension System Design Parameters:
   1. Comply with:
      a. 2006 International Building Code (Section 1621) and 2005 ASCE-7 (Section 9.6.2.6).
      b. CISCA Standards: Current latest edition unless other editions are specifically by above building code or ASCE-7.
   2. IBC Seismic Category: Category C.

1.3 SUBMITTALS
A. Samples:
   1. Three samples of each material selected for verification.
B. Contract Closeout Information:
   1. Maintenance data.
   2. Letter stating extra material has been delivered.
   3. Interior finish fire performance data:
      a. Provide for each finish material and type specified:
         1) Manufacturer's printed information including:
            a) Fire class.
            b) NFPA test number.

C. LEED Credit MRc4.1 and Credit MRc4.2, Recycled Content:
   1. Provide list of proposed materials with recycled content. Indicate separate percentages, by weight, of pre-consumer and post-consumer recycled content per unit of product. Also include material costs, excluding cost of installation.

D. LEED Credit MRc5.1 and Credit MRc5.2, Local/Regional Materials:
   1. Provide list of proposed regional materials. Indicate location of manufacturing facility including name, address and distance 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.

1.4 JOB CONDITIONS
A. Carefully coordinate ceiling layout with other work that penetrates acoustical ceiling systems.
B. Specifically coordinate with sprinkler head spacing.
C. Install acoustical material after floor and wall finishes.

PART 2 - PRODUCTS

2.1 MATERIALS - ACOUSTICAL SUSPENSION SYSTEMS
A. Suspension systems - General:
1. Heavy duty systems, ASTM C635.
2. Main runner jointing by spliced, interlocking ends, tab locks, pin locks, or other suitable connections.
3. Cross runners interlocking with main runners.
4. Provide types indicated.

B. Acceptable manufacturers (Suspension Systems):
   1. Steel Suspension Systems:
      a. Base:
         1) “Prelude XL”, by Armstrong.
      b. Optional:
         1) Chicago Metallic.
         2) USG Corporation.
   2. Other manufacturers desiring approval comply with Section 00 26 00.
   3. LEED Credit MRc4.1 and MRc4.2: Recycled Content
      a. Material shall contain recycled content as certified.

C. Hanger Wire:
   1. General:
      a. Pre-stretched, with a yield stress load of at least 5 times design load, but not less than 0.080 IN (12 GA).
      b. Utilize continuous lengths, without kinks and splices.
   2. Galvanized Steel (general use):
      a. Galvanized, soft annealed steel wire, conforming to ASTM A641.

D. Trim: Provide moldings wherever ceiling meets walls, partitions, other vertical elements, and other types of ceilings or ceiling fixtures; where ceiling mounted fixtures have integral flange trim, no additional trim is required.

E. Attachment Devices:
   1. Size for 5 times the design load indicated in ASTM C635, Table 1, "Direct Hung," unless otherwise indicated.
      a. Comply with seismic design requirements where applicable.
   2. Anchors in Concrete:
      a. Anchors of type and material indicated below, with holes or loops for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to 5 times that imposed by ceiling construction, as determined by testing per ASTM E488 or ASTM E1512 as applicable.
      c. Material: Carbon-steel components zinc plated to comply with ASTM B633, Class Fe/Zn 5 (0.005 mm) for Class SC 1 service condition.
   3. Power-Actuated Fasteners in Concrete:
      a. 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 E1190.

F. Suspension systems - types:
   1. CG-1: Exposed grid, non-rated:
      a. Description: Galvanized, double web steel, main and cross runners.
      b. Face width: 15/16 IN.
      c. Finish on exposed surfaces: Smooth, flat white.

2.2 MATERIALS - CEILING TILES

A. Acceptable manufacturers (Ceiling Tiles):
   1. Ceiling tile - Wet-formed mineral fiber:
      a. Base:
1) Armstrong.

b. Optional:
   1) CertainTeed:
   2) USG:
   3) Other manufacturers desiring approval comply with Section 00 26 00.

c. General performance description:
   1) Scheduled finishes to be factory applied.
   2) Light reflectance: Not less than 0.75.
   3) Noise reduction coefficient: 0.50 - 0.65.
   4) Class A incombustible units.
   5) Fire rated units (when used): UL labeled.
   6) Edges uniformly fabricated, true, square.
   7) Sizes as required to fit scheduled suspension system.
   8) Lay-in style: Minimum 5/8 IN thick.
   9) Standard tile size(s): See Reflected Ceiling Plan(s).

B. LEED Credit MRc4.1 and MRc4.2: Recycled Content
   1. Material shall contain recycled content as certified.

2.3 EXTRA MATERIAL

A. Provide Owner with minimum 50 tiles of each type and pattern of material for maintenance purposes.

B. Provide in sealed labeled boxes to facilitate identification.

2.4 RELATED MATERIALS (SPECIFIED ELSEWHERE)


B. Light Fixtures: Specified in Section 26 51 13.

2.5 FABRICATION

A. Intersections between Main Tees and Cross Tees: Butt cut and notch as required.

B. Perimeter Wall Angles: Fabricate to match the system(s) specified.

C. Include components and accessories necessary resist seismic loads and dead loads of items such as light fixtures and air diffusers.

PART 3 - EXECUTION

3.1 INSPECTION

A. Verify suitability of substrate to accept installation.

B. Examine installation site for unevenness or irregularities that would affect quality and execution of work.

C. Installation constitutes acceptance of responsibility for performance.

3.2 PREPARATION

A. Consult other trades involved before start of ceiling work, to determine areas of potential interference.

B. Do not start installation until interferences have been resolved.

3.3 INSTALLATION TOLERANCES

A. Comply with ASTM C635.
B. Maximum deviation from level plane: Not to exceed 1/8 IN in 10 FT (with no load applied).
C. Maximum Bow: Not to exceed 1/32 IN in 2 FT.
D. Maximum Camber: Not to exceed 1/32 IN in 2 FT.
E. Maximum Twist: Not to exceed 1 Degree in 2 FT.

3.4 INSTALLATION - SUSPENSION SYSTEM - GENERAL

A. Design and install ceiling system per CISCA standards indicated in Part 1.
B. Install suspension system in accordance with ASTM C636 and manufacturers' instructions.
C. Grid layout: See Reflected Ceiling Plans.
   1. Install grid square with room and with grid center lines or acoustical panel center lines coinciding with center lines of room, each direction.
      a. Acoustical panel dimension at perimeter walls: Not less than 6 IN.
      b. In case of conflict with lighting plan contact Architect.
D. Do not use defective or damaged materials.
E. Install moldings where ceilings meet walls, partitions, other vertical elements, and other types of ceilings.
   1. Support runners and border units on moldings.
   2. Secure moldings to wall construction by fastening through holes drilled in web.
   3. Space holes not more than 3 IN from each end and at each stud.
   4. Draw up fasteners tight against vertical surfaces.
   5. Miter cut inside and outside corners.
   6. Level to a tolerance not more than 1 in 1000.
   7. Install with leg supporting bottom flange of runners.
F. Leave suspension system ready to accept installation of acoustic materials.

3.5 INSTALLATION – WALL ANGLES

A. Install Wall Angles where ceilings meet walls, partitions, other vertical elements, and other types of ceilings.
   1. Secure Wall Angles to wall construction (coincident with stud spacing).
      a. Maximum spacing from terminal ends: 3 IN.
      b. Draw up fasteners tight against vertical surfaces.
   2. Level to a tolerance not more than 1 in 1000.
   3. Miter cut inside and outside corners.
   4. Install with leg supporting bottom flange of main tee’s and cross tees.

3.6 INSTALLATION – HANGER WIRES

A. General:
   1. Provide in time to avoid delay in progress of work.
   2. Provide hangers and inserts necessary to support ceiling suspension systems and ceiling dead loads.
   3. Locate and align hangers and inserts correctly.
   4. Coordinate location and alignment with work of other trades.
   5. Do not suspend any part of suspension system from ducts, pipes, conduit, equipment, cable tray, etc.
   6. Provide supplementary rough suspension system and trapezeing where necessary to support ceilings beneath pipes, ducts, equipment, etc.
   7. Install hanger wires plumb to main tees and cross tees.
   8. Splay hangers no greater than 30 degrees from vertical to avoid obstructions or other conditions that prevent plumb, vertical installation.
9. Install wires vertically in such a manner that they are not more than 1:6 out-of-plumb, unless counter-sloping wires are provided.
10. Do not attach wires to, bend around, interfering material or equipment.

B. Space hangers to prevent loads from items in or on ceiling from causing eccentric deflection and rotation.
   1. Provide additional hangers to support lighting fixtures.
   2. Provide additional hangers within 6 IN of end of main runners.
   3. Do not bear runners on walls or partitions.

3.7 INSTALLATION – MAIN RUNNERS

A. Utilize Wall Angles to align and receive terminal ends of Main Tees without transferring load to Wall Angle.
B. Space Main Tees as indicated, and as required to receive lay-in panels and fixtures.
C. Support terminal ends of Main Tees by wires located within 6 IN from boundary walls.
D. Suspend Main Tees from building superstructure with hanger wires specified.
E. Support Main Tees with hanger wire at intervals necessary to support applied load and to satisfy deflection criteria.

3.8 INSTALLATION – CROSS RUNNERS

A. Space Cross Tees as indicated, and as required to receive lay-in panels and fixtures.
   1. Install cross runners with a positive interlock.
B. Utilize Wall Angles to align and receive terminal ends of Cross Tees without transferring load to Wall Angle.
C. Support terminal ends of Cross Tees by wires located within 6 IN from boundary walls.
D. Suspend Main Tees from building superstructure with hanger wires specified.
E. Support Main Tees with hanger wire at intervals necessary to support applied load and to satisfy deflection criteria.

3.9 INSTALLATION – LAY-IN ITEMS

A. Install acoustic materials into suspension system in accordance with manufacturer's instructions.
B. Install lay-in panels, fixtures, diffusers, grilles, and similar items in a manner that will not compromise performance of the suspension system.
   1. Provide supplemental hangers for fixtures which exceed manufacturer’s published load data.
      a. Supplemental hanger systems shall be approved by Building Official.
C. Field cut as required to fit materials to grid.
   1. Tegular and similar tiles articulated edges:
      a. Machine field-cut edges to match profile of factory edges.
D. Make cuts square and true.
E. Do not install damaged units.
F. Install access splines in concealed systems as directed and as required to provide access to concealed items.
G. Identify access tile with a white headed thumb tack.
H. Do not provide access splines for tiles in security areas.
I. Hold-down Clips:
   1. Provide Hold-down-clips where mylar-faced and/or foil-faced tiles are scheduled.
2. Provide Hold-down-clips where scrubable tiles are scheduled.
3. Provide hold down clips if UL rated ceiling requires.

3.10 CLEANING

A. Perform cleaning and replacement of defective units in time to avoid delay in progress of work and before final completion of work.
B. Carefully clean soiled surfaces.
C. Remove and replace irregular, discolored, defective or damaged components at no additional expense to Owner.

3.11 PROTECTION

A. Protect installed materials from damage.

END OF SECTION
SECTION 09 60 05
WATER VAPOR EMISSION CONTROL FOR CONCRETE WITH APPLIED FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. Delaminating, blistering, staining, mold growth, and other problems related to installation and performance of moisture-sensitive flooring materials on concrete slabs are possible.
   1. Chemistry of flooring and installation products, concrete installation, and weather conditions during construction period are some factors contributing to possible problems.
   2. Moisture resistant adhesives and moisture mitigation systems may be applied to concrete surface to produce moisture state allowing flooring to bond to concrete surface.
   3. Tests are not long term predictors of moisture conditions. They only indicate conditions at time of test, but can be useful benchmarks if conditions do change.
   4. For most meaningful results, it is imperative tests are executed under environment conditions required by testing standards.
   5. Objective of this section is to reduce potential for moisture related problems in slabs-on-grade and suspended slabs.
   6. This specification requires a pre-determined level of resistance to help neutralize future problems.
   7. In the rare case that testing exceeds minimum design criteria indicated, each individual condition will need further evaluation.

1.2 DESCRIPTION

A. Test concrete floors, on grade or suspended, before finish flooring installed; to determine moisture, humidity, and alkalinity conditions. See Section 01 45 23.
   1. Provide additional testing required by flooring manufacturers.
   2. Test data may serve as benchmark for future testing.
   3. Test data may discover problematic areas that may need remediation prior to proceeding.

B. Base Bid: Provide flooring manufacturer’s recommended vapor resistive products on new and existing concrete floors, on grade or suspended, to resist (current or future) excessive moisture, humidity, and alkalinity conditions and; reduce mold, mildew, and micro-organism growth:
   1. Adhesive applied resilient sheet flooring:
      a. Adhesive: Resist humidity levels of at least 80%, ASTM F2170.
      b. Adhesive: Resist pH levels of at least 9, ASTM F710.
      c. Contractor option: Provide flooring manufacturer’s recommended water vapor emission control system, compatible with flooring installation.
      d. Floors testing above proposed adhesive’s maximum level of effectiveness; bring to attention of Architect.
   2. Other adhesive applied flooring:
      a. Adhesive: Resist humidity levels of at least 80%, ASTM F2170.
      b. Adhesive: Resist pH levels of at least 9, ASTM F710.
      c. Contractor option: Provide flooring manufacturer’s recommended water vapor emission control system, compatible with flooring installation.
      d. Floors testing above proposed adhesive’s maximum level of effectiveness; bring to attention of Architect.

C. Provide materials of this section in areas to receive applied flooring products:
   1. See Section 09 06 10 Room Finish and Color Schedule and Drawings.

D. If different systems are used on differing adjacent flooring areas, verify compatibility of systems.
1. One system that satisfies criteria for all flooring types may be used.

1.3 QUALITY ASSURANCE

A. References:
1. ASTM F710: Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.
2. ACI-302.2R: Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials.

B. Installation Contractor:
1. Firm with not less than 5 years of successful flooring experience similar to work of this section and flooring systems specified; and accepted by flooring manufacturer, including:
   a. Testing procedures.
   b. Moisture resistive adhesives.
   c. Moisture mitigation systems.
2. Upon request, submit letter from flooring manufacturer stating acceptance.

1.4 PRE-INSTALLATION MEETING

A. Pre-installation meeting, directed by Contractor, prior to beginning of flooring work to discuss following:
2. Floor plan.
3. Flooring manufacturer’s recommendations and details.
4. Leveling compound manufacturer’s recommendations.
5. Adhesive manufacturer’s recommendations.
6. Moisture resistant adhesive manufacturer’s recommendations.
7. Moisture mitigation system manufacturer’s recommendations.
8. UL requirements.
10. Floor protection from damage by other trades.

B. Attendance is recommended for:
1. Contractor.
2. Flooring installer’s superintendent.
3. Flooring manufacturer’s representative.
4. Concrete installer.
5. Other trades whose work may affect flooring system.

C. Minimum two weeks prior to meeting forward pertinent information to Contractor for review.
1. Installation drawings.
2. Manufacturer product data.
3. Samples of proposed materials.
4. Sample warranty.
5. Other information deemed pertinent for sound and secure application.

D. Include review of specifications, details, application requirements and preliminary work.

E. Objectives of pre-installation meeting to include:
1. Review foreseeable methods and procedures related to flooring work.
2. Tour representative areas of flooring substrates (decks); inspect and discuss condition of substrate, joints, drains, curbs, penetrations and other preparatory work performed by others.
4. Review metal deck, vented or non-vented.
5. Review water/cement ratios.
6. Review curing process.
7. Review under-slab vapor barrier and soil conditions.
8. Review deck for loss of flatness/levelness.
10. Review weather history from time of concrete pour to until meeting.
11. Review mechanical system requirements for testing and flooring installation.
12. Review testing and installation temperature and humidity requirements.
13. Review flooring system requirements, (drawings, specifications and other contract
documents).
14. Review required submittals both completed and yet to be completed.
15. Review and finalize construction schedule related to flooring work and verify availability of
materials, installer’s personnel, equipment and facilities needed to make progress and avoid
delays.
16. Review conditions at adjacent flooring types.
17. Review required inspection, testing, certifying and material usage accounting procedures.
18. Record discussion of meeting including decisions and agreements (or disagreements)
reached.
   a. If substantial disagreements exist at conclusion of meeting, determine how
   disagreements will be resolved and set date for reconvening conference.
   F. Furnish copy of record to each party who may be affected by flooring work, (weather or not they
were in attendance) and to Owner and Architect.

1.5 SUBMITTALS
A. Project Information:
   1. Test reports:
      a. Each flooring area of each flooring type.
   2. Manufacturer and product for each flooring type.
B. LEED Credit EQc4.1, Low-Emitting Materials, Adhesives and Sealants:
   1. Provide product data and material safety data sheets (MSDS) for adhesives and sealants
   used inside the building indicating VOC content of each product used. Indicate VOC
   content in g/L calculated according to 40 CFR 59, Subpart D.

PART 2 - PRODUCTS

2.1 WATER VAPOR EMISSION CONTROL
A. Acceptable manufacturers:
   1. Water vapor resistive adhesive, or water vapor emission control system:
      a. Base:
         1) Flooring manufacturer’s approved products.
B. Capable of meeting design criteria:
   1. Compatible floor covering, mitigation system, adhesive, and leveling system products.
C. LEED Requirements with the Building Vapor Barrier:
   1. LEED Credit EQc4.1 Low-Emitting Materials, Adhesives, and Sealants:
      a. Material shall contain VOC content as certified.

PART 3 - EXECUTION

3.1 EXAMINATION
A. Examine substrate and conditions under which flooring is to be installed.
B. Verify substrates are clean, free from moisture, or materials that may affect adhesion.
C. Verify concrete cured a minimum of 28 days.
D. Verify concrete surfaces are free of defects and irregularities.
E. Verify concrete type and water/cement ratio, see Section 03 31 00.
F. Verify installation of under-slab retarder, see Section 03 31 10.
G. Verify curing procedure used, see Section 03 31 10.
H. Verify floors are level or meet indicated slope, see Section 03 35 00.
I. Do not proceed with installation until unsatisfactory conditions have been corrected.
J. Installation indicates acceptance of substrates and responsibility for performance.
K. Verify flooring manufacturer’s installation criteria for each type of flooring.

3.2 TESTING
A. Test concrete for each area of each flooring type as required by flooring manufacturer.
B. Conditioning: Minimum 48 hours prior to testing:
   1. Concrete floor slabs: Service temperature.
   2. Occupied air space above the floor slab: Service temperature.
   3. Occupied air space relative humidity above the floor slab: Service humidity.
   4. Continue conditioning required until, during, floor installation.
   5. Continue conditioning after flooring installation as required by applicable manufacturers.
   6. See Construction Schedules, Section 01 32 16.
   7. See Heating, Ventilation, and Cooling, Section 23 05 00.
   8. Tests:
      a. Alkalinity: ASTM F710.
      c. As required by flooring manufacturer.

3.3 PREPARATION
A. Moisture Resistant Adhesive: As recommended by flooring and adhesive manufacturers.
B. Emission control system: As recommended by mitigation system manufacturer.
   1. Mask and protect walls, equipment from installation process.
   2. Shot blast or grind concrete surfaces, grind near walls and clean joints.
   3. Broom-sweep and vacuum slab surfaces to remove dust and debris.

3.4 INSTALLATION
A. Install system components with manufacturer employed or approved personnel.
B. Apply control system as recommended by manufacturer.
   1. Fill cracks, joints, and surface irregularities as recommended by manufacturer.

3.5 FIELD QUALITY CONTROL
A. Allow materials to acclimate for a minimum of 72 hours at a temperature of 70 DegF and relative humidity of 50%.
B. Protect floor.

END OF SECTION
PART 1 - GENERAL

1.1 QUALITY ASSURANCE

A. Resilient Base (RB):
      a. Thermoplastic Rubber: Type TP per ASTM F1861.

B. Fire and smoke rating (RB):
   1. Critical Radiant Flux, per ASTM E648 / NFPA 253:
      a. Class I, not less than 0.45 W/cm².
   2. Smoke Developed: 450 or less per ASTM E662 / NFPA 258.
   3. ASTM E84 flame spread: Maximum, 75; smoke developed: Maximum, 250.

1.2 SUBMITTALS

A. Submittals Package:
   1. Submit product data and sample submittals specified below at the same time as a package.

B. Product Data:
   1. Submit manufacturer's product data for each product installed.

C. Samples:
   1. Resilient Base:
      a. Four samples of material and color selected for verification.
      b. Field-fabricated corners: Construct sample base inside and outside corner:
         1) Include minimum 4 FT straight base each direction from corner.
         2) If not acceptable construct additional corners.
            a) Stress whitening and cracking will not be acceptable.
            b) Color and height variation will not be acceptable.
         3) Sample corners constitute standard of quality for actual construction.
         4) Maintain sample corners during construction.
         5) Remove when directed.
         6) Sample corners may be built into permanent construction provided sample area is readily identifiable during construction.
         7) Do not proceed with base installation until sample corners are approved by Architect.

D. Contract closeout information:
   1. Warranty.
   2. Maintenance data.
   3. Letter stating extra material has been delivered.
   4. Interior finish fire performance data:
      a. Provide for each finish material and type specified:
         1) Manufacturer's printed information including:
         2) Fire class.

E. LEED Credit MRec4.1 and Credit MRec4.2, Recycled Content:
   1. Provide list of proposed materials with recycled content. Indicate separate percentages, by weight, of pre-consumer and post-consumer recycled content per unit of product. Also include material costs, excluding cost of installation.

F. LEED Credit MRec5.1 and Credit MRec5.2, Local/Regional Materials:
1. Provide list of proposed regional materials. Indicate location of manufacturing facility including name, address and distance 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.

G. LEED Credit EQc4.1, Low-Emitting Materials, Adhesives and Sealants:
1. Provide product data and material safety data sheets (MSDS) for adhesives and sealants used inside the building indicating VOC content of each product used. Indicate VOC content in g/L calculated according to 40 CFR 59, Subpart D.

1.3 PRODUCT DELIVERY, STORAGE AND HANDLING
A. Deliver materials in manufacturer's unopened containers indicating name, brand, color and pattern.
B. Store at minimum 70 DegF for 72 hours before installation.

1.4 JOB CONDITIONS
A. Maintain work spaces at 65-85 DegF with maximum 75 percent humidity 72 hours prior, during, and after installation.
B. Protect adjacent work from damage.
C. Install after wall finishes.
D. Install prior to carpet and acoustical material.
E. Schedule installation to minimize accumulation of air contaminants that cannot be removed prior to occupancy.
F. Air out construction with 100 percent outside air.
   1. Do not recirculate prior to occupancy.
   2. Ventilate during installation. Seal return air ducts and use direct exhaust to outdoors.

1.5 WARRANTY
A. Remove and replace defective areas to satisfaction of Architect at no additional expense to Owner.

PART 2 - PRODUCTS

2.1 MATERIALS
A. Acceptable manufacturers:
   1. Resilient base (RB):
      a. Base:
         1) Armstrong World Industries.
      b. Optional:
         1) BurkeMercer.
         2) Azrock.
         3) Endura.
         4) Johnsonite.
         5) Roppe.
         6) VPI Floor Products.
   2. Other manufacturers desiring approval comply with Section 00 26 00.
B. Resilient Base (RB1) at carpet:
   1. Rubber top set, straight type.
   2. 1/8 x 4 IN.
   3. Field formed external and internal corners.
4. Provide continuous rolls, minimum 95 FT long.
5. Color: Black.

C. Resilient base (RB2):
   1. Rubber top set, coved type.
   2. 1/8 x 4 IN, 1/4 IN wide at bottom.
   3. Field formed external and internal corners.
   4. Provide continuous rolls, minimum 95 FT long.
   5. Color: Black.

D. LEED Credit MRc4.1 and MRc4.2: Recycled Content:
   1. Material shall contain recycled content as certified.

E. Leveling compound: As recommended by manufacturer, compatible with adhesives.

F. Adhesives and primers:
   1. As recommended by manufacturer.
   2. Comply with EPA VOC regulations.
   3. LEED Credit EQc4.1 Low-Emitting Materials, Adhesives, and Sealants:
      a. Material shall contain VOC content as certified.

2.2 EXTRA MATERIAL
A. 120 LF of each color and type of base for maintenance.

PART 3 - EXECUTION

3.1 INSPECTION
A. Verify that substrates are clean, free from moisture, or materials which may affect adhesion.
B. Carefully examine surfaces for defects and irregularities.
C. Installation constitutes acceptance of surfaces.

3.2 PREPARATION
A. Fill cracks, joints, etc., with water resistant non-crumbling patching compound.
B. Trowel to smooth and proper level.

3.3 INSTALLATION
A. Do not start work until work of other trades has been completed.
B. Coordinate with floor and wall work.
C. Apply primer and adhesive as recommended by manufacturer.
D. Install base after wall material has dried out thoroughly.
   1. Provide base at intersections of floor and vertical surfaces in areas scheduled to receive base, where intersection is exposed to view.
   2. Set base straight and true.
   3. Fit base neatly into breaks and recesses.
   4. Install corners as recommended by manufacturer.
   5. Scribe to trim at doors and door frames.
   7. Install with top and bottom edges in firm contact with wall and floor.

3.4 CLEANING
A. Immediately after application and rolling remove surplus adhesive.
B. When materials have sufficiently seated, clean in accordance with manufacturer's recommendations.

C. Leave smooth and clean.

END OF SECTION
SECTION 09 65 15
SHEET VINYL FLOORING (SVF)

PART 1 - GENERAL

1.1 QUALITY ASSURANCE

A. Fire and smoke rating:
   1. Critical Radiant Flux, per ASTM E648 / NFPA 253:
      a. Class I, not less than 0.45 W/cm².
   2. Smoke Developed: 450 or less per ASTM E662 / NFPA 258.

B. Static coefficient of friction: Listed values per ASTM D2047.

C. Static Load Limit: Listed values per ASTM F970.

D. Applicator experienced in installation of sheet flooring using heat welded seems.

1.2 SUBMITTALS

A. Project Information:
   1. Seaming Diagram.

B. Contract closeout information:
   1. Letter stating extra material has been delivered.
   2. Maintenance data.
   3. Warranty.
   4. Interior finish fire performance data:
      a. Provide for each finish material and type specified:
         1) Manufacturer's printed information including:
            a) Fire class.
            b) NFPA test number.

C. LEED Credit MRc4.1 and Credit MRc4.2, Recycled Content:
   1. Provide list of proposed materials with recycled content. Indicate separate percentages, by weight, of pre-consumer and post-consumer recycled content per unit of product. Also include material costs, excluding cost of installation.

D. LEED Credit MRc5.1 and Credit MRc5.2, Local/Regional Materials:
   1. Provide list of proposed regional materials. Indicate location of manufacturing facility including name, address and distance 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.

E. LEED Credit EQc4.1, Low-Emitting Materials, Adhesives and Sealants:
   1. Provide product data and material safety data sheets (MSDS) for adhesives and sealants used inside the building indicating VOC content of each product used. Indicate VOC content in g/L calculated according to 40 CFR 59, Subpart D.

1.3 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Store in heated space at minimum 70 DegF for 72 hours before use.

1.4 JOB CONDITIONS

A. Remove incompatible residual materials (such as curing compounds, paint, varnish, oils, release agents, sealers, waxes and other incompatible materials) using mechanical means approved by manufacturer.
1. Determine compatibility by a bond test or by the adhesive/flooring manufacturer's recommendations.
2. Avoid organic solvents.

B. Maintain work spaces at 65-85 DegF with maximum 75% relative humidity 72 hours prior to installation, during, and after installation.
1. Provide artificial heating or cooling as required.
2. Verify equipment will not leave contaminants on concrete.

C. Schedule installation to minimize accumulation of air contaminants that cannot be removed prior to occupancy.
1. Install after wall finishes.
2. Install prior to carpet and acoustical material.

D. Air out construction with 100% outside air.
1. Do not recirculate prior to occupancy.
2. Ventilate during installation. Seal return air ducts and use direct exhaust to outdoors.

1.5 WARRANTY

A. Written warranty that material will be free from manufacturing defects:
1. From date of purchase: Material, 5 years.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Acceptable manufacturers:
1. Resilient sheet vinyl flooring (SVF):
   a. Base:
      1) Armstrong.
   b. Optional:
      1) Mannington.
      2) Johnsonite.
2. Other manufacturers desiring approval comply with Section 00 26 00.
3. Cap Strip:
   1) Aluminum cap strip as recommended by the flooring manufacturer.

2.2 DESCRIPTION OF PRODUCTS

A. Resilient Sheet Vinyl (SVF) flooring:
1. Solid polyvinyl chloride sheet floor covering, minimum 0.080 IN overall thickness.
2. Reference Specification:
   a. ASTM F1913.
3. Static coefficient of friction: 0.6.
4. Static Load Limit:
   a. 750 PSI.
5. Basis of design:

B. Integrally Coved Base (not separate):
1. Height: 4 IN.
2. Metal Cove Cap Strip:
   a. Description: Anodized aluminum for integral flash cove.
3. Include Cove Fillet.
   a. Radius: Minimum 7/8 IN.

C. Adhesive:
1. As recommended by vinyl flooring manufacturer.
2. VOC content no greater than 50 g/L.
3. LEED Credit EQc4.1 Low-Emitting Materials, Adhesives, and Sealants:
   a. Material shall contain VOC content as certified.

D. Leveling compound: Cementitious type as recommended by flooring manufacturer.
   1. Verify compatibility with moisture content of concrete.

E. Transition Strip:
   1. 1 IN wide rubber or PVC.
   2. Use tapered profiles where abutting material is of different thickness.

F. Water vapor emission control system: See Section 09 60 05.

G. Sheet Flooring Schedule:
   a. As indicated.

2.3 EXTRA MATERIAL

A. Furnish Owner with 100 SF or a minimum of 2% of total square footage installed.
   1. Maintenance materials must be from the same manufactured lot as material installed.

B. Furnish trim materials in sealed, labeled packages as applicable.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine substrate and conditions under which flooring is to be installed.
B. Verify substrates are clean, free from moisture, or materials that may affect adhesion.
C. Carefully examine surfaces for defects and irregularities.
D. Verify floors are level or meet indicated slope.
   1. See Section 03 35 00.
E. Do not proceed with installation until unsatisfactory conditions have been corrected.
F. Installation indicates acceptance of substrates and responsibility for performance.

3.2 PREPARATION

A. Concrete preparation for floor finishes: See Section 09 60 05.
B. Do not begin installation until concrete moisture content, alkali, temperature, and humidity are acceptable to manufacturer.
C. Remove foreign matter that would prevent adhesion.
D. Coordinate leveling with water emission control system provider.
E. Clean subfloor before applying adhesive.
F. Where resilient flooring abuts other finish flooring materials and finished surfaces do not align, feather leveling compound for approximately 12 IN so finished surfaces will align.
   1. Coordinate leveling with water emission control system provider.

3.3 INSTALLATION

A. Provide material in accordance with manufacturer's instructions:
   1. Install in maximum possible sizes.
   2. Apply adhesive to substrate per manufacturer's recommendations.
   3. Provide Transition Strips as required where Sheet Vinyl flooring abuts other flooring materials.
4. Where seam occurs in door openings: Locate Transition Strip directly under door when in closed position.
5. Where abutting materials are Carpet, Ceramic Tile, Quarry Tile, Stone Tile etc: Utilize the Transition Strip specified in respective section.
6. Install in adhesive with accurate, tight seams.
7. Reverse alternate sheets.

B. Provide sheets in one room or area from one production run.

C. Mismatched materials will be rejected.

D. Provide slip resistant flooring in areas as indicated.

E. Weld to adjacent vinyl sheet flooring and weld joints in slip resistant flooring.

F. Double cut joints, butt tight, groove out and hot weld.

G. Weld seams using vinyl welding rod.

H. Remove excess rod with sharp knife and buff to match adjacent surfaces.

I. Coved Base:
   1. Provide an integral cove by extending the flooring material 6 IN up the wall supported by a cove stick having a minimum radius of 7/8 IN and adhering to the wall. Cap the integral coving with an approved cap strip installed in accordance with the manufacturer's recommendations.

3.4 PROTECTION

A. Restrict heavy traffic for 48 HR.

B. Do not expose to water for 30 days.

C. Protect flooring.
   1. Use dollies with boards underneath whenever normally stationary equipment and/or furnishings must be moved across the floor. Protect floors from rolling loads for 72 hours after installation by covering with hardboard or plywood. Protect the floor with un-dyed, untreated building paper until final inspection.
   2. Remove damaged and delaminated flooring to nearest seam and replace with new flooring at no additional expense to Owner.

3.5 CLEAN

A. When final building cleanup is being accomplished clean flooring and base in accordance with manufacturer's instructions.
PART 1 - GENERAL

1.1 QUALITY ASSURANCE

A. Minimum Physical Properties:

<table>
<thead>
<tr>
<th>Property</th>
<th>Test Method</th>
<th>Required Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abrasion Resistance (min)</td>
<td>ASTM D3389</td>
<td>0.501 Grams/1000 cycles +/-5mg</td>
</tr>
<tr>
<td>Minimum Hardness Shore A</td>
<td>ASTM D2240</td>
<td>Not less than 80</td>
</tr>
<tr>
<td>Static Load Limit (min)</td>
<td>ASTM F970</td>
<td>Less than .005 IN Residual Compression</td>
</tr>
<tr>
<td>Compression (max)</td>
<td>ASTM D395</td>
<td>9.7%</td>
</tr>
<tr>
<td>Critical Radiant Flux</td>
<td>ASTM E648</td>
<td>Class I</td>
</tr>
<tr>
<td>Coefficient of Friction (James Method)</td>
<td>ASTM D2047</td>
<td>1.04 (Dry)</td>
</tr>
<tr>
<td>Stain Resistance</td>
<td>ASTM D543</td>
<td>No change (ammonia, bleach, rust, grass, coffee, fruit juice, cola, ink, lipstick)</td>
</tr>
<tr>
<td>Conductivity (RFT ESD tile only)</td>
<td>ASTM F150</td>
<td>Resistance to grounding</td>
</tr>
</tbody>
</table>

B. Products shall contain no asbestos, halogens, or poly-vinyl-chloride.

C. Installer qualifications:
   1. Installer shall be approved by the manufacturer of the rubber tile flooring.
   2. Installer shall provide an effective project manager to manage the installers and ensure that all of the required procedures are followed, documented, and the installation guides are followed.

1.2 SUBMITTALS

A. Product Data:
   1. Submit manufacturer’s product data, installation guide, and maintenance guide for each material proposed for use.
   2. MSDS (Material Safety Data Sheets) for adhesives and cleaning agents.

B. Shop Drawings:
   1. Floor plans at 1/8” for each typical area.
   2. Showing transition details.

C. Samples:
   1. Manufacturer’s sample selection brochure for color selections.
   2. Four full-sized specimens of each product for verification.

D. Contract Closeout Information:
   1. Warranty.
   3. Interior finish fire performance data:
      a. Provide for each finish material and type specified:
         1) Manufacturer's printed information including:
            a) Fire class.
            b) NFPA test number.
E. LEED Credit MRc4.1 and Credit MRc4.2, Recycled Content:
   1. Provide list of proposed materials with recycled content. Indicate separate percentages, by
      weight, of pre-consumer and post-consumer recycled content per unit of product. Also
      include material costs, excluding cost of installation.

F. LEED Credit MRc5.1 and Credit MRc5.2, Local/Regional Materials:
   1. Provide list of proposed regional materials. Indicate location of manufacturing facility
      including name, address and distance 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.

G. LEED Credit EQc4.1, Low-Emitting Materials, Adhesives and Sealants:
   1. Provide product data and material safety data sheets (MSDS) for adhesives and sealants
      used inside the building indicating VOC content of each product used. Indicate VOC
      content in g/L calculated according to 40 CFR 59, Subpart D.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Tiles: Maintain stored tiles in a clean and dry, protected environment.

B. Adhesive: Store above 50 DegF in a dry, heated space.

1.4 JOB CONDITIONS

A. Remove incompatible residual materials (such as curing compounds, paint, varnish, oils, release
   agents, sealers, waxes and other incompatible materials) using mechanical means approved by
   manufacturer.
   1. Determine compatibility by a bond test or by the adhesive/flooring manufacturer's
      recommendations.
   2. Avoid organic solvents.

B. Maintain work spaces at 65-85 DegF with maximum 75% relative humidity 72 hours prior to
   installation, during, and after installation.
   1. Provide artificial heating or cooling as required.
   2. Verify equipment will not leave contaminants on concrete.

C. Protect adjacent work from damage.

D. Install after wall finishes.

E. Install prior to carpet and acoustical material.

F. Schedule installation to minimize accumulation of air contaminants that cannot be removed prior
   to occupancy.

G. Air out construction with 100% outside air.
   1. Do not recirculate prior to occupancy.
   2. Ventilate during installation. Seal return air ducts and use direct exhaust to outdoors.

1.5 WARRANTY

A. 5-year limited wear warranty against manufacturing defects in material workmanship and
   installation.
   1. Provide written warranty that material will be free from manufacturing defects.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Acceptable manufacturers:
1. Rubber Floor Tiles (RFT):
   a. Base:
      1) Nora Systems, Inc.
   b. Optional:
      1) Johnsonite.
      2) Roppe.
2. Other manufacturers desiring approval comply with Section 00 26 00.

B. Rubber Floor Tiles (RFT):
1. Description: .012 IN (3.0 mm) thickness, smooth surface rubber tiles.
2. Composition: Rubber compound with abundant natural fillers and environmentally compatible color pigments. Rubber content approximately 20%.
3. Edge Style / Tile Size:
   a. Straight Edge Mat / 24 x 24 IN.
4. Back of Tile:
   a. Smooth, double sanded back.
5. Abrasion Resistance: Taber abrasion test, ASTM D3389, H-18 wheel, 500 gram load, 1000 cycles, gram weight loss less than 0.70.
6. Hardness: Shore A, not less than 85 when tested in accordance with ASTM D2240.
7. Static Load: Less than 0.005 IN when tested with 800 lbs. in accordance with ASTM F970.
8. Slip Resistance: Static coefficient of friction equal to or greater than 0.5 in accordance with ASTM D2047.
10. Color(s):
    a. See Section 09 06 10 Room Finish and Color Schedule.

C. Rubber Floor Tiles (RFT-ESD): Static Dissipative.
1. Description: .014 IN (3.5 mm) thickness, smooth surface rubber tiles.
2. Composition: Rubber compound with abundant natural fillers and environmentally compatible color pigments.
3. Edge Style / Tile Size:
   a. Straight Edge Matt / 39.45 x 39.45 IN.
4. Back of Tile:
   a. Smooth, double sanded back.
5. Abrasion Resistance: Taber abrasion test, ASTM D3389, H-18 wheel, 500 gram load, 1000 cycles, gram weight loss less than 0.50.
6. Hardness: Shore A, not less than 81 when tested in accordance with ASTM D2240.
7. Slip Resistance: Static coefficient of friction equal to or greater than 0.5 in accordance with ASTM D2047.
8. Conductivity: Between 10^6 W and 10^9 W when tested in accordance with ASTM F150.
9. Static Load: Less than 0.005 IN when tested with 800 lbs. in accordance with ASTM F970.
11. Color(s):
    a. As selected from manufacturer’s full range of standard colors.

D. Adhesive:
2. Base Product: “CX 941” by Chemrex, or other material approved by manufacturer of tiles.
3. LEED Credit EQc4.1 Low-Emitting Materials, Adhesives, and Sealants:
   a. Material shall contain VOC content as certified.

E. Water vapor emission control system: See Section 09 60 05.

F. Miscellaneous Materials:
1. Include compatible Transition/Reducer Strips as required.

2.2 EXTRA MATERIAL
A. General:
   1. Provide materials in clearly labeled containers.

B. Quantities of Extra Material Required:
   1. Provide 5 full cartons of each field tile type, color, and pattern of material for maintenance.
   2. Provide one full carton of each accent tile type, color, and pattern of material for maintenance.
   3. Furnish full-size units equal to minimum 2 percent of quantity installed.

C. Deliver to Owner’s designated storage area.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrate and conditions under which flooring is to be installed.

B. Verify substrates are clean, free from moisture, or materials which may affect adhesion.

C. Carefully examine surfaces for defects and irregularities.

D. Verify floors are level or meet indicated slope.

E. Do not proceed with installation until unsatisfactory conditions have been corrected.

F. Installation indicates acceptance of substrates and responsibility for performance.

3.2 PREPARATION

A. General:
   1. Fill cracks, joints, holes, depressions etc., in floors with leveling compound.
      a. Provide level surface or meet indicated slope.
   2. Where resilient flooring abuts other finish flooring materials and finished surfaces do not align, feather leveling compound for approximately 12 IN so finished surfaces will align.

B. Concrete Substrates:
   1. Concrete preparation for floor finishes: See Section 09 60 05.
   2. Concrete sub-floors must be thoroughly cured a minimum of 28 days after pour and dry to a level not exceeding 3 LBS of moisture per 1000 SF as tested with a Calcium Chloride test kit.
      a. Consult adhesive specifications for allowable moisture tolerance.
   3. Concrete sub-floors must be clean and free of all debris, including paints, existing adhesives, dirt, dust, etc.
      a. If the concrete surface has a layer of paint, dirt, oil, or contamination, a 25% solution of chemical grade muriatic acid and water (1 part acid to 3 parts water) will create a permanent bond by roughing the concrete surface.
      b. Rinse thoroughly and allow to dry.
   4. Ensure that concrete must be smooth and level to a tolerance not exceeding 1/8 IN in 10 LF.
   5. If existing concrete is rough, or does not meet the 1/8 IN in 10 LF criteria:
      a. Apply a Portland cement based leveling compound to smooth and level the surface, allowing a minimum of 7 days for curing.
   6. Once all surfaces are level, make sure the total surface is clean and dry before starting the installation.
   7. Insure good drainage.

3.3 PRE-INSTALLATION

A. Allow ample time for tiles to equalize to ambient temperature.

B. Maintain appropriate room temperature 24 hours before, during and after installation of tiles.
1. Temperature range for adhesive use: Above 50 DegF and below 104 DegF.

3.4 INSTALLATION - GENERAL

A. Layout as indicated on Drawings.

B. If not indicated, center in rooms as follows:
   1. Establish a starting course by finding the mid-point on all four walls.
   2. Use a chalk line and mark the two center lines across the whole area.
   3. Use the perpendicular chalk line as starting point to lay out the tiles.

3.5 INSTALLATION – SQUARE-EDGED TILES

A. Pattern:
   1. Install in pattern indicated.

B. Do not allow adhesive to build up between seams or be spilled on the surface of the tiles.
   1. Do not tape seams.

C. Roll each row when finished and roll total floor when completed.
   1. Roll floor in both directions.
   2. Avoid traffic on newly installed tiles.
   3. NO foot traffic of any kind should be allowed on tiles for 72 hours.
   4. Roll with device and weight recommended by maker of tiles to ensure that the underside mat surface is fully bonded to the glue and sub-floor.
   5. Avoid over-rolling.

D. Do not allow misapplied adhesive to cure on the flooring.
   1. Immediately wipe off excess adhesive using a damp cloth dampened with mineral spirits (use sparingly and only on the adhesive itself).

3.6 REPAIR

A. Protect installed work from damage by others.

B. Repair damaged units prior to final approval.

3.7 CLEANING

A. Immediately after application and rolling, remove surplus adhesive.

B. Damp mop entire floor.

C. Clean floors in accordance with manufacturer's recommendations.

D. Leave floors smooth and clean.

E. Protect with non-staining building paper as may be necessary to prevent dirt and damage.

F. Protect traffic areas with fiberboard or plywood.

END OF SECTION
SECTION 09 67 81
SEALED CONCRETE (SC)

PART 1 - GENERAL

1.1 QUALITY ASSURANCE
A. Applicator must be a licensee of manufacturer, or approved in writing.

1.2 SUBMITTALS
A. Project Information:
   1. Maintenance data.
B. LEED Credit EQc4.1, Low-Emitting Materials, Adhesives and Sealants:
   1. Provide product data and material safety data sheets (MSDS) for adhesives and sealants used inside the building indicating VOC content of each product used. Indicate VOC content in g/L calculated according to 40 CFR 59, Subpart D.

1.3 JOB CONDITIONS
A. Install only when surface and ambient temperatures are between 60 and 95 DegF.
B. Install prior to other finishes.
C. Provide adequate ventilation during installation.
D. Post and enforce No Smoking signs.

PART 2 - PRODUCTS

2.1 MATERIALS
A. Acceptable manufacturers:
   1. Concrete Floor Sealer – Normal Duty (SC):
      a. Base:
         1) L&M Construction Chemicals.
      b. Optional:
         1) Sonneborn/ChemRex.
         2) Harris Specialty Chemicals.
         3) Hillyard.
   2. Other manufacturers desiring approval comply with Section 00 26 00.
B. Concrete Floor Sealer – Normal Duty (SC):
   1. Water-based, low VOC, acrylic copolymer solutions that cure, seal and dustproof concrete with minimal yellowing.
   2. Conform to ASTM C309 and ASTM C1315, Type I, Grade B, be VOC compliant, and meet all local air quality regulations.
   3. Federal Spec: TT-C-800A.
   4. Minimum Solids Content: 30% by volume.
   5. Primer: As recommended by manufacturer.
   6. Base Product:
      a. “Dress & Seal WB 30” by L&M.
   7. LEED Credit EQc4.1 Low-Emitting Materials, Paints and Coatings:
      a. Material shall contain VOC content as certified.
PART 3 - EXECUTION

3.1 INSPECTION

A. Verify suitability of substrate to accept installation.
B. Installation constitutes acceptance of responsibility for performance.

3.2 PREPARATION

A. Verify that concrete was steel troweled and hair broomed and is free of fins, ridges or voids.
B. Assure that curing agents used are compatible with coating system or completely removed.
C. Concrete must be cured for minimum of 28 days, with moisture content not exceeding 8 percent.
D. Remove surface contamination by cleaning or if necessary by sandblasting.
E. Patch holes or voids.
F. Rout out cracks exceeding 1/16 IN wide and calk.
G. Calk non-moving joints up to 1 IN wide with suitable backer and sealant.
H. Do not calk or overcoat joints where movement exceeds 25% or joints over 1 IN wide.
I. These joints must receive other joint treatment to assure watertightness.
J. Install test patch.
K. If test patch indicates lack of adhesion, install primer.

3.3 INSTALLATION

A. DO NOT apply to surfaces scheduled to subsequently receive cementitious coatings or toppings, such as concrete, terrazzo, polyester or epoxy coatings.
B. Apply by airless spray, long handled roller or brush.
C. Apply in accordance with manufacturer's recommendations; minimum 2 coats.
D. Apply first coat at not over 400 SF/GAL.
E. Apply subsequent coat at a coverage rate not over 400 SF/GAL.
F. Allow no traffic on sealed surface for 72 hours after application.

3.4 PATCHING AND CLEANING

A. Patch areas which fail to match adjacent work.
B. Clean surface "broom clean" after completion of work.
C. Remove debris resulting from these operations.
D. Refer to Section 01 77 00 for final cleaning requirements.

END OF SECTION
SECTION 09 68 13
CARPET TILE (CPTT)

PART 1 - GENERAL

1.1 QUALITY ASSURANCE

A. General requirements:
   1. Manufacturer:
      a. Carpet manufacturer shall have no less than 10 years of production experience with
         carpet similar to type specified in this document and whose published product literature
         clearly indicates compliance of products with requirements of this section.
      b. Single source responsibility: Provide product material by a single manufacturer for
         each carpet type specified.
   2. Trade Contractor:
      a. Firm with not less than five (5) years of successful carpeting experience similar to work
         of this section and recommended and approved by the carpet manufacturer.
      b. Upon request, submit letter from carpet manufacturer stating certification qualifications
         and acceptance.
   3. Substitutions:
      a. Where a selected manufacturer or product has been specified, an equal or superior
         product may be accepted only upon review and written acceptance by the Architect.
      b. It is mandatory that such review and approval be obtained prior to bidding, or the
         substitution will not be considered.
      c. All such proposed substitutions shall be submitted to the architect with all appropriate
         manufacturer's specifications and literature, and independent testing laboratory data.
      d. The architect's decision as to whether a product is equal or superior to the one specified
         shall be final.
      e. This section applies to any "or equal" noted in the specifications.
   4. Installer qualifications: Mill trained, skilled mechanics supervised by experienced
      superintendent with 50,000 yards experience.

1.2 SUBMITTALS

A. Samples:
   1. Provide four full-size tiles of each material and color selected for verification.

B. Contract Closeout Information:
   1. Warranty/Guarantee.
   2. Letter stating extra material has been delivered.
   3. Maintenance data.
   4. Interior finish fire performance data:
      a. Provide for each finish material and type specified:
         1) Manufacturer's printed information including:
            a) Fire class.

C. LEED Credit MRc4.1 and Credit MRc4.2, Recycled Content:
   1. Provide list of proposed materials with recycled content. Indicate separate percentages, by
      weight, of pre-consumer and post-consumer recycled content per unit of product. Also
      include material costs, excluding cost of installation.

D. LEED Credit EQc4.1, Low-Emitting Materials, Adhesives and Sealants:
   1. Provide product data and material safety data sheets (MSDS) for adhesives and sealants
      used inside the building indicating VOC content of each product used. Indicate VOC
      content in g/L calculated according to 40 CFR 59, Subpart D.
E. LEED Credit EQc4.3, Low-Emitting Materials, Carpet Systems:
   1. Provide product data and material safety data sheets (MSDS) for carpeting and carpet
      adhesives indicating certification from the Carpet and Rug Institute Green Label Plus
      program for carpet and adherence with VOC limits for carpet adhesives.

1.3 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver with mill register numbers attached.
B. Tag and mark accessory items for identification.
C. Store Carpet and related materials in a climate-controlled, dry space.
   1. Protect Carpet from soil, dust, moisture and other contaminants.
   2. Store on a flat surface.
   3. Do not stack heavy objects on top of carpet packages.

1.4 JOB CONDITIONS

A. Install after wall and other floor finishing operations in area are complete.
B. Install after lighting system in area is complete.
C. Install prior to acoustical ceiling tile.
D. Maintain temperature of 65-95 DegF for not less than 48 hours prior to installation.
   1. Do not allow relative humidity to exceed 65%.
   2. Maintain same temperature and RH conditions throughout installation.

1.5 WARRANTY/GUARANTEE

A. Guarantee entire carpet installation complies with specifications, and damaged or defective
   carpet or carpet stained by adhesives will be removed and replaced for a period of 2 years.
B. Guarantee carpet color consisting of thermally pigmented yarns will not show significant change
   when exposed to normal light for period of 15 years.
   1. AATCC-16E.
C. Guarantee carpet color will not show significant change when exposed to normal atmospheric
   contaminates for period of 15 years.
D. Guarantee carpet will not show excessive wear for period of 15 years.
   1. Excessive wear is defined as wearing away of face yarns which reduces pile height by more
      than 15 percent in any area or pulling out of nap.
E. Guarantee carpet backing structure will not delaminate from face structure and there will be no
   shrinkage or stretching affecting performance of face or backing structure for period of 15 years
   when installed and maintained in accordance with published procedures.
   1. Guarantee when installed and maintained in accordance with published procedures will not
      edge ravel for a period of 15 years.
   2. Guarantee ability of the carpet to lay flat; will not curl or dome.
F. Guarantee entire cost of replacement, including removal, replacement, and disposal of defective
   carpet.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Acceptable manufacturers:
   1. Carpet Tile (CPTT):
      a. Base (See Section 09 06 10 for multiple manufacturers):
         1) Bentley Prince Street, Inc.
b. Optional:
   1) InterfaceFLOR, LLC.
   2) Constantine Commercial, LLC.

2. Carpet Edging and Stair Nosing Strips:
   a. Base:
      1) Burke Mercer by Burke Industries.
   b. Optional:
      1) Roppe Corporation.
      2) Johnsonite.

3. Other manufacturers desiring approval comply with Section 00 26 00.

B. Carpet Tile (CPTT):
   1. First quality, no seconds or imperfects.
   2. Comply with applicable state and local codes.
   3. Design Basis:
      a. 32 ounce per square yard.
      b. Size: 18 x 18 IN.
      c. Tufted Tip-Sheared, 14 stitches per IN.
      d. Product "Crawford Carpet Tile" by Bentley Prince Street.
   4. Nylon specification:
      a. All nylon fiber shall be advanced generation brand name nylon (i.e., federally
         registered trademark such as Antron or Ultron, etc.) from DuPont, BASF or Monsanto
         or Zeftron.
      b. Performance certification testing from Fiber Manufacturer is required.
   5. Antimicrobial:
      a. Broad spectrum efficacy against bacteria and fungus for the life of the product.
      b. Minimizes likelihood of building related illness, sick building syndrome and assists in
         improving indoor air quality.
   7. LEED Credit MRc4.1 and MRc4.2; Recycled Content:
      a. Material shall contain recycled content as certified.
   8. LEED Credit EQc4.3 Low-Emitting Materials, Carpet Systems:
      a. Material shall contain VOC content as certified.

C. Carpet Edging Strips:
   2. Thickness to match carpet.
   3. Color as selected by Architect.

D. Carpet Stair Nosing Strips:
   2. Under cut for carpet tile at floor only.
   3. Color as selected by Architect.

E. Water vapor emission control system: See Section 09 60 05.

F. Adhesive:
   1. Non-staining, non-bleeding strippable type.
   2. As recommended by carpet manufacturer.
   3. LEED Credit EQc4.1 Low-Emitting Materials, Adhesives, and Sealants:
      a. Material shall contain VOC content as certified.
      b. Carpet adhesive shall have VOC content of no greater than 50 g/L in accordance with
         SCAQMD Rule #1168.

2.2 CARPET TYPES
   1. As indicated on Room Finish and Color Schedule.
2.3 EXTRA MATERIAL

A. Furnish Owner with minimum of 5 percent additional material of each type, pattern and color for maintenance purposes.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify suitability of substrate to accept installation.
B. Concrete preparation for floor finishes: See Section 09 60 05.
C. Verify concrete is sealed. New concrete requires approximately 90 days to cure.

3.2 PREPARATION

A. Thoroughly clean areas to receive carpet tile, seal new concrete, strip waxes and finishes.
B. Thoroughly remove dust and vacuum, also wet mop then seal concrete.
C. Fill cracks, joints, holes or uneven areas with non-crumbling latex base floor filler such as Lev-L-Astic, patching compound must be mixed with latex mix not water.
D. Before commencing work, test an area with glue and carpet tile to determine "open-time" and bond.
E. Layout:
   1. Arrange joints symmetrically about centerline of rooms.
   2. Lay so pile and pattern of adjacent pieces match.
   3. Carefully check dimensions.

3.3 INSTALLATION

A. General:
   1. Comply with manufacturer's instructions and recommendations for uniformity of direction, seam locations, and lay of carpet pile.
   2. Place tile with open and visible butted joints.
   3. Install carpet under open-bottom obstructions and under removable flanges and furnishings, and into alcoves and closets of each space.
   4. Provide cut outs where required.
      a. Conceal cut edges with protective edge guards or overlapping flanges.
   5. Run carpet under open-bottom items such as heating convector and install tight against walls, columns and cabinets so entire floor area is covered with carpet.
      a. Cover over all floor type door closers.
   6. Install edging guard at all openings and doors wherever carpet terminates, unless indicated otherwise.
      a. Prior to installation, report to the Construction Manager all other obstructions which may occur.
   7. Cutting shall be done in accordance with the manufacturer's recommendation, using the tools designed for the carpet being installed, making sure carpet knives are sharp.
   8. Edges shall be butted together with the proper pressure to produce the tightest joint possible without distortion.
   9. All carpet shall be installed with pile-lay in the same direction.
   10. Use leveling compound where necessary.
      a. Any floor filling or leveling shall have a minimum of 4 FT- 0 IN of feather.
   11. Expansion joints:
      a. Do not bridge building expansion joints with continuous carpeting.
      b. Provide for movements.
B. Install carpet in accordance with manufacturer's instructions.
   1. Follow instructions on adhesives.
      a. Adhesive must have recommended flash time before carpet is positioned.
   2. Do not mix dye lots in the same area.
   3. Install all carpet tile quarter turned.

C. Where carpet terminates at non-carpeted floor surface, install Carpet Edging Strips (a.k.a. transition strips, reducer strips).
   1. Install with contact adhesive.
   2. Score and trim narrow end of reducer strip to conform to adjacent floor finish.

D. Where carpet terminates at non-carpeted steps, install Carpet Stair Nosing Strips.
   1. Install with contact adhesive per manufacturer's instructions.

E. Install according to Architect's directions for overall patterns and borders.
   1. Install carpet patterns according to drawings with no deviation.
   2. Develop templates as necessary.

3.4 CLEAN
A. Remove spillage of glue or adhesive from face or seam using remover provided by manufacturer.
B. Clean spots; remove loose threads with broadloom scissors.
C. Completely and thoroughly vacuum using a pile lifter.
D. Advise maintenance personnel regarding care and maintenance.
E. Save cuts over 9 IN for Owner stock.

3.5 PROTECTION
A. After cleaning and prior to final acceptance, protect carpeting subject to traffic with nonstaining building material paper runners or other approved material.
B. Protect installation from rolling traffic by using sheets of hardboard or plywood in potentially affected areas.
C. Protect carpeting against damage during construction:
   1. Cover with nonstaining building material paper with taped joints during the construction period, wherever protection is required, so carpet will be without any indication of deterioration, wear, or damage at the time of acceptance.
   2. Damaged carpeting will be rejected.
   3. As the carpet is laid, remove trimmings, excess pieces of carpet and laying materials from each area as it is completed.
D. Maintain protection of carpeting on each floor or area until accepted, without waiting until the entire project is complete.

3.6 INSPECTION
A. Upon completion of the installation inspect installation and verify work is complete, properly installed, and acceptable.
B. Remove and replace work not found acceptable at the installer’s expense.

END OF SECTION
PART 1 - GENERAL

1.1 REFERENCES

A. Publications listed herein are part of this specification to extent referenced.

B. American Society for Testing and Materials:
   1. ASTM C423 Test Method for Sound Absorption and Sound Absorption Coefficients by Reverberation Room Method.

C. National Fire Protection Association:

1.2 SYSTEM DESCRIPTION

A. Design Requirements:
   1. Stretched fabric panel system shall consist of continuous perimeter and butt seam mounting extrusions, site-fabricated, and applied directly to substrate.
   2. Facing fabric shall be stretched over core materials, leaving fabric floating above core surface. Fabric facing application shall not utilize adhesives, nails, tacks, screws, or tapes. Nails, tacks, screws or similar items shall not be installed through facing fabric to secure panel.
   4. Hinged, self-locking (snap-lock) type mounting extrusions and extrusions using tape to adhere fabrics do not satisfy intent of this specification.
   5. Prefabricated panels do not satisfy intent of this specification.

1.3 SUBMITTALS

A. Shop Drawings:
   1. Submit scaled shop drawings showing general layout, jointing, anchoring sizes and types, shapes, thickness, and other similar detailed information necessary to fully describe installation.
   2. Elevations shall indicate arrangement of joints. Clearly indicate locations of seams, methods of joining seams, direction of fabric, and notations as to where dye lot changes occur.
   3. Shop drawings shall be of sufficient detail and scale to determine compliance with design intent.

B. Product Data:
   1. Submit manufacturer's literature describing system to be provided.

C. Samples:
   1. Submit 2 samples as follows:
      a. Each type mounting extrusion.
      c. Each type core material.
   2. Sample Size: 12 x 12 IN or 12 IN long as appropriate to material

D. Project Information:
   1. Manufacturer's Instructions:
a. Submit manufacturer's installation procedures which shall be basis for accepting or rejecting actual installation procedures.

2. Test Reports:
   a. Submit complete, unedited test reports for stretched fabric panel system prepared by an independent testing laboratory indicating full compliance with both acoustical and fire resistance performance requirements.
      1) Fire ratings shall be for a complete assembly, including perimeter and longitudinal butt joint framing extrusions, core material, and fabric covering as required by Appendix X of ASTM E84 (NFPA-255).
   b. Submit complete test reports for fabric covering prepared by an independent testing laboratory indicating compliance with specified fire resistance performance requirements.

3. Certificates:
   a. Provide certification from manufacturer of stretched fabric panel system attesting to their product's compliance with specified requirements including fire performance characteristics.
   b. Provide certification that specialized equipment as may be required by manufacturer for proper installation of system shall be utilized.
   c. Provide certification that technicians utilized for installation have been trained or qualified by manufacturer.

E. LEED Credit MRc4.1 and Credit MRc4.2, Recycled Content:
   1. Provide list of proposed materials with recycled content. Indicate separate percentages, by weight, of pre-consumer and post-consumer recycled content per unit of product. Also include material costs, excluding cost of installation.

F. LEED Credit MRc5.1 and Credit MRc5.2, Local/Regional Materials:
   1. Provide list of proposed regional materials. Indicate location of manufacturing facility including name, address and distance 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.

G. Contract Closeout Information:
   1. Submit procedures to be followed in cleaning and maintaining stretched fabric panels. Include a copy of instruction in Operation and Maintenance Data Manual.
   2. Interior finish fire performance data:
      a. Provide for each finish material and type specified:
         1) Manufacturer's printed information including:
            a) Fire class.
            b) NFPA test number.

1.4 QUALITY ASSURANCE

A. Qualifications:
   1. Installer trained, or qualified by manufacturer in installation techniques and procedures of stretched fabric panel system and shall demonstrate a minimum of 3 years successful experience in such installation. Employ, on Project, mechanics with a minimum of 2 years documented experience.
   2. Single Source Responsibility:
      a. To greatest extent possible, materials shall be products of a single manufacturer or items standard with manufacturer of stretched fabric panel system.
      b. Provide secondary materials which are produced, or are specifically recommended by stretched fabric panel system manufacturer to ensure compatibility.

B. Field Samples:
   1. Request a review of first finished elevation of each fabric facing for workmanship.
2. Revise as necessary to secure Architects acceptance. Accepted field samples shall be used as datum for comparison with remainder of work of this Section for purposes of acceptance or rejection.

3. Accepted field samples may be included in finished Work.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Packing, Shipping, Handling, and Unloading:
   1. Deliver materials in manufacturer's original unopened packaging.

B. Acceptance of Fabric Facing:
   1. Remove paper type wrappings and inter-leavings that are wet.
   2. Fabric facings shall be unwrapped and inspected upon arrival for flaws and defects. Notify Architect at least 24 hours in advance of inspection.
   3. Fabric that is flawed by inclusion of excessive misweaves, poor color match with goods specified, water damage, inadequate continuous drops without seaming, or other unacceptable conditions, shall be rejected.

C. Storage and Protection:
   1. Store materials in a clean area, free from dust and damage from construction activities.
   2. Do not store fabric in bolts in an upright position, or beneath other materials.
   3. Cover materials with plastic in a manner to provide air circulation.
   4. Remove damaged, defective, or rejected materials from Site.

1.6 PROJECT CONDITIONS

A. Environmental Requirements:
   1. Maintain ambient temperature and humidity within spaces to receive stretched fabric panel system at levels indicated for final acceptance. Levels shall be maintained continuously from at least 48 hours prior to installation until space is turned over to Owner.
   2. Provide an illumination level of not less than 80 foot-candles measured at mid-height of substrate surface.

B. Field Measurements:
   1. Verify field dimensions prior to fabrication. Be responsible for details and dimensions not controlled by job conditions and indicate, on shop drawings, field measurements beyond control. Contractor and installer cooperate to establish and maintain these field dimensions.
   2. Measure each wall area and establish layout of panels to balance borders at opposite edges of each wall.
   3. Locate electrical receptacles, switch-boxes, elevator call buttons, and other similar devices which will be exposed in finished work.

1.7 SEQUENCING AND SCHEDULING

A. Schedule installation of stretched fabric system as late as possible in sequence of construction schedule to reduce damage.
   1. Do not install stretched fabric system until space is enclosed, weather tight and conditioned.
   2. Under no circumstances shall installation begin prior to completion of abutting grid ceiling installation.
   3. No wet work shall remain with exception of touchup.

1.8 SPECIAL WARRANTY

A. Stretched fabric system shall be warranted for a period of 5 years from Date of Substantial Completion. Upon notification of defects, replace, repair, re-stretch, or re-install fabric facing at no additional cost to Owner. Warranty shall include, but not be limited to conditions as follow:
   1. Stretched fabric system shall remain dimensionally stable and shall not sag or distort due to normal variances of temperature or humidity.
   2. Grain and weave of fabric shall be level and true with seams plumb and equally spaced.
   3. Patterns shall be aligned and matched at butt seams.
PART 2 - PRODUCTS

2.1 MATERIALS

A. Acceptable manufacturers:
   1. Stretched Fabric Panel Systems:
      a. Base:
         1) Novawall Systems, Inc.
      b. Optional:
         1) Pinta Acoustic, Inc.
         2) FabricMate Systems, Inc.
         3) Acoustical Solutions, Inc.
   2. Stretched Fabric Panel System:
      1. Panel Size and Thickness: As indicated on Drawings.
      3. Edge Configuration:
         a. Square-Classic.
      4. Mid-Wall Configuration:
         a. 1/4 IN Reveal.
      5. Acoustical Core Material: Semi-rigid fiberglass board.
         a. Density:
            1) 6 pcf.
         b. Thickness:
            1) 1 IN nominal.
         c. Noise Reduction Coefficient; determined by ASTM C423 Type A Mounting:
            1) 1 IN thickness: .80 minimum.
      6. Fire Resistance: ASTM E84 or NFPA 255.
         a. Complete panel assembly, including framework, mid-wall support, mounting devices, core, and fabric shall have a Class A rating.
            1) Flame Spread: 25 or less.
            2) Smoke Developed: Not to exceed 450.
   C. Fabric Facing:
      1. Source:
         a. Base:
            1) Textile Mania. See Section 09 06 10 Room Finish and Color Schedule.
      2. Fabric Content: 100% Polyester.
      5. Width: As indicated.

2.2 FABRICATION

A. Fabric Treatment:
   1. Provide fabric with single pass, upholstery grade acrylic backing when required for proper installation. Other backings shall not be used without written approval from stretched fabric panel system manufacturer.
   2. Provide liner when required to ensure uniform appearance of face fabric.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Site Verification of Conditions:
   1. Examine substrate and spaces in which work is to be performed.
2. Do not begin installation until:
   a. Space has been enclosed and is weather-tight
   b. Wet work has been completed and is dry
   c. Painting is completed and wall base and floor covering is installed
   d. Adjacent work of other trades such as woodwork, ceilings, wall coverings, etc. have been completed
3. Drywall surfaces shall be taped, bedded, sanded, and primed. Penetrations shall be sealed against air and moisture leakage through wall.
4. Do not proceed with installation until unsatisfactory conditions have been corrected. Beginning of installation indicates acceptance of existing substrate conditions.

3.2 INSTALLATION

A. General Requirements:
   1. Panel edges shall abut adjacent finishes or surfaces or to conform to adjacent joint conditions without reveals or gaps unless required by design.
   2. Visible surfaces shall be fully covered and free from wrinkles, sags, blisters, and foreign matter.
   3. Panel joints shall be tight, straight, true, plumb, and in proper relation to building lines without ripples, waviness, and "hourglass" effects.
   4. Seaming of fabric by sewing shall not be allowed.

B. Framework:
   1. Install framework in strict compliance with shop drawings and manufacturer's instructions.
   2. Framework shall be installed around perimeter of each panel area. To greatest extent possible, install members in continuous lengths.
   3. Install framework shimmed, plumbed, and scribed to align with adjacent surfaces. Attach in a manner to prevent sagging or moving out of position after fabric has been stretched tightly. Framework members shall not telescope through face of fabric.
   4. Secure framework to wall surface using pneumatically driven 18 gauge staples with a diverging head to form divergent-tine wall anchors spaced at 2-3" on center.
   5. Provide framework flush with face of panel around outlet boxes, duplex receptacles, thermostats, etc., which may occur within fabric panel area.

C. Core Materials:
   1. Materials shall be installed in a continuous manner, flush and level with framework.

D. Fabric Facing:
   1. Cut fabric from each roll maintaining sequence of drops and matching direction of weave for sequential and uniform installation.
   2. Install fabric with warp and weft threads plumb, level, and true. Patterns, textures, and grain of fabric shall be aligned and matched at seams. Throughout entire seam, join wall panels without distortion to geometry of fabric or pattern.
   3. Fabric shall be stretched, re-stretched, and tensioned over framework and left to atmospherically cure for a minimum of 24 hours between stretchings until sufficiently taught to avoid sagging under varying year-round temperature and humidity conditions.
   4. Installed fabric shall be stretched taut so as not to puddle or dent when touched or leaned upon. Fabric shall be self-healing when pushed, punched, or hit, and shall revert back to original finished condition.
   5. Fabric shall be applied securely to grounds using a hand tool appropriate for joint condition and nature of fabric. No nailing, tacking, stapling, adhesive taping, or gluing of fabric shall be permitted. Ensure that fabric surface is free of wrinkles and that weave is plumb and straight and properly aligned horizontally and vertically.

E. Site Tolerances:
   1. Maximum variation of panels from true location shall be 1/8 IN.
   2. Maximum variation of surfaces intended to be flush shall be 1/32 IN.
3. Maximum variation of reveal width shall be 1/16 IN.

3.3 CLEANING
A. Clean exposed surfaces of wall fabric. Trim and remove loose threads.
B. Remove surplus materials, rubbish and debris, leaving area in a neat and clean condition.

3.4 PROTECTION
A. Cover wall fabric installation with new, clean vinyl sheeting.

END OF SECTION
PART 1 - GENERAL

1.1 DESCRIPTION

A. Definitions:
   1. "Paint" and "painting" refer to applied coatings.
   2. Finished room or space:
      a. One that has finish called for on Room Finish and Color Schedule.
   3. Mechanical work (and equipment): Work included in Mechanical Specification Divisions.
   4. Electrical work (and equipment): Work included in Electrical Specification Divisions.

B. Work included:
   1. Interior surfaces in finished rooms or spaces, unless indicated not to be painted or indicated to be painted under other sections.
   2. Mechanical and electrical work:
      a. Interior mechanical and electrical equipment not completely factory finished.
      b. In finished rooms and spaces with finished ceilings: Exposed ductwork, piping, insulated piping, conduit, busways, raceways, and associated accessories.

1.2 SUBMITTALS

A. Product data:
   1. Manufacturer's data for each paint type to be applied indicating conformance to specifications.

B. Samples:
   1. Manufacturers complete range of colors for selection.
      a. Provide four 8 1/2 x 11 IN samples of each color and texture for approval.

C. LEED Credit EQc4.2, Low-Emitting Materials, Paints and Coatings:
   1. Provide product data and material safety data sheets (MSDS) for paints and coatings used inside the weatherproofing system indicating VOC content of each product used. Indicate VOC content in g/L calculated according to 40 CFR 59, Subpart D.

D. Contract closeout information:
   1. Maintenance data.

1.3 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver in original labeled containers.

B. Protect from freezing or damage.

C. Store materials in place designated by Owner or Architect.

D. Keep storage neat and clean.

E. Repair damage thereto or to surroundings.

F. Remove rags and waste from building daily and avoid danger of fire.

1.4 JOB CONDITIONS

A. Install when temperature and humidity conditions approximate conditions that will exist when building is occupied. Maintain conditions after installation.

B. Install prior to adhesively applied flooring and wall covering.
C. Install prior to carpet and acoustical material.

D. Schedule installation to minimize accumulation of air contaminants that cannot be removed prior to occupancy.

E. Air out construction with 100% outside air.
   1. Do not recirculate prior to occupancy.
   2. Ventilate during installation. Seal return air ducts and use direct exhaust to outdoors.

F. Maintain schedule indicating when painter expects to complete respective coats of paint for various areas.
   1. Keep schedule current as job progress dictates.

**PART 2 - PRODUCTS**

2.1 **MATERIALS**

A. Acceptable manufacturers:
   1. Provide paint as product of one manufacturer as far as possible.
   2. Paint, stain, and coating systems listed are Sherwin Williams unless noted otherwise.
      a. Use comparable performance, environmental, and aesthetic requirements for paints by Optional manufacturers.
      b. Manufacturers listed in Room Finish and Color Schedule are for color reference only.
   3. Paints:
      a. Base:
         1) Sherwin-Williams.
      b. Optional:
         1) Benjamin Moore.
         2) ICI Dulux Paint.
         3) PPG Architectural Finishes.
         4) Pratt & Lambert.
   4. Stains:
      a. Base:
         1) Sherwin-Williams.
      b. Optional:
         1) Benjamin Moore.
         2) ICI Dulux Paint.
         3) PPG Architectural Finishes.
         4) Pratt & Lambert.
   5. Other manufacturers desiring approval comply with Section 00 26 00.

B. Paints and stains: As Scheduled in Part 3,
   1. Unscheduled items: Bring to the attention of Architect.
   2. Colors: As noted in Room Finish and Color Schedule and as indicated in Section 20 05 53.
      a. Architect reserves right to select accent colors from entire range of manufacturer's colors, including deep colors.
      b. Architect reserves right to require that one or more walls in a room or space be painted a contrasting accent color, except in janitor's and electric closets and other small miscellaneous rooms and spaces.
      c. Primer color: White.
         1) Bold, deep, vivid, and transparent top coats: Gray tint.
            a) Coordinate with top coat color.
   3. Gloss range: MPI Standards as measured in accordance with ASTM D523:
      a. Gloss Level 1 (Flat): Maximum 5 at 60 degrees, maximum 10 at 85 degrees.
      b. Gloss Level 2 (Velvet): Maximum 10 at 60 degrees, 10-35 at 85 degrees.
      c. Gloss Level 3 (Eggshell): 10-25 at 60 degrees, 10-35 at 85 degrees.
      d. Gloss Level 4 (Satin): 20-35 at 60 degrees, minimum 35 at 85 degrees.
e. Gloss Level 5 (Semi-gloss): 35-70 at 60 degrees.
f. Gloss Level 6 (Gloss): 70-85 at 60 degrees.
g. Gloss Level 7 (High gloss): More than 85 at 60 degrees.
4. If the gloss range is not indicated, provide top coat with a MPI Gloss Level 3 (Eggshell) finish.
5. Submit gloss samples for approval prior to use.
6. Add flatteners if necessary to achieve specified gloss.
7. Part 3 includes a listing of surfaces and type of paint to be applied.

C. LEED Credit EQc4.2 Low-Emitting Materials, Paints and Coatings:
   1. Material shall contain VOC content as certified.

2.2 EXTRA MATERIAL:

A. Provide and deliver to Owner stock.
   1. 5 gallons of project standard white wall paint.
   2. 1 gallon of every paint and stain specified.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine surfaces carefully for defects which cannot be corrected and might prevent satisfactory results.
B. Commencing of work in a specific area constitutes acceptance of surfaces, and responsibility for performance.

3.2 SURFACES NOT TO BE PAINTED

A. Anodized aluminum, stainless steel, chromium plate, glass, copper, bronze or similar materials.
B. Moving parts of valves, operating units, mechanical and electrical parts, such as valve and damper operators, sending devices, motor and fan shafts.
C. Code labels, such as UL, FM that are mylar or flat (non-embossed) plates.
   1. Embossed plates and labels stamped into frames will be painted, label and information on label to be readily visible and convenient for identification by authority having jurisdiction.
D. Equipment identification or rating plates.
E. Items having complete factory finish with exception of:
   1. Electrical panels.
   2. Control cabinets.
   3. Similar surfaces in finished areas.

3.3 PREPARATION - GENERAL

A. Assure that surfaces are clean and dry.
B. Assure that surfaces are free of foreign materials which will affect adhesion or appearance.
C. Remove mildew and neutralize surface.
D. Eliminate efflorescence before painting.
E. Before painting, test surfaces with moisture meter.
F. Paint when moisture is within paint manufacturer's acceptable limits.

3.4 MATERIAL PREPARATION

A. Mix and prepare materials per manufacturer's specifications.
B. Stir, agitate or blend materials to produce a mixture of uniform density as required for application of materials.

3.5 PREPARATION - WOOD

A. General:
   1. Immediately before applying finish:
      a. Sand all surfaces with 180-grit, or finer, as necessary to accomplish the following:
         1) Remove fingerprints and other marks which may have occurred during shipment to site and during installation.
         2) Restore surface to smooth surface texture.
         3) Prepare grain to receive finish.
      b. Remove dust.

B. Opaque Finishes:
   1. After priming coat has dried, seal knots, pitch and resinous sapwood.

C. Stained and Clear Finishes:
   1. Treat wood with compatible wash-coat prior to stain application.
   2. Putty nail holes and minor defects, to match wood color.

3.6 PREPARATION - FERROUS METAL SURFACES AND HOLLOW METAL

A. Follow requirements of SSPC SP1 and SP3.
   1. Except where higher prep levels are indicated.

B. Wire brush, or grind as necessary to remove shoulders at edge of sound paint to prevent telegraphing.

C. Touch up damaged shop coats.

D. For surfaces with touched up shop coat, omit first coat.

E. Hollow metal frame joints at intersections of Rabbets, Stops, and Soffit Joints:
   1. Neatly fill corner seam with painter's caulk (in field) prior to painting.

3.7 PREPARATION - GALVANIZED METAL SURFACES AND NONANODIZED ALUMINUM

A. Follow requirements of SSPC SP1.

B. Treat surfaces with galvanized surface cleaner as recommended by primer and topcoat manufacturer.

3.8 PREPARATION - GYPSUM WALLBOARD

A. Repair minor irregularities left by finishers.

B. Exercise care to avoid raising nap of paper.

C. Apply prime coat.

D. Notify gypsum wallboard finisher to repair and refinish areas which indicate defects after application of primer.

E. Re-prime refinished areas.

3.9 PREPARATION – CONCRETE AND MASONRY

A. Repair minor defects.

B. Remove oil from concrete by washing with xylol.

C. Block Filler:
1. Apply masonry to fill pinholes and minor surface defects, and to prime surface for
topcoat(s).
2. Apply by brush, roller or sprayer.
   a. Where spray-applied: Back-roll with roller or squeegee.
3. Minimum Nominal Thickness: 10 mil DFT.
   a. Comply with manufacturer’s recommended coverage rates for conditions encountered.
4. Provide complete cover with recommended coating system.

D. Obtain architect's approval of finish for surfaces to receive high build glazed coatings.

3.10 APPLICATION - GENERAL

A. Paint surfaces as specified in paragraphs "Schedule - Interior Paint Systems".
B. Provide complete coverage and hide.
   1. Paint systems are to cover.
   2. When color or undercoats show through, apply additional coats at no additional cost until
      paint film is of uniform finish and color.
C. Employ only skilled mechanics.
D. Mix and apply as recommended by manufacturer.
E. If Architect so directs, do not apply succeeding coats until Architect has an opportunity to
   observe previous coat.
F. Remove and protect hardware, accessories, plates, fixtures, finished work, and similar items; or
   provide ample in-place protection.
G. Upon completion of painting, carefully replace removed items and/or remove protection.
H. Apply materials under adequate illumination.
I. Evenly spread and smoothly flow on for full, smooth cover.
J. Assure that coats are dry before recoating.
K. Touch up suction or hot spots in plaster, gypsum wallboard, concrete block, and concrete before
   painting.
L. Touch up abraded areas of shop prime coats before subsequent coats are applied.
M. Back prime wood trim with penetrating sealer.

3.11 APPLICATION - INTERIOR

A. Finish door edges same as faces of doors.
B. Finish closets, semi-exposed surfaces behind grilles, radiation, etc., to match nearest adjoining
   surfaces.

3.12 PROTECTION AND CLEANUP

A. Protect adjacent work against damage by painting and finishing work.
B. Clean, repair or replace, and repaint damaged work as directed by Architect.
C. Provide "WET PAINT" signs.
D. Remove temporary protective wrappings, after completion of operations.
E. Clean paint spattered surfaces.
F. Use care not to damage finished surfaces.
G. Remove surplus materials, scaffolding and debris.
H. Leave areas broom clean.
I. Refer to Section 01 77 00 for final cleaning requirements.

3.13 SCHEDULE - INTERIOR PAINT SYSTEMS

A. Concrete and concrete block walls:
   1. Latex (PNTL), Gloss Level 3 (Eggshell):
      a. Sherwin Williams:
         1) Primer coat: Latex block filler, PrepRite Block Filler; B25W25.
         2) Intermediate coat: ProGreen 200 Interior Latex Egg-Shel; B20W651.
         3) Topcoat: ProGreen 200 Interior Latex Egg-Shel; B20W651.
      b. ICI:
         1) Primer coat: Prep & Prime Block Filer; 3010.
         2) Intermediate coat: Pro Premium Eggshell Interior Wall & Trim Enamel; 1402.
         3) Topcoat: Pro Premium Eggshell Interior Wall & Trim Enamel; 1402.
      c. PPG:
         1) Primer coat: Speedhide Latex Block Filler; 6-7.
         2) Intermediate coat: Speedhide Latex Eggshell; 6-411.
         3) Topcoat: Speedhide Latex Eggshell; 6-411.

   2. Epoxy (PNTE), Gloss Level 5 (Semi-gloss):
      a. Sherwin Williams:
         1) Primer coat: Loxon Block Surfacer, A24W200.
         2) Intermediate coat: Water-Based Catalyzed Epoxy, Semi-Gloss, B70W/B60V25.
         3) Topcoat: Water-Based Catalyzed Epoxy, Semi-Gloss, B70W/B60V25.
      b. ICI:
         1) Primer coat: Bloxfil Heavy Duty Acrylic Block Filler; 4000.
      c. PPG:
         1) Primer coat: Perma-Crete Block Surfacer; 4-100.
         2) Intermediate coat: Aquapon WB Water Based Epoxy; 98-1.
         3) Topcoat: Aquapon WB Water Based Epoxy; 98-1.

B. Gypsum wallboard and plaster surfaces (walls):
   1. Latex (PNTL), Gloss Level 3 (Eggshell) See UCB Standards for sheen and volume solids ratings:
      a. Sherwin Williams:
         1) Primer coat: ProGreen 200 Interior Latex Primer; B28W600.
         2) Intermediate coat: ProGreen 200 Interior Latex Egg-Shel; B20W651.
         3) Topcoat: ProGreen 200 Interior Latex Egg-Shel; B20W651.
      b. ICI:
         1) Primer coat: Prep & Prime Griper Multi-Purpose Primer; 3210.
         2) Intermediate coat: Pro Premium Eggshell Interior Wall & Trim Enamel; 1402.
         3) Topcoat: Pro Premium Eggshell Interior Wall & Trim Enamel; 1402.
      c. PPG:
         1) Primer coat: Pure Performance 0 VOC Latex Primer; 9-900.
         2) Intermediate coat: Speedhide Latex Eggshell; 6-411.
         3) Topcoat: Speedhide Latex Eggshell; 6-411.

   2. Epoxy (PNTE), Gloss Level 5 (Semi-gloss):
      a. Sherwin Williams:
         1) Primer coat: Prep Rite 200 Prime, B28W201.
         2) Intermediate coat: Water-Based Catalyzed Epoxy, Semi-Gloss, B70W/B60V25.
         3) Topcoat: Water-Based Catalyzed Epoxy, Semi-Gloss, B70W/B60V25.
      b. ICI:
         1) Primer coat: Prep & Prime Griper Multi-Purpose Primer; 3210.
      c. PPG:
1) Primer coat: Primer coat: Pure Performance 0 VOC Latex Primer; 9-900.
2) Intermediate coat: Aquapon WB Water based Epoxy; 98-1.
3) Topcoat: Aquapon WB Water based Epoxy; 98-1.

C. Gypsum wallboard and plaster surfaces (ceiling):
   1. Latex (PNTL), Gloss Level 1 (Flat):
      a. Sherwin Williams:
         1) Primer coat: ProGreen Primer, B28W600.
         2) Intermediate coat: ProGreen 200 Interior Latex Flat; B30W600.
         3) Topcoat: ProGreen 200 Interior Latex Flat; B30W600.
      b. ICI:
         1) Primer coat: Prep & Prime Griper Multi-Purpose Primer; 3210.
         2) Intermediate coat: Pro Premium Eggshell Interior Wall & Trim Enamel; 1402.
         3) Topcoat: Pro Premium Eggshell Interior Wall & Trim Enamel; 1402.
      c. PPG:
         1) Primer coat: Pyre Performance 0 VOC Latex Primer; 9-900.
         2) Intermediate coat: Speedhide latex Flat; 6-70.
         3) Topcoat: Speedhide latex Flat; 6-70.

2. Epoxy (PNTE), Gloss Level 5 (Semi-gloss):
   a. Sherwin Williams:
      1) Primer coat: Harmony Interior Latex Primer, B11W900.
      2) Intermediate coat: Water-Based Catalyzed Epoxy, Semi-Gloss, B70W/B60V25.
      3) Topcoat: Water-Based Catalyzed Epoxy, Semi-Gloss, B70W/B60V25.
   b. ICI:
      1) Primer coat: Prep & Prime Griper Multi-Purpose Primer; 3210.
      2) Intermediate coat: Devflex QD Waterborn Semi-Gloss Enamel; 4206.
      3) Topcoat: Devflex QD Waterborn Semi-Gloss Enamel; 4206.
   c. PPG:
      1) Primer coat: Primer coat: Pure Performance 0 VOC Latex Primer; 9-900.
      2) Intermediate coat: Aquapon WB Water based Epoxy; 98-1.
      3) Topcoat: Aquapon WB Water based Epoxy; 98-1.

D. Metal stairs, handrails, and guardrails; Miscellaneous metals (ferrous, primed, zinc-coated, and aluminum):
   1. Water based urethane, Gloss Level 6 (Gloss):
      a. Sherwin Williams:
         1) Primer coat: Pro-Cryl Universal Acrylic Primer, B66-310 Series.
         2) Intermediate coat: Acrolon 100 Water Based Urethane Gloss, B65-720.
         3) Topcoat: Acrolon 100 Water Based Urethane Gloss, B65-720.
      b. ICI:
         1) Primer coat:
         2) Intermediate coat:
         3) Topcoat:
      c. PPG:
         1) Primer coat: Pitt Tech 100% Acrylic Primer; 90-712.
         2) Intermediate coat: Durethane WB Water Based Urethane; 98-8200.
         3) Topcoat: Durethane WB Water Based Urethane; 98-8200.

E. Metal doors and frames:
   1. Waterborne acrylic, Gloss Level 5 (Semi gloss):
      a. Sherwin Williams:
         1) Primer coat: Pro-Cryl Universal Acrylic Primer, B66-310 Series.
      b. ICI:
         1) Primer coat:
         2) Intermediate coat:
3) Topcoat:
   c. PPG:
      1) Primer coat: Pitt Tech 100% Acrylic Primer; 90-712.

F. Structural steel (exposed):
1. Water based urethane, Gloss Level 6 (Gloss):
   a. Sherwin Williams:
      1) Primer coat: Shop-applied. See Section 05 12 10.
         a) Touch-up in field as required.
      2) Intermediate coat: Acrolon 100 Water Based Urethane Gloss, B65-720.
      3) Topcoat: Acrolon 100 Water Based Urethane Gloss, B65-720.

   b. ICI:
      1) Primer coat: Shop-applied. See Section 05 12 10.
         a) Touch-up in field as required.
      2) Intermediate coat: Devthane UVA Aliphatic Urethane Gloss Enamel; 389.
      3) Topcoat: Devthane UVA Aliphatic Urethane Gloss Enamel; 389.
      4) Clear coat: Manufacturer recommended.

   c. PPG:
      1) Primer coat: Shop-applied. See Section 05 12 10.
         a) Touch-up in field as required.
      2) Intermediate coat: Durethane WB Water Based Urethane; 98-8200.
      3) Topcoat: Durethane WB Water Based Urethane; 98-8200.
      4) Clear coat: Durethane WB Water Based Urethane; 98-8200.

G. Wood:
1. Exposed items, Gloss Level 3 (Eggshell):
   a. Sherwin Williams:
      1) Primer coat: Harmony Interior Latex Primer, B11W900.

   b. ICI:
      1) Primer coat: Lifemaster Prep & Prime Primer-Sealer; LM9116.
      2) Intermediate coat: Lifemaster Eggshell Interior Enamel; LM9300.
      3) Topcoat: Lifemaster Eggshell Interior Enamel; LM9300.

   c. PPG:
      1) Primer coat: Pure Performance 0 VOC Latex Primer; 9-900.
      2) Intermediate coat: Pure Performance 0 VOC Latex; 9-300.
      3) Topcoat: Pure Performance 0 VOC Latex; 9-300.

2. Concealed items, Gloss Level 3 (Eggshell):
   a. Sherwin Williams:
      1) Primer coat: ProGreen Primer, B28W600.
      2) Intermediate coat: ProGreen 200 Interior Latex Egg-Shel; B20W651.
      3) Topcoat: ProGreen 200 Interior Latex Egg-Shel; B20W651.

   b. ICI:
      1) Primer coat: Ultra-Hide Interior Primer; 1030.
      2) Intermediate coat: Pro Premium Eggshell Interior Wall & Trim Enamel; 1402.
      3) Topcoat: Pro Premium Eggshell Interior Wall & Trim Enamel; 1402.

   c. PPG:
      1) Primer coat: Pure Performance 0 VOC Latex Primer; 9-900.
      2) Intermediate coat: Speedhide Interior Latex Eggshell; 6-411.
      3) Topcoat: Speedhide Interior Latex Eggshell; 6-411.
3.14 SCHEDULE – FIELD FINISH SYSTEMS FOR INTERIOR WOOD

A. General:
1. Factory finishing of wood items specified elsewhere:
   a. Factory finishing of wood veneer-faced casework: Specified in Section 12 34 00.
   b. Factory finishing of wood veneer-faced wood doors: Specified in Section 08 14 16.

B. Interior Wood
1. Washcoat: Prepare wood to accept stain uniformly by application of a washcoat.
   a. Sherwin Williams.
      1) Wood Classics Natural.
   b. ICI:
      1) Woodpride.
   c. PPG:
      1) Olympic Wood Conditioner; 41001.
2. Wood Stain:
   a. Sherwin Williams:
      1) Wood Classics Oil Stain, A49V200.
   b. ICI:
      1) Woodpride Oil Based Stain; 1700 series.
   c. PPG:
      1) Rez Interior Oil Stain; 77-560.
3. Filler Coat (horizontal surfaces where open-grained wood is indicated): Exception: Omit filler coat at closed grained wood specie.
   a. Sherwin Williams:
      1) SherWood Natural Filler, D70T1.
   b. PPG:
      1) Olympic Wood Filler; 41003.
4. Sanding Sealer:
   a. Sherwin Williams:
   b. ICI:
      1) Woodpride 1800 or 1900 series thinned 25 percent.
   c. PPG:
      1) Speedhide Interior Oil Sanding Sealer; 6-10.
      2) Selected polyurethane varnish thinned 25 percent.
5. Polyurethane-based Varnish:
   a. Sherwin Williams:
      1) Wood Classics Polyurethane Varnish; A67.
   b. ICI:
      1) Woodpride Polyurethane Varnish; 1900 series.
   c. PPG:
      1) Rez Interior Polyurethane Varnish; 77-85 (Gloss) or 77-89 (Satin).

END OF SECTION
SECTION 10 13 00
DIRECTORIES AND BULLETIN BOARDS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Non-illuminated directories.

1.2 SUBMITTALS

A. Shop Drawings:
   1. Include dimensional plans, elevations and details, large-scale sections of typical members, and other components. Show anchors, grounds, reinforcement and layout, and indicate finishes.
   2. Include setting drawings, templates, and directions for installing anchor bolts and other anchorages to be installed as a unit of Work in other Sections.

B. Product Data:
   1. Include details of construction to show materials, dimensions of individual components, profiles, and finishes.

C. Samples:
   1. Manufacturer's color charts showing the full range of colors and textures for board and sheet finishes.
   2. Aluminum trim and accessories: 4 IN long sections of extrusions and not less than 2 IN squares of sheet or plate for each exposed metal surface showing available metal finishes.
   3. Message strips: Samples of message strips in color selected with sample of typography indicated.

D. LEED Credit EQc4.1, Low-Emitting Materials, Adhesives and Sealants:
   1. Provide product data and material safety data sheets (MSDS) for adhesives and sealants used inside the building indicating VOC content of each product used. Indicate VOC content in g/L calculated according to 40 CFR 59, Subpart D.

E. Project Information:
   1. Installer qualifications.

1.3 QUALITY ASSURANCE

A. Installer qualifications:
   1. Experienced installer who is an authorized representative of the manufacturer for installation and maintenance of units required for this Project.
   2. Capable of providing replacement message strips within 14 calendar days of receipt of an order.

B. Source limitations: Obtain through one source from a single manufacturer.

C. Product options:
   1. Drawings indicate size, profiles, and dimensional requirements based on the specific model indicated.
   2. Do not modify intended aesthetic effects, except with Architect's approval and only to the extent needed to comply with performance requirements.
1.4  PROJECT CONDITIONS

A. Field measurements:
   1. Verify rough openings by field measurements before fabrication and indicate measurements on Shop Drawings.
   2. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
   3. Where field measurements cannot be made without delaying the Work, establish opening dimensions and proceed with fabrication without field measurements, and coordinate wall construction to ensure actual opening dimensions correspond to established dimensions.

1.5  EXTRA MATERIALS

A. Deliver extra blank message strips to Owner.
   1. Furnish extra message strips that match message strips installed, are packaged with protective covering for storage, and are identified with labels describing contents.
   2. Furnish blank, full-size, message-strip units equal to 10 percent of amount installed.

PART 2 - PRODUCTS

2.1  MATERIALS:

A. Acceptable manufacturers:
   1. Non-illuminated directories:
      a. Base:
         1) Andco Industries Corporation.
      b. Optional:
         1) Apco Graphics.
         2) ASI Sign Systems.
         3) Claridge Products and Equipment, Inc.
         5) Poblocki & Sons.
         6) Ticket & Tablet Co.
         7) Vomar Products, Inc.
   2. Bulletin boards:
      a. Base:
         1) Andco Industries Corporation.
      b. Optional:
         1) Claridge Products and Equipment, Inc.
         2) Nelson-Harkins Industries.
         3) Poblocki & Sons.
   B. Aluminum Extrusions: Manufacturer's standard extruded aluminum sections with not less than the strength and durability properties specified in ASTM-B221 for 6063-T5 alloy.
   C. Plastic sheet:
      1. Uncoated acrylic sheet: ASTM-D4802; Category A-1 (cell-cast sheet); Finish 1 (smooth or polished); Type UVA (UV absorbing); monolithic sheet; thickness indicated; transparent or opaque as indicated; clear or color as indicated or selected.
   D. Tackboards:
      1. Natural-cork tackboards: Single-layer, 1/4 IN thick, seamless, compressed fine-grain, bulletin board quality, natural-cork sheet; face sanded for natural finish; complying with MS MIL-C-15116, Type II.
2.2 NON-ILLUMINATED DIRECTORIES

A. Fully recessed, non-illuminated directory consisting of a cabinet with an operable transparent cover, and a retainer frame containing a header panel and a letter board or removable message strips.
   1. Graphics for message strips, header panels, and other designs shall be in the letter style, size, spacing, and arrangement indicated.
   2. Cabinet housing: Provide perimeter cabinet frame fabricated from aluminum extrusions of the profile indicated, mitered and welded with an aluminum-sheet rear cover panel.
      a. Structural reinforcement to prevent racking and misalignment.
      b. Provide mullions between individual units as indicated.
   3. Frameless cover design: 1/4 IN thick acrylic cover with acrylic returns to engage the perimeter frame.
   4. Acrylic engraved-type message strips: 2-ply, 2-color, laminated, acrylic sheet engraving strips of size indicated.
      a. Message content: Provide message strips with wording and other designations that conform to list indicated and include blank strips as needed to fill out directory spaces.
      b. Message-strip color: Black.
      c. Letter size: 3/16 IN.
      d. Letter style: Helvetica Medium.
      e. Letter color: Black.
      f. Letter case: All capitals.
   5. Header panel: Opaque acrylic sheet header panel with letters and other graphics applied by silk-screen printing process.
   6. Tackboard insert panels: Tackboard of material indicated with mullion trim matching the frame where tackboard surface adjoins other directory panels.

2.3 BULLETIN BOARDS

A. Provide surface-mounted, top-illuminated bulletin boards consisting of a cabinet housing with an operable transparent cover, containing a top-illumination system, and with tackable surface of material indicated.
   1. Provide graphics for header panels and other designs in the letter style, size, spacing, and arrangement indicated.
   2. Perimeter frame and cover design: Match perimeter frame and cover design of directories.
   3. Header panel: Opaque acrylic sheet header panel with letters and other graphics applied by silk-screen printing process.
   4. Illumination system: Concealed top-lighting system consisting of fluorescent-strip fixtures including lamps and internal wiring with single concealed electrical connection to the building system.
      a. Coordinate electrical characteristics with the power supply provided.
      b. Ballasts: Low-temperature, high-power-factor, low-energy, fluorescent lamp ballasts that comply with Certified Ballast Manufacturers Association standards and carry its label.

2.4 ACCESSORIES

A. Fasteners: Provide screws, bolts, and other exposed fastening devices of the same material as the items being fastened.
   1. Provide types, gages, and lengths to suit installation conditions.
   2. Use theft-proof fasteners where exposed to view.

B. Hardware: Provide the following hardware:
   1. Hinges: Concealed pivot hinges.
   2. Locks: Furnish each cover with manufacturer's standard lock.
      a. Key locks alike.
      b. Furnish 2 keys per lock.
2.5 FABRICATION

A. General: Fabricate to requirements indicated, including dimensions, design, and thickness and finish of materials.
   1. Use metals and shapes of thickness, with reinforcing if needed, to produce flatness, to be free of oil canning, and to impart strength for size, design, and application indicated.
   2. Fabricate perimeter cabinet and cover frames with reinforced corners, mitered to a hairline fit, with no exposed fasteners.
   3. Hardware for covers: Equip covers with hardware of type indicated.

2.6 FINISHES

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations relative to applying and designating finishes.

B. Colors: Where message strips, header panels, or other items, other than frames or glazing materials, require color selection to distinguish letters or graphic images from the background or for other purposes, provide colors as selected by Architect from manufacturer's full range of colors.

C. Finish designations prefixed by AA conform to the system established by the Aluminum Association for designating aluminum finishes.

D. Class II, clear anodic finish: AA-M12C22A31 (Mechanical Finish: non-specular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class II, clear coating 0.010 mm or thicker) complying with AAMA 607.1.

PART 3 - EXECUTION

3.1 EXAMINATION AND PREPARATION

A. Examine wall surfaces for compliance with requirements and other conditions affecting installation.

B. Correct unsatisfactory conditions.

3.2 INSTALLATION

A. Install units plumb and level, in locations and mounted as indicated.

B. Securely attach units to supporting structure with concealed fasteners, according to manufacturer's written installation instructions.

3.3 CLEANING AND PROTECTING

A. At completion of installation, clean surfaces according to manufacturer's written instructions.

B. Protect installed units from damage until acceptance at the time of project completion.

END OF SECTION
SECTION 10 14 00
IDENTIFICATION DEVICES

1.1 DESCRIPTION

A. Furnish labor, materials, tools, equipment, and services required for fabrication and installation of Identification Devices as indicated in the drawings.

B. Completely coordinate with work of other trades.

C. Although such work is not specifically indicated, provide supplementary or miscellaneous items, appurtenances and devices incidental to, or necessary for a sound, secure and complete installation.

D. Identification devices indicated in AG-Series Drawings are specified in this Section.

E. Definitions:
   1. Identification devices refers to signage and graphics designed, fabricated, and installed for the purpose of effectively communicating directional information to persons within a building, and throughout the building campus.

F. See Division 01 for General Requirements.

1.2 QUALITY ASSURANCE


C. UL compliance: Light fixtures and electrical components.

D. Fabricate and assemble identification devices in shop to the greatest extent possible.

E. Fabricate parts and assemblies ready for installation at the building site.

1.3 SUBMITTALS

A. Shop drawings:
   1. Fabrication and erection drawings for identification device types.
      a. Complete, fully dimensioned, large scale, and detailed fabrication drawings of major components.
      b. Include plans, elevations, and full scale details of identification device wording and lettering layout.
   2. Field verify dimensions and locations for identification device types prior to developing shop drawings.
   3. Template drawings: Furnish location template drawings for items supported or anchored to permanent building construction.

B. Samples:
   1. Laser output proof: Full character set, or sets with a minimum cap height of 2 IN.
   2. Full scale pen plot of each identification device legend.
   3. Full-size spacing templates for building mounted letters and numbers.
      a. Where possible, provide on the actual background material.
   5. Minimum 6 IN x 6 IN sample of materials for identification device types.
   6. Minimum 6 IN x 6 IN sample of colors requiring color matches on samples of actual identification device material.
   7. Prototypes:
      a. Fabricate 1 prototype of each identification device type for verification and testing after shop drawing and sample submittals are approved, and prior to fabrication.
      1) To be determined.
      b. Submit clarification drawings detailing scale, materials, finishes, fasteners, etc. for section prototypes for review and approval prior to fabrication.
C. LEED Credit EQc4.1 Low-Emitting Materials, Adhesives, and Sealants:
1. Provide product data for adhesives and sealants used inside the weatherproofing system indicating VOC content of each product used. Indicate VOC content in grams per liter calculated according to 40 CFR 59, Subpart D.

D. Contract Closeout Information:
1. Operating and Maintenance Data.
2. Warranties.
3. Spare parts.

1.4 JOB CONDITIONS
A. Verify dimensions at site.
B. If necessary to vary from arrangement indicated because of other site or building considerations, advise Owner and Architect, and make such variations only after approval.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING
A. Deliver anchorage items in time to allow installation.
B. Deliver materials in cartons or crated.
C. Inspect upon delivery for damage.
D. Remove and replace damaged items.
E. Store materials off ground.

1.6 WARRANTIES
A. Manufacturer shall warrant workmanship and materials for a period of 2 years.

PART 2 - PRODUCTS
2.1 GENERAL
A. Acceptable manufacturers:
1. As noted for individual material items.
2. Identification devices:
   a. Base:
      1) ASI Sign Systems.
   b. Optional:
      1) Best Manufacturing Sign Systems.
      2) Interface Architectural Signage.
      3) Mohawk Sign Systems.
      4) Signscape.
   c. Other manufacturers with a complete line of identification devices desiring approval comply with Section 00 26 00.

2.2 IDENTIFICATION DEVICES
A. Identification device types:
1. Address Identification:
   a. Materials: As indicated on drawings.
   b. Letter height: Sizes as indicated on drawings.
      1) See drawings for locations.
   c. Letters and numbers, tactile characters:
      1) Raised 1/32 IN from sign face.
   d. Letters case:
      1) Combination upper and lower case.
   e. Letters style:
      1) Sans serif.
   f. Proportion:
IDENTIFICATION DEVICES

1) Width to height ratio, between 3:5 and 1:1.
2) Stroke-width-to-height ratio, between 1:5 and 1:10.

g. Braille: Grade 2.
1) Braille characters shall be separated from adjacent raised characters or symbols 1/2 IN.
2) Grade 2 Braille translation to be provided by identification device manufacturer.

h. Color: As selected.
1) Characters: Dark.
2) Background: Light.

i. Finish level:
1) High finish.

2. Area and Department Identification:

a. Materials: As indicated on drawings.
b. Mount to back of Identification Device and wall as indicated.
c. Letter height: Sizes as indicated on drawings.
   1) See drawings for locations.
d. Letters and numbers, tactile characters:
   1) Raised 1/32 IN from sign face.
e. Letters case:
   1) Combination upper and lower case.

f. Letters style:
   1) Sans serif.

1) Proportion:
   1) Width to height ratio, between 3:5 and 1:1.
   2) Stroke-width-to-height ratio, between 1:5 and 1:10.

h. Braille: Grade 2.
   1) Braille characters shall be separated from adjacent raised characters or symbols 1/2 IN.
   2) Grade 2 Braille translation to be provided by identification device manufacturer.

i. Color: As selected.
   1) Characters: Dark.
   2) Background: Light.

j. Finish level:
   1) Medium finish.

3. Building Identification:

a. Materials:
   1) Identification Device: As indicated on drawings.
   2) Mount to back of Identification Device and wall as indicated.
b. Letter height: Sizes as indicated on drawings.
   1) See drawings for locations.
c. Letters and numbers, tactile characters:
   1) Raised 1/32 IN from sign face.
d. Letters case:
   1) Combination upper and lower case.

e. Letters style:
   1) Sans serif.

1) Proportion:
   1) Width to height ratio, between 3:5 and 1:1.
   2) Stroke-width-to-height ratio, between 1:5 and 1:10.

h. Braille: Grade 2.
   1) Braille characters shall be separated from adjacent raised characters or symbols 1/2 IN.
   2) Grade 2 Braille translation to be provided by identification device manufacturer.

i. Color: As selected.
   1) Characters: Dark.
   2) Background: Light.

i. Finish level:
   1) High finish.
4. Directory:
   a. Materials:
      1) Identification Device: As indicated on drawings.
      2) Mount to back of Identification Device and wall as indicated.
   b. Letter height: Sizes as indicated on drawings.
      1) See drawings for locations.
   c. Letters and numbers, tactile characters:
      1) Raised 1/32 IN from sign face.
   d. Letters case:
      1) Combination upper and lower case.
   e. Letters style:
      1) Sans serif.
   f. Proportion:
      1) Width to height ratio, between 3:5 and 1:1.
      2) Stroke-width-to-height ratio, between 1:5 and 1:10.
   g. Braille: Grade 2.
      1) Braille characters shall be separated from adjacent raised characters or symbols 1/2 IN.
      2) Grade 2 Braille translation to be provided by identification device manufacturer.
   h. Color: As selected.
      1) Characters: Dark.
      2) Background: Light.
   i. Finish level:
      1) High finish.

5. Directional and Wayfinding:
   a. Materials:
      1) Identification Device: As indicated on drawings.
      2) Mount to back of Identification Device and wall as indicated.
   b. Letter height: Sizes as indicated on drawings.
      1) See drawings for locations.
   c. Letters and numbers, tactile characters:
      1) Raised 1/32 IN from sign face.
   d. Letters case:
      1) Combination upper and lower case.
   e. Letters style:
      1) Sans serif.
   f. Proportion:
      1) Width to height ratio, between 3:5 and 1:1.
      2) Stroke-width-to-height ratio, between 1:5 and 1:10.
   g. Braille: Grade 2.
      1) Braille characters shall be separated from adjacent raised characters or symbols 1/2 IN.
      2) Grade 2 Braille translation to be provided by identification device manufacturer.
   h. Color: As selected.
      1) Characters: Dark.
      2) Background: Light.
   i. Finish level:
      1) Medium finish.

6. Donor Recognition, Wall:
   a. Materials:
      1) Identification Device: As indicated on drawings.
      2) Mount to back of Identification Device and wall as indicated.
   b. Letter height: Sizes as indicated on drawings.
      1) See drawings for locations.
   c. Letters and numbers, tactile characters:
      1) Raised 1/32 IN from sign face.
   d. Letters case:
      1) Combination upper and lower case.
e. Letters style:
   1) Sans serif.

f. Proportion:
   1) Width to height ratio, between 3:5 and 1:1.
   2) Stroke-width-to-height ratio, between 1:5 and 1:10.

g. Braille: Grade 2.
   1) Braille characters shall be separated from adjacent raised characters or symbols 1/2 IN.
   2) Grade 2 Braille translation to be provided by identification device manufacturer.

h. Color: As selected.
   1) Characters: Dark.
   2) Background: Light.

i. Finish level:
   1) High finish.

7. Elevator Bank Egress Identification, non-public:
   a. Materials:
      1) Identification Device: As indicated on drawings.
      2) Mount to back of Identification Device and wall as indicated.
   b. Letter height: Sizes as indicated on drawings.
      1) See drawings for locations.
   c. Letters and numbers, tactile characters:
      1) Raised 1/32 IN from sign face.
   d. Letters case:
      1) Combination upper and lower case.
   e. Letters style:
      1) Sans serif.
   f. Proportion:
      1) Width to height ratio, between 3:5 and 1:1.
      2) Stroke-width-to-height ratio, between 1:5 and 1:10.
   g. Braille: Grade 2.
      1) Braille characters shall be separated from adjacent raised characters or symbols 1/2 IN.
      2) Grade 2 Braille translation to be provided by identification device manufacturer.
   h. Color: As selected.
      1) Characters: Dark.
      2) Background: Light.
   i. Finish level:
      1) High finish.

8. Elevator Bank Egress Identification, public:
   a. Materials: As indicated on drawings.
   b. Mount to back of Identification Device and wall as indicated.
   c. Letter height: Sizes as indicated on drawings.
      1) See drawings for locations.
   d. Letters and numbers, tactile characters:
      1) Raised 1/32 IN from sign face.
   e. Letters case:
      1) Combination upper and lower case.
   f. Letters style:
      1) Sans serif.
   g. Proportion:
      1) Width to height ratio, between 3:5 and 1:1.
      2) Stroke-width-to-height ratio, between 1:5 and 1:10.
   h. Braille: Grade 2.
      1) Braille characters shall be separated from adjacent raised characters or symbols 1/2 IN.
      2) Grade 2 Braille translation to be provided by identification device manufacturer.
   i. Color: As selected.
      1) Characters: Dark.
2) Background: Light.
   j. Finish level:
      1) High finish.
9. Elevator Jamb, Floor Identification:
   a. Materials: As indicated on drawings.
   b. Mount to back of Identification Device and wall as indicated.
   c. Letter height: Sizes as indicated on drawings.
      1) See drawings for locations.
   d. Letters and numbers, tactile characters:
      1) Raised 1/32 IN from sign face.
   e. Letters case:
      1) Combination upper and lower case.
   f. Letters style:
      1) Sans serif.
   g. Proportion:
      1) Width to height ratio, between 3:5 and 1:1.
      2) Stroke-width-to-height ratio, between 1:5 and 1:10.
   h. Braille: Grade 2.
      1) Braille characters shall be separated from adjacent raised characters or symbols 1/2 IN.
      2) Grade 2 Braille translation to be provided by identification device manufacturer.
   i. Color: As selected.
      1) Characters: Dark.
      2) Background: Light.
   j. Finish level:
      1) High finish.
10. Exit Stair Identification:
   a. Materials: As indicated on drawings.
   b. Mount to back of Identification Device and wall as indicated.
   c. Letter height: Sizes as indicated on drawings.
      1) See drawings for locations.
   d. Letters and numbers, tactile characters:
      1) Raised 1/32 IN from sign face.
   e. Letters case:
      1) Combination upper and lower case.
   f. Letters style:
      1) Sans serif.
   g. Proportion:
      1) Width to height ratio, between 3:5 and 1:1.
      2) Stroke-width-to-height ratio, between 1:5 and 1:10.
   h. Braille: Grade 2.
      1) Braille characters shall be separated from adjacent raised characters or symbols 1/2 IN.
      2) Grade 2 Braille translation to be provided by identification device manufacturer.
   i. Color: As selected.
      1) Characters: Dark.
      2) Background: Light.
   j. Finish level:
      1) Medium finish.
11. Exterior Wall Signs (At Handicapped Entrances):
   a. Materials: As indicated on drawings.
   b. Mount to back of Identification Device and wall as indicated.
   c. Letter height: Sizes as indicated on drawings.
      1) See drawings for locations.
   d. Letters and numbers, tactile characters:
      1) Raised 1/32 IN from sign face.
   e. Letters case:
      1) Combination upper and lower case.
f. Letters style:
   1) Sans serif.

g. Proportion:
   1) Width to height ratio, between 3:5 and 1:1.
   2) Stroke-width-to-height ratio, between 1:5 and 1:10.

h. Braille: Grade 2.
   1) Braille characters shall be separated from adjacent raised characters or symbols 1/2 IN.
   2) Grade 2 Braille translation to be provided by identification device manufacturer.

i. Color: As selected.
   1) Characters: Dark.
   2) Background: Light.

j. Finish level:
   1) Medium finish.

12. Loading Dock and Loading Bay Identification:
   a. Materials: As indicated on drawings.
   b. Mount to back of Identification Device and wall as indicated.
   c. Letter height: Sizes as indicated on drawings.
      1) See drawings for locations.
   d. Letters and numbers, tactile characters:
      1) Raised 1/32 IN from sign face.
   e. Letters case:
      1) Combination upper and lower case.
   f. Letters style:
      1) Sans serif.
   g. Proportion:
      1) Width to height ratio, between 3:5 and 1:1.
      2) Stroke-width-to-height ratio, between 1:5 and 1:10.
   h. Braille: Grade 2.
      1) Braille characters shall be separated from adjacent raised characters or symbols 1/2 IN.
      2) Grade 2 Braille translation to be provided by identification device manufacturer.
   i. Color: As selected.
      1) Characters: Dark.
      2) Background: Light.
   j. Finish level:
      1) Medium finish.

13. Level Identification and Stairwell Egress Identification:
   a. Materials: As indicated on drawings.
   b. Mount to back of Identification Device and wall as indicated.
   c. Letter height: Sizes as indicated on drawings.
      1) See drawings for locations.
   d. Letters and numbers, tactile characters:
      1) Raised 1/32 IN from sign face.
   e. Letters case:
      1) Combination upper and lower case.
   f. Letters style:
      1) Sans serif.
   g. Proportion:
      1) Width to height ratio, between 3:5 and 1:1.
      2) Stroke-width-to-height ratio, between 1:5 and 1:10.
   h. Braille: Grade 2.
      1) Braille characters shall be separated from adjacent raised characters or symbols 1/2 IN.
      2) Grade 2 Braille translation to be provided by identification device manufacturer.
   i. Color: As selected.
      1) Characters: Dark.
      2) Background: Light.
14. Office and Workstation Identification:
   a. Materials: As indicated on drawings.
   b. Mount to back of Identification Device and wall as indicated.
   c. Letter height: Sizes as indicated on drawings.
      1) See drawings for locations.
   d. Letters and numbers, tactile characters:
      1) Raised 1/32 IN from sign face.
   e. Letters case:
      1) Combination upper and lower case.
   f. Letters style:
      1) Sans serif.
   g. Proportion:
      1) Width to height ratio, between 3:5 and 1:1.
      2) Stroke-width-to-height ratio, between 1:5 and 1:10.
   h. Braille: Grade 2.
      1) Braille characters shall be separated from adjacent raised characters or symbols 1/2 IN.
      2) Grade 2 Braille translation to be provided by identification device manufacturer.
   i. Color: As selected.
      1) Characters: Dark.
      2) Background: Light.
   j. Finish level:
      1) Medium finish.

15. Restroom Identification:
   a. Materials: As indicated on drawings.
   b. Mount to back of Identification Device and wall as indicated.
   c. Letter height: Sizes as indicated on drawings.
      1) See drawings for locations.
   d. Letters and numbers, tactile characters:
      1) Raised 1/32 IN from sign face.
   e. Letters case:
      1) Combination upper and lower case.
   f. Letters style:
      1) Sans serif.
   g. Proportion:
      1) Width to height ratio, between 3:5 and 1:1.
      2) Stroke-width-to-height ratio, between 1:5 and 1:10.
   h. Braille: Grade 2.
      1) Braille characters shall be separated from adjacent raised characters or symbols 1/2 IN.
      2) Grade 2 Braille translation to be provided by identification device manufacturer.
   i. Color: As selected.
      1) Characters: Dark.
      2) Background: Light.
   j. Finish level:
      1) Medium finish.

16. Room Identification, non-public:
   a. Materials: As indicated on drawings.
   b. Mount to back of Identification Device and wall as indicated.
   c. Letter height: Sizes as indicated on drawings.
      1) See drawings for locations.
   d. Letters and numbers, tactile characters:
      1) Raised 1/32 IN from sign face.
   e. Letters case:
      1) Combination upper and lower case.
   f. Letters style:
1) Sans serif.

g. Proportion:
   1) Width to height ratio, between 3:5 and 1:1.
   2) Stroke-width-to-height ratio, between 1:5 and 1:10.

h. Braille: Grade 2.
   1) Braille characters shall be separated from adjacent raised characters or symbols 1/2 IN.
   2) Grade 2 Braille translation to be provided by identification device manufacturer.

i. Color: As selected.
   1) Characters: Dark.
   2) Background: Light.

j. Finish level:
   1) Medium finish.

17. Room Identification, public:
   a. Materials: As indicated on drawings.
   b. Mount to back of Identification Device and wall as indicated.
   c. Letter height: Sizes as indicated on drawings.
      1) See drawings for locations.
   d. Letters and numbers, tactile characters:
      1) Raised 1/32 IN from sign face.
   e. Letters case:
      1) Combination upper and lower case.
   f. Letters style:
      1) Sans serif.
   g. Proportion:
      1) Width to height ratio, between 3:5 and 1:1.
      2) Stroke-width-to-height ratio, between 1:5 and 1:10.
   h. Braille: Grade 2.
      1) Braille characters shall be separated from adjacent raised characters or symbols 1/2 IN.
      2) Grade 2 Braille translation to be provided by identification device manufacturer.
   i. Color: As selected.
      1) Characters: Dark.
      2) Background: Light.
   j. Finish level:
      1) Medium finish.

18. Service Entrance Identification:
   a. Materials: As indicated on drawings.
   b. Mount to back of Identification Device and wall as indicated.
   c. Letter height: Sizes as indicated on drawings.
      1) See drawings for locations.
   d. Letters and numbers, tactile characters:
      1) Raised 1/32 IN from sign face.
   e. Letters case:
      1) Combination upper and lower case.
   f. Letters style:
      1) Sans serif.
   g. Proportion:
      1) Width to height ratio, between 3:5 and 1:1.
      2) Stroke-width-to-height ratio, between 1:5 and 1:10.
   h. Braille: Grade 2.
      1) Braille characters shall be separated from adjacent raised characters or symbols 1/2 IN.
      2) Grade 2 Braille translation to be provided by identification device manufacturer.
   i. Color: As selected.
      1) Characters: Dark.
      2) Background: Light.
   j. Finish level:
B. Direction and identification devices for communications systems: International Symbols.

2.3 IDENTIFICATION DEVICE FINISH LEVEL

A. High Finish:
   1. May include following materials, or combination of materials:
      b. Etched, paint-filled letters.
      c. Etched stainless steel panel.
      d. Full round bar stock stainless steel letters.
      e. Painted aluminum letters.
      f. Painted aluminum panel.
      g. Painted die-cut vinyl letters.
      h. Pre-patina copper panel.
      i. Water-jet cut stainless steel letters.

B. Medium Finish:
   1. May include following materials, or combination of materials:
      a. Painted acrylic letter.
      b. Painted acrylic panel.
      c. Clear acrylic panel with paper insert.
      d. Painted aluminum panel with reflective die-cut vinyl letters.
      e. Painted photopolymer panel with silkscreened letters.
      f. Scotchprint Panaflex digital vinyl.

C. Finish and contrast:
   1. Characters and background:
      a. Non-glare.
      b. Characters must contrast with background; recommend 70 percent.

2.4 MATERIALS

A. All materials to be inert.

B. Contractor ensure and prevent galvanic reactions between products used.

C. Acrylic:
   1. Cast Acrylic Sheet: Cast, not extruded or continuous cast, methyl methacrylate monomer plastic sheet.
      a. Provide in sizes and thicknesses indicated.
      b. Minimum flexural strength: Mean 16,000 PSI when tested in accordance with ASTM-D790.
      c. Minimum allowable continuous service temperature of 176 DegF.
   2. General types:
      a. Transparent Sheet: Clear, colorless sheet, matte finish.
         1) Light transmittance: 92% when tested in accordance with ASTM-D1003.
      b. White Translucent Sheet:
         1) Density required to produce uniform brightness and minimum halation effects.
      c. Opaque Sheet:
         1) Colored opaque acrylic sheet in colors and finishes indicated; If not indicated, provide in colors selected from the manufacturer’s full range of standard colors.
         2) 30-30 Acrylic: Tinted.
   4. Abrasive Resistance Coating (ARC):
      a. Product: Abrasive resistant coating as recommended by manufacturer.
      b. Apply ARC to exposed faces of acrylic sheet after graphics have been applied.

D. Aluminum:
   1. Aluminum Sheet:
a. Alloy and temper recommended by aluminum manufacturer for type of use, and finish indicated.
b. Provide with minimum strength and durability properties in accordance with ASTM-B209, Table for 5052 for thickness specified.

2. Aluminum Extrusions:
a. Alloy and temper recommended by aluminum manufacturer for the type of use, and finish indicated.
b. Provide with minimum strength and durability properties in accordance with ASTM-B221, Table for 6061 for thickness indicated.

3. Aluminum Castings:
a. Alloy and temper for use and finish indicated as recommended by aluminum manufacturer for the casting process used.

4. Anodized Aluminum:
b. Coating: Clear, anodized coating, 0.2 mil thick.

E. Glass:
   1. Type:
      a. Type 1: Laminated glass.
      b. Thickness: As indicated.
   2. Color: To be selected by Architect.
      a. Color shall be consistent for identification device types, unless noted otherwise.
   3. Graphics: Apply graphics to glass surface as indicated.
      a. Abrasive Resistant Coating (ARC): Apply ARC coating to exposed faces of glass after applying graphics to glass.

F. Graphics:
   1. Electrostatic or electronic graphics process.

G. Paints:
   2. Finish:
      a. Evenly spray apply finish in accordance with manufacturer's recommendation.
      b. Finish to be free of grit, dirt, smears, spots, and "orange peel" effect.
   3. Compatibility: Ensure paint compatible with metal used.
   4. Ultra-violet inhibitors: Each coat shall have UV Inhibitors
   5. Manufacturer: Matthews Paint Company, Pleasant Prairie, WI.

H. Polymer:
   1. Photopolymer:
      a. Sheet photopolymer:
         1) Manufacturer: Nova Polymers Inc., Yeadon, PA.
         2) Product: NovAcryl, PT Series nylon based photopolymer on extruded, clear, UV stable copolyester PETG thermoplastic base.
            a) Model: PT-236.
         3) High resolution, ADA compliant, raised graphic sign.
            a) Minimum face relief: .032 IN in compliance with ADA.
            b) Maximum face relief: .040 IN in compliance with ADA.
         4) Base thickness: 6.0 mm.
         5) Face relief: 1.0 mm Nylon resin based photopolymer layer.
         6) Substrate: Clear PETG plastic base with UV inhibitor.
         7) Photopolymer Durometer: 80 Shore D Durometer hardness.
      b. Process in accordance with manufacture's General Processing Guidelines.
      c. Laminated photopolymers are not acceptable.
      d. Finishes:
         1) Automotive grade acrylic polyurethane finishes.
         2) Manufacturer:
            a) Base: Matthews Paint Company, Pleasant Prairie, WI.
b) Optional: Carbit Paint, Co, Inc., Chicago, IL
3) Lacquer based finishes are not acceptable.

2. Solid polymer:
      1) Coated, laminated, or composite construction are not acceptable.
   c. Manufacturer:
      1) Base: DuPont Corian.
      2) Optional:
         a) Avonite.
         b) Surrell.

I. Stainless steel:
   1. Stainless steel plate, sheet, or strip: ANSI Type 316 in compliance with requirements of ASTM-A167.
   2. Finish: ANSI No. 4, horizontal grain, unless noted otherwise.

J. Vinyl Film:
   1. Clear protective vinyl overlayment:
      a. Manufacturer:
         1) Base: 3M.
            a) Scotchcal Matte Overlaminate 8911 ES.
         2) Optional: Avery.
            a) Avery Protective Clear Matte Vinyl.
      b. Description:
         1) High durability, UV resistant film with pressure sensitive adhesive.
         2) Overlaminate electrostatic imaged graphics, and piezo ink jet printed graphics in accordance with manufacturer recommendations.
         3) Adhesive and color: Pressure-sensitive, clear.
         4) Liner: Kraft paper.
         5) Overlaminate 2 mils transparent vinyl.
         6) Finish gloss: Matte.
         7) Thickness overlaminate and adhesive:

K. Fasteners and Anchors:
   1. Anchors and inserts:
      a. Exterior installations, and areas requiring corrosion resistance:
         1) Non-ferrous metal, or hot-dipped galvanized anchors and inserts.
      b. Concrete and masonry work: Toothyed steel, or lead expansion bolt devices with inserts for drilled-in-place anchors.
   2. Bracket mounting:
      a. Identification devices which project at right angles from walls or ceilings.
         1) Manufacturer's recommended standard concealed brackets, fittings, and hardware.
         2) Attach brackets and fittings securely to walls or ceilings with concealed fasteners and anchoring devices in accordance with manufacturer's recommendations.
   3. Cast metal: Mount cast plaques using standard method recommended by manufacturer for each type of wall surface.
   4. Concealed mounting:
      a. Mounting plaques: Insert threaded studs into tapped lugs on back of plaque.
      b. Set in predrilled holes filled with quick setting cement.
   5. Face mounting: Mount plaques with exposed fasteners anchored through face of plaque into wall surface.
   6. Flush mounting: Letters mounted with backs in contact with wall surface.
   7. Glass mounting: When mounting identification device panels to front surface of glass, provide .080 IN aluminum backup plate, on inside surface of glass
   8. Magnetic tape:
      a. Manufacturer: 3M.
   9. Mechanical fastening: Manufacturer's recommended fasteners based on identification device type and substrate.
10. Metal letters and numbers:
   a. Manufacturer's standard fastening method for letter form, type of mounting, wall
      construction, and condition of exposure.
   b. Heavy paper template: Provided by Manufacturer for establishing letter spacing and for
      locating holes for fasteners.
11. Projected mounting: Mount letters at a projected distance from the wall surface as indicated.
12. Reclosable fasteners:
   a. Manufacturer: 3M.
   b. Fastener types.
      1) Dual Lock SJ3562, Type 170.
      2) Dual Lock SJ3560, Type 250.
      3) Dual Lock SJ3561, Type 400.
   c. Provide fastener types as recommended by manufacturer.
13. Shim plate mounting:
   a. Concealed aluminum shim plates 1/16 IN thick, with predrilled and countersunk holes.
   b. Provide at locations indicated, and where other mounting methods are not practicable.
   c. Attach shim plate with fasteners and anchors providing secure attachment to substrate.
   d. Attach panel identification devices to shim plate and substrate.
14. Wall mounting: Attach panel identification devices to wall surfaces using following
    methods:
    a. Vinyl tape mounting: Double-sided foam tape, thickness indicated, or as required to
       mount identification devices to smooth, non-porous surfaces.
    b. Silicone adhesive mounting:
       1) Liquid silicone adhesive recommended by Manufacturer for attaching
          identification devices to irregular, porous, or vinyl-covered surfaces.
15. Installer requirements:
    a. Based on manufacturer recommendations, installer shall be responsible for fastener
       compatibility with substrates.
    b. Insure that oxidation does not occur, or that other reactive processes do not occur
       between related signage materials and fasteners.

L. Adhesives:
1. Double faced laminating film:
   b. Type: FASTAPE A Laminating Film, or as recommended by manufacturer.
2. Permanent double faced tape:
   a. Manufacturer: 3M.
   b. Type: 1/32 IN, Scotch Mount Neoprene Tape No. 4962, or as recommended by
      manufacturer.
3. Removable double faced tape:
   a. Manufacturer: 3M.
   b. Type: 1/32 IN, double faced removable tape No. 4432, or as recommended by
      manufacturer.
   c. Color: Black.
4. Silicon adhesive:
   b. Type: Silicon paneling adhesive as recommended by manufacturer.
5. Permanent adhesive:
   a. Manufacturer: 3M.
   b. Scotch 468MP, hi-performance adhesive, or as recommended by manufacturer.
6. Installer ensure adhesive compatibility with substrates.
7. LEED Credit EQc4.1 Low-Emitting Materials, Adhesives, and Sealants:
   a. Material shall contain VOC content as certified.

M. Finishes:
2. Metal finishes: Finish in compliance with NAAMM "Metal Finishes Manual" for finish
   designations and application recommendations.
4. Stainless steel: ANSI No. 4 finish, horizontal grain, unless otherwise noted or specified.
5. All finishes comply with American with Disabilities Act:
   a. Measure finishes with a Glossimeter to insure compliance.

2.5 GRAPHICS
A. Image process:
   1. Graphic content and style:
      a. Provide identification device copy in compliance with requirements indicated for
         content, finishes, materials, positions, sizes, spacing, styles, and colors of letters,
         numbers, symbols, and other graphic images.

B. Typography:
   1. Typography and graphics: Photographically and/or mechanically reproduced.
   2. International Symbols: In accordance with U.S. Department of Transportation current
      standards publication.
   3. Identification device typeface fonts: Provide as indicated on drawings.
   4. Letter forms:
      a. Use approved type font masters from the original type foundry.
      b. Cut letter forms with Signus equipment, only.
      c. Die cutting: Letter forms edges and corners are to be clean and true.
         1) Letterforms with ragged edges, rounded positive or negative corners will not be
            acceptable.

C. Braille:
   1. Grade 2 Braille translations by identification device manufacture.

D. Artwork:
   1. Manufacturer provide typesetting, and mechanical artwork required for identification device
      types.

2.6 FABRICATION
A. General requirements:
   1. Surface defects considered unacceptable: Oil canning, cupping, and warping.
   2. Grind welds shall smooth.

B. Identification device panels:
   1. Comply with requirements indicated for colors, designs, details of construction, finishes,
      materials, shapes, sizes, and thicknesses.
   2. Surfaces: Smooth, even, and level.
   3. Identification device panel flatness:
      a. Fabricate panels to remain flat within 1/32 IN over the concave surface.
      b. Fabricate panels to remain flat under installed conditions within a tolerance of plus or
         minus 1/16 IN measured diagonally.
   4. Edge Condition: 90 degree square cut, unless otherwise noted.
   5. Corner condition: Provide square corners, unless otherwise noted.
   6. Panel materials:
      a. See drawings for types and locations.

C. Applied copy:
   1. Die-cut copy characters from vinyl film.
   2. Provide pressure sensitive adhesive backing.
   3. Apply copy to exposed face of identification device panel.
   4. Apply copy to other surfaces where indicated.

D. Photo-etched copy:
   1. Fabricate raised lettering on metal background using acid etching process.
   2. Metal background for acid etching: Stainless steel or magnesium plate.
      a. Finish metal background as indicated.
      b. Paint raised surface.
E. Engraved copy:
   1. Graphic elements, letters, numbers, and symbols machine engraved into identification device panel face.
      a. Engrave to a precisely formed copy, incised to uniform depth.
      b. Engrave using high speed cutters, mechanically linked to master template in a pantographic system.
   2. Engraved acrylic: Epoxy enamel fill engraved acrylic copy.
   3. Face engraved clear acrylic:
      a. Epoxy enamel fill engraved copy.
      b. Opaque background color coating shall be applied to back face of acrylic sheet.
      c. Copy shall be engraved to a minimum depth of 1/32 IN, and 1/4 IN minimum stroke thickness.
   4. Engraved metal: Epoxy enamel fill engraved copy.
   5. Engraved plastic laminate: Engrave through exposed plastic laminate face ply to expose contrasting core ply.
   6. Subsurface engraved acrylic sheet:
      a. Back face: Reverse engrave.
      b. Engraved copy: Fill with epoxy enamel.
      c. Opaque background color coating: Apply over epoxy-enamel filled copy.

F. Silkscreened copy:
   1. Subsurface copy:
      a. Form panel face: Apply copy to back face of clear acrylic sheet to form panel face.
      b. Produce precisely-formed opaque images with smooth edges.
      c. Print copy: Reverse silkscreen process.
         1) Copy shall be over sprayed with opaque background color coating.

G. Raised copy:
   1. Exterior grade:
      a. Fabrication of raised lettering on metal background to magnesium alloy plate shall be by acid etching process.
   2. Interior Grade, solid core materials:
      a. Manufacturer: Nova Polymers Inc.
      b. Provide solid core materials in thicknesses indicated.
      a. Form characters with square cut edges free from burrs and cut marks.
      b. Panel material, and raised copy thickness: Not less than 1/32 IN.

H. Metal letters and numbers:
   1. Comply with requirements indicated for manufacturing process, finish, materials, message content, style, and size.
   2. Metal: Stainless steel, unless otherwise indicated.

I. Fabricated metal letters and numbers:
   1. Fabricate metal letters and numbers in sizes and styles indicated.
      a. Thicknesses: As indicated.
      b. Form exposed faces and sides of characters.
      c. Produce surfaces free from warp and distortion.
      d. Provide internal bracing for stability.
      e. Provide internal bracing for attachment of required mounting accessories.

J. Sandblasted glass:
   1. Glass types: Annealed, or tempered glass.
   2. Oxide blast with heavy weight mask.
      b. Mask type: Cooper Mask.
         1) Manufacturer computer generate and photographically reproduce Mask from reflective, or electronic artwork.
   3. Coat exposed sandblasted surfaces with Etch Sealer, manufactured by Skyline.
   4. Spray coat glass surface prior to removal of mask material.
5. Finish: Satin.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine conditions under which materials are to be installed.
B. Installation constitutes acceptance of responsibility for performance.

3.2 INSTALLATION

A. General requirements:
   1. Locate identification devices and accessories where shown, or scheduled.
   2. Use mounting method types indicated and as described, and in accordance with manufacturer’s recommendations.
   3. Field determine exact locations and dimensions for identification devices prior to fabrication.
   4. Contractor immediately notify Owner and Architect if building and site conditions are at variance with drawings.
      a. Do not to proceed until the unsatisfactory conditions have been corrected.
   5. Install identification devices in positions shown on drawings.
      a. Install identification devices at heights indicated, plumb, and in alignment.
      b. Brace devices securely until permanent anchorage is made.
      c. Identification device surfaces are to be installed free from distortion or other defects in appearance.
      d. Perform cutting, drilling, and fitting carefully.
      e. When required, fit at site before finishing.

B. General location requirements:
   1. Single doors: Install identification device on wall adjacent to latch side of door.
   2. Double doors: Install identification device on nearest adjacent wall.
   3. Mount 60 IN above finish floor to centerline of identification device, unless otherwise indicated.
      a. Signs may be mounted so that tactile characters and Braille are located between 48 IN and 60 IN above finish floor.

C. Provide signs at elevator call stations directing use of stairs: See ASME-A17.1, Appendix H.

D. Provide stair identification devices in exit stairs connecting more than 3 stories: See UBC Standard 10-2.

E. Mount identification devices according to methods specified or as indicated on drawings for each type.

F. Manufacturer to provide printed instructions or drawings on wall blocking locations and type required to Contractor in a timely manner to allow installation.

3.3 CLEAN-UP

A. At completion of the installation, clean identification devices with appropriate cleaning agents prior to final inspection and acceptance. Grease, fingerprints, smudges, adhesive, etc. remaining on identification devices or components will not be acceptable. Protect identification device units from damage until acceptance by Owner.

B. Remove packing and debris from the project site upon completion and leave the site in a condition which is clean and free of damage and abuse.

END OF SECTION
PART 1 - GENERAL

1.1 SUBMITTALS

A. Product Data:
   1. Submit manufacturer’s technical data and brochures for each type of specified component
      required, including detail drawings, and installation instructions.

B. Shop Drawings:
   1. Shop drawings shall show dimensions, sizes, thickness, alloys, tempers, finishes, joining,
      attachments, and relationship of adjoining work.

C. Samples:
   1. Samples shall include three, 12 IN samples of each type of each partition closure and finish
      as specified and accessories.

D. LEED Credit MRe4.1 and Credit MRe4.2, Recycled Content:
   1. Provide list of proposed materials with recycled content. Indicate separate percentages, by
      weight, of pre-consumer and post-consumer recycled content per unit of product. Also
      include material costs, excluding cost of installation.

E. LEED Credit EQc4.1, Low-Emitting Materials, Adhesives and Sealants:
   1. Provide product data and material safety data sheets (MSDS) for adhesives and sealants
      used inside the building indicating VOC content of each product used. Indicate VOC
      content in g/L calculated according to 40 CFR 59, Subpart D.

1.2 QUALITY ASSURANCE

A. Manufacturer: Firm with manufacturing and delivery capacity required for the project, shall have
   successfully completed at least ten projects within the past five years, utilizing systems,
   materials and techniques as herein specified.

B. Fabricator: Approved by Manufacturer.

1.3 DELIVERY, STORAGE & HANDLING

A. Protect materials during fabrication, shipment, site storage and erection to prevent damage from
   other trades.

B. Store accessories inside a well-ventilated area, away from uncured concrete and masonry, and
   protected from the weather, moisture, soiling, abrasion, extreme temperatures, and humidity.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Acceptable manufacturers:
   1. Partition Closure units:
      a. Base:
      1) Gordon Interior Specialties Division, Gordon, Inc.
   2. Other manufacturers desiring approval comply with Section 00 26 00.
2.2 MATERIALS

A. Aluminum Extrusions:
   1. 6063-T5 temper, 31 KSI tensile strength per ASTM B221.
   2. Provide metals free from surface blemishes where exposed to view in finished unit.
   3. Surfaces that exhibit pitting, seam marks, roller marks, stains, and discolorations, or other imperfections on finished units are not acceptable.

B. Acoustical Batts for sound attenuation
   1. Fiberglass or Mineral Wool.

C. Foam, adhesive-backed gaskets: Both sides of units.

2.3 PARTITION CLOSURE UNITS

A. Description:
   1. Pre-assembled, pre-finished assemblies designed as a closure for vertical gaps between window mullions and intersecting wall partitions.
   3. Spring-loaded for tight fit.
      a. Minimum 4 springs per length.
   4. Provide acoustical batts for sound attenuation.
   5. Minimum Sound Transmission Coefficient: 38 STC.
   6. Base Product(s): “Mullion-Mate I and II” by Gordon Inc.
      a. Select model number(s) according to opening widths encountered.

2.4 FABRICATION

A. Fabricate Partitions Closures in lengths necessary to fit openings.

2.5 FINISHES

A. Shop Finish:
   1. Spray-applied, waterborne, cross-linked baked acrylic finish.

B. Color:
   1. Match mullions.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine conditions under which work is to be performed, correcting unsatisfactory conditions.

B. Verify that field measurements and block-out dimensions are as shown on shop drawings.

3.2 INSTALLATION

A. Install per manufacturer’s instructions.

B. Adhere one component to wall with foam gasket.

C. Adhere opposing component to window mullion with foam gasket.

D. Fill gaps with sealant. Color to match items being joined.

3.3 CLEANING

A. Clean all surfaces following installation.

3.4 PROTECTION

A. Install pre-finished without damage.
B. Protect the finished work from damage during the remainder of the construction period.
C. Make repairs to damaged articles to satisfaction of Architect.

END OF SECTION
PART 1 - GENERAL

1.1 SUMMARY

A. This section includes the following types of wall protection systems:
   1. Crash rails.
   2. Corner guards.
   3. Wall guard.

B. Related Sections:
   1. Section 04 20 00 Reinforced Unit Masonry.
   2. Section 09 22 16 Non-Load Bearing Metal Stud Framing.

1.2 QUALITY ASSURANCE

A. Single source responsibility:
   1. Provide each component of the wall protection system by the same company to ensure compatibility of color, texture and physical properties.

1.3 SUBMITTALS

A. Shop Drawings:
   1. Showing locations, extent and installation details of handrails.
   2. Show methods of attachment to adjoining construction.

B. Samples:
   1. Material samples of full range of standard and optional range of for pre-selection of colors.
   2. After color pre-selection furnish two 12 IN long/square samples of each item in the selected color.
      a. Include end cap and mounting hardware.

C. Contract Closeout Information:
   1. Maintenance data.
   2. Interior finish fire performance data (for each item and type specified):
      a. Manufacturer's printed information including:
         1) Fire class.

D. LEED Credit MRc4.1 and Credit MRc4.2, Recycled Content:
   1. Provide list of proposed materials with recycled content. Indicate separate percentages, by weight, of pre-consumer and post-consumer recycled content per unit of product. Also include material costs, excluding cost of installation.

E. LEED Credit EQc4.1, Low-Emitting Materials, Adhesives and Sealants:
   1. Provide product data and material safety data sheets (MSDS) for adhesives and sealants used inside the building indicating VOC content of each product used. Indicate VOC content in g/L calculated according to 40 CFR 59, Subpart D.

1.4 DELIVERY, STORAGE AND HANDLING

A. Schedule delivery of anchorage components as required for installation.

B. Store materials in original, undamaged packaging in a cool, dry place out of direct sunlight and exposure to the elements.
   1. Maintain storage conditions between 40 DegF and 100 DegF.

C. Store material flat.
1.5 PROJECT CONDITIONS

A. Materials must be acclimated in an environment of 65-75 DegF for at least 24 hours prior to beginning the installation.

B. Installation areas must be enclosed and weatherproofed before installation commences.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Acceptable manufacturers:
   1. Wall Protection Specialties:
      a. Base:
         1) C/S Group.
         2) Arden Architectural Specialties, Inc. (SS Sheet Metal).
      b. Optional:
         1) InPro.
         2) Pawling.
         3) Korogard.
         4) Sani-Rail.
   2. Other manufacturers desiring approval comply with Section 00 26 00.

2.2 MATERIALS - GENERAL REQUIREMENTS

A. The following general material requirements apply to all vinyl/acrylic wall protection devices.
   1. Cover Material:
      a. High-impact, rigid vinyl/acrylic, homogeneous color throughout entire thickness, free of embedded foreign material, and having a blemish free surface.
   2. Retainer assemblies:
      b. Finish: Anodized finish complying with AAMA 611, Class II
   3. End Caps:
      a. Pre-fabricated, color-matched rigid vinyl/acrylic.
      b. Mechanically secured with concealed fasteners.
   4. Fasteners:
      a. Non-corrosive and compatible with aluminum retainers.
      b. Attachment hardware type: As appropriate for wall construction.
   5. Impact Strength: Tested in accordance with the applicable provisions of ASTM F476.
   6. Chemical and stain resistance: In accordance with ASTM D1308.
      a. Resistant to alkali, chemicals, cleaning agents and light.
   7. Color match: Provide wall protection components that are color matched in accordance with the following: Delta E difference of no greater than 1.5 using the Hunter (Lab) Scale.
   8. Fire performance characteristics (UL-listed and tested per in accordance with ASTM E84 for Class I (Class A) characteristics listed below:
      a. Flame Spread Index: < 25.
      b. Smoke Developed: < 450.
   9. Include fasteners, mounting brackets, and hardware necessary for installations indicated.

2.3 2-PIECE VINYL CORNER GUARDS (CG-1):

A. General:
   1. Cover: 0.078 IN thick (nominal), high-impact, rigid vinyl/acrylic.
   2. Retainers: Continuous extruded aluminum; fastened at 18 IN OC (max).
   4. Unit Length: 48 IN above (base).
   5. Include end caps of matching color.
6. If corners are not 90-degree, furnish custom angled units.

7. Surface-mounted Vinyl Corner Guards (CG-1):
   b. Size: 2 IN x 2 IN.
   c. Nose Radius: 1/4 IN.
   d. Color(s), Pattern(s) and Texture(s):
      1) As selected by Architect.

2.4 CLEAR POLYCARBONATE CORNER GUARDS (CG-2):
   1. Base Product:
      a. ACG: InPro Polycarbonate Cornerguards
         1) Size: 1 1/8 IN x 1 1/8 IN.
         2) 90 degree corner guard.
      a. Nominal wall thickness: 0.075 IN.
      c. Flame spread, UL-94: V2.
   3. Install units starting at top of base molding.
   5. If corners are not 90 degree, furnish custom angled units.

2.5 CRASH RAILS (SSCR)
   A. General:
      1. Description:
         a. Heavy duty stainless crash rails securely locked over stainless steel mounting clips.
         b. Lengths to be supplied prefabricated with end plates installed, all units predrilled.
         c. Mounting hardware to be supplied by manufacturer.
         d. 4 IN high x 1/4 IN thick with 2 IN radiused ends.
         e. "Model ECR-32A" by C/S Group.
      2. Mounting Height(s): As indicated.

2.6 STAINLESS STEEL CORNER GUARDS (SSCG)
   A. Stainless Steel Corner Guards (SSGC):
      1. Material: Type 304 or 430 Stainless Steel w/satin finish.
      2. Sheet thickness: 16 GA.
      3. Unit Length: 48 IN.
      4. Provide custom units where substrate corners are other than 90 DEG.
      5. Size: 3 1/2 x 3 1/2 IN.
      6. Nose Radius: 1/8 IN.
         a. Exception: 3/4 IN Radius (“CG-55” by Pawling) where indicated over bull-nosed CMU blocks.
      8. Provide custom SS units at end-of-wall condition (SSCG-C).
         a. Provide channel type that match wall thickness with 1/16 IN clearance.
         b. Extend 3 1/2 IN legs at each wall face.

2.7 WALL GUARD (SSWG)
   A. Wall Guard (SSWG) sheets above janitor closet sinks:
      2. Material: Type 304 or 430 Stainless Steel w/satin finish.
      3. Height: 96 IN.
      4. Width: Extend 12 IN beyond edge of sink in each direction.
      5. Sheet Thickness: 16 GA.
      6. Include prefabricated stainless steel trim:
         a. Inside and outside corners.
2.8 FABRICATION

A. Fabricate wall protection systems to comply with requirements indicated for design, dimensions, detail, finish and member sizes.

PART 3 - EXECUTION

3.1 EXAMINATION

A. General:
   1. Verify that walls are in proper condition to receive installation of wall protection items.
   2. Correct unsatisfactory conditions.

B. Verify that temperature at the time of installation is between 65-75 DegF and will be maintained in this range throughout installation and for at least 48 hours after completion.

C. Insure that adequate wall backing has been installed.
   1. Metal Wall Backing: Specified in Section 09 22 16.
   2. Coordinate with other trades to ensure that backing is installed as walls are framed and prior to installation of gypsum wall board.
   3. Coordinate and direct installation of backing required for wall protection specialties scheduled.

D. Install surface-mounted items after wall finishes have been completed.

3.2 INSTALLATION – GENERAL REQUIREMENTS

A. General:
   1. Install in accordance with the manufacturer’s recommendations, using only approved mounting hardware, and locating all components firmly into position, level and plumb.
   2. Install with fasteners suitable for wall substrates encountered, and provide adequate anchoring for anticipated impact loads.

B. Install items where indicated.

C. Install end caps, trim, returns, transition etc.

D. Adhesives and Sealants: Type as recommended by manufacturer.
   1. LEED Credit EQc4.1 Low-Emitting Materials, Adhesives, and Sealants:
      a. Material shall contain VOC content as certified.

3.3 INSTALLATION - CORNER GUARDS (SSCG)

A. General:
   1. Unless otherwise indicated: Align bottom edge of corner guards with top of wall base.

B. Stainless Steel Corner Guards (SSCG):
   1. Fasten directly to finished wall surfaces using adhesive as recommended by manufacturer.
      a. Augment with stainless steel fasteners.

3.4 INSTALLATION - WALL GUARD (SSWG)

A. General:
   1. Install Wall Guard where indicated.
   2. Prepare substrates as required to receive wall guard.
   3. Install in accordance with manufacturer's recommendations.

B. Preparation – SSWG over new gypsum wallboard:
1. Ensure new drywall has been taped and sanded smooth.
2. Wipe clean to remove dust.
3. Vertical Joints (butt-joints):
   a. Install wall guard with butted joints.
   b. Joint width: 1/16 IN.

C. Sealant:
   1. Specified in Section 07 92 16.
   2. Seal to adjacent finish materials including top edge, lateral edges and bottom edge.

3.5 ADJUSTING AND CLEANING

A. Remove and replace defective, misaligned or damaged units.
B. Verify that wall protection items are plumb and rigidly secured to substrate; make any adjustments required.
C. Remove protective films.
D. Clean adjacent areas, using materials and methods recommended by manufacturer.

3.6 PROTECTION

A. Protect installed materials to prevent damage by other trades.

END OF SECTION
PART 1 - GENERAL

1.1 QUALITY ASSURANCE
A. Conform to NFPA 10 requirements for portable fire extinguishers.
B. Provide fire extinguishers, cabinets and accessories by a single manufacturer.
C. Fire-Rated Cabinets: Listed and labeled to comply with requirements in ASTM E814 for fire-resistance rating of walls where they are installed.
D. Conform to Americans with Disabilities Act (ADA) regarding mounting heights and maximum projection of cabinets into corridors.

1.2 SUBMITTALS
A. Contract Closeout Information:
   1. Maintenance data.
B. LEED Credit MRc4.1 and Credit MRc4.2, Recycled Content:
   1. Provide list of proposed materials with recycled content. Indicate separate percentages, by weight, of pre-consumer and post-consumer recycled content per unit of product. Also include material costs, excluding cost of installation.

1.3 PRODUCT DELIVERY, STORAGE AND HANDLING
A. Deliver cabinets in time to allow installation.
B. Deliver and install filled and charged extinguishers just prior to building occupancy.

PART 2 - PRODUCTS

2.1 MATERIALS
A. Acceptable manufacturers:
   1. Fire Protection Specialties:
      a. Base:
         1) JL Industries.
      b. Optional:
         1) Larsen's Manufacturing.
         2) Potter Roemer.
   2. Other manufacturers desiring approval comply with Section 00 26 00.

2.2 FIRE EXTINGUISHER CABINETS (FEC AND FVC)
A. General:
   1. Provide FIRE EXTINGUISHER decal for each cabinet. Orient letters vertically.
   2. Provide fixed door pull at each cabinet.
   3. Keys to Door Locks: Three per lock.
   4. LEED Credit MRc4.1 and MRc4.2 Recycled Content:
      a. Material shall contain recycled content as certified.
B. FEC-1 – Semi-recessed, Steel, Fire Extinguisher Cabinet:
   1. Description: Semi-recessed steel tub with 1 1/4 IN (face width) steel trim and door.
a. Fire-rated Cabinets: Provide fire-rated cabinets where FEC-1 is indicated to be installed in fire-rated walls.

2. Cabinet Construction:
   a. Non-fire rated Units: Single-wall, 0.026 IN (26 GA) cold-rolled steel.
   b. Fire Rated Units: Double-wall construction fabricated from 0.043 IN (18 GA) cold-rolled steel lined with minimum 5/8 IN thick, fire-barrier material.


4. Tub Size, inside clear (WxTxD): 10 1/2 x 24 x 6 IN.
5. Door Style: Full Glazing; Clear acrylic.
6. Lock: Cam lock with emergency break-away release mechanism.


C. FEC-2 – Fully-recessed, Steel Fire Extinguisher Cabinet w/Stainless Steel Trim & Door:

1. Description: Fully-recessed steel tub with 1 1/4 IN (face width) stainless steel trim and door.
   a. Fire-rated Cabinets: Provide fire-rated cabinets where FEC-2 is indicated to be installed in fire-rated walls.

2. Tub Construction:
   a. Non-fire rated Units: Single-wall, 0.026 IN (26 GA) cold-rolled steel.
   b. Fire Rated Units: Double-wall construction fabricated from 0.043 IN (18 GA) cold-rolled steel lined with minimum 5/8 IN thick, fire-barrier material.


4. Trim and Door Material: 0.026 IN (26 GA) stainless steel.
   a. Finish: #4 brushed.
5. Tub Size, inside clear (WxTxD): 10 1/2 x 24 x 6 IN.
6. Door Style: Full Glazing; Clear acrylic.
7. Lock: Cam lock with emergency break-away release mechanism.


D. FVC-1 – Semi-recessed, Steel, Fire Valve Cabinet with Extinguisher:

1. Description: Semi-recessed steel tub with 1 1/4 IN (face width) steel trim and door.
   a. Fire-rated Cabinets: Provide fire-rated cabinets where FVC-1 is indicated to be installed in fire-rated walls.

2. Cabinet Construction:
   a. Non-fire rated Units: Single-wall, 0.026 IN (26 GA) cold-rolled steel.
   b. Fire Rated Units: Double-wall construction fabricated from 0.043 IN (18 GA) cold-rolled steel lined with minimum 5/8 IN thick, fire-barrier material.


4. Tub Size, inside clear (WxTxD): 16 x 40 x 9 IN.
5. Door Style: Full Glazing; Clear acrylic.
6. Lock: Cam lock with emergency break-away release mechanism.


2.3 FIRE EXTINGUISHERS (FE)

A. General:
1. Determine proper type of extinguisher is required for room in which they are indicated.
2. Coordinate cabinet and extinguisher sizes. Bring discrepancies to attention of Architect prior to or during submittal phase.
3. Include wall brackets where extinguishers are indicated without cabinets.
4. Provide FIRE EXTINGUISHER decal for each extinguisher.
B. General-purpose Fire Extinguishers (typical item except where more specialized types are required):
   1. Extinguishing Agent: Multipurpose chemical powder suitable for classes A, B & C fires.
   2. Construction:
      a. Heavy-duty steel cylinder with metal valve and siphon tube with replaceable molded valve stem seal, visual pressure gauge, pull pin and upright squeeze grip.
      b. Corrosion and impact-resistant.
      c. Powder coat finish.
      d. Color: Red, in accordance with OSHA requirements.
   3. Capacity: 10 LBS.
      a. UL-rating: 4A-60BC.
   4. Locations: Furnish one FE for each:
      a. Fire Extinguisher Cabinet (FEC).
      b. Fire Extinguisher (FE) location.

C. Non-conductive Halotron Fire Extinguishers (for areas with computers, servers and electronics):
   1. Extinguishing Agent: Environmentally clean, electrically non-conductive, Halotron® 1 suitable for classes A, B & C fires.
      a. EPA-approved.
      b. NFPA-10 rating.
   2. Construction:
      a. Drawn steel cylinder with steel siphon tubes, power cone discharge stream, upright squeeze grip visual pressure gauge.
      b. Corrosion-resistant paint finish.
      c. Color: Red, in accordance with OSHA requirements.
   4. Locations: Furnish this type for where extinguishers are indicated for Rooms, Computer Rooms and similar rooms with sensitive electronics.

D. Class K Fire Extinguishers (provide at Kitchens):
   1. Extinguishing Agent: Class K, low pH wet chemical discharged in a fine mist suitable for suppressing liquid cooking media fires (Class K).
   2. Construction:
      a. Stainless steel cylinder with protective nozzle tip orifice seal and non-metallic nozzle tip finger guard.
      b. Standard horn and nozzle design.
      c. Name plate shows only the class “K” symbol.
   4. Locations: Furnish this type for where extinguishers indicated for Kitchens, Food Prep and similar areas.

E. Wall Brackets:
   1. Manufacturer's standard steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated
   2. Finish: Baked-enamel or powder coat.
   4. Locations: Install wall brackets for each extinguisher (FE) not indicated to be installed in a cabinet.
   5. Include mounting accessories suitable for substrate wall type.

2.4 FABRICATION

A. Cabinets:
   1. Provide manufacturer's standard box (tub) with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.
   2. Weld joints and grind smooth.
   3. Provide factory-drilled mounting holes.
4. Prepare doors and frames to receive locks.
5. Install door locks at factory.

B. Cabinet Doors:
   1. Fabricate doors according to manufacturer's standards, from materials indicated and
      coordinated with cabinet types and trim styles selected.
   2. Fabricate door frames with tubular stiles and rails and hollow-metal design, 1/2 IN thick.

C. Cabinet Trim:
   1. Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

2.5 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.

PART 3 - EXECUTION

3.1 INSPECTION

A. Verify suitability of substrates to accept installation.

B. Installation constitutes acceptance of responsibility for performance.

3.2 INSTALLATION

A. General:
   1. Install items included in this section in locations and at mounting heights indicated, or if not
      indicated, at heights to comply with applicable regulations of governing authorities.
   2. Prepare recesses in walls for cabinets as required by type and size of cabinet and style of
      trim and to comply with manufacturers instructions.
   3. Securely fasten mounting brackets and cabinets to structure, square and plumb, to comply
      with manufacturer’s instructions.
   4. Install in accordance with NFPA-10 and manufacturer's instructions.
   5. Provide required closures.

B. Installation Heights:
   1. General:
      a. Install extinguishers and cabinets with in limitations of NFPA-10 and ADA.
   2. Fire Extinguisher Cabinets (FEC):
      a. Locate with centerline of cabinet door handle not more than 48 IN AFF.
   3. Fire Extinguishers (FE) not contained in a cabinet:
      a. Locate wall brackets such that top of extinguisher will not be higher 48 IN AFF.

3.3 PROTECTION

A. Protect installed items from damage.

3.4 ADJUSTING AND CLEANING

A. Remove temporary protective coverings and strippable films.

B. Adjust fire protection cabinet doors to operate easily without binding.
   1. Verify that integral locking devices operate properly.
C. Clean interior and exterior surfaces.

D. Touch up marred finishes, or replace cabinets that cannot be restored to factory-finished appearance.
   1. Conform to procedures recommended by manufacturer.

E. Replace items that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION
SECTION 11 53 00
LABORATORY & VIVARIUM EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Laboratory Washers and Dryers:
   1. Laboratory Glassware Washers.
   2. Laboratory Glassware Washers: Base Cabinet Height.
   3. Laboratory Glassware Dryers.

B. Vivarium Washers:
   1. Cage and Bottle Washer.

C. Bottle Filler:
   1. Batch Type.

D. Bedding Dispenser:
   1. Freestanding Cabinet Type.

E. Bedding Disposal:
   1. Containment Cabinet – Dry Bag Type.

F. Cage Changing Station.

G. Ice Maker.

H. Modular Wall/Equipment Enclosure Panels.

I. Procedure Lights.

J. Isolation Cubicles

K. Individually Ventilated Cage Rack Systems

1.02 UNDIVIDED RESPONSIBILITY

A. Unless specified otherwise, because of special coordination requirements, the scope of work described in this Section shall be provided by the supplier of the Section 12 35 53 scope of work Related Sections.

1.03 REFERENCES

A. Standards:
4. ASME Section VIII, Division 1, Unfired Pressure Vessels Code: for steam coils.
5. UL 1262, as certified by ETL Testing Laboratory Inc. (except units with pH neutralization and detergent monitoring system.

1.04 DESCRIPTION

A. Furnish and install all laboratory equipment with necessary components and accessories required to ensure a complete installation and ready for intended use as specified herein and shown on the Laboratory Furnishings Drawings.

B. Provide side panels to cover all exposed sides of cabinet-type equipment designed for under-counter installation.

C. Work of this section requires close coordination with work of Division 22, 23 and 26 as well as installation of Owner furnished components and work specified in other Sections. Sequence all work to assure an orderly progress in the project without removal of previously installed work and so as to prevent damage to finishes and products.

D. Refer to General Laboratory Equipment Schedule included in this Specification.

E. Utility Requirements: Mechanical and electrical services have been designed for the services and loads as described for individual equipment items herein. If a manufacturer requires services in excess of those indicated, either of type, size, quantity or quality, that cost will be borne by the Contractor and shall not be justification for a change order.

F. Equipment Pits: Equipment pits shall be designed around standard pit of successful bidder. Manufacturer shall submit certified pit drawing within 30 days of Award of Contract from Owner to Contractor. Manufacturer shall provide height adjustments, thresholds, and other items required to finish off machines for pit mounted arrangement.

1.05 SUBMITTALS

A. Submit as specified herein and under provisions of Section 01 33 00.

B. Materials List/Product Data: Submit for review a complete materials list, including catalog data and performance data of all materials, equipment, and products for work in this Section.

C. Shop Drawings: Submit complete shop fabrication and installation drawings, including plans, elevations, sections, details, finished and materials dimensions, utility connections and locations, sizes and loads, and schedules. Show relationship to adjoining materials and construction and requisite service, operating and installation clearances. Piping and wiring diagrams shall be included. Shop Drawings shall be in the form of reproducibles or photocopies, not to exceed 11 inches by 17 inches (A3) in size. Blueline or blackline prints are not acceptable.

D. Submit detailed anchorage and attachment drawings and calculations provided by a licensed Structural Engineer to show compliance with the applicable Building Code seismic restraint requirements.

  1. Equipment shall be designed and anchored in accordance with IBC 2000 Seismic Design Category C requirements.

E. Samples: Submit for Architect's approval two (2) samples of each type of specified finish and color range available.

F. Certifications: As a condition of acceptance, submit certification stating that equipment is complete and ready for intended function.
G. Informational Submittals:
1. Notice of factory testing.
2. Manufacturer’s installation, start-up and adjustment instructions.
4. Start-up report.
5. Demonstration and instruction report.
7. Operations/Maintenance Manuals: Accompanying certification, submit for Architect's review and Owner's use, complete operating and maintenance manuals that describe proper operating procedures, maintenance and replacement schedules, components parts list, including non-proprietary parts, and closest factory representative for components and service. Manual shall include non-proprietary list of all valves and other serviceable components.

1.06 REGULATORY REQUIREMENTS AND SUBSTITUTIONS

A. Regulatory:
1. Specified products, materials, or systems for Project may include engineering or on file standards required by the Regulatory Agency. Contractor’s substitution of products, materials or systems may require additional engineering, testing, reviews, approvals, assurances, or other information for compliance with Regulatory Agency requirements or both. Contractor shall provide all Agency approvals or other additional information required, and pay for additional costs required for Architect's services made necessary by the substitution at no increase in Contract Sum or schedule time, and as a part of substitution proposal.
2. When applicable, comply with:
   a. Underwriters Laboratory Standards.

B. Substitutions
1. Substitution shall not affect dimensions shown on Drawings.
2. The Contractor shall pay for changes to the building design, including engineering design, detailing, utility and service requirements, and construction costs caused by the requested substitution.
3. Substitutions shall have no adverse affect on other trades, the construction schedule, or specified warranty requirements.
4. Maintenance and service parts shall be locally available for the proposed substitution.

1.07 PRODUCT HANDLING

A. Protection: Use all means necessary to protect work of this section before, during and after installation including installed work and materials of other trades. Maintain polyethylene film or other protective covering until start-up.

B. Delivery of laboratory equipment shall occur after wet operations in building are completed.

C. Receiving, distribution, and storage areas shall be of sufficient size and capacity to accommodate crated equipment.

D. Laboratory equipment shall be stored in a ventilated area, protected from weather, with relative humidity of 50 percent or less at 70 degrees F (21 degrees C).

E. Modular Wall/Equipment Enclosure Panels:
1. Schedule delivery of modular wall system after wet operations in building are completed.
2. Provide receiving, distribution, and storage areas of sufficient size and capacity to accommodate crated modular wall system.
3. Store modular wall system in a ventilated place, protected from the weather, with relative humidity therein of 50 percent or less at 70 degrees F.
4. Protect finished surfaces from soiling and damage during handling and installation. Keep covered with polyethylene film or other protective covering.
5. Painting and Other Finishing Trades. Protect installed modular wall system from debris, paint and damage from adjoining construction work.

F. Replacement: Any damage as a result of this contractors work will be replaced, repaired and restored to original condition to the approval of the Architect at no additional cost or inconvenience to the Owner.

1.08 QUALIFICATIONS

A. Contractor for work in this section shall have an established organization and production facilities including all tools, equipment and special machinery necessary for specializing in the fabrication and installation of the type of equipment specified, with skilled personnel, factory trained workmen and an experienced engineering department. Each shall have the demonstrated knowledge, ability and the proven capability to produce the specified equipment of the required quality and the proven capacity to complete an installation of this size and type within the required time limits. Contractor and manufacturers for work of this section shall have a minimum of five years and ten installations experience installing products specified.

PART 2 PRODUCTS

2.01 LABORATORY GLASSWARE WASHERS: TALL (E-6 & E-7)

A. Manufacturers: Products, which comply with this specification section as judged and approved by the Architect, may be provided by the following manufacturers.

1. Steris Corporation, 5960 Heisley Road, Mentor, Ohio 44060, Tel: 440 354-2600. website: http://www.steris.com/
3. GetingeUSA, Inc., 1777 East Henrietta Road, P.O. Box 93070, Rochester, NY 14692, Tel: 800 541-5569. website: http://www.getingeusa.com/
5. Substitutions are not permitted.

B. Small Laboratory Glassware Washer (E-6): Basis of Design: Steris Reliance Laboratory Glassware Washer Model 400, as specified herein.

1. Dimensions:
   a. Chamber: 26 inches wide by 25 inches high by 26 inches deep (660 mm wide by 635 mm high by 660 mm deep).
   b. Exterior: 42 inches wide by 80 inches high by 31 inches deep (1067 mm wide by 2032 mm high by 787 mm deep).

2. Description: Cabinet-type washer equipped for laboratory glassware, plasticware, and metal goods. Washer shall accept up to six mixed loads of different shapes and sizes of goods at the same time.
   a. Operation:
   b. Configuration:
1) Installation: Freestanding.
2) Door: Single power operated door.
3) Type: Building steam-heated unit.

3. Construction:
   a. Materials:
      1) Washer Frame and Cabinet: Type 304 stainless steel with No. 4 finish.
      2) Chamber and Sump: Type 304 stainless steel, argon welded, with No. 4 finish.
      3) Door: Vertical sliding door of tinted, tempered glass with Type 304 stainless steel trim with No. 4 finish, argon welded.
      4) Spray system: All components of Type 304 stainless steel, including screens, rotary spray arm, pump, piping and valves.
      5) Steam Coils: Type 304 stainless steel.
   b. Features:
      1) Vertical Sliding Door(s): Power door(s) shall operate automatically by pneumatic cylinders when appropriate touch pad is pressed. Door(s) shall be equipped with sensing gasket to automatically retract (open) door if obstruction is detected in doorway. If power failure occurs, door(s) shall be manually operable. Double door configuration shall be interlocked to prevent contamination. Interlock system shall allow only one door to be opened at a time, and prevent either door from being opened when cycle is in progress, until STOP/RESET touch pad is pressed.
         a) Door Cable Safety System: If an obstruction is present when door is closing, a micro switch shall detect the obstruction and send a signal to stop pneumatic door cylinders to prevent door from closing. Door shall slowly rise. To prevent door from slamming, a double safety cable with stoppers shall be provided to stop door in case of an accidental cable breakage.
      2) Interior Light: 20-watt light, mounted within an explosion/vapor proof enclosure to illuminate the wash carrier.
      3) Spray System: Two manifold connectors, positioned on bottom of chamber, and one rotary spray arm, suspended from top of chamber. Manifold connectors shall automatically connect to accessory headers at the start of each cycle.
      4) Removable Stainless Steel Debris Screens: Two screens located in bottom of wash chamber (sump) shall prevent large debris from entering the piping system and pump. All screens shall be easily removable for cleaning.
      5) Two adjustable peristaltic pumps shall automatically dispense a selected amount of liquid chemicals (1/4 to 2 oz/US gal) (2 to 16 ml/L) into the chamber sump during desired treatment. Include 50 feet (15 m) of tubing and electrical wiring, pick-up tubes and low level sensors for remote location of chemical containers.
      6) Pump: Stainless steel pump with dual-speed (approximately 7.5/1.9 HP) (approximately 5.6/1.5 kW) motor to deliver all treatments under pressure. (High speed shall be used only with optional Multiple Level Loading System.) Mechanically sealed pump impeller, shaft and casing. Equip pump motor with totally enclosed frame, magnetic starter, overload protection and sealed bearings, requiring no periodic lubrication.
         a) High pressure rating: 242 gpm (916 L/min) at 70 ft head.
         b) Low pressure rating: 90 gpm (341 L/min) at 25 ft head.
      7) Install valve in the sump to facilitate sampling of wash and rinse water.
      8) Water Saver Feature: Programmable feature to retain water used during the final rinse treatment for reuse during the first treatment of next cycle. Water shall be retained only if no chemicals were used during the final rinse treatment and if optional drying is not selected. If retained water is too hot for reuse in first treatment of next cycle or if optional cold water pre-wash is selected, water shall be automatically drained from sump.
      9) Drain discharge cool down and cold water pre-wash. Programmable pre-wash treatment to spray load with recirculated cold tap water. At the end of each
treatment, drain discharge feature ensures water drained to the building drain system does not exceed 140 degrees F (60 degrees C).

10) Vapor Removal Fan to remove vapor from chamber throughout the cycle.

11) Resistive Temperature Devices (RTD) shall sense temperature inside wash chamber and pure water tank, and provide accurate control inputs and readouts throughout all cycles.

12) Main Power ON/OFF Switch on electrical supply box shall shut off power to the unit before servicing.

13) Service Panels on front of washer shall provide easy access to all piping, valves, electrical components and wiring. Service from back of washer is not acceptable.

14) Washer shall be pre-piped and pre-wired in the factory to require a single point of connection for each service/utility.

4. Control System:
   a. Control Panel: Consisting of vacuum fluorescent, or equivalent, display window and touch pads, to allow initiation, programming and monitoring of all cycle treatments.
   b. Integral Thermal Printer: Printer shall record of all pertinent cycle data and include automatic paper take-up. Printout shall include cycle name, starting time and date of cycle, completion time of each treatment, and a list of any cycle deviations that occurred.
   c. Cycles: Controller shall be capable of retaining in memory up to ten processing cycles, programmed, named according to user preferences.
      1) Three cycles shall be pre-programmed and adjustable for light, medium and heavy washes.
      2) Seven cycles shall be available for customized programming.
      3) Once a cycle is selected, the programmed cycle values shall be locked in and cannot be changed until cycle is complete.
   d. Cycle Descriptions:
      1) Each cycle shall be programmable with up to fifteen separate treatments. Treatments shall include pre-wash, wash, rinse, and pure water rinse. Controller shall set off visible and audible alarms on the occurrence of any cycle deviations for acknowledgement by the operator.
      2) Service Mode: Provide the following for preventive maintenance testing and troubleshooting.
         a) Built-in service diagnostic program to permit system calibration and verification of component operations.
         b) Cycle/Day Count Recall System: To remind operator when a complete preventive maintenance check is required.
         c) Descaling Cycle: To remove scale and other hard water deposits from chamber and recirculation piping without the need for additional cycle programming. Factory programmed; user modifiable.
         d) Priming Cycle: For automatic priming of chemical pump(s) on initial start-up of equipment or as needed.
   e. Provide internal battery to back-up all cycle memory for up to ten years. If a power disruption occurs during a cycle, the battery shall permit completion of cycle once power is restored.

5. Required Options and Accessories:
   a. Seismic tie down to conform to building code requirements.
   b. Non-Vented Vapor Condenser: Vapor shall be exhausted through a cold-water condenser to the room, eliminating the need for venting the unit.
   c. Drying System: Programmable drying phase to occur after the final rinse treatment of a cycle. During drying treatment, chamber air shall be heated to the selected temperature up to 240 degrees F (116 degrees C) and recirculated through the chamber and accessory headers, while a portion is exhausted to vent. Drying time shall be programmable (0-30 minutes). System shall include blower and electric heaters.
d. Universal Shelving System for 2-level cleaning capability. Removable loading shelf shall be made of 2 easily removable sections. After removal of one of these sections, the wash chamber will have a 2-level configuration, providing ultimate flexibility for processing small, medium and large glassware items simultaneously.

e. Accessory Kit:
   1) Accessories will be determined at a later time.

f. Transfer Cart for loading accessory headers into and out of washer.

6. Utility Requirements: Refer to Laboratory Equipment Schedule. Power shall be supplied from a fused disconnect switch.

2.02 Large Laboratory Glassware Washer (E-7):

A. Basis of Design: Steris Reliance Laboratory Glassware Washer Model 500, as specified herein.

1. Dimensions:
   a. Chamber: 39 inches wide by 25 ½ inches high by 26 inches deep (990 mm wide by 647 mm high by 660 mm deep).
   b. Exterior: 56 inches wide by 80 inches high by 31 ½ inches deep (1422 mm wide by 2032 mm high by 787 mm deep).

2. Description: Cabinet-type washer equipped for laboratory glassware, plasticware, and metal goods. Washer shall accept up to six mixed loads of different shapes and sizes of goods at the same time.
   a. Operation:
   b. Configuration:
      1) Installation: Freestanding.
      2) Door: Single power operated door.
      3) Type: Building steam-heated unit.

3. Construction:
   a. Materials:
      1) Washer Frame and Cabinet: Type 304 stainless steel with No. 4 finish.
      2) Chamber and Sump: Type 304 stainless steel, argon welded, with No. 4 finish.
      3) Door: Vertical sliding door of tinted, tempered glass with Type 304 stainless steel trim with No. 4 finish, argon welded.
      4) Spray system: All components of Type 304 stainless steel, including screens, rotary spray arm, pump, piping and valves.
      5) Steam Coils: Type 304 stainless steel.
   b. Features:
      1) Vertical Sliding Door(s): Power door(s) shall operate automatically by pneumatic cylinders when appropriate touch pad is pressed. Door(s) shall be equipped with sensing gasket to automatically retract (open) door if obstruction is detected in doorway. If power failure occurs, door(s) shall be manually operable. Double door configuration shall be interlocked to prevent contamination. Interlock system shall allow only one door to be opened at a time, and prevent either door from being opened when cycle is in progress, until STOP/RESET touch pad is pressed.
         a) Door Cable Safety System: If an obstruction is present when door is closing, a micro switch shall detect the obstruction and send a signal to stop pneumatic doors if cylinders to prevent door from closing. Door shall slowly rise. To prevent door from slamming, a double safety cable with stoppers shall be provided to stop door in case of an accidental cable breakage.
      2) Interior Light: 20-watt light, mounted within an explosion/vapor proof enclosure to illuminate the wash carrier.
      3) Spray System: Three manifold connectors, positioned on bottom of chamber, and two rotary spray arms, suspended from top of chamber. Manifold connectors shall automatically connect to accessory headers at the start of each cycle.
4) Removable Stainless Steel Debris Screens: Three screens located in bottom of wash chamber (sump) shall prevent large debris from entering the piping system and pump. All screens shall be easily removable for cleaning.

5) Two adjustable peristaltic pumps shall automatically dispense a selected amount of liquid chemicals (1/4 to 2 oz/US gal) (2 to 16 ml/L) into the chamber sump during desired treatment. Include 50 feet (15 m) of tubing and electrical wiring, pick-up tubes and low level sensors for remote location of chemical containers.

6) Chemical dispenser: Integral system to inject liquid detergent or other chemical into the chamber sump under program control.

7) Pump: Stainless steel pump with dual-speed (approximately 7.5/1.9 HP) (approximately 5.6/1.5 kW) motor to deliver all treatments under pressure. (High speed shall be used only with optional Multiple Level Loading System.) Mechanically sealed pump impeller, shaft and casing. Equip pump motor with totally enclosed frame, magnetic starter, overload protection and sealed bearings, requiring no periodic lubrication.
   a) High pressure rating: 242 gpm (916 L/min) at 70 ft head.
   b) Low pressure rating: 90 gpm (341 L/min) at 25 ft head.

8) Install valve in the sump to facilitate sampling of wash and rinse water.

9) Water Saver Feature: Programmable feature to retain water used during the final rinse treatment for reuse during the first treatment of next cycle. Water shall be retained only if no chemicals were used during the final rinse treatment and if optional drying is not selected. If retained water is too hot for reuse in first treatment of next cycle or if optional cold water pre-wash is selected, water shall be automatically drained from sump.

10) Drain discharge cool down and cold water pre-wash. Programmable pre-wash treatment to spray load with recirculated cold tap water. At the end of each treatment, drain discharge feature ensures water drained to the building drain system does not exceed 140 degrees F (60 degrees C).

11) Vapor Removal Fan to remove vapor from chamber throughout the cycle.

12) Resistive Temperature Devices (RTD) shall sense temperature inside wash chamber and pure water tank, and provide accurate control inputs and readouts throughout all cycles.

13) Safety Door Switch shall prevent a cycle from starting if door(s) not fully closed, and to stop the washer operation if door(s) opened during a cycle.

14) Main Power ON/OFF Switch on electrical supply box shall shut off power to the unit before servicing.

15) Key-Locked Service Panels on front of washer shall provide easy access to all piping, valves, electrical components and wiring. Service from back of washer is not acceptable.

16) Washer shall be pre-piped and pre-wired in the factory to require a single point of connection for each service/utility.

4. Control System:
   a. Control Panel: Consisting of vacuum fluorescent, or equivalent, display window and touch pads, to allow initiation, programming and monitoring of all cycle treatments.
   b. Integral Thermal Printer: Printer shall record all pertinent cycle data and include automatic paper take-up. Printout shall include cycle name, starting time and date of cycle, completion time of each treatment, and a list of any cycle deviations that occurred.
   c. Cycles: Controller shall be capable of retaining in memory up to ten processing cycles, programmed, named according to user preferences.
      1) Three cycles shall be pre-programmed and adjustable for light, medium and heavy washes.
      2) Seven cycles shall be available for customized programming.
      3) Once a cycle is selected, the programmed cycle values shall be locked in and cannot be changed until cycle is complete.
d. Cycle Descriptions:
   1) Each cycle shall be programmable with up to fifteen separate treatments. Treatments shall include pre-wash, wash, rinse, and pure water rinse. Controller shall set off visible and audible alarms on the occurrence of any cycle deviations for acknowledgement by the operator.
   2) Service Mode: Provide the following for preventive maintenance testing and troubleshooting.
      a) Built-in service diagnostic program to permit system calibration and verification of component operations.
      b) Cycle/Day Count Recall System: To remind operator when a complete preventive maintenance check is required.
      c) Descaling Cycle: To remove scale and other hard water deposits from chamber and recirculation piping without the need for additional cycle programming. Factory programmed; user modifiable.
      d) Priming Cycle: For automatic priming of chemical pump(s) on initial start-up of equipment or as needed.

 5. Required Options and Accessories:
   a. Seismic tie down to conform to building code requirements.
   b. Heated Pure Water Rinse: Programmable pure water rinse treatment to spray load with heated pure water supplied from the 316 L stainless steel storage tank, steam coil and inlet valve. Heating coil shall be located in bottom of storage tank to heat and maintain pure water temperature to 190 degrees F (88 degrees C).
   c. Non-Vented Vapor Condenser: Vapor shall be exhausted through a cold-water condenser to the room, eliminating the need for venting the unit.
   d. Drying System: Programmable drying phase to occur after the final rinse treatment of a cycle. During drying treatment, chamber air shall be heated to the selected temperature up to 240 degrees F (116 degrees C) and recirculated through the chamber and accessory headers, while a portion is exhausted to vent. Drying time shall be programmable (0-30 minutes). System shall include blower and electric heaters.
   e. Universal Shelving System for 2-level cleaning capability. Removable loading shelf shall be made of 3 easily removable sections. After removal of one or two of these sections, the wash chamber will have a 2-level configuration, providing ultimate flexibility for processing small, medium and large glassware items simultaneously.

 6. Utility Requirements: Refer to Laboratory Equipment Schedule. Power shall be supplied from a fused disconnect switch.

2.03 LABORATORY GLASSWARE WASHERS: BASE CABINET HEIGHT (E-8)

A. Manufacturers: Products, which comply with this specification section as judged and approved by the Architect, may be provided by the following manufacturers.

2. Lancer USA, Inc., 705 W. Highway 434, Longwood, FL 32750, Tel: 800 332-1855. website: http://www.lancer.com/
3. Hamo from Steris Corporation, 5960 Heisley Road, Mentor, OH 44060 Tel: 800 548-4873. website: http://www.steris.com/
4. Substitutions are not permitted.

B. Basis of Design: Miele G7893 Under-Counter Electrically Heated Glassware Washer, or equivalent, as specified herein.
1. Description: Undercounter-size glassware washer and dryer designed for laboratory use, with a minimum of nine wash programs. Washer shall be capable of direct injection washing and drying.

2. Dimensions:
   a. Chamber: 21.1 inches wide by 19.7 inches deep by 19.7 inches high (536 mm wide by 500 mm deep by 500 mm high).
   b. Overall: 23.6 inches wide by 23.7 inches deep by 32.3 to 33.5 inches high; height is adjustable (599 mm wide by 602 mm deep by 820 to 851 mm high; height is adjustable).

3. Installation Type: Undercounter installation.

4. Features and Characteristics:
   a. Interior:
      1) Sides, back, and top: Type 304 stainless steel, brushed finish.
      2) Floor and door: Type 316 or Type 304 stainless steel, polished finish.
      3) Chamber shall be laser welded with no weld marks.
   b. Exterior: Type 304 stainless steel with brushed finish.
   c. Sound Levels: 52.9 dBA average for a cycle, including drying, measured 1 m from door.
   d. Circulation Pump: 106 gpm (400 lpm), minimum, constructed of ABS plastic impeller and housing. Pump shall include speed sensor to shut down washer in event of obstruction or pump failure, and to prevent overheating.
   e. Drain Pump: Provide separate drain pump to prevent cross contamination between drain and intake cycles.
   f. Inlet Filters: Provide mesh filters for inlet hoses.
   g. Sump Filter: Four-stage sump filter, upstage of pumps, to prevent recirculation of debris. Filters shall be progressive in size with final filter of 0.25 mm mesh. Filters shall be easily removable without the use of tools.
   h. Heater rating: 6 kW.
   i. Water-Proof System: Incoming water lines shall be double-wall and be protected with electronically-activated solenoids, and shall include float sensor in washer drip pan. Float switch shall shut off incoming water and activate drain pump in the event of a leak.
   j. Steam Condenser: Provide steam condenser and send condensate to drain; no external venting shall be required.
   k. Water Softener: Provide built-in water softener with adjustable water hardness control.
   l. Unit shall be capable of accepting 18 megohm deionized water for rinse cycles without risk or damage or corrosion.
   m. Detergent Dispensers: Provide pull-out drawer for 5 l liquid detergent container and door cup for powder detergent. Detergent shall be automatically dispensed into washer. System shall include detergent level sensor and flow sensor to monitor system.
   n. Neutralizer Dispenser: Provide pump for liquid neutralizer stored external to machine. Detergent shall be automatically dispensed into washer.
   o. Cleaning Mechanism: Dual rotary spray arm located at the top and bottom of the chamber. Direct injection manifold shall be provided for upper, lower, or dual-level injection baskets, or middle rotary spray arm.
   p. Flow Meters: Provide flow meters on water supply lines for precise water fills. System shall include float switch to prevent overfill.
   q. Water Temperatures:
      1) Wash: Programmable up to 199 degrees F (93 degrees C).
      2) Final Rinse: Programmable up to 199 degrees F (93 degrees C).
      3) Temperatures shall be monitored by dual sensors for accuracy.
r. Drying System: HEPA filtered forced air-drying cycle with adjustable temperature and time. A second stage shall be programmable for cool down. Optional spindle injectors may be used to dry interior of narrow-necked glassware.

s. RS-232 port for connection to printer for monitoring/validating washer cycles.

t. Chamber Validation Port: Provide test port for monitoring chamber conditions.

u. Safety Features:
   1) Alarm: Alarm shall alert operator to machine status and error conditions.
   2) Automatic door lock to prevent door from being opened during wash routine.
   3) No door vent.
   4) Dual temperature sensors.
   5) Built-in backflow prevention.
   6) Gentle cleaning action to avoid glass breakage.
   7) Color-coded dispensing system to avoid mixing up acids and detergents.

v. Programs: 8 standard wash programs with programmable cycle times and temperatures, and 1 custom program slot.

x. Required Accessories: Provide one of each of the following for each washer:
   a. Accessories will be determined at a later date.

z. Required Options:
   a. Door cup for powder detergents.

2.04 LABORATORY GLASSWARE DRYERS: TALL (E-9)

A. Manufacturers: Products, which comply with this specification section as judged and approved by the Architect, may be provided by the following manufacturers.

1. Steris Corporation, 5960 Heisley Road, Mentor, Ohio 44060, Tel: 440 354-2600. website: http://www.steris.com/  
2. GetingeUSA, Inc., 1777 East Henrietta Road, P.O. Box 93070, Rochester, NY 14692, Tel: 800 541-5569. website: http://www.getingeusa.com/  
4. Substitutions are not permitted.

B. Basis of Design: Steris Reliance Model 1044 High Temperature Glassware Dryer, as specified herein.

1. Dimensions:
   a. Chamber: 30 inches wide by 53-3/4 inches high by 24-1/2 inches deep (762 mm wide by 1365 mm high by 622 mm deep).
   b. Exterior: 36 inches wide by 80 inches high by 32 inches deep (914 mm wide by 2032 mm high by 813 mm deep).

2. Description:
   a. Heavy duty, fully automatic dryer, utilizing forced air for drying large quantities of laboratory glassware, plasticware and metal goods. Dryer shall be capable of achieving temperatures of up to 500 degrees F (260 degrees C).
   b. Operation: During operation, a blower shall circulate hot air throughout drying chamber to efficiently dry glassware, plastic or metal goods.
   c. Configuration: Refer to Drawings for installation configuration including door swing and freestanding or recessed installation.

3. Construction and Fabrication:
   a. General: Double-wall, welded stainless steel construction to create corrosion-resistant, easy-to-clean chamber.
   b. Cabinet and Drying Chamber: Type 304 stainless steel, argon welded, with No. 4 finish.
c. Bottom Platform and Shelves: Type 304 perforated stainless steel with No. 4 finish. Provide fixed shelf 36 inches (914 mm) above floor and two removable, height-adjustable shelves.

d. Doors: Type 304 stainless steel, argon welded, with No. 4 finish. Doors shall close against a heat resistant gasket.

e. Insulation: 3 inch (75 mm) mineral wool-type on top and sides of chamber and inside door.

f. Six 1.8 kW electric heaters.

g. Electrical wiring and wire harness shall have “High Temperature” rating.

h. Control panel shall be mounted on and accessible from front of cabinet. Panel shall include illuminated start/stop pushbutton, adjustable cycle timer, and adjustable temperature controller.

1) Adjustable Digital Cycle Timer: Provide adjustable digital cycle timer to allow operator to set cycle time up to 99 hours, 59 minutes. Dryer shall shut off when set time is reached.

2) Adjustable Temperature Controller: Provide adjustable temperature controller with advanced PID control to allow operator to set drying temperature from ambient to 500 degrees F (260 degrees C). Digital temperature gauge, mounted on control panel, shall provide constant temperature monitoring.

i. Drying System:

1) Finned-strip electric coils located beneath bottom platform.

2) Recirculation blower. Blower shall run continuously when power is on. Air shall be drawn through a filter. Blower shall be rated at approximately 400 scfm (11.3 m³/min).

3) Two cooling fans shall be located in service compartment to cool recirculation blower and electrical components.

j. Serviceability: Blower, motor, and electrical components shall be easily accessed through top of dryer. Dryer shall be inter-wired for single service connection.

4. Required Options and Accessories:

a. Seismic tie down to conform to building code requirements.

b. Additional Interior Shelves: Provide two additional perforated stainless steel shelves for drying chamber.

5. Utility Requirements: Refer to Laboratory Equipment Schedule. Power shall be supplied from a fused disconnect switch.

2.05 CAGE AND BOTTLE WASHER – OSCILLATING SPRAY TYPE (E-11)

A. Manufacturers: Products, which comply with this specification section as judged and approved by the Architect, may be provided by the following manufacturers.

1. Steris Corporation, 5960 Heisley Road, Mentor, Ohio 44060, Tel: 440 354-2600. website: http://www.steris.com/

2. GetingeUSA, Inc., 1777 East Henrietta Road, P.O. Box 93070, Rochester, NY 14692, Tel: 800 541-5569. website: http://www.getingeusa.com/

3. Lynx Product Group, 650 Lake Street, Wilson, NY 14172, Tel: 716 751-3100. website: http://www.lynxpg.com/

4. Substitutions are not permitted.

B. Basis of Design: Basil Model 3700 Cage and Bottle Washer, or equivalent, as specified herein.

1. Size:

a. Chamber (nominal): 48 inches wide by 34 inches long by 31 inches high (1219 mm wide by 864 mm long by 787 mm high).

b. Overall Machine (basic, nominal): 77 inches wide by 38-1/2 inches long by 83 inches high (1956 mm wide by 978 mm long by 2108 mm high).
C. Description: A heavy duty, cabinet type hydrospray washer designed for thorough, efficient cleaning of cages, bottles, debris pans and miscellaneous items used in the care of laboratory animals. The washer shall be specifically designed to reduce energy and water consumption.

D. Configuration: Refer to drawings for door, cabinet, and recessing requirements.

E. Washing Cycles: Programmable washing cycles shall include the following options (optional cycles indicated shall be able to be programmed by the Owner):
   1. Pre-wash.
   2. Alkaline Wash.
   3. Acid Wash.
   4. First rinse, non-recirculated.
   5. Second rinse, non-recirculated.
   6. Final rinse, may be recirculated for pre-wash.
   7. Vapor exhaust.

F. Construction and Fabrication:
   1. Wash chamber, base and sump: All-welded, 12 gauge, Type 304 stainless steel, with of No. 4 finish and smooth construction without crevices or ledges for the potential build up of debris and contamination. Base and chamber sump shall be of one-piece, welded construction with the base containing integral floor gutters and floor grating supports.
   2. Chamber shall be insulated with 2 inches (51 mm) fiberglass rigid or equivalent chlorine-free rigid insulation, covered by protective 20 gauge, Type 304 stainless steel jacket, with a No. 4 finish.
   3. Noise level shall not exceed 80 dBA in cage wash areas during operation of equipment: provide vibration isolation for pumps and equipment if necessary. Mounts shall be designed to protect equipment and machinery against damaging vibration for the specified type of equipment and installation.
   4. Doors:
      a. 14 gauge, Type 304 Stainless steel with No. 4 finish, counterbalanced, vertical sliding doors, double wall reinforced construction, insulated with non-hygroscopic rigid insulation, minimum 2 inches (51 mm) thick. Provide double-glazed, tempered glass view panel to permit operator to see inside the chamber with the door closed.
      b. Hardware:
         1) Provide appropriate gasketing and sweeps to prevent leakage of water, vapors and heat. Material shall be resilient, capable of maintaining seal after long term use, such as EPDM or silicone.
   5. Service Doors: 16 gauge, Type 304 stainless steel with No. 4 finish. A top service access panel shall be provided for servicing.
   6. Trim: Type 304 stainless steel trim, with No. 4 finish, to prevent vermin intrusion between washer and adjacent modular wall or construction.
   7. All fittings, valves, threaded piping and connections shall be NPT.
   8. Piping:
      a. External Steam: Schedule 80 black iron.
      c. Internal and Recirculating Piping: Type 304 stainless steel.
      d. Drain: Type 304 stainless steel.
   9. Valves:
      a. Valves and pumps shall be non-proprietary.
      b. Valves: Provide manual ball valves on water and steam supply piping. Provide unions at service connections. Provide automatically-actuated ball valves to control the output of the jet system, drain, or detergent return system.
      c. Recirculating Valves, Drain Valves, and Components: Type 304 stainless steel.
d. Pressure Reducing Valve: Equipment shall be provided pressure reducing valves at incoming utility feeds.
e. All shut off valves shall be supplied with a minimum 3/8 inch (10 mm) hole for tagging and lock-out procedures or valve manufacturer-supplied handle locking device.

10. Water Hammer Arrester: Provide on water supply piping.
11. Washer shall be equipped with a centralized lubricating system for convenient maintenance.
12. Oscillating Jet System: Washer shall be equipped with a stainless steel oscillating jet spray system for all treatment solutions. Machined jets shall be Type 304 stainless steel and shall be mounted oscillating header along top, bottom, and sides of wash chamber. Oscillating header shall travel on self-lubricating machined wheels. Jets shall be positioned to reach all load surfaces including the underside. System shall include a safety system to prevent the oscillating header from damaging items being washed.
13. Steam Coil: 7 gauge, Type 304 stainless steel steam coil with No. 2B finish, designed to ASME Section VIII, Div. 1, Unfired Pressurized Vessel Code, with automatic temperature control to maintain temperature of the treatment solution. Steam coil shall be easily removable for maintenance. Heating system shall be complete with condensate return and steam traps.
14. Heat Exchanger/Hot Water Booster: Provide steam coil to boost incoming water temperature to 180 degrees F (82.2 degrees C). Equip with bucket trap at steam inlet.
15. Temperature Guarantee: Provide guaranteed final rinse at programmed temperature. Final rinse timer shall not begin until recirculated final rinse water reaches the set temperature.
16. Automatic Level Control: Provide automatic level control float device; sensor not acceptable. Device is for recirculating sump or staging tanks to ensure sump/tank is filled to proper level prior to pump operation. Design to prevent overfilling; include drain overflow.
17. Pump shall be appropriately sized, 7.5 hp minimum, with a mechanical seal to deliver all treatments under pressure. Pump shall be equipped with a direct reading pressure gauge.
18. Central Spray Header System: Additional vertical, stainless steel spray arm for use with processing rack accessories. Arm shall swing up and out of way, and be secured, within the chamber when not in use. An automatic shut off valve shall be provided to hold the central spray header when not in use.
19. Injection Ports: Provide one detergent injection port and dry electrical contacts for dispensing and chemical treatment pumps. Include sampling port.
20. Drain System: Drain system shall be designed to minimize potential for cross-contamination between cycles, and rapid and thorough removal of water. Residue shall be fully removed from sump before next cycle begins. Controls shall allow operator to hold or drain final rinse solution for any cycle.
   a. Debris Screen: Type 304 stainless steel, easily removable, self-cleaning debris screen.
22. Blower: Provide top-mounted stainless steel blower from exhaust chamber to building exhaust system. Blower shall be inter-wired with the microprocessor control system to exhaust residual vapors from within the wash chamber.
23. Water Saver Feature:
   a. Include water saver option if available.
24. Safety Features:
   a. Automatic Shutdown: Provided if door is opened during operation, with restart button to begin operation have door has been closed.

G. Control System:
1. Washer shall be provided with a microcomputer, touch pad control system that monitors and automatically controls all process operations and functions. Controller shall have 12 cycle menu of treatment processes to accommodate a wide variety of load and processing requirements. Provide battery backup of microprocessor memory. Treatment times, temperature settings, and other key cycle parameters shall be programmable, and have the ability to be locked by supervisor. Controller shall be non-proprietary, and shall be UL listed.

2. Control panels and electrical connections shall be water-tight and vermin-proof. Main panel shall be lockable. Control panel shall be located on washer.

3. A display screen shall display cycle program data on demand and real time in-process cycle performance.

4. Load End: Include the following features:
   a. Cycle control settings.
   b. Cycle status indicators.
   c. Cycle time settings.
   d. Cycle temperature settings.
   e. Final rinse drain or retention control.
   f. Adjustable drain time.
   g. Emergency power off button.
   h. Manual drain command.
   i. An integral impact strip chart printer shall record all cycle program and in-process performance data.
   j. Connections for treatment operation options.
   k. RS-232 port for downloading information to remote computer.
   l. Integral data collection system: Chronological performance data shall be stored for up to 90 days, nominally.

5. Unload End: Include the following features:
   a. Cycle status indicators.
   b. Visual cycle complete indicators.
   c. Emergency power off button.

6. Controller shall require a single electrical connection; provide transformer, as required.

7. Coordinate control system with Owner-supplied remote bulk detergent storage tanks.

H. Required Options and Accessories:

1. High Altitude Treatment Pump: Provide pump to enable washer operation at elevations 3000 ft. (914 m) or more above sea level.

2. Vapor Condenser: 14 gauge, Type 304 stainless steel with No. 4 finish. The washer shall be equipped with a vapor condenser to remove residual vapors from within the wash chamber and direct condensed vapors to drain.

3. Acid and Alkaline System: Provide separate liquid detergent injection pumps, detergent pick up tubes, conductivity controllers, conductivity probes, and 50 feet (15.24 m) of tubing for each system. System shall provide timed, direct injection of respective detergent into chamber sump during the acid and alkaline wash phases.

4. pH Monitoring and Neutralization System: Washer shall be equipped with control hardware and conductivity probes to monitor and control the pH level of drain discharge and the concentration of detergent being used. pH level shall be checked each time washer attempts to drain. If the discharge is within a pre-set range, the washer shall drain; otherwise, the neutralizing agent shall be injected and the solution recirculated and tested again. The process shall be repeated up to three times until all parameters are satisfied. If parameters are not satisfied after the third test, an alarm shall sound. System shall provide all controls, separate liquid neutralization injection pumps, detergent pick up tubes, and 50 feet (15.24 m) of tubing for each, acid and alkaline neutralization, pH probe, etc., and shall be inter-piped and inter-wired for automatic operation.
5. Cage Processing Rack: Stainless steel rack to process cages from 5 inches to 8 inches (127 mm to 203 mm) high. Rack shall be mounted on stainless steel casters with roller bearings.

6. Mouse Cage Processing Rack for Central Header System: Stainless steel rack to process 48 mouse cages, 7-1/2 inches wide by 11-1/2 inches long by 5 inches high (190 mm wide by 292 mm long by 127 mm high).

7. Feeder Bottle Basket: Stainless steel bottle baskets; 5 by 5 arrangement, 16 oz. (454 ml) bottles. Quantity: 12.


9. Transfer Cart.

10. Seismic tie-down kit to comply with Seismic Zone 3 and 4 requirements.

I. Utility Requirements:

1. Refer to Laboratory Equipment Schedule.

2. Washer shall be inter-piped and inter-wired so that only one connection is required for each service or utility.

2.06 HIGH PERFORMANCE CAGE AND RACK WASHER (E-10)

**Note: Bring the manufacturer of your choice to the top of the list.** While the manufacturers of this equipment would have you believe there is some mystique to their design, in reality they appear to be fairly competitive. There are, however, some differences in the options available, and features that may be standard with one manufacturer may be an option with another. Coordinate the top listed manufacturer with the Basis of Design selection below. These items are not presented here in any preferred order or bias. The spec writer is encouraged to become familiar with each manufacturer’s product and determine which is the most appropriate as the Basis of Design for each project.

A. Manufacturers: Products, which comply with this specification section as judged and approved by the Architect, may be provided by the following manufacturers.

1. Tecniplast USA Incorporated, 180 Gordon Drive, Exton, PA 19341, Tel: 484 875-0500.

2. Steris Corporation, 5960 Heisley Road, Mentor, Ohio 44060, Tel: 440 354-2600.

3. GetingeUSA, Inc., 1777 East Henrietta Road, P.O. Box 93070, Rochester, NY 14692, Tel: 800 541-5569.


B. Basis of Design: Steris 5700LSR Cage and Rack Washer, or equivalent, as specified herein.

1. Size:
   a. Chamber (nominal): 46 inches wide by 85 inches long by 84 1/4 inches high (1168mm wide by 2159mm long by 2140mm high).
   b. Overall Machine (nominal): 130 1/4 inches wide by 98 1/4 inches long by 121 inches high (3308mm wide by 2495mm long by 3073mm high).

C. Description: Pit- or floor-mounted rack and cage washer for use in sanitation of animal cages, racks, debris pans, feeder bottle, and other miscellaneous items. Washer shall be specifically designed to effectively wash loads with short cycle times reducing energy and water consumption. Washer shall incorporate storage tanks to reduce overall cycle water and energy consumption when compared to standard industry rack and cage washer.
D. Configuration: Refer to drawings for door, cabinet, and recessing requirements.

E. Mounting:

Mounting: Keep 1 of the following 2 paragraphs:

End of Mounting selection.

F. Washing Cycles: Washing cycles shall be provided as determined by the manufacturer for effective cleaning and vapor removal. Cycles shall be programmable.

Descaling Cycle: Standard from Steris and Getinge. Keep the following paragraph if dryer is included, which should be typical. It seems hard to justify a specification that would not include drying. Tecniplast claims this feature is unnecessary in their machine because they use soft water (note the requirement) which eliminates this issue.

G. Automatic descaling cycle, selectable by operator. Provide chemical injection pump with flow meter, 50 feet (15m) of tubing and pick-up tube for chemical containers.

End of Descaling cycle requirement.

H. Construction and Fabrication:

1. Wash chamber, base and sump:
   a. Chamber construction shall be welded and polished to prevent dirt traps and be leak-proof.
   b. Base and sump shall be 14 gauge (2mm), Type 304 or 316L stainless steel with No. 2B finish.
   c. Walls shall be 14 gauge (2mm), Type 304 stainless steel with No. 4 finish.
   d. Cladding, Chamber Exterior: Fully insulated, 1 inch (25mm) thick, aluminum sheathed, rigid fiberglass insulation, or expanded polystyrene insulation with stainless steel jacket, covering top and sides of chamber exterior.

2. Chamber floor: Removable stainless steel grating panels. Grating shall run lengthwise for quiet loading/unloading of cages, and include handles to facilitate removal.

3. Doors:

Doors: Doors appear to be a means of developing a signature for these manufacturers.

1st paragraph: Keep for Tecniplast, and Northwestern.
2nd paragraph: Keep for Getinge and Tecniplast.
3rd paragraph: Keep for any manufacturer.

a. Door design and construction shall be as provided by manufacturer.

End of Door design and construction selection.

Door Operation: Keep one of the following paragraphs if specification is proprietary. Door specification may not be critical for the specification of these units.

1st paragraph: Keep for Tecniplast and Northwestern.
2nd paragraph: Keep for Steris and Getinge.

b. Doors shall be automatic, powered, sliding doors. Provide door sensors to detect obstructions.

End of Door Operation selection.

Double Door Units: Keep the following for double door units.

c. Door Interlock, double door units: Shall be fitted to prevent both doors from being opened simultaneously and prevent the clean side/unload door from being opened until the cycle has been completed.

End of Double Door Interlock requirement.
4. Automatic Floor Tilt System: Standing water shall be eliminated by means of an automatic floor tilt system that shall pitch cart(s) for drainage at beginning of cycle and return to level position at completion of cycle, by the design of the floor and presentation racks, or by other means provided by the manufacturer.

5. Trim: Stainless steel trim to prevent vermin intrusion between washer and adjacent modular wall or construction.

6. Service connections and serviceable components shall be designed and located in a manner for ease of maintenance.

7. All fittings, valves, threaded piping and connections shall be NPT or tri-clamp fittings, unless specified otherwise herein.


10. Water Hammer Arrester: Provide on water supply piping.

11. Steam Coil: 7 gauge (4.75mm), Type 304 stainless steel steam coil with No. 2B finish, designed to ASME Section VIII, Div. 1, Unfired Pressurized Vessel Code, with automatic temperature control to maintain temperature of the treatment solution. Steam coil shall be easily removable for maintenance. Heating system shall be complete with condensate return and steam traps.


13. Pumps:
a. Motor shall be TEFC (drip proof) frame, with magnetic starter, overload protection and sealed bearings requiring no lubrication.

b. Impeller, shaft, and casing shall be Type 316L stainless steel, fitted with a mechanical seal.

c. High pressure and suction pumps shall be Type 316L stainless steel.

14. Heat Exchanger/Hot Water Booster: Provide Type 304 stainless steel, inline steam-to-water heat exchanger to boost incoming water temperature to 50 degrees to 80 degrees F (10 degrees to 27 degrees C). Equip with bucket trap at steam inlet.

15. Rinse Water Pre-Heat System: Provide steam coil in rinse tank to pre-heat water prior to final thermal rinse phase.

Mobile Mechanical Core: Keep the following when Steris is the only allowable manufacturer/bidder.

Flexible Hose Connection: Keep the following if Steris will be included as a possible manufacturer/bidder. Steris provides the mechanical core as a mobile unit. This specification is not intended to direct the manufacturer to provide a mobile or fixed mechanical core.

a. Flexible Hoses for Utility Connections: If a movable mechanical core is provided, flexible hoses for water and steam utility supply piping shall be provided, allowing mechanical core to be moved up to 25 inches (635mm) away from chamber without need to disconnect utilities to facilitate servicing. Provide quick connects and purge valves for easy and safe connections.

16. Oscillating Spraying System: Two horizontally mounted, Type 304 stainless steel spray headers, one on each side of wash chamber to optimize load coverage and cycle time. Horizontal spray headers shall alternate movement vertically. Oscillating spray system shall be designed to ensure constant and consistent coverage of the load.

17. Noise level shall not exceed 80 dBA in cage wash areas during operation of equipment: provide vibration isolation for pumps and equipment if necessary. Mounts shall be designed to protect equipment and machinery against damaging vibration for the specified type of equipment and installation.

18. Chamber Rails: Provide Type 304 stainless steel rails in chamber interior to protect oscillating jets from damage.

19. Chamber Light: Provide two exterior-mounted, fluorescent lamps or similar long-life light sources, with sealed tempered glass window to washing chamber.

20. Electronic Temperature Control: Provide Resistive Temperature Device (RTD) sensors or thermocouples to provide accurate control inputs and readouts. RTD sensors shall be located in-line, prior to spray jets.

21. Sampling Port: Provide sampling port to allow operator to safely collect samples of wash or rinse water for titration purposes or verification of rinsing efficacy.

22. Temperature Guarantee: Provide guaranteed final rinse at programmed temperature. Final rinse timer shall not begin until recirculated final rinse water reaches the set temperature.

23. Integral Self-Priming Automatic Chemical Dispenser: Provide pumps to dispense pre-determined amount of liquid chemical into wash solution staging tank(s). Detergent injection system shall be capable of being calibrated. Chemical containers may be stored up to 25 feet (7.62m) from washer using 50 foot (15.24m) long color-coded tubing extension.

End of Flexible Hose Connection option.
End of Mobile Mechanical Core option.

Second Detergent System: Review this feature with Owners Representative prior to selecting – allows for acid wash or disinfection cycle.

End of Second Detergent System option.

pH Neutralization System: The following paragraph should generally be kept. There may be cases where the owner is insistent that it is not required, but it is more efficient to treat the effluent at the washer than in the building lab waste neutralization system.

24. pH Neutralizing System: pH neutralizing system shall include a Type 316L stainless steel mixing pump, a pH controller, a pH probe, and alarm. System shall neutralize effluent before discharging it to ensure that it is within a programmable pH range.
25. Drain System: Drain system shall be designed to minimize potential for cross-contamination between cycles, and rapid and thorough removal of water. Residue shall be fully removed from sump before next cycle begins. Controls shall allow operator to hold or drain final rinse solution for any cycle.
   a. Debris Screen: Type 304 stainless steel, easily removable, self-cleaning debris screen.

Drain Discharge: Keep 1 of the following 2 paragraphs. Wash effluent should not be discharged to sewer at temperatures above 140 degree F (60 degree C).

1st paragraph: This option simplifies injects cold water to cool the effluent.
2nd paragraph: This option requires a chilled water connection, but offers a temperature guarantee. Advise Mechanical Engineer if you would like to specify this option. This option will consume less water.

b. Guaranteed Drain Discharge Cool Down System with Chilled Water: Washer shall be equipped with a Type 304 stainless steel electropolished finished surge tank, two water level sensors, and a chilled water heat exchanger to guarantee that no effluent is discharged to drain if the temperature is above 140 degrees F (60 degrees C). Chilled water shall be automatically circulated in a stainless steel coil inside the tank to cool the effluent until the setpoint is achieved. Effluent shall then be discharged to the building drain.

End of Drain Discharge options.

26. Tool-less, Self-Cleaning Filter: Filter shall be cleaned by recirculating solutions through filter before being directed to storage tank(s). Filter cartridge shall be easily removable for servicing or replacement. Filter shall have 1/32 inch (0.79mm), maximum, filter hole diameter. Filter shall be flushed for cleaning between each cycle phase.

27. Vent Damper: Provide automatically-actuated vent damper in exhaust line for vapor removal. Provide a set of dry contacts in control panel for connection under Division 25. Contacts shall be controlled by the automatic exhaust cycle of the washer. Coordinate damper with building exhaust ductwork.

Blower/Exhaust Fan: Keep the following paragraph if option is required. Review with mechanical engineer.

28. Blower/Exhaust Fan: Provide top-mounted stainless steel blower from exhaust chamber to assist building exhaust system in evacuating vapor from chamber. Blower shall be inter-wired with the microprocessor control system to exhaust residual vapors from within the wash chamber.

End of Blower/Exhaust Fan option.

Drying System: We should always specify the capability for drying the load. Note that Tecniplast’s system is their Steam Sanitization system (it uses very dry steam) and requires a clean steam generator, which, in turn, requires additional utilities. Note available from Northwestern.

29. Non-Recirculated, Vented Drying System: System shall dry processed load at completion of each cycle. Fresh, heated, HEPA filtered air shall be blown at high velocity into wash chamber to dry the load. Dry air shall be evacuated through the chamber vent.

End of Dry System option.

Heat Recovery System: For the drying system, the incoming air can be pre-heated to reduce the energy required to heat the air. It is recommended when the drying system is specified and only applies when the drying system is specified.

30. Heat Recovery System: Air to supply drying system shall be pre-heated by recovered heat to reduce the energy required to heat the air during the drying phase.

End of Dry Heat Recovery System option.

Steam Sanitizing Option: This feature is unique to Tecniplast. This is also how Tecniplast provides a drying system. Since we will always want a drying system, we should allow for this in the spec under the drying description, but if you want to make the spec proprietary just for Tecniplast, you can include this paragraph. Tecniplast’s system requires clean steam; thus, a clean steam generator.

End of Steam Sanitization option.
Pure Water Final Rinse Option: This feature is not typically specified, but is available: it will reduce the mineral deposits on the load. Advise Plumbing Engineer if you intend to specify this option.

End of Pure Water Final Rinse option

I. Safety Features:

1. Emergency Exit: Upon activation of emergency stop button, emergency stop cable or bars, or equivalent, door shall be easily opened, manually, from inside or outside allowing emergency exit from wash chamber.
2. Safety Door Switch: Provide microswitch requiring door(s) to be completely closed to start or continue operations.
3. Interior Shut Down System: Red cable mechanism or stainless steel bars on each side of chamber interior to immediately shut down operation if pulled.
4. Emergency Stop Button: Red button at each door of washer to immediately cease all washer operations. Button must be pulled out to restart operations.
5. Interior chamber light shall flash indicating cycle start, followed by a pause prior to initializing of wash cycle

J. Control System:

Controller: At this time the manufacturers are only providing these with their preferred controller (Tecniplast uses Siemens, Northwestern uses Omron, Steris uses Allen Bradley, Getinge uses their own PACS 3000) and it is not appropriate to specify a particular controller manufacturer that they are not prepared to incorporate. Generally, specifying a controller other than that preferred by the manufacturer will result in some loss of features.

1. Washer shall be provided with a microcomputer, touch pad PLC control system that monitors and automatically controls all process operations and functions. Cycle menu shall have four factory-set adjustable cycles for rodent cages, bottles, rabbit cages, and primate cages, and allow for a minimum of four additional cycles for customized programming. Provide battery backup of microprocessor memory. Treatment times, temperature settings, and other key cycle parameters shall be programmable, and have the ability to be locked by supervisor. Controller shall be UL listed.
2. Control panels and electrical connections shall be water-tight and vermin-proof. Main panel shall be lockable. Control panel shall be located on washer, unless indicated otherwise on drawings.
3. A display screen shall display cycle program data on demand and real time in-process cycle performance.
4. Security Access Codes shall provide restricted access of unauthorized users.
5. Provide an Ethernet port for remote monitoring and troubleshooting.
6. Load End: Include the following features:
   a. Cycle control settings.
   b. Cycle status indicators.
   c. Cycle time settings.
   d. Cycle temperature settings.
   e. Final rinse drain or retention control.
   f. Adjustable drain time.
   g. Emergency power off button.
   h. Manual drain command.
   i. An integral impact strip chart printer shall record all cycle program and in-process performance data.
   j. Connections for treatment operation options.
   k. Integral data collection system: Chronological performance data shall be stored for up to 90 days, nominally.
7. Unload End: Include the following features:
   a. Cycle status indicators.
b. Visual cycle complete indicators.
c. Emergency power off button.

8. Controller shall require a single electrical connection; provide transformer, as required.

K. Options and Accessories required to be provided:

1. **Leveling Adjustment:** Provide adjustable mechanism to level the machine.

Floor-Mounted Ramps: Keep the following if machine is floor-mounted.
End of Floor Mounted Ramp option.

Barrier Wall Flange: The following is recommended for all recessed installations, but is not required in modular wall installations.
End of Barrier Wall Flange option.

Programmable Self-Start: This feature is available from Tecniplast, Steris and Northwestern can provide, though there may be some safety concerns; other manufacturers should be able to provide this.
End of Programmable Self Start option.

Air Compressor: Keep the following if there is no building compressed air system. Note that mechanical system control air may be sufficient for this use, if available (100 psi). Compressed air may not be required by all manufacturers, but is typically required for double door units, as a minimum. If house compressed air is not available, it is recommended to include the following paragraph.
End of Air Compressor option.

VHP Decontamination Option: This feature can be provided by Tecniplast, Northwestern, and Steris.
End of VHP Decontamination option.

Chemical Fogging Option: This feature is unique to Tecniplast.
End of Chemical Fogging Decontamination option.

Rodent Cage Rack: This is a feature that may be included, unless the Owner will purchase directly.
Specify the quantity of racks to be provided. Confirm the number of racks with the Owner. If manifold coupling and central spray header are being specified, two racks will be required for each load.
End of Rodent Cage Rack option.

2. **Rodent Cage Presentation Rack:** Stainless steel rack to process up to approximately 90 mouse cages, 30 rat cages, cage tops, or feeder tops. Rack shall be mounted on autoclavable casters with roller bearings. Quantity: 6.
End of Rodent Cage Rack option.

Manifold Coupling System: Keep the following paragraph when accessory is specified. This is a Steris, Northwestern, and Getinge feature, not available from Tecniplast. This single feature exposes a weakness in Tecniplast’s design. With this feature, Steris can accommodate almost twice the number of cages as Tecniplast, and wash bottles. Without this feature, Tecniplast IWT does not have the capability to wash bottles, arguably to get the Owner to purchase their bottle washing system.
End of Manifolded Coupling System option.

Central Spray Header: This is available from Steris and should be specified with most units if Steris is the basis of the specification. This should also be included for Getinge-based specifications, though Getinge incorporates this feature in the rodent rack. It must now doubles the washer capacity, well beyond the number of cages Tecniplast can process in a load.
End of Central Spray Header option.

3. **Manifold Coupling System:** Automatic floor coupling system provided to automatically divert solution to an accessory manifolded or cart processing.
End of Manifolded Coupling System option.

Rack Flushing System: This is a feature that can be specified when Tecniplast or Steris are the Basis of Design. Keep the following paragraph when accessory is specified.
End of Rack Flushing System option.

4. **Central Spray Header System:** Stainless steel cage rack for processing up to 184 standard mouse cages. Rack shall be mounted on stainless steel casters and roller bearings and automatically couple to manifolded rack coupling system.
End of Central Spray Header option.

Rack Flushing System: This is a feature that can be specified when Steris, Northwestern, or Getinge are the Basis of Design. Keep the following paragraph when accessory is specified.
End of Rack Flushing System option.

Bottle Carts: This is a feature that can be specified when Steris, Northwestern, or Getinge is the Basis of Design. Keep the following paragraph if bottles will be washed in washer.

End of Bottle Rack option.

Bottle Baskets: This is a feature that can be specified when Steris, Northwestern, or Getinge is the Basis of Design. Keep 1 of the following 4 paragraphs. Owner may provide baskets; if not, verify preferred arrangement with Owner.

7. Feeder Bottle Basket: Stainless steel bottle baskets; 5 by 5 arrangement, 16 oz. (454ml) bottles. Quantity: to match capacity of feeder bottle rack.

8. Feeder Bottle Basket: Stainless steel bottle baskets; 5 by 5 arrangement, 8 oz. (227ml) bottles. Quantity: to match capacity of feeder bottle rack.

End of Bottle Basket options.

Universal Cage and Pan Presentation Rack: Stainless steel cart to hold up to approximately 54 mouse cages or 36 rat cages. Cart shall be mounted on stainless steel casters with roller bearings. Quantity: 2.

End of Universal Cage and Pan Rack option.

Pan Cart: Keep the following paragraphs if required.

End of Pan Rack option.

Seismic attachment: keep the following paragraph in seismic zones 3 and 4.

10. Seismic tie-down kit to comply with local code requirements.

End of Seismic Attachment option.

L. Utility Requirements:

1. Refer to Laboratory Equipment Schedule.
2. Washer shall be inter-piped and inter-wired so that only one connection is required for each service or utility.

2.07 BOTTLE FILLER: BATCH TYPE (E-12)

A. Manufacturers: Products, which comply with this specification section as judged and approved by the Architect, may be provided by the following manufacturers.

1. Steris Corporation, 5960 Heisley Road, Mentor, Ohio 44060, Tel: 440 354-2600. website: http://www.steris.com/
2. GetingeUSA, Inc., 1777 East Henrietta Road, P.O. Box 93070, Rochester, NY 14692, Tel: 800 541-5569. website: http://www.getingeus.com/
3. Lynx Product Group, 650 Lake Street, Wilson, NY 14172, Tel: 716 751-3100. website: http://www.lynxpg.com/
4. Substitutions are permitted subject to Section 01 63 00.

B. Basis of Design: Steris Basil Model 1000 Feeder Bottle Filler, as specified herein.

C. Description:

1. Batch type, manifold type filler designed for filling basket loads of feeder bottles used in the care of laboratory animals.
2. Automatic operation: Filler shall be equipped with a solenoid water valve and push button reset timer for automatic operation. Electrical control panel shall contain main power switch, push button reset timer, and operational lights. Control panel shall be capable of being mounted to the right of left side of the splash hood.
3. Manual operation: Provide a quick operating valve to supply water to the manifold header.
D. Dimensions: Overall Filler: 26 inches wide by 46 inches long by 62 inches high (660 mm wide by 1168 mm long by 1575 mm high).

E. Filler Head Configuration: Provide two interchangeable manifolds: one with 4 by 6 jets, and one with 5 by 5 jets.

F. Construction:
   1. Structure: Drain pan and legs shall be constructed of 14 gauge Type 304 stainless steel with a No. 3 or 4 finish and integral, watertight welds. Legs shall be provided with adjustable leveling feet.
   2. Valves and Piping: Type 316 stainless steel. Provide filler with quick-connect attachment for interchanging manifolds. Provide quick operating 1/4 turn stainless steel valve with Teflon seals and seats for controlling water supply to header.
   3. Pressure Reducing Valve: Equipment shall be provided pressure reducing valves at incoming utility feeds.
   4. Conveyor: CPVC rollers on Type 304 stainless steel conveyor frame and basket storage.
   5. Bottle Basket: Type 304 stainless steel, fully welded, sized for bottle filler. Provide one for each filler head configuration indicated.
   6. Seismic Tie Down Kit: Designed and selected to meet jurisdictional seismic codes.

G. Utility Requirements: Refer to Laboratory Equipment Schedule.

2.08 BEDDING DISPENSER: FREESTANDING CABINET TYPE (E-13)

A. Manufacturers: Products, which comply with this specification section as judged and approved by the Architect, may be provided by the following manufacturers.
   1. Steris Corporation, 5960 Heisley Road, Mentor, Ohio 44060, Tel: 440 354-2600. website: http://www.steris.com/
   2. GetingeUSA, Inc., 1777 East Henrietta Road, P.O. Box 93070, Rochester, NY 14692, Tel: 800 541-5569. website: http://www.getingeusa.com/
   3. Lynx Product Group, 650 Lake Street, Wilson, NY 14172, Tel: 716 751-3100. website: http://www.lynxpg.com/
   4. Substitutions are permitted subject to Section 016300.

B. Basis of Design: Steris Basil Model 9600 Bedding Dispenser, as specified herein.

C. Description: Semi-automated unit designed to dispense bedding into two (2) rodent cages simultaneously as they are placed in the unit. The dispenser shall be capable of handling most chip-type, free flowing solid bedding as currently used in the care of laboratory animals.

D. Dimensions:
   1. Overall Machine: 92-1/2 inches high by 34 inches deep by 40 inches wide (2350 mm high by 864 mm deep by 1016 mm wide).
   2. Maximum Cage: 13 inches high by 13 inches wide (330 mm high by 330 mm wide).

E. Construction:
   1. Structure: All structural support shall be stainless steel. All sprockets, shafts, chains, etc. shall be carbon steel.
   2. Hoppers: Storage bins shall be 14 gauge (2.0 mm thick) stainless steel. Total hopper capacity shall be a minimum of 15 cubic feet (425 l).
   3. Work Surface: Stainless steel 3/8 inch (10 mm) diameter welded rod grid designed to permit the dumping of bagged bedding through the grid to the storage bin. Grid shall be easily removable for cleaning or maintenance.
4. Exhaust and Dust Collection System: Provide exhaust fan, exhaust duct and dust collector to remove dust generated by filling operation and eliminate need for connection to building exhaust system. System shall be electrically connected to the bedding dispenser. Dust collector shall produce have a maximum noise level of 78 dB.

5. Controls: Main power on-off switch for bedding transfer system, and a method for precise metering and distribution of bedding.

6. Pressure Reducing Valve: Equipment shall be provided pressure reducing valves at incoming utility feeds.

F. Required Options:

1. Seismic Tie Down Kit: Designed and selected to meet jurisdictional seismic codes.

G. Utility Requirements: Refer to Laboratory Equipment Schedule.

2.09 BEDDING DISPOSAL CONTAINMENT CABINET (E-14)

A. Manufacturers: Products, which comply with this specification section as judged and approved by the Architect, may be provided by the following manufacturers.

1. Labconco Corporation, 8811 Prospect Ave., Kansas City, MO 64132, Tel: 800 821-5525. website: http://www.labconco.com/
2. NuAire, 2100 Fernbrook Lane, Plymouth, MN 55447, Tel: 800 328-3352. website: http://www.nuaire.com/
3. The Baker Company, 161 Gatehouse Road, Sanford, ME 04073, Tel: 800 992-2537. website: http://www.bakerco.com/
4. Substitutions are not permitted.

B. Basis of Design: Labconco PuriCare Bedding Disposal Station.

C. Description: Specially designed ventilated enclosure offering personnel protection while performing rodent cage changing.

D. Dimensions:

1. Overall Machine: 36 inches wide by 35 inches deep by 75.5 inches high.

E. Materials:

1. Sheet Steel: 18 gauge, cold-rolled, carbon steel sheet.
2. Stainless Steel Sheet: Type 304 stainless steel with No. 4 finish.
3. Finish (on sheet steel): Baked Urethane or Epoxy powder coating; color to be selected from manufacturer’s standard options.

F. Construction:

1. Filter: HEPA filter exhaust (99.99 percent efficient on 0.3 microns). Provide pre-filter and activated sorbent odor removal filter. Filters shall be removable from front.
2. Work Surface: Stainless steel with opening in work surface to waste receptacle below.
5. Waste receptacle on casters.
8. 10 foot power cord.

G. Utility Requirements: Refer to Laboratory Equipment Schedule.
2.10 CAGE CHANGING STATION (E-15)

A. Manufacturers: Products complying with this specification may be provided by the following manufacturers. All products specified in this section shall be provided by a single manufacturer.
1. NuAire, 2100 Fernbrook Lane, Plymouth, MN 55447, Tel: 800 328-3352. website: http://www.nuaire.com/
2. Labconco Corporation, 8811 Prospect Ave., Kansas City, MO 64132, Tel: 800 821-5525. website: http://www.labconco.com/
3. The Baker Company, 161 Gatehouse Road, Sanford, ME 04073, Tel: 800 992-2537. website: http://www.bakerco.com/
4. Substitutions are not permitted.

B. Basis of Design: NuAire Model 612-400 Dual Access, as specified herein.

C. Description: Specially designed ventilated enclosure offering personnel protection while performing rodent cage changing.

D. Dimensions:

E. Materials:
1. Sheet Steel: 18 gauge, cold-rolled, carbon steel sheet.
2. Stainless Steel Sheet: Type 304 stainless steel with No. 4 finish.
3. Finish (on sheet steel): Baked Urethane or Epoxy powder coating; color to be selected from manufacturer’s standard options.

F. Construction:
1. Filter: HEPA filter exhaust (99.99 percent efficient on 0.3 microns). Provide pre-filter and activated sorbent odor removal filter. Filters shall be removable from front.
2. Work Surface: Stainless steel with opening in work surface to waste receptacle below.
6. 10 foot power cord.

G. Utility Requirements: Refer to Laboratory Equipment Schedule.

2.11 ICE MAKER (E-16)

A. Manufacturers: Products, which comply with this specification section as judged and approved by the Architect, may be provided by the following manufacturers.
1. Hoshizaki America, Inc. 618 Hwy 74, South Peachtree, GA 30269, Tel: 800 438-6087. website: http://www.hoshizakiamerica.com/
2. Scotsman, 775 Corporate Woods Parkway, Vernon Hills, IL 60061, Tel: 800 726-8762. website: http://www.scotsman-ice.com/
3. Manitowoc, 2110 S. 26th St., Manitowoc, WI 54220, Tel: 800 545-5720. website: http://www.manitowocice.com/
4. Substitutions are permitted subject to Section 01 63 00.

B. Ice Flaker and Storage Bin:
1. Basis of Design: Hoshizaki F-801M Ice Flaker and B-700SF Storage Bin, as specified herein.
2. Description:
   a. Ice flaker with stainless steel auger and storage bin.
   b. **Overall Dimensions:** 71 7/8 inches high by 44 inches wide by 32.5 inches deep.
   c. Finish: stainless steel with No. 4 finish.
3. Flaker:
   a. Ice Producing Capacity: **720 lbs of flaked ice in 24 hours.**
   b. Compressor Unit: Water-cooled.
4. Ice Storage Bin:
   a. Description: **550 lbs. capacity ice storage bin.**
5. Utility Requirements: Refer to Laboratory Equipment Schedule.

2.12 MODULAR WALL/EQUIPMENT ENCLOSURE PANELS (E-17)

A. Manufacturer:
   2. Substitutions are permitted subject to Section 01 63 00.

B. Description: Prefabricated enclosure system to surround sterilizing, washing and related equipment. Enclosure may include front wall or back and side walls in any combination. Enclosure shall conceal equipment body, piping, wiring, and other appurtenances, confine excessive equipment heat and vapor to enclosure area, and provide a finished wall appearance to complement the equipment and adjacent surfaces.

C. Materials:
   1. Panels: 18 gauge (1.3mm thick), Type 304 stainless steel.
   2. Trim angles and corner posts: 16 gauge (1.6mm thick), Type 304 stainless steel.
   3. Access doors: Insulated sandwich panel consisting of 18 gauge (1.3mm thick) exterior panel and 20 gauge (1.0mm thick) interior panel, Type 304 stainless steel.
   4. Finish: No. 3 or No. 4; finish shall match adjacent equipment.
   5. Louvers: 18 gauge (1.3mm thick), Type 304 stainless steel.
   6. Insulation: Closed-cell, flexible, elastomeric insulation, sheet or roll, black in color: Armacell AP/Armaflex SA, or equal. Insulation shall be manufactured without the use of CFC’s, HFC’s, or HCFC’s. Insulation shall be formaldehyde-free, low VOC’s, fiber free, dust free, and resistant to mold and mildew. Insulation shall be bonded to metal surface.
      a. Density: 3 to 6 lbs/cu ft (48kg/m³ to 96kg/m³).
      b. Thickness: 3/4 inch (19mm).
   7. Column Support: Refer to Slotted Channel Framing specification in Section 12 35 53.

D. Construction:
   1. Box-shaped panels, finished on face side and insulated on reverse side. Pre-drilled for connecting hardware. Provide insulation to the backside of all panels, trim angles, and corner posts. Provide insulation between the two panels of the access doors. Corners shall be tack welded. Panel construction shall including framing and stiffening as necessary to prevent “oil canning” or deflection of panel between supports.
   2. Refer to details and plans on the drawings.
   3. Vertical Panels: Panels shall cover the areas between pieces of equipment; supported by support posts. Provide leveling shims to accommodate uneven floors.
   4. Column Supports: Support columns shall provide rigidity for vertical panels. Anchored to building structural ceiling and bolted to vertical panels.
   5. Horizontal Panels: Panels enclose openings remaining in the wall after equipment has been set in place.
   6. Trim Angles: Trim angles conceal clearance openings between modular wall and adjacent building walls and ceiling.
7. Access Doors: Provide cylinder lock keyed to building system. Refer to plans for door swing. Provide gasketing to prevent vermin intrusion.

8. Horizontal Support Angles: Bolt horizontal support angles to top of horizontal and vertical panels to provide a surface to which ceiling trim angles can be connected. Support angles also provide additional support to entire wall.

9. Corner Post: Provide corner posts at junction of two faces of modular walls.

10. In areas where panels are designed to enclose cage wash or sterilizer service areas, modular wall shall extend 6 inches (152mm) above ceiling with remainder of wall extending above ceiling to underside of structure to be USG Fiberock Sheathing Aqua Tough gypsum board, or equivalent.

E. Access Door Hardware:

1. Hinge: Continuous, stainless steel with stainless steel pin.

2. Latch: Sliding flush style, push to close latch; Southco, Inc. Model B7-50-501-10. Latch shall have steel housing and mounting trimplate with black, powder coat finish. Slide shall be black nylon. Mounting hardware shall be steel with zinc coating or plating.

2.13 PROCEDURE LIGHTS (E-19)

A. Manufacturers: Products complying with this specification may be provided by the following manufacturers.

1. Steris Corporation, 5960 Heisley Road, Mentor, Ohio 44060, Tel: 440 354-2600. website: http://www.steris.com/

2. Getinge Inc. (ALM series), 1777 East Henrietta Road, P.O. Box 93070, Rochester, NY 14692, Tel: 800 541-5569. website: http://www.getingeusa.com/

3. Substitutions are permitted subject to Section 01 63 00.

B. Basis of Design: AMSCO Examiner 10 Lighting Fixture, or equivalent, as specified herein.

C. Description:

1. Examination Light, Single Head:
   a. Light assembly consisting of single head unit on a center ceiling mount and extension arm. Beam intensity 3200fc, radiant energy not over 18,600 microwatts per sq. cm. at 42 inches (1067 mm) below rim.

D. Standards:

1. Illuminating Engineering Society (IES).


E. Features and Characteristics:

1. Mounting: Ceiling mounted, single fixture, with horizontal suspension arm extension. Provide post and finish canopy. Mount light suspension system to a structural steel support using a mounting plate furnished with light assembly.

2. Lighthead suspension system shall be designed for limitless and continuous positioning without binding or drifting.

3. Horizontal Extension Arm: Arm shall allow continuous rotational movement about the mounting point. Horizontal arm pivot joint shall allow vertical positioning of approximately 40 degrees up from the joint and 45 degrees down from the joint, and allow for 360 degree rotation in the horizontal plane around the joint.

4. Optical System:
   a. Lamp: 150 watt tungsten-halogen lamp rated at 500 hours. Color temperature: 4,400 degrees Kelvin

   b. Lighthead Reflector: Dichroic-coated reflector assembly.
c. Lens shall be of optical grade polycarbonate, sealed to prevent dust accumulation on the system’s optics.

F. Electrical Requirements: 120V AC, 60Hz, hard wire connection.

G. Seismic Tie Down: Mounting shall be designed to comply with local code requirements.

H. Accessories required:
   1. 14 inch (356 mm) Extension.
   2. Sterile Handle Kit (one per lighthead).

I. Utility Requirements: Refer to Laboratory Equipment Schedule.

2.14 ISOLATION CUBICLES (E-21)

A. Manufacturers: Products complying with this specification may be provided by the following manufacturers.
   2. LGL, 721 Peach Creek Cutoff Road, College Station, TX 77845, Tel: 979-690-3434 website: http://www.lglacp.com/isolation_cubicle.htm
   3. Substitutions are not permitted.


C. Description:
   1. Animal isolation Cubicle with telescoping door:
      a. Unit dimensions: 84”w x 48”d x 108”h.
      b. Clear door opening: 72” x 84”

D. Features and Characteristics:
   2. Interior lighting: 4' WR fluorescent fixtures mounted on inside of cubicle door columns w/ automatic controls for setting of day/night cycles.
   4. Divider Walls:
      a. Provide 1 ½” thick divider walls between cubicles.

E. Electrical Requirements: 120V / 20A NEMA L5-20 twist lock connection.

F. Utility Requirements: Refer to Laboratory Equipment Schedule.

2.15 INDIVIDUALLY VENTILATED CAGE RACK SYSTEMS (E-24, E-25, E-26)

A. Manufacturers: Products complying with this specification may be provided by the following manufacturers.
   1. Lab Products, Inc. P.O. Box 639, Seaford, DE 19973 Tel: 800 526-0469.
   2. Tecniplast USA, P.O. Box 1457, Exton, PA 19341 Tel: 877 669-2243.
   3. Allentown, Inc., P.O. Box 698, Allentown, NJ 08501 Tel: 609 259-7951.
   4. Substitutions are not permitted.

B. Basis of Design: Lab Products Super Mouse 750 System.

C. Description:
1. Model 75070AR - 70-Cage Single-Sided rack (E-24)
3. Model 750140AR - 140-Cage Double-Sided rack (E-26)

D. Quantities:
1. Provide minimum quantity of cages in each room as indicated on the Drawings. Refer to Bid Submittal Requirements.
2. Extra Stock: Provide additional cages equal to 33 percent of the total number of each type of cage indicated on the Drawings.

E. Cage Dimensions:
1. Mouse Cages:
   a. Cage Floor Area: 75 square inches, minimum.
   b. Cage Height: 5 inches, minimum.

F. Materials and Construction:
1. Cage Rack:
   a. 304 stainless steel; all joints fully and continuously welded and ground smooth; bead blast or No. 4 finish.
   b. Casters: Minimum 5 inch diameter, autoclavable, swivel casters with grease zerk and brakes. Stainless steel with non-scuff molded rubber tires that do not discolor or damage floor surfaces. Pair of casters on one end shall be locking type.
   c. Ventilation:
      1) Blower/Fan Mounting: Racks shall be designed for wall-mounted blowers/fans units on the supply side of the rack. Units to be wall-mounted above rack.
      2) Supplier to provide wall-mounted fan unit support for each blower/fan unit.
      3) Racks and caging systems shall be designed to operate under positive or negative relative pressurization.
      4) Ventilation Ducts/Plena: Design for optimal air circulation and static pressure and easily cleanable; capable of withstanding frequent disinfecting and washing in a rack washer with maximum temperature of 200 degrees F.
      5) Filters:
         a) Provide HEPA filters on rack supply air.
      6) Exhausts shall be direct-connected to the house exhaust system.
      7) Exhaust requirements: 70 cfm for 140 cage unit; 55 cfm for 70 & 80 cage units.
   2. Animal Cage:
      a. Molded transparent, Udel® polysulfone capable of withstanding frequent autoclaving without the plastic surface or transparency changing in such a manner as to make the plastic brittle. Cage design shall easily stack and lift without binding or catching during robotic automation operation.
      b. Alternate transparent plastic caging materials with a heat deflection temperature of 345ºF may be considered. Bidders must submit product information at time of Bid for consideration.
      c. Cage Top: Transparent top of the same material as the cage.
      d. Accessories: Provide the following:
         1) Type 304 electropolished stainless steel wire bar lid with feed hopper and water bottle holder.
         2) Cage Card Holder.
   3. Balancing Valves:
      a. Provide racks with IRIS dampers at each supply and exhaust connection.
      b. Provide with magnehelic differential pressure gages for flow indication.
   4. Load Simulators: Provide to allow temporary disconnection of racks from system without creating a path of least resistance.

G. Noise Levels:
1. Maximum noise level generated from the cage rack fans shall be 50 dBA. Within the octave band 32 kHz, maximum noise level shall be 45 dBA. These noise requirements shall apply when taking measurements inside the animal cages.
2. Maximum level of noise generation in the cage room shall be 50 dBA.
3. Noise caused by equipment vibration is not permitted.

H. Electrical Requirements: Rack blowers shall operate at 120V.

PART 3 EXECUTION

3.01 PREPARATION

A. Coordinate with Divisions 22, 23 and 26 for location, size, and type of mechanical, power and communications services required.

B. Before shipping, equipment shall be cleaned inside and outside, be free of rust, loose scale, and other deposits. Finished surfaces shall be protected to prevent shipping and/or storage damage. All threaded connections, flanges, and couplings shall be protected.

C. Equipment to be disassembled before shipment to allow for rigging through a 72 inch by 84 inch (1825mm x 2130mm) door frame at the job site. Delivery shall be coordinated so that equipment can be positioned in-place prior to installation of door frames of smaller dimensions.

D. Equipment to be securely crated and/or packaged to prevent damage during shipment. Loose parts shipped inside of the unit shall be secured.

E. The vendor shall be responsible for delivery of the unit(s) to the job site, setting the equipment in place, unpacking and reassembly.

F. The vendor shall verify that required utilities are available, in proper locations, and ready for use.

G. Beginning of installation means acceptance of existing conditions by the vendor.

H. Upon unpacking of the equipment, the vendor shall remove all debris, crating material and packaging from the location.

3.02 SITE CONDITIONS

A. Inspection: Prior to installation of laboratory equipment, carefully inspect the installed work specified in other Sections and verify that all such work is complete to the point where this installation may properly commence.

B. Discrepancies: In the event of discrepancy, immediately notify the Architect.

3.03 EXAMINATION

A. Examine surfaces designated to receive work for conditions that would adversely affect the finished work. Repair or replace surfaces not meeting tolerances or quality requirements governing substrate construction prior to start of work.

B. Verify that surfaces, prepared openings, or support structures are ready to receive work.

C. Verify field measurements and opening dimensions are as instructed by manufacturer.
D. Inspect and verify that the required utilities are available, in proper locations and ready for use, prior to equipment installation.

3.04 WORK REQUIRED OF OTHER SECTIONS PRIOR TO INSTALLATION

A. Install shutoff valves on service lines.

B. Install fused disconnect switches (with lockout in OFF position) in electric supply lines near the equipment.

C. Provide building service lines supplying specified pressures and flow rates.

D. Provide illumination of service area, with provision of convenience outlet for maintenance.

3.05 INSTALLATION

A. General:
   1. Equipment shall be installed by personnel approved by the manufacturer.
   2. Install all equipment per manufacturer's recommendations and reviewed submittals.
   3. Properly align and position all equipment.
   4. Refer to Section 01 45 00 for Quality Control of Installation.
   5. Manufacturer’s Field Services:
      a. Refer to Section 01 45 00.
      b. Provide manufacturer’s field services to supervise installation. Manufacturer’s personnel shall be on site prior to installation to inspect field conditions and make preparations for installation. Installation shall under the direct supervision of the manufacturer’s personnel until the completion of initial start up.
   6. Repair or remove and replace defective Work as directed by the Architect.

B. Vivarium Washers:
   1. Installer shall be responsible for any and all on-site assembly and installation including shipping, unloading, rigging, set-in-place, assembly, leveling, interconnections, hook-up to building utilities, start-up and testing.
   2. Coordinate with Divisions 22, 23, and 26 the installation and location of building services for equipment, such as isolation valves, vacuum breakers, fused disconnect switches, and floor drains.
   3. Ducted ventilation to the exterior of the building shall slope towards the washer with drip legs at low points.
   4. With Owner’s Representative, operate washer and test full range of cycles and preprogrammed parameters over a minimum period of 30 hours to verify operation. At a minimum, washers shall match their performance during the factory inspection, including target cycle times. All safety devices shall be challenged. Record all test data onto start-up log and checklist to be supplied to the owner after completion of start-up.
   5. Cover washer, piping and controls after installation, to protect against dust and damage until Date of Substantial Completion.

C. Modular Wall/Equipment Enclosure Panels:
   1. Protect finished surfaces from soiling and damage during handling and installation. Keep covered with polyethylene film or other protective covering.
   2. Bolt panels to adjacent panels through pre-drilled holes. Bolt channel clips to underside at top and bolt to support column at rear.
   3. Install ceiling trim angles using expansion shields and screws.
   4. Anchor vertical panels to floor with expansion bolts.
5. Protect installed modular wall system from debris, paint, and damage in the course of the construction sequence.

D. Connection to Building Systems: Refer to Laboratory Plumbing and Electrical drawings and Divisions 22, 23, and 26 for final connections.

3.06 START UP AND TESTING

A. Test, clean, and adjust equipment and apparatus installed to ensure performance meets specified requirements.

B. Operate each unit and test full range of cycles over a continuous period. Record test data.

C. Adjust and re-test any units not meeting requirements.

D. Refer to Section 01 75 00.

3.07 DEMONSTRATION AND INSTRUCTIONS

A. Refer to Section 01 79 00 for equipment specified in Part 2.

B. Test equipment prior to demonstration. Ensure equipment, including specified accessories, is operational.

C. Provide demonstration of equipment operation and instruction of Owner’s personnel.

D. Demonstration operating capability of equipment and systems. Include control and safety features, and service and maintenance procedures.

E. Engage services of qualified instructor to instruct and train Owner's operating and maintenance personnel in operation, service, and maintenance of equipment. Provide at least two hours of instruction for each type of equipment.

3.08 SYSTEM VALIDATION

A. Refer to Section 01 75 00.

3.09 CLEANING AND PROTECTION

A. All equipment shall be protected before, during and after installation. Protect from paint, debris, and damage in the course of the construction sequence. Damage to material due to improper protection shall be cause for rejection.

B. Packaging and debris and other waste resulting from installation of equipment shall be removed.

C. At no time shall worker use the installed equipment as a work bench, scaffolding, or for other uses.

D. Clean finished equipment, touch up as required and remove and refinish damaged or soiled areas.

E. Prior to final acceptance by the customer, any external soiled surfaces shall be cleaned.
SECTION 11 53 13
FUME HOODS AND EXHAUST DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Chemical Fume Hoods, including bench mounted hoods, and floor-mounted hoods, (all to be high performance/low velocity hoods).

B. Fume Extractor Arms (Snorkels).

C. Backdraft Perfusion Stations

1.02 UNDIVIDED RESPONSIBILITY

A. Unless specified otherwise, because of special coordination requirements, the scope of work described in this Section shall be provided by the supplier of the Section 12 35 53 scope of work.

1.03 RELATED WORK SPECIFIED IN OTHER SECTIONS

A. Canopy hoods and low slotted exhausts are specified in Section 12 35 53 under Stainless Steel Fabrications.

1.04 DESCRIPTION

A. Provide fume hoods, complete with accessories as described herein, and shown on Laboratory Furnishings drawings.

B. Fume hoods with accessories shall be pre-piped and pre-wired.

1. Pre-pipe service fittings to single point connection for each service at 6 inches (150 mm) above top of hood or as otherwise shown. Cup sink tailpiece shall be provided with fume hood. Refer to Section 11 53 43 and details on Laboratory Furnishings drawings for service fittings. P-trap, waste piping and tailpiece extensions for cup sinks, if required, shall be furnished and installed by Division 22. Comply with Division 22 requirements for piping and installation requirements.

2. Pre-wire all electrical devices to junction box at top of hood. Provide wire terminal blocks and terminal identification. Comply with Division 26 requirements for electrical work. Lighting fixtures, electrical outlets, switches, wiring, terminal blocks, terminal boxes, safety alarms and other electrical devices mounted on or in fume hoods shall be approved for use in any Class 1, Division 2 locations indicated on the drawings.

3. Work of this Section requires close coordination with Work of Divisions 22, 23, 25 and 26, as well as installation of Owner furnished components and Work specified in other Sections. Sequence all Work to ensure an orderly progress in the project without removal of previously installed Work and so as to prevent damage to finishes and products.

1.05 REFERENCES

B. Work shall conform to the recommended practices of the Scientific Equipment and Furniture Association (SEFA), current version, except as superseded by this specification:
   1. SEFA 1 - Fume Hoods.
   2. SEFA 2 - Installation.
   3. SEFA 3 - Laboratory Work Surfaces.
   4. SEFA 7 - Fixtures.
   5. SEFA 8 W - Laboratory Grade Wood Casework.
   6. SEFA 8 M - Laboratory Grade Metal Casework.


D. American National Standards Institute/American Industrial Hygiene Association (ANSI/AIHA) Z9.5 “Standard for Laboratory Ventilation.”


F. American Conference of Government Industrial Hygienists (ACGIH) “Industrial Ventilation.”

1.06 SUBMITTALS WITH PROPOSAL

A. Description of hoods, including construction details, materials, gauges, sash lock and release procedure, hardware cut sheets, piping of equipment and description of re-lamping procedures.

B. Statement giving face velocity, operating volume and pressure drop at operating sash position for each size hood.

C. Description of proposed factory dynamic testing procedures.

1.07 SUBMITTALS

A. Submit as specified herein and under provisions of Section 01 33 00.

B. Materials List/Product Data: Submit complete materials list, including catalog data of all materials, equipment, fan curves, test designs, performance charts, and products for Work specified in this Section.

C. Shop Drawings:

   1. Submit complete shop fabrication and installation drawings, including plans, elevations, sections, dimensions, materials and metal gauge sizes, details, fittings, duct connections, power an control wiring diagrams, schedules, and steam table piping and vents from cabinets below where applicable. Show relationship to adjoining materials and construction. Shop Drawings shall be in the form of reproducibles or photocopies, not to exceed 11 inches by 17 inches (A3) in size. Blueline prints are not acceptable.

   2. Coordinate shop drawing submittals of both this Section and Section 12 35 53 so that each recognizes and incorporates each others products.

D. Submit detailed anchorage and attachment drawings and calculations provided by a licensed Structural Engineer complying with the applicable Building Code seismic restraint requirements.

   1. Fume hoods shall be designed and anchored in accordance with IBC 2000 Seismic Design Category C requirements.
E. **Samples:** Submit two (2) samples of each type of specified finish and color range available, or as identified in the Finish Schedule.

F. **Certification:** Submit certification by an independent testing company stating that equipment is installed per applicable and referenced codes and standards, adjusted and balanced for design operations, and is complete and ready for intended function.

1. Certify that fume hoods will not exceed design maximum at specified operating conditions.

G. **“As Manufactured” (AM) Fume Hood Testing in Manufacturing Facility:** Provide certification that each type and size of fume hood has achieved an AM performance rating equal or better than 0.05 ppm with 4.0 Lpm tracer gas release rate when tested in accordance with ASHRAE 110-1995.

H. **Fume Hood Sound Level Certification:** Provide certification of fume hood compliance with design criteria for maximum allowable noise within laboratories.

1. For fume hoods operating with a face velocity of 100 fpm, test data of octave band analysis verifying hood is capable of a 50 NC value when connected to a 50 NC HVAC source. Measurements shall be taken 36 inches (915 mm) in front of open sash, 60 inches (1.524 m) above the floor, at 100 fpm (0.51 m/s) face velocity.

2. For fume hoods operating with a face velocity of 125 fpm, test data of octave band analysis verifying hood is capable of a 50 NC value when connected to a 50 NC HVAC source. Measurements shall be taken 36 inches (915 mm), 60 inches (1.524 m) above the floor, in front of open sash at 125 fpm (0.64 m/s) face velocity.

I. **Operations/Maintenance Manuals:** Accompanying certification, submit for Architect's review and Owner's use, complete operating and maintenance manuals that describe proper operating procedures, maintenance and replacement schedules, component parts list, wiring diagrams, and closest factory representative for components and service.

1. Videotape showing recommended operation and maintenance of each type of hood specified.

1.08 **MOCK-UP:** Refer to Section 01 45 00.

A. Construct a full-scale, non-working mock-up of designated fume hoods at the designated on-site mockup during the design phase. Mockup drawings delineating scope and responsibilities have been issued.

B. Approved mock-up may be installed as part of the work.

C. Fume hoods designated for mock up are:

1. CFH60HVa (5' benchtop CFH)

1.09 **QUALITY ASSURANCE**

A. Coordinate work of this Section with Section 12 35 53 Laboratory Casework and Furnishings.

B. Provide interface products of style, material, finish, and color in order to produce a homogenous installation.

C. Fume Hoods shall be UL tested and labeled and conform to Class A requirements of ANSI Z9.5 Laboratory Ventilation.
1.10 QUALIFICATIONS

A. Fume Hood Manufacturer:

1. Work in this Section shall be manufactured by a firm having a minimum eight years documented experience, and an established organization and production facilities including all tools, equipment and special machinery necessary for specializing in the fabrication and installation of the type of equipment required with skilled personnel, factory trained workmen and an experienced engineering department. Each shall have the demonstrated knowledge, ability and the proven capability to produce the specified equipment of the required quality and the proven capacity to complete an installation of this size and type within the required time limits.

2. Manufacturer shall maintain a factory test facility which provides variable exhaust and make-up air control. Test facility shall contain, as permanent equipment, ANSI/ASHRAE 110 testing equipment as specified for performance testing.

PART 2 PRODUCTS

2.01 ACCESSIBILITY FOR THE PHYSICALLY DISABLED

A. Where indicated on Laboratory Furnishings drawings, fume hoods shall be furnished and installed in a manner to make them accessible to the disabled in accordance with the Americans with Disabilities Act and any state or local building code or regulation having jurisdiction. The height of the highest point of access to the work surface above finished floor shall not exceed 34 inches. Fittings for piped services and electrical receptacles shall be of a design and in a location in order to be considered accessible.

2.02 EXHAUST REQUIREMENTS

A. Refer to Exhaust Schedule for requirements.

B. Fume hoods and exhaust devices shall be designed to operate safely within the values provided on the Exhaust Schedule. The airflow values provided on the Exhaust Schedule represent the total airflow through the fume hood or exhaust device, including the airflow through the sash or work opening, airfoil, bypass, and leakage, respectively, as they apply to particular devices. Exhaust devices shall operate at specified face velocity within total airflow scheduled.

C. Proposed modifications or corrections shall be reviewed and approved by Laboratory Planner and Mechanical Engineer for any device that requires adjustment to operate within specified design requirements.

2.03 CHEMICAL FUME HOODS

A. Manufacturers: Products complying with this specification may be provided by the following manufacturers. All chemical fume hoods shall be the product of a single manufacturer.


2. Mott Manufacturing Limited. 452 Hardy Road, P. O. Box 1120, Brantford, ON, Canada N3T 5T3 Tel: 519 752-7825. website: [http://www.mott.ca](http://www.mott.ca)

3. Bedcolab Limited, 2305 Francis-Hughes Avenue, Laval QC Canada H7S 1N5 Tel: 514 384-2820 website: [www.bedcolab.com](http://www.bedcolab.com)

4. Substitutions are not permitted.
B. Underwriters Laboratory Listing: Fume hoods shall be UL subject 1805 classified. Label shall be attached to the face of each fume hood indicating classification to the UL 1805 standard for Laboratory Fume Hoods.

C. Materials: The following materials shall be provided, unless superseded by the requirements listed below for specific fume hood types.

1. Steel:
   a. ASTM A366 high quality, cold rolled, mild steel, and free from rust, scale, scratches, buckles, ragged edges, and other defects.
   b. Minimum Thickness: 18 gauge (1.2 mm).

2. Stainless Steel:
   a. Type 304, ASTM 240, with exposed surfaces ground and polished to a No. 4 finish.
   b. Minimum Thickness: 16 gauge (1.6 mm).
   c. Welding: All stainless steel welding material shall be of similar type to sheet material. Welds shall be made without discoloration, ground, polished, and passivated to blend with a No. 4 finish.

3. Liner and Baffle:
   a. Typical: Glass-reinforced polyester panel, flame-retardant and self-extinguishing with smooth finish and white color. Flexural strength: 14,000 psi (96.53 mPa). Flame spread: 15 or less per U.L. 723 and ASTM E84-80. Baffle shall be same material as liner. Liner thickness: 3/16 inch (4.76 mm); baffle thickness: 1/4 inch (6.35 mm), minimum. Liner performance characteristics shall be as specified below.

4. Glass: 7/32 inch (5.56 mm) laminated safety glass. Glass shall not be etched with manufacturer’s name, logo, or any other permanent markings, other than to identify the glass as safety glass. Light fixture lens may be tempered safety glass. Safety glass shall be in compliance with ANSI Z97.1.

5. Sash Guides: Extruded PVC.

6. Sash pull: Full width corrosion-resistant steel with chemical resistant powder coating, stainless steel, or plastic.

7. Gaskets: White 70 durometer PVC for interior access panels. Gasket interior access panels to eliminate air leakage and to retain liquids inside hood.

8. Fasteners:
   a. Exterior structural member attachments: Sheet metal screws, zinc plated.
   b. Exposed exterior fastening devices shall be corrosion-resistant, non-metallic material; exposed screws are not acceptable.
   c. Interior fastening devices: Except where specifically allowed by this Specification, interior fastening devices shall be concealed; exposed screws are not acceptable. (Screw head “caps” not acceptable.)

9. Instruction Plate: Corrosion resistant or plastic plate attached to the fume hood exterior with condensed information addressing the recommended locations for apparatus and accessories, baffle settings, if adjustable, and use of sash.

D. Construction:

1. Superstructure: Rigid, self-supporting assembly of double wall construction, maximum 4 7/8 inch (124 mm) thick. Wall shall consist of a sheet steel outer shell and a corrosion resistant inner liner, and shall house and conceal steel framing members, piping, wiring, attaching brackets, and remote operating service fixture mechanisms and services. Panels shall be attached to a full frame construction, minimum 14 gauge (2.0 mm) galvanized members. Panels and brackets attached to eliminate screw heads and metallic bracketry from hood interior. Front panels shall be factory-punched for service fittings, electrical, control, and monitoring equipment. Provide stainless steel or epoxy- or urethane-coated plug buttons for holes not used.

2. Access Panel: Access to fixture valves and piping concealed in wall shall be through flush access panels on the inside liner walls, or through removable front posts. Panels shall be secured with fitted gasket, tamperproof, epoxy- or urethane-coated, countersunk, flat head
screws, or similar method, providing a tight fit. Hook and loop type attachments and panels held by gravity are not acceptable.

3. Baffle Adjustment: Baffles shall be remotely adjustable. The adjustment control shall be operable from outside the hood without exposing the user to the hood interior environment and, for ADA compliant hoods, shall be within the reach of a wheelchair bound operator. Baffles shall be removable for cleaning.

4. Ceiling Closure Panels: Provide 18 gauge (1.27 mm) steel paneled enclosure from top of hood to the ceiling. Enclosure shall include hinged door to access hood lighting fixture. Finish shall match superstructure exterior. Panels shall terminate 1 inch below finished ceiling, where provided, or at 9'-0" above finished floor where there is no finished ceiling.

5. Vertical Sash Enclosure:
   a. Fume hoods shall be provided with sash enclosures, gasketed or sealed penetrations and connections, as required, which limit air leakage to 1 percent of the design air flow quantities indicated on the Exhaust Schedule. Fume hood manufacturer shall remain responsible for achieving the required capture velocity at the specified operating sash height.
   b. Provide sheet metal enclosure to completely encase vertically operated or combination sashes when sash is in the full open position.
   c. Enclosure shall prevent air of fume leakage above the fume hood.
   d. Enclosure shall be easily removed and replaceable to allow access to light fixture housing.

6. Bypass Grill: Low-resistant type 18 gauge (1.27 mm) steel with upward directional louvers. Alternative bypass solutions are acceptable; manufacturer shall notify Contractor and Architect/Engineer/Laboratory Planner of alternative solutions and verify solution is coordinated.

7. Trim and Side Panels: Provide matching steel trim and side panels, as required, to finish any openings around and between hoods. Finish shall match superstructure exterior.

8. Finished Back: Provide for any fume hood where back of hood is exposed to view. 18 gauge (1.27 mm) steel sheet. Finish shall match superstructure exterior.

9. Exhaust Collar:
   a. Provide contoured 20 gauge (7.1 mm) exhaust collar and transition piece, if necessary, to receive circular exhaust duct connection by Division 23. Collar and transition piece shall receive urethane powder coating. Collar shall be stainless steel if hood has stainless steel liner.

10. Cup Sink:
    a. Rectangular with raised rim, color to match work surface, size in accordance with drawings. Comply with Section 11 53 43 requirements.
    b. For floor-mounted hoods, wall-mounted oval molded black epoxy resin complete with strainer, outlet and wall mounting bracket. Comply with Section 11 53 43 requirements.
    c. Raised Rim Height: 1/4 inch (6.35 mm).

11. Piping shall be as specified in Division 22 for respective system.

12. Service Fittings: As shown on Laboratory Furnishings Drawings and specified in Section 11 53 43, factory-installed and complete with all gaskets, grommets and sleeves.

13. Alarm and Controls: Coordinate cut outs for fume hood alarm and controls to be provided under Division 25. All cut outs for alarm and controls shall be made in the factory; field cutting is not acceptable.

14. Electrical Receptacles:
    a. Flush mounting, 120V/20A duplex type, single gang, NEMA 5-20R, 3-wire, grounding type receptacle, one per side, or as indicated on the Laboratory Furnishings Drawings, with brushed stainless steel cover plate.
    b. Flush mounting, 208V/20A single gang, NEMA 6-20R, 3-wire, grounding type receptacle, one per side, or as indicated on the Laboratory Furnishings Drawings, with brushed stainless steel cover plate.
c. Color: Receptacles shall be brown with hoods painted dark colors and white for hoods painted white, off white, grey, yellow, or similar colors.

15. Interior Hood Lighting:
   a. Lighting within hood shall be provided by a protected fluorescent lighting fixture with two lamps (32W T8, electronic ballast, rapid start) operated by an exterior switch with stainless steel cover plate located on the face of the fume hood. Lamp size shall not exceed 48 inches; provide multiple fixtures as required.
   b. Provide safety glass panel cemented and vapor-tight sealed to the hood roof.
   c. Light level: Average light level on the work surface shall be 80 footcandles (860 lux), minimum.
   d. Relamping shall be achieved from outside the hood enclosure.
   e. Light fixture shall be U.L. Listed.
   f. Color: Switch shall be brown with hoods painted dark colors and white for hoods painted white, off white, grey, yellow, or similar colors.

16. Safety label: Provide self-adhesive polyester label, as described on the drawings. Labels shall indicate safe operating conditions with respect to fume hood sash position. Labels solely indicating 100 fpm face velocity sash position are not acceptable. Manufacturer: Lab Safety Supply Inc., P. O. Box 1368, Janesville, WI 53547 Tel: 800 356-0783, or approved substitution.

17. Hood Finish: Fume hood finish shall comply with SEFA 8 M Cabinet Surface Finish performance requirements.

18. Exterior Color: As selected by Architect from manufacturer's full color line and complying with finish requirements.

19. Lattice Rod Assemblies: Provide where indicated on the drawings.
   a. Manufacturers: Products complying with this specification may be provided by the following manufacturers. All products specified in this section shall be the provided by a single manufacturer.
      1) Water Saver Faucet Co., 701 West Erie Street, Chicago, IL 60610 Tel: (312) 666-5500. - website: http://www.wsflab.com/
      2) Chicago Faucets, 2100 South Clearwater Dr., Des Plaines, IL 60018 Tel: (847) 803-5000. website: http://www.chicagofaucets.com
      3) Manufacturer of fume hoods.
      4) Substitutions are permitted subject to Section 01 63 00.
   b. Fume Hood-Mounted 1/2 inch (12.7 mm) Diameter Aluminum Lattice Rod Assembly:
      1) Rack assembly:
         a) Rods: 1/2 inch (12.7 mm) diameter extruded solid aluminum rods, 12 inches (305 mm) on center, horizontally and vertically. Lengths as required such that vertical rods are 4 inches (100 mm) from the rear baffle of the fume hood.
         b) Rod Clamps, closed style, adjusted with Allen wrench. Provide at each rod intersection.
         c) Flange: Aluminum adjustable flange, adjusted with Allen wrench, side wall mounted.
   20. Through Port: Provide where indicated on the drawings.
       a. 3 inch (76 mm) inside diameter threaded polypropylene or polyolefin sleeve with threaded pipe flanges and end caps. Provide rubber membrane inside each end cap with radiating cuts to allow for easy passage of cords and tubing.

E. High Performance/Low Velocity Chemical Fume Hoods:
   1. Basis of Design: Hamilton Products, a part of Thermo Fisher Scientific, Concept Hood, or equal, as specified herein.
   2. Drawing designations:
      a. 8' benchtop = CFH96HVa
      b. 6' benchtop = CFH72HVa
      c. 5' benchtop = CFH60HVa
3. Depth: 28 inches (711 mm) interior, 37-1/4 inches (946 mm) exterior, nominal.
4. Design:
   a. Restricted bypass fume hoods for variable air volume or constant volume exhaust systems with airfoil. Bypass shall be sufficient in size to allow 25 percent flow with sash closed. Bypass must be achieved through low resistance opening at top of front lintel panel. Bypass shall be designed to provide a smooth down flow effect.
   b. Design fume hoods for consistent and safe air flow through the hood face. Negative variations of face velocity shall not exceed 20 percent of the average face velocity at any designated measuring point as defined in this section.
      1) Fume hoods shall be designed to operate safely at face velocities between 60 feet per minute (0.30 m/s) and 100 feet per minute (0.51 m/s).
5. Work Surface: 1-1/4 inch (32 mm) dished epoxy resin, as in compliance with Section 12-35.53 requirements. Color: Dark Khaki #20 by Epoxyn.
6. Downdraft bypass: Low resistant type, 18 gauge (1.27 mm) steel chamber; directional louvers are not acceptable. All bypass air shall enter top of bypass chamber and enter hood in a downflow direction. Chamber shall protect user from expelled particulate in the event of an adverse internal reaction.
7. Airfoil: The airfoil shall allow ample room for electrical hospital grade cords to fit beneath the airfoil. Sill must pivot forward to provide cord and trough access. Bottom horizontal foil shall provide nominal 1 inch (25.4 mm) bypass when sash is in the closed position. Bottom foil shall not be removable without use of special tools. Airfoil shall be steel with urethane or epoxy powder coating.
   a. Sill shall consist of a half-round bullnose on front edge. Airfoil and sill to be flush with the height of the work surface; airfoil sills that are not flush with the top plane of the work surface dish are not acceptable. A secondary containment trough shall be located in front of the work surface and extend below the airfoil sill.
8. Fume hood sash (Combination horizontal/vertical): Provide vertical and horizontal sash access with a 35 inch (890 mm), nominal, high sight line. Sash shall be top hung on nylon tired stainless steel ball bearing wheels. Sash frame on bottom and sides must be no more than 1-1/2 inch (38 mm) thick and radiused to minimize turbulence. Area above the 28-1/2 inch (724 mm), nominal, vertical sash opening shall be glazed with a minimum of 3/8 inch (9.53 mm) thick laminated safety glass. All glass to have polished exposed edge treatment. Horizontal panels provided with finger pulls.
9. Counter balance system: Single weight, sprocket and chain, counter balance system to prevent sash tilting and permit ease of operation at any point along full width pull. Maximum 7 pounds (3 kg) pull required to raise or lower sash throughout its full length of operating sash opening. Design system to hold sash at any position without creep and to prevent sash drop in the event of chain failure. Sash shall open and close against rubber bumper stops.
   a. Sash shall have the capability to be raised to full 28-1/2 inch (724 mm), nominal, vertical opening for loading or unloading of large apparatus.
   b. Sash shall lower automatically to the operating position when released from any position above 18 inches (457 mm).
10. Sash Stop: Rubber bumper stops to allow manual override with automatic reset for an 18 inch (457 mm) sash opening.

F. High Performance/Low Velocity Floor-Mounted Fume Hoods:
1. Basis of Design: Hamilton Products, a part of Thermo Fisher Scientific, Concept Hood, or equal, as specified herein.
2. Drawing designations:
   a. 8' floor-mounted = FMFH96xDA
3. Depth: 35-1/2 inches (902 mm) interior, 44-1/2 inches (1130 mm) exterior, nominal.
4. Design:
   a. Restricted bypass fume hoods for variable air volume or constant volume exhaust systems with airfoil. Bypass shall be sufficient in size to allow 25 percent flow with...
sash closed. Bypass must be achieved through low resistance opening at top of front lintel panel. Bypass shall be designed to provide a smooth down flow effect.

b. Design fume hoods for consistent and safe air flow through the hood face. Negative variations of face velocity shall not exceed 20 percent of the average face velocity at any designated measuring point as defined in this section.

1) Fume hoods shall be designed to operate safely at face velocities between 60 feet per minute (0.30 m/s) and 100 feet per minute (0.51 m/s).

5. Downdraft bypass: Low resistant type, 18 gauge (1.27 mm) steel chamber; directional louvers are not acceptable. All bypass air shall enter top of bypass chamber and enter hood in a downflow direction. Chamber shall protect user from expelled particulate in the event of an adverse internal reaction.

6. Fume hood sash (Combination horizontal/vertical): Provide vertical and horizontal sash access with a 35 inch (890 mm), nominal, high sight line. Sash shall be top hung on nylon tired stainless steel ball bearing wheels. Sash frame on bottom and sides must be no more than 1-1/2 inch (38 mm) thick and radiused to minimize turbulence. Area above the 28-1/2 inch (724 mm), nominal, vertical sash opening shall be glazed with a minimum of 3/8 inch (9.53 mm) thick laminated safety glass. All glass to have polished exposed edge treatment. Horizontal panels provided with finger pulls.

7. Counter balance system: Single weight, sprocket and chain, counter balance system to prevent sash tilting and permit ease of operation at any point along full width pull. Maximum 7 pounds (3 kg) pull required to raise or lower sash throughout its full length of operating sash opening. Design system to hold sash at any position without creep and to prevent sash drop in the event of chain failure. Sash shall open and close against rubber bumper stops.

a. Sash shall have the capability to be raised to full 28-1/2 inch (724 mm), nominal, vertical opening for loading or unloading of large apparatus.

b. Sash shall lower automatically to the operating position when released from any position above 18 inches (457 mm).

8. Sash Stop: Rubber bumper stops to allow manual override with automatic reset for an 18 inch (457 mm) sash opening.

9. Work Surface: Removable Type 304 stainless steel vertically adjustable work surface for use at 18 inch (457 mm) or 36 inch (915 mm) height.

10. Fume Hood Floor: Provide 14 gauge (2.0 mm) Type 316L stainless steel fume hood floor with raised lip at sash opening. Lip shall have chamfered corners. Stainless steel shall have a No. 4 finish.

G. Fume Hood Liner Test: Polyresin

1. Test No. 1: Spills and Splashes:
   a. Suspend a 42 inches (1067 mm) by 12 inches (305 mm) panel (42 inch (1067 mm) dimension horizontal) in a position to expose the surface to be tested in a vertical plane. Divide the panel vertically into 3/4 inch (19 mm) spaces.
   b. Using an eyedropper, apply five drops of each reagent as listed.
   c. Liquid reagents shall be applied at the top of the panel and permitted to flow down full panel height. (CAUTION! Flush away any reagent drops.)

2. Test No. 2: Fumes and Gases:
   a. Prepare a panel 24 inches (610 mm) by 12 inches (305 mm) by dividing panel into 2 inch (51 mm) squares. Using 100 ml beakers, place 25 ml (approximately 1/2 inch (13 mm) of reagent) into each beaker. Place beakers in position so that test panel may be placed over beaker tops in the proper sequence. Place panel over beakers. Note: Beaker pouring lip permits atmospheric oxygen to enter and participate in the reaction of the reagent fumes.
   b. After a 24 hour time period has elapsed, remove panel, flush off with water, clean with naphtha and detergent, rinse and wipe dry. Evaluate.

3. Evaluating Ratings:

<table>
<thead>
<tr>
<th>Rating</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No effect. No detectable change in the material surface.</td>
</tr>
</tbody>
</table>
1 Excellent  Slight detectable change in color or gloss but no change in function or life of the surface.
2 Good  A clearly discernable change in color or gloss but no significant impairment of surface life or function.
3 Fair  Objectionable change in appearance due to discoloration or etch, possibly resulting in deterioration of function over an extended period of time.
4 Failure  Pitting, cratering, or erosion of the surface. Obvious and significant deterioration.

4. Performance: Test results shall equal or exceed the following:

<table>
<thead>
<tr>
<th>Reagent</th>
<th>% by wt.</th>
<th>Spills</th>
<th>Fumes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetic acid, glacial</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Acetone</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Acid dichromate</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Ammonium hydroxide</td>
<td>28%</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Amyl acetate</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Benzene</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Butyl alcohol</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Carbon tetrachloride</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Chloroform</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Chromic acid, saturated</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Cresol</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Dichloro acetic acid</td>
<td>93%</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Dimethyl formamide</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Dioxane</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Ethyl acetate</td>
<td>0</td>
<td>0</td>
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</tr>
<tr>
<td>Ethyl alcohol</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Ethyl ether</td>
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<td>0</td>
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</tr>
<tr>
<td>Formaldehyde</td>
<td>37%</td>
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<td>0</td>
</tr>
<tr>
<td>Formic Acid</td>
<td>88%</td>
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<td>0</td>
</tr>
<tr>
<td>Furfural</td>
<td>3</td>
<td>0</td>
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</tr>
<tr>
<td>Gasoline</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Hydrochloric acid</td>
<td>37%</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Hydrofluoric acid</td>
<td>48%</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Hydrogen peroxide</td>
<td>30%</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Methyl alcohol</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Methyl ethyl ketone</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Methylenne chloride</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Monochlorobenzene</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Naphthalene</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Nitric acid</td>
<td>20%</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Nitric acid</td>
<td>30%</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Nitric acid</td>
<td>70%</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Phenol</td>
<td>85%</td>
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<td>1</td>
</tr>
<tr>
<td>Phosphoric acid</td>
<td>85%</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Silver Nitrate</td>
<td>10%</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Sodium Hydroxide</td>
<td>10%</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Sodium Hydroxide</td>
<td>20%</td>
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<td>0</td>
</tr>
<tr>
<td>Sodium Hydroxide</td>
<td>40%</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Sodium Hydroxide Flake</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Sodium Sulfide, saturated</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Sulfuric acid</td>
<td>33%</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Sulfuric acid</td>
<td>77%</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Reagent</td>
<td>% by wt.</td>
<td>Spills</td>
<td>Fumes</td>
</tr>
<tr>
<td>-------------------------------</td>
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<tr>
<td>Zinc Chloride</td>
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</table>

Note: Maximum concentration is to be understood unless a lower concentration is shown in the table.

2.04 FUME EXTRACTOR ARMS (SNORKELS) (E-18)

A. Manufacturers: Products complying with this specification may be provided by the following manufacturers. All snorkel fume extractors shall be the products of a single manufacturer.

3. Airflow Systems, Inc., 11370 Pagemill Road, Dallas, TX 75243 Tel: 214 503-8008. Website: [http://www.airflowsystems.com/](http://www.airflowsystems.com/)
4. Substitutions are permitted subject to Section 01 63 00.

B. Basis of Design: Nederman Miniair F100, self-supporting tubing and inlet accessory, or approved equal, as specified herein.

1. Fume extractor shall be constant volume device with no manual damper.
2. Extraction Arm:
   a. 57 inch (1.448 m) long tubing with three mechanical joints.
3. Extraction Arm Diameter:
   a. 4 inches (102 mm).
4. Construction:
   a. Anodized aluminum pipes with white polypropylene joints. Base shall be polyamid.
5. Ceiling Mounting:
   a. White powder coated steel ceiling column with side-mounted 4 inch (102 mm) duct flange. Ceiling column shall be 4 inches diameter (102 mm) by 40 inches (1.016 m) long.
   b. Ceiling column extension shall be supported from structural deck with slotted channel framing.
6. Inlet Accessory:
   a. Metallic: White, powder-coated aluminum, 10 inch (254 mm) diameter cone hood.

C. Refer to Exhaust Schedule for airflow rate.

D. Contractor to provide twenty (20) units to the jobsite for future installation by Owner.

2.05 BACKDRAFT PERFUSION STATION (E-20)

A. Manufacturers: Products complying with this specification may be provided by the following manufacturers. All products specified in this section shall be the provided by a single manufacturer.

1. Flow Sciences, Inc., 2025 Mercantile Drive, Leland, NC 28451 Tel: 800 849-3429. Website: [http://www.flowsciences.com](http://www.flowsciences.com)
2. Rice Lake Weighing Systems, 230 West Coleman Street, Rice Lake, WI 54868 Tel: 800 472-6703. website: http://www.ricelake.com
3. Substitutions are permitted subject to Section 01630.

B. Basis of Design: Flow Sciences FS2350, or equal, as specified herein.

C. Description: Enclosure specifically designed to provide maximum containment for animal perfusion applications. Enclosure opening shall be designed to allow turbulence-free airflow. Enclosure shall have angled front for ergonomic design.

D. Construction:
   1. Enclosure shall be constructed of 3/8 inch (9.5 mm) clear acrylic with air plenum mounted on rear of enclosure.
   2. Base shall be black, solid phenolic resin.

E. Features:
   1. Enclosure Dimensions: 35 ¾ inches wide x 23 inches deep x 30 ¼ inches tall.
   2. Face velocity alarm, providing visual and audible alarm if flow is not maintained to the programmed parameters. Sensor shall have ability to be programmed to alarm between 30 and 150 feet per minute (0.152 and 0.762 m/s).
   3. (2) 4 inch (100 mm) diameter, 8 foot (2.4 m) long PVC flexible hose with spring steel wire helix. Hose shall be chemical and abrasion resistant and flame resistant to UL 94V-O standards.
   4. Unit to be connected to house exhaust system.
   5. 5 inch (127 mm) diameter waste chute mounted in enclosure side.
   6. Provide (2) 5 inch (127 mm) diameter thimble connections for connection to 4 inch (100 mm) diameter building exhaust duct.
   7. Provide Aldehyde filter.

PART 3 EXECUTION

3.01 SITE CONDITIONS

A. Prior to installation of the Work of this Section, carefully inspect the installed Work specified in other sections and verify that all such Work is complete to the point where this installation may properly commence.

B. Verify that all Work has been installed in complete accordance with the original design, received submittals, and the manufacturer's recommendations.

C. In the event of discrepancy, immediately notify the Architect. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.

3.02 INSTALLATION

A. Work in this Section requires close coordination with Work specified in Divisions 22, 23, 25 and 26, as well as installation by Owner of Owner furnished components. Coordinate all Work to ensure an orderly process in the Project, without removal of previously installed Work, and so as to prevent damage to finishes and products.

B. Coordinate location and alignment of fume hoods and cabinets for proper connection of all piping and duct work.
C. Install all equipment in accordance with manufacturer’s written instructions, applicable codes and regulations, accepted Shop Drawings, and as necessary for a complete operating system.

D. Install equipment plumb, square, and straight with no distortion and securely anchored, as required.

E. Coordinate with Section 12 35 53 for venting corrosives storage cabinets behind rear baffle of fume hood.

3.03 FIELD TESTING: CHEMICAL FUME HOODS

A. Provide two week advance notice of scheduled testing.

B. Balance, test and certify each fume hood in accordance with ASHRAE 110-1995 (AI) for Flow Visualization, Face Velocity, and Tracer Gas Containment Testing Requirements.

C. Fume hood field tests shall be performed by a qualified independent testing company on each hood to determine face velocity and air flow patterns.

D. Fume hoods shall achieve an “As Installed” (AI) performance rating equal or better than 0.10 ppm with 4.0 Lpm tracer gas release rate when tested in accordance with ASHRAE 110-1995.

E. Companies certified to perform this testing are to be prior approved by the University.

F. Balancing of the system is in the scope of work of Division 23.

G. Verify exhaust air quantity does not exceed design, plus allowable leakage.

H. Verify hood pressure drop does not exceed design.

I. Adjust and retest hoods that do not meet specified performance.

J. Replace hoods which do not meet standards after repetitive testing.

3.04 ADJUSTING, CLEANING, AND PROTECTION

A. Repair or remove and replace defective work as approved by the Architect upon completion of installation.

B. Adjust all moving or operating parts to function within their design parameters.

C. Clean equipment, touch up as required.

D. Protect all units before, during, and after installation. Damaged materials due to improper protection shall be cause for rejection.

END OF SECTION
SECTION 11 53 43
LABORATORY SERVICE FITTINGS AND FIXTURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Laboratory service fittings, valves and related components.
B. Laboratory sinks.
C. Ice Maker Hook Up.
D. Recessed Valve Box.
E. CO₂ Point of Use Panel.

1.02 UNDIVIDED RESPONSIBILITY

A. Unless specified otherwise, because of special coordination requirements, the scope of work described in this Section shall be provided by the supplier of the Section 12 35 53 scope of work.

1.03 REFERENCES

A. Conform to the recommended practices for laboratory service fittings and fixtures published by the Scientific Equipment and Furniture Association (SEFA) 7:-: Fixtures, current version.
C. Where identified, service fittings and sinks shall be accessible to the disabled in compliance with the requirements of the federal Americans with Disabilities Act (ADA), ADA Accessibility Guidelines (ADAAG), and state accessibility regulations.
D. All emergency plumbing fixtures shall be accessible to the disabled in compliance with the requirements of the federal Americans with Disabilities Act (ADA), ADA Accessibility Guidelines (ADAAG), and state accessibility regulations.

1.04 DESCRIPTION

A. Work includes but is not necessarily limited to furnishing to the project site for installation by Division 22, all laboratory fittings, emergency plumbing fixtures, and fixtures described herein and shown on the Laboratory Furnishings Drawings. When specified, Division 26 shall install associated electrical work associated with emergency equipment.
B. Scrub stations are specified under Section 11 72 00 Examination and Treatment Equipment.

1.05 SUBMITTALS

A. Submit as specified herein and under provisions of Section 01 33 00.
B. Materials List/Product Data: Submit complete materials list, including catalogue data, of all materials, equipment, and products for Work in this Section.

C. Shop Drawings: Submit complete shop fabrication and installation drawings, including plans, elevations, sections, dimensions, details and schedules. Show relationship to adjoining materials and construction. Shop Drawings shall be in the form of reproducibles or photocopies, not to exceed 11 inches by 17 inches (A3) in size. Blueline prints are not acceptable.

D. Samples: Submit two (2) samples of each type of specified finish and color specified.

E. Operations/Maintenance Manuals: Submit under provisions of Section 01 77 00 complete operating and maintenance manuals that describe proper operating procedures, maintenance and replacement schedules, components parts list, and nearest local factory representative for components and repairs.

1.06 QUALIFICATIONS

A. Work of this Section shall be performed by an organization with five years documented experience specializing in the manufacture of the type of equipment specified, with demonstrated ability to produce the specified equipment of the required quality and quantity for complete installation in a project of this type and size within the required time limits.

B. Work in this Section requires close coordination with Work in Section 12 35 53, Division 22 Plumbing, Division 23 HVAC and Division 26 Electrical. Coordinate all Work to assure an orderly progress in the Project, without removal of previously installed Work, and so as to prevent damage to finishes and products.

C. Review conditions of installation, procedures and coordination with related Work.

D. Carefully inspect the installed Work specified in other Sections and verify that all such Work is complete and ready for the installation of this Work to properly commence.

E. Verify that all Work may be installed in complete accordance with the original design, reviewed submittals and manufacturer's recommendations.

PART 2 PRODUCTS

2.01 GENERAL

A. All service fittings and emergency plumbing fixtures shall be specifically designed for laboratory use.

B. All service fittings and emergency plumbing fixtures shall be factory pre-assembled including the assembly of valves to turrets, mounting shanks to turrets, etc., and individually factory tested.

C. All laboratory service fittings shall be the product of one service fitting manufacturer to assure ease of replacement and maintenance.

D. All emergency plumbing fixtures shall be the product of one manufacturer to assure ease of replacement and maintenance.
E. All service valves, fittings, and accessories shall be of cast brass with a minimum copper content of 85 percent, except for items which are to be brass forging or bar stock, or are specifically specified to be of another material.

F. Provide fittings as shown in laboratory fitting details for all laboratory equipment at locations shown on the Laboratory Furnishings drawings. Refer to Service Fitting Schedule.

G. Assembly components and operating parts such as valve stems, renewable units, packing nuts, outlet nozzles and straight serrated hose ends shall be made from solid brass stock.

H. Replaceable seats, needle cones, valve disc screws and other accessories shall be Monel or stainless steel alloys especially selected for use intended.

I. Fittings shall be factory tested and shall be supplied with nipples, lock nuts, shanks, etc.

J. Serrated tip fittings shall have 3/8 inch (9.525 mm) IPS thread with the hose end being tapered. Diameter of orifice in serrated tip shall be 1/8 inch (3.2 mm), except where otherwise specified.

K. Turrets shall be brass drop forging of design indicated in details shown elsewhere in the Section and shall be one or two-way, as required, with 3/8 inch (9.525 mm) IPS female inlet thread for connections. Units shall be furnished with brass shanks, brass locknuts, and washers.

L. Fittings located on the same plane shall have their handles project the same distance from the plane of reference to present a uniform related appearance, regardless of valve type construction.

M. Flanges shall be brass forging of approved design with 3/8 inch (9.525 mm) IPS female inlet and outlet.

N. All goosenecks shall provide full thread for attachment of anti-splash outlet fittings, serrated tips, and filter pumps.

O. Hot water/cold water gooseneck mixers and wall-mounted cold water goosenecks shall swivel. Swivel point shall be at turret or at valve level if wall mounted. Swing joints shall have heavy Teflon type packings; "0" rings will not be permitted. Cold water goosenecks at cup sinks shall be rigid.

P. All fittings shall have plastic colored service index buttons as specified in this Section.

Q. Provide durable 2 inch by 3 1/4 inch (51 by 83 mm) sign "CAUTION: NON-POTABLE WATER, DO NOT DRINK" at each bench- and panel-mounted laboratory (industrial) water faucet; refer to details on Laboratory Furnishings drawings.


S. Fittings and fixtures designated to be accessible to the disabled (ADA) with operable parts shall be operable with one hand and shall not require tight grasping, pinching, or twisting of the wrist. The force required to activate operable parts shall be 5 pounds (22.2 N), maximum.
2.02 LABORATORY SERVICE FITTINGS

A. Manufacturers: Products, which comply with this specification section as judged and approved by the Architect, may be provided by the following manufacturers. All laboratory service fittings specified in this section shall be provided by a single manufacturer.

2. T&S Brass and Bronze Works, Inc., 2 Saddleback Cove, P. O. Box 1088, Travelers Rest, SC 29690 Tel: (800) 476-4103. - website: http://www.tsbrass.com/.
3. The Chicago Faucet Company, 2100 S. Clearwater Dr., Des Plaines, IL 60018-5999 Tel: 847-803-5000. website: http://www.chicagofaucets.com
4. Substitutions are not permitted.

B. Body Style: All service fittings shall have traditional body profiles (cylindrical and tapered). Mushroom-profile body styles are not allowed. Turrets shall be provided without deck flanges.

C. Handles:

1. Faucets designated to be accessible to the disabled (ADA): provide “wrist-blade” handles with screw on index (identification) discs.
2. Laboratory gas, air and vacuum valves at workstations indicated to be accessible to the disabled (ADA): Provide ball valves fitted with lever-type handles and screw on index (identification) discs.
3. Other fittings shall be fitted with four arm handles.

D. Finish: Satin chrome, with clear, acid-resistant (epoxy) coating.

E. Water Valves:

1. Water valves shall include a renewable unit containing all the working parts which are subject to wear, including stainless steel or monel seat, monel screw and heavy duty seat disk and Teflon packing, and an integral adjustable volume control.
2. Unit shall be capable of being readily converted from compression to self-closing, and vice versa, without disturbing faucet body proper and shall also be capable of being readily converted from water construction to needle valve or steam valve construction having outside packing gland without disturbing faucet body.
3. Unit shall be sealed in valve body with special composition gasket. Metal-to-metal or ground joint type of sealing is not acceptable.
4. All water service fixtures shall satisfy the requirements of ANSI/ASME A 112.18.1M-1989 and be certified by the Canadian Standards Association (CSA) under Standard CAN/CSA B.125.89.
5. Water fixtures shall be fully assembled and factory tested at 80 psi (0.55 mPa) water pressure.
6. See Fixture and Fitting Schedule on drawings for model and type of fixture.
7. IHCW-3: Bench-mounted, hot and cold water faucet: Water Saver L412AC-8-BH, or approved equal, as specified herein:
   a. Exposed metal shall be finished as specified elsewhere in this Section.
   b. Wrist blade handles with colored plastic index buttons.
   c. Renewable water valves and deck-mounted valve body.
   d. Swing gooseneck with 8 inch (203 mm) spread.
   e. Removable aerator. Aerator should terminate approximately 3 inches (76 mm) above deck.
   f. Threaded mounting with locknut, washer, and coupling nuts.
   g. Adjustable volume control.
   h. Accessible to the disabled.
8. **IHCW-2**: Panel-mounted, concealed hot and cold water faucet: Water Saver L1712AC-8-55, or approved equal, as specified herein:
   a. Exposed metal shall be finished as specified elsewhere in this Section.
   b. Four-arm handles with colored plastic index buttons.
   c. Renewable water valves. Valve body shall be mounted in front of panel.
   d. Swing gooseneck with 8 inch (203 mm) spread.
   e. Removable aerator.
   f. Threaded mountings with locknuts, washers, and coupling nuts.
   g. Adjustable volume control.
   h. Mounting shank.

9. **HCW-3**: Panel-mounted, sensor-operated hot and cold water faucet with thermostatic mixing valve: Water Saver L4511PM-303-55, or approved equal, as specified herein:
   a. Exposed metal shall be finished as specified elsewhere in this Section.
   b. Panel-mounted infrared sensor.
   c. Solenoid valve.
   d. Thermostatic mixing valve with angle check stops. Adjustable limit stop on mixing valve shall be set for 110 degrees F.
   e. Panel-mounted, rigid gooseneck on turret base with 6 inch (152 mm) spread and mounting shank.
   f. Removable aerator. Aerator should terminate approximately 3 inches (76 mm) above deck.
   g. Electrical connection box and shielded cables.
   h. Plug-in transformer.
   i. Adjustable volume control.

10. **ICW-1**; **IHW-1**; **PW-1**; **PCWS-1**; **PCWR-1**; **UPCWS-1**; **PCWS-2**; **PCWR-2**: Wall/panel-mounted, 1/2 inch (13 mm) ball valve for equipment cooling water: Water Saver L4303-169WSA, or approved equal, as specified herein:
    a. Exposed metal shall be finished as specified elsewhere in this Section.
    b. Lever handle with colored plastic index button.
    c. 1/2 inch (13 mm) IPS female inlet.
    d. Quick connect fitting with 3/8 inch (9.5 mm) NPT male plug.
    e. Wall flange.
    f. Mounting shank.
    g. Length of valve from wall to quick connect fitting shall be approximately 5-3/8 inches (137 mm), nominal.

11. **IHCW-PR-2**: Panel-mounted, hot and cold water pre-rinse unit: Water Saver PR1711, or approved equal, as specified herein:
    a. Exposed metal shall be finished as specified elsewhere in this Section, unless noted otherwise.
    b. Panel-mounted cast brass valve body with riser and valve hook.
    c. Four-arm handles with index buttons.
    d. Adjustable wall support bracket.
    e. 39 inch (990 mm) flexible stainless steel hose.
    f. Self-closing valve with insulated handle, locking ring, and rubber-bound, spray-type outlet head.
    g. Mounting shank.

12. **ICW-h**: Fume hood-mounted, remote control, laboratory water valve for water service: Water Saver L740xW-L050WSA-BO358B, or approved equal, as specified herein:
    a. Exposed metal shall be finished as specified elsewhere in this Section, unless noted otherwise.
    c. Four-arm handle with colored plastic index button.
    d. Locking ring.
    e. Forged brass valve body located behind panel at front of hood.
    f. Epoxy coated, panel-mounted turret base with serrated hose end.
g. Adjustable volume control fitting with hex wrench knob to be attached between turret base and serrated hose end.

h. Mounting shank.

i. End of serrated hose end shall be 2-1/4 inches (57 mm), nominal, from turret centerline. Centerline of serrated hose end shall be 2-1/8 inches (54 mm), nominal, from panel. Handle shall be 2-3/4 inches (70 mm) long from panel to index button.

13. PCWS-h; PCWR-h: Fume hood-mounted, remote control, laboratory ball valve for water service: Water Saver L4285B-L023WSA-BO358B, or approved equal, as specified herein:

a. Exposed metal shall be finished as specified elsewhere in this Section, unless noted otherwise.

b. Rod-type remote control valve.

c. Lever handle with colored plastic index button.

d. Guide plate.

e. 3/8 inch (9.5 mm) aluminum rod with brass coupling.

f. Epoxy coated, panel-mounted turret base with quick connect fitting end.

g. Quick connect fitting with 3/8 inch (9.5 mm) NPT male plug

h. Adjustable volume control fitting with hex wrench knob to be attached between turret base and quick-connect end.

i. Mounting shank.

j. End of quick-connect shall be 3-1/8 inches (79mm), nominal, from panel. Lever handle shall be 2-7/16 inches (62 mm) from stem centerline to end.

k. Fixture shall satisfy requirements for accessibility of the disabled.

F. High Purity Water Valves: Suitable for purified water and provided with polypropylene liner. Valve stem and bonnet shall be brass.

1. See Fixture and Fitting Schedule on drawings for model and type of fixture.

2. PW-3: Bench-mounted purified water fixture: Water Saver L7833SC, or approved equal, as specified herein:

a. Exposed metal shall be finished as specified elsewhere in this Section.

b. All components in contact with water shall be polypropylene.

c. Forged brass valve body and 8 inch (203 mm) spread riser with polypropylene interior and lining.

d. Self-closing lever that can also be turned to operate in a stay-open mode.

e. Polypropylene serrated hose end.

f. Deck mounting flange.

g. Mounting shank.

h. End of serrated hose end shall be 7-7/8 inches (199 mm), nominal, above bench top.

G. Needle Valves: Fully assembled and factory tested at 225 psi (1.55 mPa) air pressure. Gas, air, vacuum and steam needle valve fittings shall have stainless steel replaceable floating cone that is precision ground and self-centering which shall seat against a stainless steel or monel renewable valve seat. Valve shall be for standard control under pressure up to 150 psi (1.03 mPa) and shall have subject-to-wear parts easily replaceable. Provide pressure regulators designed for use with the appropriate service at locations indicated on the Laboratory Furnishing drawings. Needle valves for natural (laboratory) gas service shall be certified for use with natural gas by the Canadian Standards Association under ANSI Z21.15-1997/CGA9.1-M97. Needle valves in fume hoods shall be mounted on the front panel of the fume hood, with all components subject to wear accessible from the exterior face of the hood.

1. See Fixture and Fitting Schedule on drawings for model and type of fixture.

2. GAS-3; CDALP-3; VAC-3; SG1-3: Bench-mounted, single straight pattern, needle valve: Water Saver L2880-131WSA, or approved equal, as specified herein:

a. Exposed metal shall be finished as specified elsewhere in this Section.

b. Four-arm handle with colored plastic index button.

c. Turret base.

d. Serrated hose end.
e. Mounting shank.
f. End of serrated hose end shall be 5-1/8 inches (130 mm), nominal, from turret centerline. Centerline of serrated hose end shall be 2-1/16 inches (52 mm), nominal, above bench top.

3. GAS-1; CDALP-1; VAC-1; UPA-1; N2-1; He-1; CO2-1; SG1-1; SG2-1; SG3-1; CDALP-2; N2-2: Wall/panel-mounted, single angle pattern, needle valve: Water Saver L3180-158WSA, or approved equal, as specified herein:
   a. Exposed metal shall be finished as specified elsewhere in this Section.
   b. Four-arm handle with colored plastic index button.
   c. Wall mounting flange. Flange shall be threaded in a manner to be installed tight to wall surface in wall mounted applications, and allow fitting to be installed straight.
   d. Serrated hose end.
   e. Mounting shank.
   f. Length of valve from wall to index button shall be 5-1/2 inches (140 mm), nominal.

4. GAS-2; CDALP-2; CDALPa-2; N2a-2: Overhead service carrier-mounted, single angle pattern, needle valve: Water Saver L3180-131WSA, or approved equal, as specified herein:
   a. Exposed metal shall be finished as specified elsewhere in this Section.
   b. Four-arm handle with colored plastic index button.
   c. Turret base.
   d. Serrated hose end.
   e. Mounting shank.
   f. Length of valve from turret base to serrated hose end shall be 5-3/16 inches (131 mm), nominal.

5. STM-1: Wall/panel-mounted, single angle pattern, steam valve: Water Saver L5190F-225, or approved equal, as specified herein:
   a. Exposed metal shall be finished as specified elsewhere in this Section.
   b. Four-arm handle, heat resistant black nylon.
   c. Wall mounting flange. Flange shall be threaded in a manner to be installed tight to wall surface in wall mounted applications, and allow fitting to be installed straight.
   d. Serrated hose end.
   e. Length of valve from wall to index button shall be 5-7/8 inches (149 mm), nominal.

6. GAS-h; CDALP-h; VAC-h; SG1-h; SG2-H; SG3-h: Fume hood-mounted, remote control, laboratory needle valve for gas service: Water Saver L739xN-L022WSA or L740N-022WSA, or approved equal, as specified herein:
   a. Exposed metal shall be finished as specified elsewhere in this Section, unless noted otherwise.
   c. Four-arm handle with colored plastic index button.
   d. Locking ring.
   e. Valve body to be located behind panel at front of fume hood.
   f. Panel-mounted, color epoxy coated brass flange with angled serrated hose end.
   g. Mounting shank.
   h. End of serrated hose end shall be 2-5/8 inches (67 mm), nominal, from panel. Handle shall be 2-3/4 inches (70 mm) long from panel to index button.

H. Fine Control Needle Valves: Fully assembled and factory tested at 375 psi (2.59 mPa) helium pressure. Action of valve shall be slow compression for fine control under pressure up to 250 psi (1.72 mPa) and shall have subject-to-wear parts easily replaceable. Valve shall be constructed with long taper stainless steel needle and a small orifice stainless steel seat, screwed bonnet with extended heavy-duty threads, and molded TFE stem packing with externally adjustable packing nut. Both needle and seat shall be removable and replaceable. Ultra-fine threads shall provide precise flow control at high working pressures. Provide pressure regulators designed for use with the appropriate service at locations indicated on the Laboratory Furnishing drawings. Needle valves for natural (laboratory) gas service shall be certified for use with natural gas by the Canadian Standards Association under ANSI Z21.15-1997/CGA9.1-M97.
Needle valves in fume hoods shall be mounted on the front panel of the fume hood, with all components subject to wear accessible from the exterior face of the hood.

1. See Fixture and Fitting Schedule on drawings for model and type of fixture.
2. CDAHP-1: Wall/panel-mounted, angle pattern, fine control needle valve: Water Saver L3173-365-158, or approved equal, as specified herein:
   a. Exposed metal shall be finished as specified elsewhere in this Section.
   b. Four-arm handle with colored plastic index button.
   c. Wall mounting flange. Flange shall be threaded in a manner to be installed tight to wall surface in wall mounted applications, and allow fitting to be installed straight.
   d. Quick connect fittings.
   e. Pressure regulator.
   f. Length of valve from wall to quick connect fitting shall be 7-1/4 inches (184 mm), nominal.

I. Laboratory Ball Valves: Suitable for laboratory gas, air and vacuum and be supplied fully assembled and factory tested at 125 psi (0.86 MPa) air pressure. Ball valves shall be of quarter-turn (closed to fully open) design, be fitted with lever handle requiring less than 5 lbf (22 N) force to operate, and shall have subject-to-wear parts easily replaceable. Ball valves for natural (laboratory) gas service shall be certified for use with natural gas by the Canadian Standards Association under ANSI Z21.15-1997/CGA9.1-M97.

1. See Fixture and Fitting Schedule on drawings for model and type of fixture.

J. Quick Connect Fittings: Provide plug and socket (2-piece) quick connect service fittings.

1. See Fixture and Fitting Schedule on drawings for model and type of fixture.

K. Service Fitting Color Index: for colored plastic index buttons:

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<td>AR</td>
<td>White</td>
</tr>
<tr>
<td>Nitrogen</td>
<td>Brown</td>
<td>N2</td>
<td>White</td>
</tr>
<tr>
<td>Carbon Dioxide</td>
<td>Pink</td>
<td>CO2</td>
<td>Black</td>
</tr>
<tr>
<td>Helium</td>
<td>Black</td>
<td>HE</td>
<td>White</td>
</tr>
<tr>
<td>Oxygen</td>
<td>Light Green</td>
<td>O2</td>
<td>Black</td>
</tr>
<tr>
<td>CWS/R</td>
<td>Green</td>
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<td>Black</td>
</tr>
<tr>
<td>Steam</td>
<td>Black</td>
<td>STM</td>
<td>White</td>
</tr>
<tr>
<td>Sea Water</td>
<td>Dark Green</td>
<td>SEAWAT</td>
<td>White</td>
</tr>
<tr>
<td>Cylinder Gas</td>
<td>Light Blue</td>
<td>CYL GAS</td>
<td>Black</td>
</tr>
</tbody>
</table>

L. EW-3: Dual-purpose eye wash/drench hose, deck mounted: Water Saver Model No. EW1022-BP, or approved equal, with the following characteristics or modifications.

1. Dual-purpose eye wash/drench hose unit with dual gentle spray outlet heads and squeeze handle/valve with locking clip.
2. Heads shall be equipped with flip top dust cover that automatically releases with water pressure.
3. Flexible, reinforced PVC hose shall be furnished with swivel fitting at inlet end.
4. Furnish with in-line backflow preventer at the hose inlet.
5. Mounting flange and squeeze valve shall be chrome-plated brass with clear epoxy coating.
6. Mounting flange and squeeze valve shall be chrome-plated brass with clear epoxy coating.

2.03 FINISHES

A. Satin chrome finish with clear, acid-resistant coating:
   1. Applicable to:
      a. All laboratory service fittings (except fittings inside fume hoods).
      b. All laboratory service fittings mounted on stainless steel work surfaces, scullery sinks, hand or service sinks, or any other stainless steel laboratory furnishing item or equipment.
   2. Chrome finish: All exposed surfaces shall be polished and buffed, then electroplated with one layer of nickel and one layer of chrome. Each layer of plating shall completely cover all visible areas. Total plating thickness shall be not less than 0.4 mil (10 µm). Finish:
      a. Satin (AISI No. 6 brushed finish).
   3. Clear epoxy coating: Following plating, clear epoxy coating shall be applied to all exposed surfaces and then baked to permit curing. Surfaces shall have a minimum coating thickness of 2 mils (50 µm).

B. Performance requirements for coated finishes:
   1. Chemical resistance:
      a. Fume Test: Suspend coated samples in a container of at least 6 cu. ft. (170 l) capacity, approximately 12 inches (300 mm) above open beakers, each containing 100 ml of 70 percent nitric acid, 94 percent sulfuric acid and 35 percent hydrochloric acid, respectively. After exposure to these fumes for 150 hours, the finish on the samples shall show no discoloration, disintegration or other effects.
      b. Direct Application Test: Subject coated samples to the direct action of the following reagents and solvents at a temperature of 25 degrees C dropping from a burette at the rate of 60 drops per minute for ten minutes. Finish on samples shall not rupture, though slight discoloration or temporary softening is permissible.

<table>
<thead>
<tr>
<th>Reagent</th>
<th>Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetic Acid</td>
<td>98%</td>
</tr>
<tr>
<td>Acetone</td>
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</tr>
<tr>
<td>Ammonium Hydroxide</td>
<td>28%</td>
</tr>
<tr>
<td>Amyl Acetate</td>
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<tr>
<td>Amyl Alcohol</td>
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</tr>
<tr>
<td>Benzene</td>
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</tr>
<tr>
<td>Butyl Alcohol</td>
<td></td>
</tr>
<tr>
<td>Calcium Hypochlorite</td>
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</tr>
<tr>
<td>Carbon Disulfide</td>
<td></td>
</tr>
<tr>
<td>Carbon Tetrachloride</td>
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</tr>
<tr>
<td>Chloroform</td>
<td></td>
</tr>
<tr>
<td>Chromic Trioxide Acid</td>
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</tr>
<tr>
<td>Cresol</td>
<td></td>
</tr>
<tr>
<td>Crude Oil</td>
<td></td>
</tr>
<tr>
<td>Dioxane</td>
<td></td>
</tr>
<tr>
<td>Distilled Water</td>
<td></td>
</tr>
<tr>
<td>Ether</td>
<td></td>
</tr>
<tr>
<td>Ethyl Acetate</td>
<td></td>
</tr>
<tr>
<td>Ethyl Alcohol</td>
<td></td>
</tr>
<tr>
<td>Reagent</td>
<td>Concentration</td>
</tr>
<tr>
<td>-------------------------</td>
<td>---------------</td>
</tr>
<tr>
<td>Ethyl Ether</td>
<td></td>
</tr>
<tr>
<td>Formaldehyde</td>
<td>37%</td>
</tr>
<tr>
<td>Formic Acid</td>
<td>90%</td>
</tr>
<tr>
<td>Gasoline</td>
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<tr>
<td>Glacial Acetic Acid</td>
<td>99.5%</td>
</tr>
<tr>
<td>Glycerine</td>
<td></td>
</tr>
<tr>
<td>Hydrochloric Acid</td>
<td>38%</td>
</tr>
<tr>
<td>Hydrofluoric Acid</td>
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</tr>
<tr>
<td>Hydrogen Peroxide</td>
<td>5%</td>
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<tr>
<td>Isopropyl Alcohol</td>
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<tr>
<td>Lactic Acid</td>
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<td>Kerosene</td>
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<tr>
<td>Methanol</td>
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<td>Methyl Ethyl Ketone</td>
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<tr>
<td>Methylene Chloride</td>
<td></td>
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<tr>
<td>Mineral Oil</td>
<td></td>
</tr>
<tr>
<td>Monochlor Benzene</td>
<td></td>
</tr>
<tr>
<td>N-Hexane</td>
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<tr>
<td>Naphthalene</td>
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</tr>
<tr>
<td>Nitric Acid</td>
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<tr>
<td>Perchloric Acid</td>
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</tr>
<tr>
<td>Phenol</td>
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</tr>
<tr>
<td>Phosphoric Acid</td>
<td>75%</td>
</tr>
<tr>
<td>Sea Water</td>
<td></td>
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<tr>
<td>Silver Nitrate</td>
<td>30%</td>
</tr>
<tr>
<td>Sodium Bichromate</td>
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</tr>
<tr>
<td>Sodium Carbonate</td>
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<tr>
<td>Sodium Chloride</td>
<td>20%</td>
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<tr>
<td>Sodium Hydroxide</td>
<td>50%</td>
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<tr>
<td>Sodium Hypochlorite</td>
<td></td>
</tr>
<tr>
<td>Sodium Sulfide</td>
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<tr>
<td>Sulfuric Acid</td>
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<tr>
<td>Toluene</td>
<td></td>
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<td>Trichlorethylene</td>
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<tr>
<td>Turpentine</td>
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<tr>
<td>Urea</td>
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<tr>
<td>Xylene</td>
<td></td>
</tr>
<tr>
<td>Zinc Chloride</td>
<td>saturated</td>
</tr>
</tbody>
</table>

2. Mar and abrasion resistance: Coating material shall have a pencil hardness of 2H – 4H with adhesion substantial enough to withstand both direct and reverse impacts of 160 inch-pounds (18 Nm). Coating shall have excellent mar resistance and be capable of withstanding scuffing, marring and other ordinary wear.

3. Repairability: Scratches and other localized surface damage shall be field-repairable.

2.04 LABORATORY SINKS

A. Epoxy Resin:

1. Manufacturer: Manufacturer shall be the manufacturer of the epoxy resin work surfaces specified in Section 12 35 53.

2. Laboratory Sinks:
   a. Drop-in Type: Drop-in installation by Division 11 in epoxy resin work surface. Color to match work surface.
b. Comply with the requirements of Section 12 35 53 for epoxy resin.
c. All exposed edges shall be radiused not less than 1/4 inch (6 mm).
d. Drain grooves in top, when indicated on drawings: Sink shall be set 1/8 inch (3 mm) below the lowest drain groove level.
e. Tops without drain grooves: Sink shall be set 1/8 inch (3 mm) below the level of the adjacent surface.
f. Provide epoxy resin sink outlet with strainer, stopper and open-end overflow, and install in sink with continuous bead of silicone sealant.
g. Provide tailpiece compatible with waste piping system for all sinks unless otherwise specified. Refer to Division 22 for piping requirements.

3. Cup Sinks:
   a. Fume Hood Locations: Provide cup sinks at fume hoods as described in Section 11 53 13.
   b. Laboratory Work Surface Installations:
      1) Flush with work surface, color to match work surface, sizes as indicated on drawings, with integral outlet and threaded tailpiece. Tailpiece shall be compatible with waste piping system for all sinks unless otherwise specified. Refer to Division 22 for piping requirements.
      c. Comply with the requirements of Section 12 35 53 for epoxy resin.
   c. Provide strainer for all cup sinks.

B. Stainless steel:

1. Laboratory Sinks, integral with stainless steel work surface:
   a. Refer to Section 12 35 53, Stainless Steel Fabrications.
   b. Provide stainless steel strainer, outlet, standpipe overflow and stopper for all sinks unless otherwise specified.
   c. Provide tailpieces compatible with waste piping system for all sinks unless otherwise specified. Refer to Division 22 for piping requirements.

2. Scullery Sink: Refer to Section 12 35 53, Stainless Steel Fabrications.
   a. Provide stainless steel strainer, outlet, standpipe overflow and stopper for all sinks, unless otherwise specified.
   b. Provide tailpieces compatible with waste piping system for all sinks unless otherwise specified. Refer to Division 22 for piping requirements.

3. Wall-Mounted Sinks:
   a. Manufacturers: Products, which comply with this specification section as judged and approved by the Architect, may be provided by the following manufacturers.
      1) Elkay, 2222 Camden Ct., Oak Brook, IL 60523 Tel:  630 574-8484. website: http://www.elkay.com/  tel:  630 574-8484.
      3) Substitutions are permitted subject to Section 01 63 00.
   b. Hand Wash Sink: Elkay Model No. ELVWO2219, or equal.
      1) Material: Type 304 stainless steel with No. 4 finish.
      2) Material Thickness: 18 gauge (1.3 mm).
      3) Underside of sink shall be provided with sound deadening coating.
      4) Provide all necessary mounting hardware required for wall-mounted installation.
         a) Lavatories mounted on metal stud partitions shall be provided with floor mounted lavatory carrier.
      5) Coordinate fixture holes with specified faucet.
   c. Service Sink: Elkay Model No. ESS2118, or equal.
      1) Material: Type 304 stainless steel with No. 4 finish.
      2) Thickness: 14 gauge (2.0 mm).
      3) Provide with two stainless steel wall brackets and stainless steel wall clip and all necessary mounting hardware required for wall-anchored sinks.
      4) Coordinate fixture holes with specified faucet.
d. Animal Room Sink: Elkay Model No. ESS4924R with LK18B, or equal.
   1) Material: Type 304 stainless steel with No. 4 finish.
   2) Material Thickness: 14 gauge (2.0 mm).
   3) Provide integral drainboard.
   4) Provide with three stainless steel wall brackets and stainless steel wall clip and all necessary mounting hardware required for wall-anchored sinks.
      a) Lavatories mounted on metal stud partitions shall be provided with floor mounted lavatory carrier.
   5) Provide stainless steel perforated strainer grid and stainless steel tailpiece.
   6) Coordinate fixture holes with specified faucet.
e. Provide stainless steel strainer and outlet for all sinks unless otherwise specified.
f. Provide tailpieces compatible with waste piping system for all sinks unless otherwise specified. Refer to Division 22 for piping requirements.

2.05 ICE MAKER HOOK-UP

A. Manufacturers: Products, which comply with this specification section as judged and approved by the Architect, may be provided by the following manufacturers.
   1. IPS Corporation, 202 Industrial Park Lane, Collierville, TN 38017 Tel: 800 888-8312.
   2. Substitutions are permitted subject to Section 01 63 00.

B. Basis of Design: IPS Guy Gray Model MIB 1 wall recessed ice maker hook-up, or equal.

C. Recessed wall box and faceplate shall be fabricated of 20 gauge steel with white powder coated finish. Approximate overall dimensions: 11-5/8 inches wide by 9-1/2 inches high by 3-1/2 inches deep.

D. Box shall be equipped with 1/4 inch compression angle valve and with 1/2 inch soldered connection.

E. Backflow protection to comply with Boulder County Health Department.

2.06 RECESSED VALVE BOX AT UNDERCOUNTER DISHWASHERS

A. Stainless Steel Valve Box (Hot and Cold Water):
   1. Manufacturers: Products, which comply with this specification section as judged and approved by the Architect, may be provided by the following manufacturers.
      a. Bradley, P.O. Box 309, Menomonee Falls, WI 53052 Tel: 800 272-3539.
      b. Substitutions are permitted subject to Section 01 63 00.
   2. Basis of Design: Bradley Model 7906VB recessed hose box with hot and cold water valves, or equal.
   3. Recessed wall box shall be fabricated of 18 gauge Type 304 stainless steel. Exposed surfaces shall be polished to a No. 4 finish. All seams shall be heliarc welded and ground smooth. Approximate overall dimensions: 10-1/4 inches wide by 12-1/4 inches high by 4-1/2 inches deep (260 mm wide by 311 mm high by 114 mm deep).
   4. Stops and valve bodies shall be cast brass.
   5. Box shall be equipped with two 1/2 inch (12.7 mm) threaded inlet connections and 3/4 inch (19 mm) male hose thread outlets. Provide vacuum breakers.
   6. Provide cutout for 2 inch drain connection.

2.07 CO₂ POINT OF USE PANEL FOR STACKED INCUBATORS

A. Manufacturers: Products, which comply with this specification section as judged and approved by the Architect, may be provided by the following manufacturers. All products specified in this section shall be the provided by a single manufacturer.
1. Spectra Gases, Inc., 3434 Route 22 West, Branchburg, NJ 08876 Tel: 800 932-0624.
2. Matheson Tri-Gas, 166 Keystone Drive, Montgomeryville, PA 18936 Tel: 215 648-4000.
4. Substitutions are not permitted.

B. Basis of Design: Spectra Gases Inc. Model 3700 CO$_2$ Point of Use Panel for Stacked Incubators, or equal, with features or modifications as described herein.

C. Description:
1. Regulator: Brass body, Kel-F seats, stainless steel diaphragm, 0 – 25 psig delivery pressure, 1/4 inch brass tube compression inlet connection.
2. Gauge: Brass, 2 inch diameter, Bourdon type, 30” – 0 - 30 range.
3. Valves: Two high-purity, low diffusion brass diaphragm valves with Kel F seats, 1/4 inch inlet and outlet compression connections.
4. Mounting: All components shall be mounted to 12 inch by 10 inch by 3/8 inch clear anodized aluminum panel. Panel shall be bolted to wall through four 7/16 inch mounting holes. Panel shall be functionally labeled.

D. Testing: Panel shall be Helium leak checked and dead end pressure tested.

PART 3 EXECUTION

3.01 SITE CONDITIONS

A. Inspection:
1. Prior to installation of fixtures specified in Section 11 53 43, carefully inspect the installed Work specified in other Sections and verify that all such Work is complete to the point where this installation may properly commence.
2. Verify that all Work has been installed in complete accordance with the original design, approved submittals, and the manufacturer's recommendations.

B. Discrepancy:
1. In the event of discrepancy, immediately notify the Architect.

C. Installation:
1. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.
2. Install fixtures plumb and level.
3. Provide piping connections to fixtures with valves and escutcheons as specified in Division 22.
4. Verify that fixtures and trim are tight, leak-free and function properly

3.02 PACKING AND DELIVERY

A. Deliver all fittings and fixtures to job site in recommended packaging, with each fitting individually packaged, marked, and scheduled for point of use.

B. Inventory fittings, at job site, verify that type and quantity are correct, and re-package until installed.

C. Store in clean, dry location.
3.03 INSTALLATION

A. Set internal volume control on all cup sink water fittings so water does not splash out of sink.

B. Set sinks in chemical resistant sealing compound, secure and support, as recommended by the manufacturer.

END OF SECTION
SECTION 12 24 14
ROLLER SHADES

PART 1 - GENERAL

1.1 REFERENCES
B. NFPA 70, National Electrical Code.

1.2 SUBMITTALS
A. Shop Drawings:
   1. Plans, elevations, sections, product details, installation details, operational clearances, wiring diagrams and relationship to adjacent work.
B. Product Data:
   1. Manufacturer's data sheets on each product to be used, including:
      a. Preparation instructions and recommendations.
      b. Styles, material descriptions, dimensions of individual components, profiles, features, finishes and operating instructions.
      c. Storage and handling requirements and recommendations.
      d. Mounting details and installation methods.
      e. Window Treatment Schedule: For roller shades. Use same room designations as indicated on the Drawings and include opening sizes and key to typical mounting details.
C. Samples:
   1. 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.
   2. 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.
D. Contract Closeout Information:
   1. Maintenance Data:
      a. Methods for maintaining roller shades, precautions regarding cleaning materials and methods, instructions for operating hardware and controls.
   2. Warranty.

1.3 QUALITY ASSURANCE
A. Manufacturer Qualifications: Obtain roller shades through one source from a single manufacturer with a minimum of twenty years experience in manufacturing products comparable to those specified in this section.
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: Passes NFPA 701-99 small and large-scale vertical burn. Materials tested shall be identical to products proposed for use.
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 G21 results for fungi ATCC 9642, ATCC 9644, ATCC 9645.

F. Mock-Up: Provide a mock-up (manual shades only) of one roller shade assembly for evaluation of mounting, appearance and accessories.
   1. Locate mock-up in window designated by Architect.
   2. Do not proceed with remaining work until, mock-up is accepted by Architect.

1.4 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.

1.5 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.

1.6 WARRANTY

A. Roller Shade Hardware, Chain and Shadecloth: Manufacturer's standard non-depreciating twenty-five year limited warranty.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Acceptable manufacturers:
   1. Roll shades:
      a. Base:
         1) MechoShade Systems.
      b. Optional:
         1) Lutron, Vimco, Lutron Electronics Co.
         2) Hunter Douglas.
   2. Other manufacturers desiring approval comply with Section 00 26 00.

2.2 APPLICATIONS/SCOPE

A. Roller Shade Schedule:
   1. Shade Type 1: Manual operating, chain drive, visually transparent roller shades in exterior windows of rooms and spaces shown on the Drawings.
   2. Shade Type 4: Motorized interior “double”, room darkening visually transparent and vinyl roller shades, operating independently of each other, in exterior windows of rooms and spaces shown on Drawings, and related motor control systems.

2.3 SHADE CLOTH

A. Visually Transparent Single-Fabric Shadecloth: MechoShade Systems, Inc., ThermoVeil group, single thickness non-raveling 0.030 IN thick vinyl fabric, woven from 0.018 IN diameter extruded vinyl yarn comprising of 21 percent polyester and 79 percent reinforced vinyl, in colors selected from manufacturer's available range.
   2. Color: Selected from manufacturer's standard colors.
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 IN 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: Selected from manufacturer's standard colors.

   Room darkening (PVC Free) Shadecloth with opaque acrylic backing: MechoShade Systems, Inc., "Equinox 0100 series", .008 IN thick blackout material and weighing 0.94 lbs. per square yard, comprising of 53% fiberglass, 45% acrylic, 2% poly finish.

2. Color: Selected from manufacturer’s standard colors.

2.4 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 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 IN in diameter for manual shades, and less than 2.55 IN 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.

2.5 SHADE FABRICATION

A. Fabricate units to completely fill existing openings from head to sill and jamb-to-jamb, unless specifically indicated otherwise.

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 IN in either direction per 8 feet of shade height due to warp distortion or weave design. Fabricate hem as follows:


2.6 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 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 IN 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. Manual Operated Chain Drive Hardware and Brackets:
1. Provide for universal, regular and offset drive capacity, allowing drive chain to fall at front, rear or non-offset for shade drive end brackets. Universal offset shall be adjustable for future change.
2. Provide hardware capable for installation of a removable fascia, for both regular and/or reverse roll, which shall be installed without exposed fastening devices of any kind.
3. Provide shade hardware system that allows for removable regular and/or reverse roll fascias to be mounted continuously across two or more shade bands without requiring exposed fasteners of any kind.
4. Provide shade hardware system that allows for operation of multiple shade bands (multi-banded shades) by a single chain operator, subject to manufacturer’s design criteria. Connectors shall be offset to assure alignment from the first to the last shade band.
5. Provide shade hardware system that allows multi-banded manually operated shades to be capable of smooth operation when the axis is offset a maximum of 6 degrees on each side of the plane perpendicular to the radial line of the curve, for a 12 degrees total offset.
6. Provide positive mechanical engagement of drive mechanism to shade roller tube. Friction fit connectors for drive mechanism connection to shade roller tube are not acceptable.
7. Provide shade hardware constructed of minimum 1/8 IN thick plated steel or heavier as required to support 150 percent of the full weight of each shade.
8. Drive Bracket / Brake Assembly:
   a. MechoShade Drive Bracket Model M5 shall be fully integrated with MechoShade accessories, including, but not limited to: SnapLoc fascia, room darkening side / sill channels, center supports and connectors for multi-banded shades.
   b. M5 drive sprocket and brake assembly shall rotate and be supported on a welded 3/8 IN steel pin.
   c. The brake shall be an over-running clutch design which disengages to 90 percent during the raising and lowering of a shade. The brake shall withstand a pull force of 50 lbs. in the stopped position.
   d. The braking mechanism shall be applied to an oil-impregnated hub on to which the brake system is mounted. The oil impregnated hub design includes an articulated brake assembly, which assures a smooth, non-jerky operation in raising and lowering the shades. The assembly shall be permanently lubricated. Products that require externally applied lubrication and or not permanently lubricated are not acceptable.
   e. The entire M5 assembly shall be fully mounted on the steel support bracket, and fully independent of the shade tube assembly, which may be removed and reinstalled without effecting the roller shade limit adjustments.

D. Drive Chain: #10 qualified stainless steel chain rated to 90 lb. minimum breaking strength. Nickel plate chain shall not be accepted.

2.7 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 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.

2.8 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 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 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 Electrical Specification Divisions.
   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 Electrical Specification Divisions.
2.9 ACCESSORIES

A. Roller Shade Pocket for recessed mounting in acoustical tile, or drywall ceilings as indicated on the Drawings (for Shade Type 2).
   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 IN diameter holes per foot allowing the solar gain to flow above the ceiling line.

B. Fascia (for Shade Type 1):
   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.
   5. Notching of Fascia for manual chain shall not be acceptable.

PART 3 - EXECUTION

3.1 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.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.
B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 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 IN to interior face of glass. Allow proper clearances for window operation hardware.
B. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.
C. Clean roller shade surfaces after installation, according to manufacturer's written instructions.
D. Engage Installer to train Owner's maintenance personnel to adjust, operate and maintain roller shade systems.

3.4 PROTECTION

A. Protect installed products until completion of project.
B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION
PART 1 - GENERAL

1.1 SUBMITTALS

A. Shop drawings:
   1. Casework:
      a. Plan of casework at 1/8 IN = 1 FT-0 IN scale or larger.
      b. Elevations of casework at 1/4 IN = 1 FT-0 IN scale or larger.

B. Product data:
   1. Manufacturer technical data and specifications.

C. Samples:
   1. Finishes.

1.2 JOB CONDITIONS

A. Verify all dimensions at site.
B. Verify locations of all existing items and work furnished in other sections.
C. If necessary to vary from arrangement indicated because of structural, mechanical, electrical or other considerations, make such variations only after approval of Architect.
D. Where existing casework to be relocated is indicated, disconnect, remove, store, and install such casework in same manner as new equipment.
E. Contractor and Owner inspect existing casework prior to removal by Contractor, upon delivery by Contractor to new location, and after installation by Contractor to verify physical appearance and condition of such casework.

PART 2 - PRODUCTS

2.1 MATERIALS - GENERAL

A. Acceptable manufacturers:
   1. Metal casework:
      a. Base:
         1) “Boscotex” by Bosco Storage Solutions.
      b. Optional:
         1) Tennsco Corp.
         2) Global Industrial, a Systemax Company.
   2. Other manufacturers desiring approval comply with Section 00 26 00.

B. Casework: All steel, modular, complete with all components indicated, and electrical fixtures, fittings and connections.
   1. Steel finish: Color to be selected from manufacturer’s full line of standard colors.

   1. Use 20 GA minimum for: Solid door interior panels, scribing strips, filler and security panels, enclosures, drawer fronts and bodies, shelves, finished back panels and sloping tops.
   2. Use 18 GA minimum for: Case tops, ends, bottoms and backs; glazed door and drawer members, partitions, security panels, door exterior panels, and top and rear corner gussets.
3. Use 16 GA for: Top front and back rails, intermediate horizontal rails, table frames and legs, and leg rails and stretchers.
4. Use 14 GA minimum for: Drawer suspensions, door and case hinge reinforcements, and front corner reinforcements.
5. Use 11 GA minimum for: Table leg corner brackets and gussets for leveling screws.
6. Finish: Reagent resistant, electrostatically applied, baked enamel, satin finish, in minimum of two of manufacturer's standard colors.

D. Maple tops: 2 1/4 IN thick, solid, maple butcher block, glued under pressure with water resistant resin.
   1. Bullnosed leading edge.

E. Leveling devices: 1/2 IN diameter threaded leveling screw fastened to bottom of leg or to bracket attached to cabinet.
   1. Screw slotted for screw driver.
   3. Bearing area: 1.22 SQ IN (750 SQ mm), minimum.

F. Pulls for drawers and hinged doors: Long, slimline type, anodized brushed aluminum, with screws at 5 IN on center.

G. Hinges: Institutional, 5 knuckle, brushed chrome plated, with barrel only projecting beyond face of cabinet.
   1. Not less than 2 1/2 IN long.
   2. Drilled for 3 screws each leaf; not welded to case or door.
   3. For doors up to 36 IN high: 2 hinges.
   4. For doors over 36 IN high: 3 hinges.

H. Door catches: Spring actuated, cadmium plated with nylon roller, adjustable for controlled opening and closing action.

I. Elbow catches: Spring type, cadmium plated steel, with strike of suitable design.

J. Locks: Heavy duty cylinder type.
   1. Exposed keyway nose: Satin nickel plated, stamped with identifying numbers.
   2. Provide 2 stamped brass keys, 3/32 IN (2.3 mm) thick, minimum, with each keyed lock.
   3. Provide for 500 primary key changes in 5 master keyed groups.
   4. Extra keys available from manufacturer or registered locksmiths only.
   5. Provide 7000 primary key changes in 240 master keyed and 30 grand master keyed groups.
   6. Extra keys available from manufacturer only.

K. Label holders: Formed steel, brushed chrome finish.

L. Shelf clips: Die formed steel, zinc plated, designed to engage in 2 rectangular holes on 1/2 IN (12 mm) centers in wall cases and 2 IN (50 mm) centers in base units.

M. File followers: Metal backs engaging in steel bottom channel, with spring positioning lock.

2.2 ELECTRICAL

A. Electrical fixtures and fittings: Flush, pedestal or line types as indicated. Comply with Electrical Specification Divisions requirements.

2.3 FABRICATION

A. Fabrication - General:
   1. Combine all products under responsibility of casework manufacturer.
   2. Provide all components indicated.
   3. Grind all exposed welding smooth.
   4. No exposed fasteners.
   5. Pulls: Attach through both panels of doors and drawer fronts.
B. All cases: All welded shell, with front and rear corner posts formed with end panels, fixed back and bottom, front and rear top rails, intermediate cross rails as required, integral bases.
   1. Drawers and doors as indicated.
   2. Shelves as indicated.
   3. Accessories as indicated.

C. Drawers: Modular sized, removable.
   1. Fronts: Interchangeable, flush mounted, 3/4 IN thick.
      a. Formed steel, double wall construction with sound deadening.
   2. Bodies: Bottom, sides, back and inner front, one piece welded assembly.
      a. Top edges formed into semicircular tote grip.
      b. Bottom corners coved.
   3. Suspension: Provide self-centering drawers, removable without use of tools, locking or full open position.
      a. Drawer runner welded to drawer body.
      b. Case runner attached with screws or into slotted rail.
      c. Coved runner raceways with round nylon tired ball bearing rollers.
      d. Rubber closing bumpers.
      e. Friction centering devices not acceptable.

D. Swinging doors: 3/4 IN thick, double wall telescoping box construction with inner and outer panels welded together.
   1. Over 14 IN wide and under 36 IN high: Formed, embossed stiffener.
   2. 36 IN high and over: Vertical channel stiffener.
   3. Sound deadening honeycomb core laminated to interior of panels.
   4. Hinge mounting brackets and hinge reinforcement.
   5. Fit to case with minimum clearance.
   6. Provide roller catch, pull, hinges, rubber bumper.

E. Finish of steel components:
   1. Apply 2 coats of enamel, baked on.
   2. Backs and surfaces not exposed to view: One coat.
   3. Concealed interior surfaces: One coat, lab black.

F. Maple tops:
   1. Finish all surfaces with 2 coats of boiled linseed oil, well rubbed into surface.
   2. Round and sand smooth all edges and corners.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Use manufacturer's printed instructions or Drawings in all cases where items or details are not indicated.

B. Except for final electrical connection, installation of each item shall be complete in every respect, including all necessary items required for proper operation and appearance.

C. Provide all trim, fillers, closures, stands, supports, braces or other miscellaneous items required for complete installation.

3.2 ADJUST AND CLEAN

A. Repair all damage done to premises as result of installation.

B. Remove all debris left by this installation.

C. Test and adjust all items of equipment for satisfactory operation.
END OF SECTION
PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Plastic and wood veneer faced casework.
   2. Countertops, backsplashes, filler panels and scribe.
   3. Hardware and accessory items.

B. Related Sections:
   1. Section 06 10 53 Carpentry.
   2. Section 06 42 16 Wood Paneling Flush.
   3. Divisions 22 and 23 Plumbing and Mechanical: Service fittings, fixtures and connections.
   4. Division 26 Electrical: Electrical fixtures and connections.

C. Work includes:
   1. Furnish labor, materials, tools, equipment, and services for laminate faced architectural casework (AC) as indicated in the A-series drawings, plans and elevations, both plastic laminate and wood veneer-faced, standard and custom configurations as indicated.
   2. Completely coordinate with work of other trades.
   3. Although such work is not specifically indicated, provide supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation, including, but not limited to accompanying countertops and brackets, and other surrounds.
   4. See Division 01 for General Requirements.
   5. Architectural casework (AC) elevations as indicated in A-Series Drawings in Contract Documents are covered in this section.

D. See drawings for types of countertops required.

E. Definitions:
   1. Refer to Fabrication requirements in Part II of this specification.
      a. Exposed surfaces: Surfaces visible after installation.
      b. Concealed surfaces: Surfaces not visible after installation.
      c. Semi exposed surfaces: Surfaces not meeting the definition of exposed or concealed, including the interiors of drawer and door components.

1.2 QUALITY ASSURANCE

A. Installer qualifications: Manufacturer, or manufacturer's authorized representative.

B. Construction details, fastening, tolerances and workmanship:
   1. Comply with 8th Edition (or most current) of “Architectural Woodwork Quality Standards” by AWI.
   3. NEMA (National Electrical Manufacturer's Association) LD3-High Pressure Decorative Laminates.

C. Mock-up
   1. Provide full-size base cabinet complete with drawers, hinged door, adjustable shelf, and countertop.
   2. Approved mock-up will establish a minimum standard of quality for this work.
   3. Approved unit may be used as part of the Work.
1.3 SUBMITTALS

A. Shop Drawings:
   1. Plans and elevations:
      a. Plans of casework at 1/8 IN = 12 IN or larger.
      b. Elevations of casework at 1/4 IN = 1 FT or larger.
      c. Cross reference shop drawings to Construction Drawing casework elevation reference numbers.

B. Samples:
   1. Sealant colors for selection.
   2. Hardwood veneer.
   3. Hardware.

C. Contract Closeout Information:
   1. Operating and maintenance data.
   2. Warranty.

D. LEED Credit MRc7, Certified Wood:
   1. Provide list of proposed certified wood products. Provide documentation from the manufacturer certifying that wood based product is made from wood obtained from forests certified by an FSC accredited certification body to comply with the Forest Stewardship Councils "Principles and Criteria." Include cost of material and chain-of-custody certification number obtained from manufacturer. Vendor's invoices must be included with chain-of-custody certificate number listed.

E. LEED Credit EQc4.1, Low-Emitting Materials, Adhesives and Sealants:
   1. Provide product data and material safety data sheets (MSDS) for adhesives and sealants used inside the building indicating VOC content of each product used. Indicate VOC content in g/L calculated according to 40 CFR 59, Subpart D.

F. LEED Credit EQc4.4, Low-Emitting Materials, Composite Wood and Agrifiber Products:
   1. Provide product data indicating the type of binder used, and confirming the product does not contain urea-formaldehyde resin binders.

1.4 JOB CONDITIONS

A. Verify dimensions at site.

B. Verify locations of items furnished in other sections.

C. If necessary to vary from arrangement indicated because of structural, mechanical, electrical or other considerations, make such variations only after approval of Architect.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Store in dry, weathertight, ventilated, temperature and humidity controlled spaces.

B. Stack to provide air circulation.

C. Time delivery and installation to avoid delaying progress of other work.

1.6 WARRANTY

A. Manufacturer to provide 5-year warranty against defects in materials and workmanship, such as but not limited to delamination, swelling, or warping.

PART 2 - PRODUCTS

2.1 GENERAL

A. Wood and particleboard requirements:
1. **LEED Credit MRc7 Certified Wood:**
   a. Materials shall contain wood and agrifiber products as certified.

2. **LEED Credit EQc4.4 Low-Emitting Materials, Composite Wood and Agrifiber Products:**
   a. Material shall be free of urea-formaldehyde glues.

B. Adhesives and Sealants: Type as used and recommended for field by manufacturer.

1. **LEED Credit EQc4.1 Low-Emitting Materials, Adhesives, and Sealants:**
   a. Material shall contain VOC content as certified.

2. **LEED Credit EQc4.4 Low-Emitting Materials, Composite Wood and Agrifiber Products:**
   a. Material shall be free of added urea-formaldehyde glues.

C. Acceptable manufacturers:

1. **Plastic Laminate-faced Architectural Casework:**
   a. Base:
      1) TMI Systems Design Corporation.
   b. Optional:
      1) LSI Corporation of America, Inc.
      2) Sidney Millwork Company.
      3) Other manufacturers desiring approval comply with Section 00 26 00.
   c. Provide the following prior to submittal of Shop Drawings:
      1) Sample of finished base cabinet unit, 18 IN wide minimum, with one drawer, door and shelf, complete with hardware conforming to requirements.
      2) Catalog of standard units (detailing construction and assembly of components.
      3) If not acceptable, construct additional sample cabinets.
      4) Sample cabinet constitutes standard of quality for actual construction.
      5) Maintain sample at job office during construction, as a basis for Architect's acceptance of the remainder of the work.

2. Formaldehyde-free particleboard:
   a. Base:
      1) PureKor Formaldehyde-free Plus.
      2) SkyBlend Formaldehyde-free.

3. **Agrifiber Composite Board:**
   a. Base:
      1) Primeboard.
      2) BioFiber Wheat.

4. **Medium Density Fiberboard:**
   a. Base:
      1) Sierra Pine.

5. **Plastic Laminate:**
   a. Base:
      1) Formica.
   b. Optional:
      1) Nevamar.
      2) Wilsonart.

6. **Contact Adhesive:**
   a. Base:
      1) Conbond.

7. **Plastic Overlay Panel products:**
   a. Base:
      1) Simpson Timber.; Shelton, WA.
   b. Optional:
      1) Selply.; White City, OR.
      2) Casework Manufacturer.

8. **Cabinet Hardware:**
   a. Base:
      1) Accuride.
2) Epco; Flint, MI.
3) Hafele.
4) Blum.
5) Knape & Vogt.
6) Grant; West Hyack, NY.
7) National Lock; Mauldin, SC.
8) Ilco Unican Corporation.
9) Stanley Hardware.
10) Stylmark; Minneapolis, MN.
11) HEWI.
12) LSI America.
13) TMI Systems Design.
14) Rockford Process Control; Rockford, IL.
15) U.S. Futaba; Santa Ana, CA.
16) Rohm & Haas.
18) Corbin Cabinet Lock Div.
19) Schlage Lock.
20) Olympus Lock; Seattle, WA.
21) Sugatsune America, (Lamp); Carson, CA.
22) Bull Dog Lock.; Chicago, IL.
23) Colson Caster Corporation; Jonesboro, AR.
24) PX Industries; Farmingdale, NY.

9. Stains and Varnishes:
   a. Base:
      1) Pratt and Lambert.
   b. Optional:
      1) Sherwin-Williams.
      2) Glidden Paint.
      3) Fuller-O'Brien Paints.

10. Plastic Laminate-faced Countertops:
    a. Base:
       1) VT Industries.; Holstein, IA.

11. Wood Moulding:
    a. Base:
       1) Southern Architectural Woodwork, Columbia, SC.
    b. Optional:
       1) Custom Woodworks Limited, Sioux City, IA.

12. Acoustical wall covering:
    a. Base:
       1) Eurotex.

13. PVC-free Wall and bumper guards:
    a. Base:
       1) Construction Specialties.
       2) Arden.

14. Sealant:
    a. Base:
       1) Color Rite.

15. Other miscellaneous items:
    a. Base: Products and Manufacturers as listed.

16. Other manufacturers desiring approval comply with Section 00 26 00.

2.2 MATERIALS - GENERAL

   A. Plastic Laminate-Faced Casework:
1. Fixed factory built formaldehyde-free core casework finished on exterior with high pressure laminate. Interior of plastic laminate faced units with plastic overlay. Provide units complete with hardware, countertops and subbases, in sizes and configurations indicated. Refer to Fabrication requirements in Part II of this specification.
   a. Style:
      1) Reveal overlay, with square cornered doors and drawer fronts overlapping case front with minimum reveal at plastic laminate casework.
      2) Plastic laminate doors and drawer fronts shall be edged with 3mm ABS banding, machine applied using waterproof hot melt adhesive. Machine profile exposed edges with 1/8 IN radius.
   b. Jointing:
      1) Cabinet body construction shall be 3/4 IN thick formaldehyde-free core joined with 10mm diameter industrial grade hardwood dowels, securely glued and clamped under pressure during assembly.

B. Plastic Laminate Facings:
   2. Thickness and Grade:
      a. Countertops and backsplashes, and their edges: Grade-GP50, 0.050 IN thick.
      b. Formed surfaces: Post form Grade-PF42.
      c. Other exposed surfaces: Grade-GP28, 0.028 IN thick.
   3. Backer Sheets for laminated items.
      a. Semi-exposed cabinet liner: Grade-CL20, 0.020 IN thick; color to match plastic overlay.
      b. Concealed backer sheet: Grade-BK20, 0.020 IN thick.
   4. Laminate Color(s): as selected by Architect from laminate manufacturer's full line.
      a. See color schedule for selections (Section 09 06 10).
      b. Allow for 5 different cabinet face colors for project; no more than 1 color per each elevation.
      c. Allow for 5 different countertop colors.
      d. Color of laminate on countertop edges: Same as surface of the item.
      e. Color of other plastic laminate edges: Black or to match plastic overlay, as selected by Architect.
   5. See "Fabrication-Case Components" for components requiring plastic laminate finish.

C. Contact Adhesive:
   1. Comply with South Coast Air Quality Management District Rule 1168 for VOC content of not more than 80 g/L.

D. Plastic Overlay:
   1. Resin impregnated 80 gram paper overlay, glued and press cured onto substrate.
   2. Conform to NEMA LD3.3 wear resistance Grade-GP28 requirements for "General Purpose" decorative board (not "Light Duty" liner type).
   4. Color: As selected by Architect from manufacturer's standard color line of dove gray, frosty white and light beige.
   5. Material: Polyester or Melamine; phenolic resin may be used on concealed surfaces.
   6. Substrates: As indicated below; see "Fabrication-Case Components" for components requiring plastic overlay finish.

E. Hardwood:
   1. Solid, S4S.
   2. Type: Quarter sawn white oak.
   3. Grade: AWI Premium grade.

F. Formaldehyde-free particleboard:
   1. ANSI-A208.1, mat formed.
   2. Density: 45 PCF.
3. Type 1-M-3 for general use.

G. Wood Moulding:
   1. Type: White oak for transparent finishes.
   2. Type: Softwood or birch for opaque finishes.
   3. Grade: AWI Premium grade.
   4. Sizes and Profile: As detailed on drawings.

H. Factory Stains and Varnishes:
   1. Quality Assurance: 8th Edition (or more current) of “Architectural Woodwork Quality Standards” by AWI.
      a. Comply with Section 1500; Premium Quality.
   2. Washcoat: Prepare wood to accept stain uniformly by application of a compatible washcoat.
   3. Stain:
      a. Stain shall have a VOC content not greater than 250 g/L in accord with the SCAQMD Rule 1113.
      b. Color: To be determined by Architect based on submittal of samples of actual wood specified.
   4. Sanding Sealer:
      a. Vinyl-based.
   5. Clear Topcoat:
      a. Conversion Varnish (formerly AWI finish system TR-4) shall have a VOC content not greater than 275 g/L in accord with SCAQMD Rule 1113.
      b. Minimum of 2 coats, lightly scuff sand between coats.
      c. Sheen (measured with 60 degree gloss meter):
         1) Satin: 31 to 45 points.

I. Adhesives:
   1. No greater than 80 g/L in accord with SCAQMD Rule 1168.

J. Medium Density Fiberboard (MDF):
   1. Meet or exceed ANSI 1037-87.
   2. Exterior grade, 48 PCF density, formaldehyde free.
   4. Core material for counters, backsplash, and sidesplashes with sinks.
   5. Core material for p-lam faced window sills where indicated.

K. Tackboards (TB), vinyl fabric faced:
   1. Vinyl fabric complying with F.S.CCC-W-408, Type II, Class 2, laminated to 1/4 IN cork sheet.
   3. Laminate under pressure to minimum 1/4 IN thick plywood or hardboard backing.
   5. Provide as noted on Q-series drawings.

L. Acrylic Compartment Divider Panels:
   1. Material: Acrylic plastic.
   2. Thickness: 1/4 IN.
   3. Color: Clear or opaque as selected by Architect.
   4. Exposed edges: Route surface and sand to satin finish.

M. Optional pencil drawer:
   1. As detailed on drawings.

N. ABS Edge-banding for case body & components:
   2. Thickness: 1mm.
   3. Color: To match case, as selected by Architect.

O. ABS edge banding (all shelves in plastic laminate clad units):
2. Shelves: Apply to 4 edges.
3. Thickness: 1mm.
4. Color: To match case, as selected by Architect.

P. ABS Edge-bandning for doors and drawer fronts and removable panels:
2. Thickness: 3mm.
3. See color schedule for selections.
4. Color: As selected by Architect, to match laminate.
   a. Allow for 5 different colors.

Q. Sealant:
2. Description:
   a. Polymers suspended in 100% Silicone.
   b. Specifically formulated for applications indicated, including wet areas.
   c. Mold/Mildew-resistant.
   d. Elastomeric.
   e. Shore A Hardness: 25.
   f. Compatible with Gypsum wallboard, Painting, Plastic Laminate, Stone, Wood, Solid Polymer Materials (SPM), and other materials specified in this section.
3. Colors:
   b. Architect to select from no less than 450 standard color choices.
   c. Number of different colors required for project shall not be limited.

2.3 CABINET HARDWARE

A. 5-knuckle Hinges:
1. Concealed type, 5 knuckle, European type, self closing.
2. Not less than 2 3/4 IN long.
3. Minimum 8 screws per hinge.
4. Shall pass ANSI/BHMA-A156.9 Grade-1 requirements.
5. Hinge Quantities per leaf:
   a. For doors up to 48 IN high: 2 hinges.
   b. For doors over 48 IN high: 3 hinges.

B. Pulls:
1. Wire pulls.
2. Provide 2 pulls for drawers over 24 IN wide.

C. Elbow Catch:
1. Provide at doors with locks.

D. Door Stops:
1. Metal slide type with positive stop.

E. Wall Bumpers:
1. Provide on adjacent wall.

F. Drawer Guides:
1. Accuride No. 4032, 150 LB capacity, or approved substitute full extension type for file drawers, lateral file drawers, knee space drawers, and where indicated.
2. Provide 1 pair for each drawer.
3. Include life time warranty.
G. Adjustable Shelf Supports:
   1. 4 per shelf.
   2. Provide predrilled holes in cabinet sides spaced at 1.25 IN OC and not more than 1.5 IN from shelf edges, 2 pin, self-locking shelf clip.

H. Index Followers:
   1. Steel rod and plate.
   2. Provide for all file drawers.

I. Drawer and Cupboard Locks:
   1. Half-mortise type, disc tumbler and cam bolt, round cylinder on exposed, plated finish, with strike.
   2. Provide National Lock "RemovaCore" or approved substitute with a minimum of 50 lock changes.

J. Drawer bumpers:
   1. Provide on backside of drawer faces.

K. Label Holders:
   1. Provide where indicated, size to receive standard label cards approximately 1 x 2 IN nominal size, finished to match other exposed hardware.

### 2.4 SUPPORTS AND BRACKETS

A. Adjustable Shelf Supports (drilled hole type):
   1. Description: Friction fit into cabinet end panels and vertical dividers, readily adjustable on 1 1/4 IN centers.
   3. Color: Clear to blend with selected interior finish.
   4. Provide non-tip feature and allow for field fixing of shelf if desired
   5. Capacity: Structural test shall indicate loading of shelf to 1500 LBS (375 LBS per support device).
   6. No substitutions.

B. Waste Receptacles:
   1. Provide recycle/trash receptacles within casework cabinets at each countertop opening in recycle counters.
   2. Provide largest container possible that can be easily removed and emptied.
   3. Minimum Product Basis of Design:
      a. "Galvanized 30 Gallon Garbage Pail" by Behrens Manufacturing Company.
      b. Height: 27 IN.
      c. Width at top: 20 IN.
      d. Coordinate with standard 33 gallon trash can liners.

### 2.5 GROMMETS

A. Grommets for cords:
   2. Finish: Black or putty as selected by Architect.
   3. Provide cap with 5/8 IN cord slot.
   4. Provide as indicated on Drawings and at each location with undercounter electrical or systems outlet, cord drop location, and keyboard drawer location.

B. Grommets for paper slots:
   2. Finish: Black or putty as selected by Architect.
   3. Provide as indicated on Drawings.
2.6 MISCELLANEOUS CABINET HARDWARE

A. Articulating keyboard drawer:
   2. Length: 14 IN.

B. Hinged lid stay:
   1. Base Manufacturer: Hafele.
   2. Finish: Satin chrome.
   3. Provide with metal construction and spring loaded adjustable brake mechanism.

C. Hinge, continuous:
   2. Finish: Chrome finish.

D. Pocket door slide system:
   2. Finish: Satin chrome.

2.7 COUNTERTOP MATERIALS & FABRICATIONS

A. Plastic Laminate-Faced Countertops:
   1. General:
      a. HPDL facing on exposed surfaces: 0.050 IN thick.
      b. Backer sheets on concealed surfaces: 0.020 IN thick.
      c. All edges of raw formaldehyde-free to be sealed with polyurethane before assembly.
   2. Countertop Construction:
      a. Core Material: Formaldehyde-free particleboard, agrifiber composite board or Medium Density Fiberboard.
      b. Core Thickness: 1 1/4 IN, or 3/4 IN with 1/2 IN build-down.
      c. Laminate backer sheet on underside of countertop.
      d. Laminate top surface with HPDL.
      e. Joints in plastic laminate: Not closer than 24 IN to sinks.
      f. Joints in counter length: Factory fitted, splined, glued, and mechanically fastened.
      g. Provide 1 1/2 IN radius on exposed outside corners (Exception: Radius not required at 3mm ABS applications)
   3. Backsplash:
      a. Backsplash with scribe piece 1 IN to be glued and secured to back edge of countertops where indicated.
      b. Apply laminate to vertical face before top edge.
      c. Apply backer sheet on back face.
      d. Height as indicated.
      e. Cove radius 1/4 IN maximum.
   4. Sidesplash:
      a. Apply backer sheet on back face.
      b. Apply laminate to vertical faces before top edge.
      c. Provide laminate backer sheet on hidden surfaces before applying plastic laminate.
      d. Secure to top and side wall.

2.8 WINDOW SILL AND COUNTERTOP MATERIALS FABRICATIONS

   1. Solid Surface Countertops where indicated.

2.9 FABRICATION - DEFINITIONS

A. Definitions:
   1. Exposed surfaces: Surfaces visible when doors and drawers are closed:
a. Door and drawer fronts, and their edges.
b. Exposed ends.
c. Bottom of wall case.
d. Countertop and backsplash and their exposed edges.
e. Face of cabinet body not covered by doors or drawer fronts.
f. Toe strip not to be covered by separate base.
g. Wall mounted adjustable shelves and their edges.
h. Interior of open cabinets, including shelving.
i. Interior of cabinets with glass doors.

2. Concealed surfaces: Surfaces not visible after installation:
   a. Solid top panels.
   b. Security panels.
   c. Locking rails.

3. Semi-exposed surfaces: Other surfaces not exposed or concealed, and:
   a. Interior of closed cabinets.
   b. Top of wall and tall cases.
   c. Drawers.

2.10 CASE COMPONENTS (FOR PLASTIC LAMINATE-FACED CABINETS)

A. General Finishes for non-fire-rated cabinets:
   3. Edges of Doors and Drawer Fronts: 3mm ABS edge banding.
   4. Edges of Case Body members: 1mm ABS edge banding.
   5. Edges of Shelves: 1mm ABS edge banding (4-sides).

B. Case Body Members:
   2. Top Panels: 3/4 IN Formaldehyde-free core with Plastic Overlay (2-sides).
      a. Exception: Where back face is exposed to view: Upgrade to 3/4 IN Formaldehyde-free
         core; Plastic Overlay on inside face; Plastic Laminate (color matching sides and fronts)
         on exposed back face.
   5. Exposed edges of Formaldehyde-free core: 1mm ABS edge banding.
   8. Base: 3/4 IN Formaldehyde-free core, with intermediate reinforcing at 24 IN on O.C.
      (maximum).

C. Shelves:
      a. Exception: Increase thickness to 1 IN for spans exceeding 30 IN.
      a. Exception: Increase thickness 1 IN for spans exceeding 30 IN.

D. Doors:
   1. 3/4 IN Formaldehyde-free core with Plastic Laminate on exposed faces, Plastic Overlay on
      semi-exposed faces.
   2. Edges: 3mm ABS edge banding on laminate-faced doors.
   3. Doors not to exceed 25 IN in width.

E. Drawers:
   1. Drawer Fronts:
      a. 3/4 IN Formaldehyde-free core with Plastic Laminate on exposed faces, Plastic Overlay
         on semi-exposed faces.
      b. Edges: 3mm ABS edge banding on laminate-faced drawer fronts.
2. Sub-fronts, Sides and Backs:
   a. 1/2 IN Formaldehyde-free core with Plastic Overlay (2-sides).
   b. Exposed top edges finished with 1mm ABS banding.
3. Bottoms:
   a. 1/2 IN Formaldehyde-free core with Plastic Overlay (2-side).
   b. Include intermediate reinforcing rails where drawer width exceeds 18 IN.

F. Case Base: Integral or separate base for each unit.
   1. Resilient base shall be furnished and applied by others.

G. Filler Panels and Scribe Pieces: 3/4 IN Formaldehyde-free core with Plastic Laminate exposed surfaces; Plastic Overlay on semi-exposed or fully concealed surfaces,

H. Grain Direction (where laminate has a predominate grain direction): Vertical grain at all frames, cases, doors faces, drawer faces and all other vertical surfaces.

2.11 FABRICATION - CONVENTIONAL JOINTING

A. Case body:
   1. Sides, dividers, bottom, and tops members:
      a. Dowel with 10mm fluted hardwood dowels. Provide minimum of 6 dowels at each joint for 24 IN deep cabinets and a minimum of 4 dowels for 12 IN deep cabinets.
      b. Glue joints.
   2. Back:
      a. Dado into sides, bottom, and top. Locate dado 3/4 IN in from back face of cabinet or on-set type, lead in at finished ends, screwed at the top and bottom, stapled at the sides.
      b. Glue joints.
   3. Compartment dividers & lock rails:
      a. Doweled.
   4. Base:
      a. Integral or separate, to receive base material to match adjacent walls, unless noted otherwise.
   5. Blind-fasten to bottom of case body when separate.

B. Drawers with subfront:
   1. Sub-front, sides and back:
      a. Doweled corners.
      b. Glue joints.
   2. Bottom: Dado into 4 sides and glued or screwed to the bottom with the use of bottom supporting drawer slide hardware.
   3. Front:
      a. Secured from subfront side with no less than four screws after adjustments.

C. Use no blocking or fasteners in exposed or Semi-exposed locations.

2.12 FABRICATION - MECHANICAL FASTENERS

A. Countertop joints:
   1. Provide joint connectors every 6 IN OC.

B. Pre-drill and countersink screw holes before installation.

C. Do not use mechanical fasteners or blocking in exposed locations. When fasteners are required on exposed surfaces color, materials and finish to be approved by Architect.

2.13 FABRICATION - CASE CONFIGURATION

A. Plastic Laminate-Faced Units:
   1. Provide reveal, approximately 1/8 IN, at top of doors and drawer fronts, and between doors and drawer fronts in same unit; reveal approximately 7/16 IN at sides.
B. Provide reveal 1/8 x 1/8 IN (black) in upper edge of exposed sides of wall case when plastic laminate soffits provided.

C. Toe space:
   1. As indicated.

D. Pairs of sliding doors:
   1. Equal width; overlap approximately 1 IN.

E. Countertop:
   1. Plastic laminate units:
      a. Overhang 3/4 IN beyond doors, drawer fronts and exposed ends.

F. Hardware mounting:
   1. Drawers:
      a. Center pull in front, horizontally.
      b. No more than 4 IN from top.
   2. Drawers with 2 pulls:
      a. Set pulls at 1/4 points.
      b. No more than 4 IN from top.
   3. Framed glass doors:
      a. Center pull in corner of frame.
   4. Swinging doors:
      a. Set pull in swing side corner, vertically; at top of base units; at bottom of wall units.

G. Exposed adjustable shelves:
   1. Use drilled hole supports only (32mm centers).

H. Semi-exposed adjustable shelves:
   1. Use drilled hole supports (32mm centers).
      a. Depth: 1/2 IN less than inside cabinet depth.
      b. Width: 1/8 IN, maximum, less than inside cabinet width.

I. Provide doors at locations requiring access to electrical devices, as indicated on drawings.

PART 3 - EXECUTION

3.1 INSPECTION

A. Verify suitability of substrate to accept installation.

B. Insure that adequate Wall Backing has been installed.
   1. Metal Wall Backing: Specified in Section 09 22 16.
   2. Coordinate and direct installation of backing where required.

C. Correct unsatisfactory conditions.

D. Installation constitutes acceptance of responsibility for performance.

3.2 INSTALLATION

A. Install the work plumb and level with no distortions to a tolerance of 1/8 IN in 8 FT for plumb and level (including countertops) and with 1/32 IN maximum offsets in revealed adjoining surfaces.
   1. Shim as required.

B. Manufacturer to provide printed instructions or drawings on wall blocking locations and type required to Contractor.

C. Use manufacturer's printed instructions or drawings in cases where items or details are not indicated.
D. Provide trim, fillers, closures, stands, supports, sleeves, collars, escutcheons, ferrules, brackets, braces or other miscellaneous items required for complete installation.

E. Provide cutouts for mechanical and electrical items.

F. Seal sink cutouts.

G. Install extra locks as directed; deliver unused locks to Owner.

3.3 SEALING OF JOINTS

A. Seal casework, countertops and splashes to walls, to seal joints.
   1. Sealant color to match countertop color.

B. Seal perimeter of counter-mounted sinks.
   1. Sealant color to match countertop color.

3.4 ADJUSTMENTS AND CLEANING

A. Test and adjust items of equipment for satisfactory operation.

B. Adjust hinges for proper door alignment.

C. Adjust drawer guides for proper drawer front alignment and operation.

D. Adjust countertops to a level position and align to adjacent unit.

E. Repair damage to casework or countertops to appear in original new condition.

F. Repair damage to premises as a result of installation.

G. Remove debris left by this installation.

H. Clean casework and countertops after above items have been completed.

END OF SECTION
PART 1 - GENERAL

1.1 QUALITY ASSURANCE

A. Applicable standards:
   1. Standards of the following, as referenced herein:
      c. National Electrical Manufacturers Association (NEMA).
      d. NSF International.

B. NSF/ANSI standards:
   1. Refer to www.nsf.org for the latest compliance to NSF/ANSI Standard 51 for food zone - all food types.

C. Fabricator/Installer Qualifications:
   1. Firm 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.

D. Source Limitations: Obtain materials and products from single source.

1.2 DELIVERY, STORAGE AND HANDLING

A. Deliver components to project site in a timely manner, when areas are ready for installation.
   1. Store components indoors prior to installation.
   2. Deliver fabrications appropriately wrapped in protective materials.

B. Protect stored material and fabrications from damage.

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

1.3 WARRANTY

A. Provide 10-year manufacturer’s warranty including colorfastness and material defects.
   1. Warranty shall provide material and labor to repair or replace defective materials.

1.4 SUBMITTALS

A. Shop Drawings:
   1. Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices and other components.
   2. Show full-size details, edge details, thermoforming requirements, attachments, etc.
   3. Show locations and sizes of furring, blocking, including concealed blocking and reinforcement.
   4. Show locations and sizes of cutouts and holes for plumbing fixtures, faucets, soap dispensers, waste receptacle and other items installed in surface.
   5. Indicate dimensions, component sizes, fabrication details, attachment provisions and coordination requirements with adjacent work.

B. Samples:
   1. For each SSF color selected:
      a. Minimum 6 x 6 IN sample in specified gloss.
      b. Cut sample and seam together for representation of inconspicuous seam.
c. Indicate full range of color and pattern variation.
2. Sealant colors for selection.
3. Approved samples will be retained as a standard for work.

C. LEED Credit EQc4.1, Low-Emitting Materials, Adhesives and Sealants:
1. Provide product data and material safety data sheets (MSDS) for adhesives and sealants used inside the building indicating VOC content of each product used. Indicate VOC content in g/L calculated according to 40 CFR 59, Subpart D.

D. Contract Closeout Information:
1. Maintenance data.
2. Warranty.

1.5 JOB CONDITIONS

A. Site-verify dimensions.
B. Coordinate installation with work of all trades.
C. Environmental Conditions:
   1. Maintain relative humidity planned for building occupants for 48 hours prior to and during installation.
   2. Maintain ambient temperature between 65 Deg F and 75 Deg F for 48 hours prior to and during installation.
   3. After installation, maintain relative humidity and ambient temperature planned for building occupants.
D. Jobsite Tooling:
   1. Protect adjacent materials from dust and damage due to tooling operations.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Acceptable manufacturers:
   1. Solid Surfacing (SSF) fabrications:
      a. Base:
         1) DuPont de Nemours (Corian).
      b. Optional:
         1) Aristech Acrylics LLC, (Avonite).
         2) Wilsonart International.
         3) Formica Surell.
         4) Staron.
         5) LG Deroative Surfaces.
   2. Sealant (elastomeric):
      a. Base:
         1) Color Rite.
         2) Other products as approved by SSF manufacturer.
   3. Other manufacturers desiring approval comply with section 00 26 00.

2.2 SOLID SURFACING MATERIALS

A. Description:
   2. Cast, non-porous, homogeneous, acrylic polymer composition with additional fire retardant fillers and pigments.
      a. Prime product may not coated, laminated of composite construction.
      b. Through body colors shall comply with ANSI Z124.3 or ANSI Z124.6, having minimum physical and performance properties specified.
3. **LEED Credit EQc4.1 Low-Emitting Materials, Adhesives, and Sealants:**
   a. Material shall contain VOC content as certified.
4. **Defects with depth < 0.010 IN shall be considered “superficial.”**
   a. Superficial damage shall be repaired by sanding and/or polishing.
   b. Components with more severe defects shall be rejected.
5. **Physical properties:**

<table>
<thead>
<tr>
<th>Property</th>
<th>Method</th>
<th>Value</th>
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</thead>
<tbody>
<tr>
<td>Tensile Strength</td>
<td>ASTM D638</td>
<td>6000 PSI</td>
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<tr>
<td>Tensile Elongation</td>
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<td>Flexural Strength</td>
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<td>Hardness</td>
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<td>Matte = 5; Highly Polished = 75</td>
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<tr>
<td>Light Resistance</td>
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<td>No Effect (Xenon Arc)</td>
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<tr>
<td>Wear and Clean ability</td>
<td>ANSI Z124.3 &amp; Z124.6</td>
<td>Pass</td>
</tr>
<tr>
<td>Stain Resistance</td>
<td>ANSI Z124.3 &amp; Z124.6</td>
<td>Pass</td>
</tr>
<tr>
<td>Fungus and Bacteria Resistance</td>
<td>ASTM G21 &amp; G22</td>
<td>Does not support microbial growth</td>
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<tr>
<td>High Temperature Resistance</td>
<td>NEMA LD 3-2000 Method 3.6</td>
<td>No change</td>
</tr>
<tr>
<td>Boiling Water Resistance</td>
<td>NEMA LD 3-2000 Method 3.5</td>
<td>No visible change</td>
</tr>
<tr>
<td>Ball Impact Resistance; 1/2 LBS Ball</td>
<td>NEMA LD 3-2000 Method 3.5</td>
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<td>Specific Gravity</td>
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<td>Water Absorption</td>
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<td>Toxicity</td>
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<tr>
<td>Smoked Developed Index</td>
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</table>

### MISCELLANEOUS MATERIALS

2.3 **Backgrading materials (build down):**

1. Finished or exposed edges: SSF material.
   a. Profiles as indicated.
2. Concealed spaces and non exposed edges:
   a. Moisture-resistant medium-density fiberboard (MDF) Panels or moisture-resistant plywood.
      1) Base Product: “Medite FR” by Sierra Pine.
      2) Particleboard is not acceptable.
   b. Physical Properties, Based on 3/4 IN Thickness, ASTM D 1037, Part A:
      1) Density: 48 LBS/FT³.
      2) Modulus of Rupture: 4,500 PSI.
      3) Screw Holding: Required to pull 1 IN #10 sheet metal screw:
         a) Face: 230 pounds.
         b) Edge: 185 pounds.
      4) Water Absorption: 14 percent average, 24-hour soak.
      5) Thickness Swell: 6 percent average, 24-hour soak.
      6) Flame Spread Rating, ASTM E84: Class A (1).
   c. Panel Thickness:
1) As required for application, utilize a single thickness to achieve build down to cross sectional thickness.

3. Backer Sheets for knee spaces (open areas under countertops):
   a. Backer sheet: Grade-BK20, 0.020 IN thick.
   b. Apply to bottom side of backing material.

4. Backing materials adhesive:
   a. Construction grade adhesive recommended by SSF manufacturer for backing materials.

B. Joint Adhesive:
   1. Manufacturer’s standard one- or two-part adhesive as required for inconspicuous, non-porous joints.

C. Sealant (elastomeric):
   1. Description:
      a. Mildew-resistant, FDA-compliant, NSF 51-compliant (food zone - any type), UL-listed silicone sealant in colors matching components.
      b. Specifically formulated for applications indicated, including wet areas.
      c. Elastomeric.
      e. Compatible with SSF specified.
      f. Compatible with Gypsum wallboard, Painting, laminates and other materials being sealed.
   2. Colors:
      a. Architect to select from no less than 450 standard color choices.
      b. Number of different colors required for project shall not be limited.
   3. Base Product(s):
      a. Where “solid” colored SSF: “Color-Sil” by Color Rite; 100% Silicone, uniformly colored, no suspended accent color partials.
      b. Where “speckle-colored” SSF is specified: “Poly-Sil” by Color Rite; 100% Silicone with suspended accent color particles.
      c. Architect to select final colors and locations during submittals phase.

D. Conductive Foil Tape:
   1. Manufacturer’s standard aluminum foil tape, with required thickness, for use with cutouts near heat sources.

E. Insulating Felt Tape:
   1. Manufacturer’s standard for use with conductive tape in insulating solid surface material from adjacent heat source.

2.4 SHOP FABRICATION - GENERAL

A. Shop assembly
   1. Fabricate components to greatest extent practical to sizes and shapes indicated, in accordance with approved shop drawings and manufacturer’s instructions.
   2. Form joints between components using color-matched Joint Adhesive in an inconspicuous manner.
      a. Reinforce with 4 IN wide strip of SSF material.
   3. Provide factory cutouts for plumbing fittings and bath accessories as indicated.
      a. Radius all inside corners of cutouts as large as but not less than 1/4 IN.
      b. Reinforce with SSF corner blocks to avoid stress cracking.
      c. Sand edges and corners smooth and free of chips or nicks.
      d. Utilize heat-conductive aluminum tape around drop-in stoves and other heat sources to protect SSF from thermal stress.
   4. Rout and finish component edges with clean, sharp returns.
      a. Rout cutouts, radii and contours to template.
      b. Smooth edges.
      c. Repair or reject defective and inaccurate work.
5. Fabricate coved splashes where indicated.
6. Reinforce inside corners, narrow pieces, cantilevered overhangs, and stress points against breakage by laminating an additional thickness of SSF on concealed face.
7. Laminate additional thicknesses of SSF and tool edge profiles indicated.
8. Finishing: Ensure that completed pieces are uniformly finished according to SSF schedule.

2.5 FABRICATIONS

A. SSF Window Sills (stools):
   1. Configurations detailed on Architectural Drawings.
   2. Thickness: Minimum 1/2 IN (unless otherwise indicated).
   3. Join multiple pieces, where required, with Joint Adhesive to create inconspicuous seam.
   4. Edge Treatments: As indicated on the drawings.
   5. Polish exposed faces.
   6. SSF Color / Pattern / Finish: Per SSF Schedule.

B. SSF Countertops:
   1. General:
      a. Configurations as indicated on the Drawings.
      b. Composite thickness of countertop assemblies: 1 1/2 IN unless otherwise indicated.
         1) Nominal Thickness of SSF material: Minimum 1/2 IN unless otherwise indicated.
      c. Radius exposed outside corners: Minimum 1 1/2 IN.
      d. Join multiple pieces, where required, with Joint Adhesive to create inconspicuous seam.
   2. Backer:
      a. General:
         1) Configure backing material as required for application:
      b. Ladder frame at SSF countertops supported by base cabinets:
         1) Form ladders from approved backing material ripped into 3-4 IN wide strips.
         2) Locate main runner strips (rails) along front and back edges of countertops.
            a) Provide clearance for shrinkage and normal expansion and contraction.
         3) Space front-to-back supports (stiles) to align with line where base cabinet units adjoin. Locate stiles over other wall brackets and supports.
         4) Where base cabinets and supports exceed in 24 IN width: Include additional intermediate stiles so that maximum spacing does not exceed 24 IN.
         5) Provide additional intermediate stiles at seams in SSF countertop material.
         6) Join the stiles to rails using screwed or glued wooden biscuit seams, serrated dowels or rabbeted seams.
         7) Overhangs: Configure backer material per SSF manufacturer’s guidelines according to amount of overhang projects past its support.
      c. Countertops which span between supports 30 IN and wider:
         1) Fabricate backer from solid backing material (not stile and rail construction).
         2) Extend one-piece, solid backer material, across entire span. Extend load bearing edges not less than 4 IN over edge of supporting cabinets (or similar support).
   3. Backsplashes and Sidesplashes:
      a. Provide where indicated.
      b. Thickness: Minimum 1/2 IN (unless otherwise indicated).
      c. Height: As indicated.
      d. Fabricate from same material and color as top.
      e. Backsplash Style: Integrally-coved.
   4. Front overhang of Tops: As indicated on the drawings.
   5. Edge Treatments: As indicated on the drawings.
   6. Polish exposed faces.
7. SSF Color / Pattern / Finish: Per SSF Schedule.

C. Sinks (specified elsewhere):
   1. Vitreous china or stainless steel bowls: Specified in Section 22 40 00.

D. Faucets and Trim: Specified in Section 22 40 00.

2.6 SCHEDULE OF SSF FINISHES

A. Schedule of SSF Finishes as indicated on the drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with fabricator present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
   1. Verify measurements, dimensions and drawing details before proceeding.
   2. Coordinate location of furring, nailers, blocking, grounds and similar supports for attached work.
   3. Examine conditions under which work is to be installed.
   4. Correct unsatisfactory conditions.

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

C. Installation constitutes acceptance of responsibility for performance.

3.2 INSTALLATION

A. General:
   1. Install components plumb, level and rigid, scribed to adjacent finishes, in accordance with approved shop drawings and product data.
   2. Provide product in the largest pieces available.
   3. Form field joints using manufacturer’s recommended adhesive, with joints inconspicuous in finished work.
      a. Exposed joints/seams will not be allowed.
   4. Reinforce field joints with SSF strips extending a minimum of 1 to 2 IN on either side of the seam with the strip being the same thickness as the top.
   5. Cut and finish component edges with clean, sharp returns.
   6. Rout radii and contours to template.
   7. Anchor securely to base cabinets or other supports.
   8. Align adjacent countertops and form seams to comply with manufacturer’s written recommendations using adhesive in color to match countertop.
   9. Carefully dress joints smooth, remove surface scratches and clean entire surface.
  10. Install countertops with no more than 1/8 IN sag, bow or other variation from a straight line.

B. Window Sills (stools):
   1. Shim as required so that installed items are plumb, true and level.
   2. Install Window Sills full length of window, set securely into place using only concealed fasteners and approved adhesive.
   3. Adhere sills to substrate with dabs of a clear silicone sealant at 10 to 12 IN intervals.
   4. Where sills are abutted by walls at both ends: Allow 1/8 IN expansion gaps at both ends for every of 10 FT sill.
      a. Seal gaps with elastomeric sealant.
   5. Ease edges and sand smooth.

C. Countertops:
   1. Install plumb, level, true and straight.
3.3 **CLEANING AND PROTECTION**

A. Keep components clean during installation.

B. Protect finished surfaces from damage.

C. Remove adhesives, sealants and other stains.

3.4 **REPAIR**

A. Repair damaged work.

B. Replace damaged work which cannot be repaired to Architect’s satisfaction.

**END OF SECTION**
SECTION 12 61 13
AUDITORIUM SEATING

PART 1 - GENERAL

1.1 QUALITY ASSURANCE

A. Comply with all standards and requirements listed.
B. Welding and welders:
   1. Utilize skilled and qualified welders.
   2. Weld in conformance with AWS welding code.

1.2 SUBMITTALS

A. Samples:
   1. Metal and wood finishes.
   2. Fabric samples.
B. Contract Closeout Information:
   1. Interior finish fire performance data:
      a. Provide for each finish material and type specified:
         1) Manufacturer's printed information including:
            a) Fire class.
            b) NFPA test number.
C. LEED Credit EQc4.1, Low-Emitting Materials, Adhesives and Sealants:
   1. Provide product data and material safety data sheets (MSDS) for adhesives and sealants
      used inside the building indicating VOC content of each product used. Indicate VOC
      content in g/L calculated according to 40 CFR 59, Subpart D.

PART 2 - PRODUCTS

2.1 SEATING

A. Acceptable Manufacturers:
   1. Base:
      a. KI Corporation.
   2. Optional:
      a. American Seating Company.
   3. Other manufacturers desiring approval comply with Section 00 26 00.
B. Seating – General:
   1. Design Basis:
   2. Mounting: Welded steel, pedestal and riser to fit conditions.
      a. Dual tubular uprights.
   3. Sizes: Nominal 21 1/2 IN OC.
      a. Fabric: Pallas No. 27118154 “New Leaf”.
      b. Outer back, seat pan, end panel, and arm cap: Black plastic.
C. Aisle lights: Every 10th row alternating; to provide 1 light per 5 rows.
D. Tablet arm:
   1. Size: Large.
   2. Plastic laminate faced both sides over multi-ply plywood.
4. In writing position, capable of supporting 250 LBS.
E. Adhesives and Sealants: Type as used and recommended for field by manufacturer.
   1. LEED Credit EQc4.1 Low-Emitting Materials, Adhesives, and Sealants:
      a. Material shall contain VOC content as certified.

2.2 FABRICATION
   A. Units may be single or multiple mounted to fit layout radii.
   B. Supplier provide complete layout plan showing seating, mounting, accessories, electrical rough-in points, etc.
   C. Maintain 5 percent surplus stock of upholstery fabric.

PART 3 - EXECUTION

3.1 INSPECTION
   A. Verify suitability of substrate to accept installation.
   B. Installation assumes responsibility for performance.

3.2 INSTALLATION
   A. Comply fully with manufacturer's layout plan, shop and erection drawings, and installation recommendations.
   B. Set units plumb, level and true to line.
   C. Anchor securely in place.
   D. Set bases in a bed of sealant.

3.3 CLEANING AND PROTECTION
   A. Clean promptly after installation.
   B. Exercise care to avoid damage to finishes.
   C. Protect work and take other precautions required to ensure that work will be without damage at time of acceptance.

END OF SECTION