

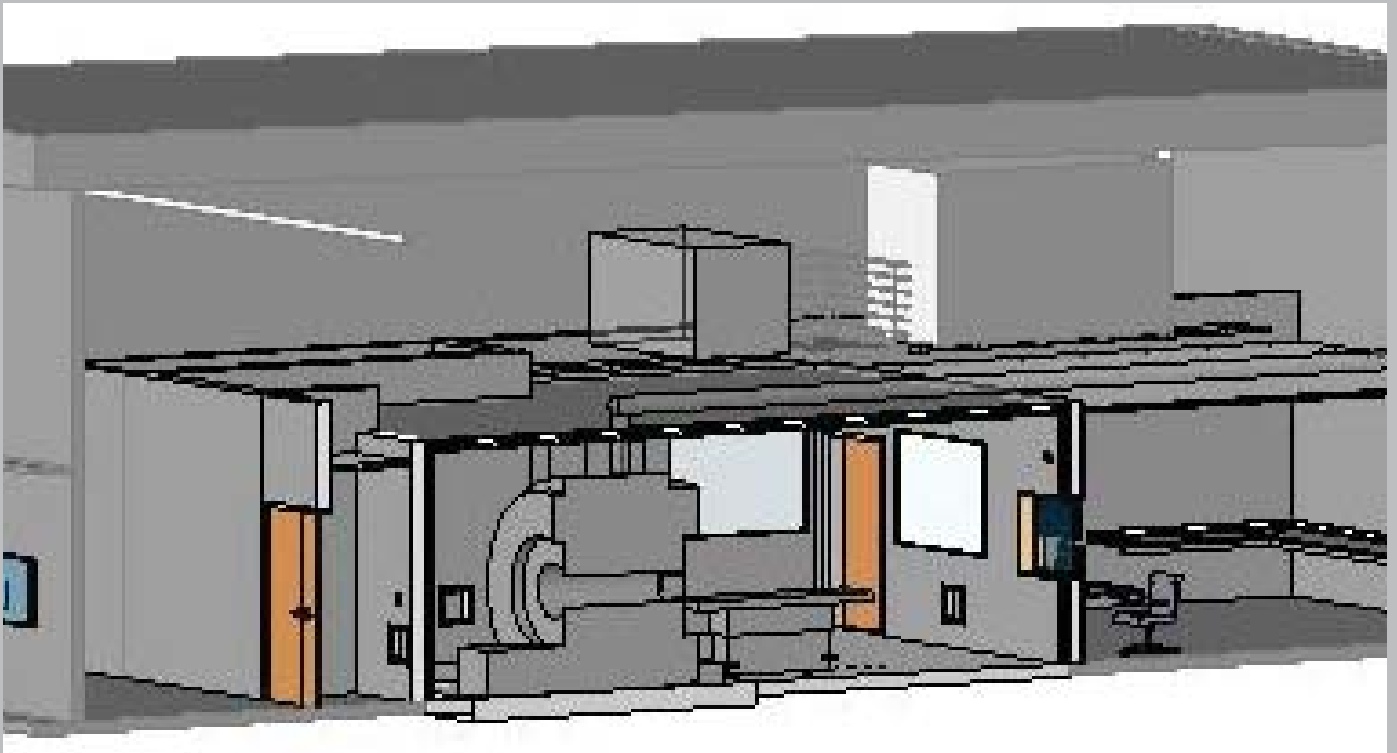


University of Colorado at Boulder  
CINC fMRI Suite

Schematic Design  
Project Manual

October 15, 2010

State of Colorado Project #PR128237  
Architect's Project #10839.00



**DAVIS**  
PARTNERSHIP  
ARCHITECTS



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**DOCUMENT 00106**

**PROJECT DIRECTORY**

University of Colorado @ Boulder fMRI Remodel at CINC

**Client/Owner**

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END OF PROJECT DIRECTORY



## SECTION 01210 - ALLOWANCES

### 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 allowances.
  - 1. Certain items are specified in the Contract Documents by allowances. Allowances have been established in lieu of additional requirements and to defer selection of actual materials and equipment to a later date when direction will be provided to Contractor. If necessary, additional requirements will be issued by Change Order.
- B. Types of allowances include the following:
  - 1. Contingency allowances.
- C. Related Requirements:
  - 1. Divisions 2 through 16 Sections for items of Work covered by allowances.

#### 1.3 SELECTION AND PURCHASE

- A. At the earliest practical date after award of the Contract, advise Architect of the date when final selection and purchase of each product or system described by an allowance must be completed to avoid delaying the Work.
- B. At Architect's request, obtain proposals for each allowance for use in making final selections. Include recommendations that are relevant to performing the Work.
- C. Purchase products and systems selected by Architect from the designated supplier.

#### 1.4 ACTION SUBMITTALS

- A. Submit proposals for purchase of products or systems included in allowances, in the form specified for Change Orders.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.
- B. Submit time sheets and other documentation to show labor time and cost for installation of allowance items that include installation as part of the allowance.
- C. Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

#### 1.6 COORDINATION

- A. Coordinate allowance items with other portions of the Work. Furnish templates as required to coordinate installation.

#### 1.7 CONTINGENCY ALLOWANCES

- A. Use the contingency allowance only as directed by Architect for Owner's purposes and only by Change Orders that indicate amounts to be charged to the allowance.
- B. Contractor's overhead, profit, and related costs for products and equipment ordered by Owner under the contingency allowance are included in the allowance and are not part of the Contract Sum. These costs include delivery, installation, taxes, insurance, equipment rental, and similar costs.
- C. Change Orders authorizing use of funds from the contingency allowance will include Contractor's related costs and reasonable overhead and profit margins.
- D. At Project closeout, credit unused amounts remaining in the contingency allowance to Owner by Change Order.

#### 1.8 ADJUSTMENT OF ALLOWANCES

- A. Allowance Adjustment: To adjust allowance amounts, prepare a Change Order proposal based on the difference between purchase amount and the allowance, multiplied by final measurement of work-in-place where applicable. If applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, and similar margins.
  - 1. Include installation costs in purchase amount only where indicated as part of the allowance.
  - 2. If requested, prepare explanation and documentation to substantiate distribution of overhead costs and other margins claimed.
  - 3. Submit substantiation of a change in scope of work, if any, claimed in Change Orders related to unit-cost allowances.
  - 4. Owner reserves the right to establish the quantity of work-in-place by independent quantity survey, measure, or count.

- B. Submit claims for increased costs because of a change in scope or nature of the allowance described in the Contract Documents, whether for the purchase order amount or Contractor's handling, labor, installation, overhead, and profit.
  - 1. Do not include Contractor's or subcontractor's indirect expense in the Change Order cost amount unless it is clearly shown that the nature or extent of work has changed from what could have been foreseen from information in the Contract Documents.
  - 2. No change to Contractor's indirect expense is permitted for selection of higher- or lower-priced materials or systems of the same scope and nature as originally indicated.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine products covered by an allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

3.2 PREPARATION

- A. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.

3.3 SCHEDULE OF ALLOWANCES

- A. Allowance No. 1: Contingency Allowance of \$50,000 for RF Shielding and enclosure.
- B. Allowance No. 2: Contingency Allowance of \$10,000 for siliconized steel, magnetic shielding.

END OF SECTION 01210



## SECTION 02070 - SELECTIVE DEMOLITION

### PART 1 - GENERAL

#### 1.1 SUMMARY:

##### A. Section Includes:

##### 1. Types of Selective Demolition Work:

- a. Portions of building structure as required to accommodate new construction.
- b. Removal of interior partitions.
- c. Removal of doors and frames.
- d. Removal of built-in casework.
- e. Removal and protection of existing material to be reused. Fixtures and equipment items indicated as "salvage" or for "reuse".

2. Demolition requires the selective removal and subsequent off-site disposal of removed material, except salvaged items or items to be relocated. The disposal of all debris must be off the UCB campus. Any construction debris placed in University dumpsters will be removed at the Contractor's expense.

##### B. Related Sections:

1. Section 01121 - Hazardous Material Procedures.
2. Section 02060 - Building Demolition.
3. Section 02080 - Asbestos Removal.

#### 1.2 SUBMITTALS:

##### A. Schedule:

1. Submit schedule indicating proposed methods and sequence of operations for selective demolition work.
2. Include selective demolition work in the construction waste management plan. (LEED MRc2: Construction Waste Management)

#### 1.3 JOB CONDITIONS:

##### A. Occupancy:

1. University personnel will be continuously occupying areas of the building immediately adjacent to areas of selective demolition. Verify with CU project manager whether building will be occupied or vacated during expected work activities.

2. Conduct selective demolition work in manner that will minimize the need for disruption of normal operations if building remains occupied.
  1. Provide minimum of 72 hours advance notice of demolition activities and utility outages.
- B. Condition of Structures:
1. The University assumes no responsibility for actual condition of items or structures to be demolished.
  2. Conditions existing at time of commencement of contract will be maintained insofar as practical. A copy of the environmental site assessment will be available for inspections at the CU project manager's office.
- C. Protection of Persons and Property:
1. Provide temporary barricades, traffic control, and other forms of protection as required. Contractor to comply fully with OSHA requirements.
- D. Traffic:
1. Conduct selective demolition operations and debris removal in a manner to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities. Clean-up is required daily as work progresses.
- E. Explosives:
1. Use of explosives will not be permitted.
- F. Utility Services:
1. Maintain existing utilities indicated to remain, keep in service, and protect against damage during demolition operations.
  2. Coordinate utility outages with Department of Facilities Management, affected utility companies, and affected users.
- G. Environmental Controls:
1. Use water sprinkling, temporary enclosures, and other suitable methods to limit dust and dirt rising and scattering in air to lowest practical level. Comply with the Department of Environmental Health and Safety requirements pertaining to environmental protection. Comply with Colorado Department of Health requirements regarding debris control.
  2. Keep dust and dirt from migrating to occupied building areas.

## PART 2 - PRODUCTS

### 2.1 SALVAGE:

- A. The Owner reserves first salvage rights including:
  - 1. Items of historic or archaeo-logical significance or value.
  - 2. Construction material and products.
  - 3. Mechanical, electrical equipment and components.
- B. The Contractor shall notify the Owner for review of material to be stored or selected for salvage.
- C. Coordinate with the Department of Facilities Management.

Items indicated to be removed but of salvageable value to Contractor may be removed in a timely manner from structure as work progresses, if such items are not claimed by the Owner.

LEED MRc2: Construction Waste Management

Documentation must be completed before items are removed from the project site in order to complete the waste reduction progress reports.

- D. Transport salvaged items from site as they are removed.
- E. Storage or sale of removed items on site will not be permitted.

LEED MRc2: Construction Waste Management

If items are salvageable, but are of no value to the owner or contractor, items must be donated. Waste reduction progress reports must be completed. See section 02060, under Submittals, for report requirements.

2.2 RECYCLE:

- A. All selective demolition debris that is recyclable must be recycled.
- B. Waste reduction progress reports must be completed for all recycled material.  
(LEED MRc2: Construction Waste Management)

PART 3 - EXECUTION

3.1 PREPARATION:

- A. Provide interior and exterior shoring, bracing, or support, as required.
- B. Cover and protect furniture, equipment and fixtures, if not removed by Owner.
- C. Erect and maintain dust-proof and weatherproof partitions and closures as required.
- D. Locate, identify, stub-off and disconnect utility services that are indicated to be removed.

- E. Request inspection by Department of Facilities Management and applicable utility companies:
  - 1. When utilities are uncovered.
  - 2. Prior to covering-up or concealing utilities.

### 3.2 DEMOLITION:

- A. Perform selective demolition work in a systematic manner.
  - 1. Demolish concrete and masonry in small, manageable sections. Do not overload structure with debris. Cut concrete and masonry using power-driven masonry saw or hand tools; do not use powder-driven impact tools in buildings.
  - 2. Locate demolition equipment throughout structure to avoid imposing excessive loads on supporting walls, floors or framing.
  - 3. Construct chutes as required to conduct debris safely to grade disposal areas. Comply with Environmental Health and Safety and Colorado Department of Health dust control and safety requirements.
  - 4. Do not cut or alter any structural member without authorization of the Architect.

### 3.3 REUSED MATERIALS:

- A. Items for Owner Salvage:
- B. Items for Reuse or Reinstallation:

### 3.4 DISPOSAL OF DEMOLISHED MATERIALS:

- A. Remove debris, rubbish and other materials resulting from demolition operations from building site and off the campus.
- B. Under no circumstances should the University's dumpsters be used for disposal of demolished materials.
- C. Transport and dispose of non-recyclable or non-salvageable materials off site in legal manner.
- D. Burning of removed materials is not permitted on project site.

LEED MRc2: Construction Waste Management

Recyclable materials shall be taken to local recycling facility. Waste reduction progress reports shall be completed for all recycled material.

END OF SECTION 02070

## SECTION 03200 - CONCRETE REINFORCEMENT

### PART 1 - GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

1. Reinforcing steel bars, welded steel wire fabric, fabricated steel bar or rod mats for cast-in-place concrete.
2. Support chairs, bolsters, bar supports, and spacers, for supporting reinforcement.

##### B. Related Sections:

1. Section 0300 – Cast-in-Place Concrete: Concrete placement.

#### 1.2 REFERENCES:

- A. ACI 301 – Specifications for Structural Concrete for Buildings.
- B. ACI 315 – Details and Detailing of Concrete Reinforcement.
- C. ASTM A82 – Cold Drawn Steel Wire for Concrete Reinforcement.
- D. ASTM A185 – Welded Steel Wire Fabric for Concrete Reinforcement.
- E. ASTM A615 – Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
- F. ASTM A706 – Low-Alloy Steel Deformed Bars for Concrete Reinforcement.
- G. AWS D1.4 – Structural Welding Code Reinforcing Steel.
- H. CRSI – Manual of Practice
- I. CRSI 63 – Recommended Practice for Placing Reinforcing Bars.
- J. CRSI 65 – Recommended Practice for Placing Bar Supports, Specifications and Nomenclature.

#### 1.3 QUALITY ASSURANCE:

- A. Perform concrete reinforcement work in accordance with CRSI Manual of Standard Practice, and Documents 63 and 65.
- B. Conform to ACI 301.

- C. Submit mill test certificates of supplied concrete reinforcing, indicating physical and chemical analysis.

## PART 2 - PRODUCTS

### 2.1 MATERIALS:

- A. Reinforcing Steel: ASTM A615 plus (S1) and ASTM A706 for bars where welding is required, Grade 60 if not otherwise specified. Finish: Plain.
- B. Welded Wire Fabric: ASTM A185. Finish: Plain. Furnish in flat sheets.

### 2.2 ACCESSORY MATERIALS:

- A. Tie Wire: Minimum 16 gage annealed type. Acceptable patented system.
- B. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for strength and support of reinforcement during installation and placement of concrete.

### 2.3 FABRICATION:

- A. Fabricate in accordance with ACI 315, providing concrete cover specified in Section 03300.
- B. Weld reinforcing bars in accordance with AWS D1.4.

## PART 3 - EXECUTION

### 3.1 FIELD QUALITY CONTROL:

- A. Notify Architect 24 hours prior to placement of concrete.

END OF SECTION 03200

## SECTION 03300 - CAST-IN-PLACE CONCRETE

### PART 1 - GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

1. Cast-in-place concrete quality control.
2. Concrete finishing standards

##### B. Related Sections:

1. Section 01400 – Quality Control: Concrete testing.

#### 1.2 SUBMITTALS:

##### A. Mix Designs:

1. Submit concrete mix designs a minimum of 30 days prior to first concrete placement.
2. Data for each mix shall include the following:
  - a. Mix identification.
  - b. Intended use.
  - c. Mix proportions, including admixtures.
  - d. Manufacturer's data and certifications for mix materials.
  - e. Wet and dry unit weight.
  - f. Entrained air content.
  - g. Design slump.
  - h. Required average strength qualification data per ACI 301 3.9.1 and 3.9.2.
  - i. Average strength qualification data (trial mix data or field test data per ACI 301 3.9.3).
  - j. Field test data shall include copies of the Concrete Testing Agency's report.

### PART 2 - PRODUCTS

#### 2.1 CURING COMPOUND (ACI 301 12.2.1.7):

##### A. Interior Slabs With Resilient Flooring, Carpet or Left Exposed:

1. "Floor Seal VOX" by The Euclid Chemical Company.
2. "Dress and Seal WB" by L&M.
3. "Kure-N-Seal WB" by Sonneborn-Chemrex.
4. Approved substitute.

- B. All Other Interior Slabs Including Slabs to Receive Concrete Topping, Mortar Setting Beds, Cementitious Flooring and Special Flooring:
  - 1. Moisture curing methods only.

### PART 3 - EXECUTION

#### 3.1 FIELD QUALITY CONTROL

- A. Inspection: Provide free access for the Architect and Consulting Engineer to locations where concrete materials are stored, proportioned or mixed.
- B. Testing: Owner will employ and pay for the services of a qualified testing laboratory to perform specified tests. Contractor is responsible for timely notification and scheduling of testing agency.
- C. Quality Control Testing During Construction:
  - 1. Perform sampling and testing for field quality control during the placement of concrete.
    - a. For concrete having specified strength of 5000 psi or greater, one test per 50 cu. yds., but not less than one test each day such concrete is placed.
  - 2. For concrete of each type poured in any one day, provide:
    - a. Sampling Fresh Concrete: ASTM C172, except modified for slump to comply with ASTM C94. Comply with ASTM C31 for compressive strength specimens. For concrete placed by pumping, take test specimens and concrete at the point of placement of concrete into the forms.
    - b. Slump: ASTM C143, one test for each set of compressive strength test specimens. Additional slump tests may be required by Architect to be provided by Contractor at no additional cost. Reject concrete where tests exceed specified limits.
    - c. Air Content: ASTM C231, pressure method; one test for each set of compressive test specimens, or when there is any indication of change.
    - d. Compression Test Specimens: ASTM C39, one set of 4 standard cylinders for each compressive strength test, unless otherwise directed.
      - 1) Cast and store cylinders for laboratory cured test specimens and filed cured test specimens as specified in ASTM C31.
    - e. Concrete Temperature: Test hourly when air temperature is 40 degrees F. and below, and when 80 degree F. and above; and each time a set of compression test specimens is made.
    - f. Compressive Strength Tests: ASTM C39; one specimen tested at 7 days, 2 specimens tested at 28 days, and one specimen retained in reserve for later testing if required.

- 1) When the frequency of testing will provide less than 5 strength tests for a given mix design, conduct testing from at least 5 randomly selected batches or from each batch if fewer than 5 are used.
  - 2) When the total quantity of a given mix design of concrete is less than 50 cu. yds., the strength test may be waived by the Architect or the Owner if adequate evidence of satisfactory strength is provided.
3. Report test results in writing to the Architect, Engineer, Contractor, and Ready-Mix Supplier on the same day that tests are made. Include in reports of compressive strength tests, project identification, date of concrete placement, name of Contractor, name of concrete supplier and truck number, name of concrete testing service, concrete type and class, location of concrete batch in the structure, design compressive strength at 28 days, concrete mix proportions and materials, concrete temperature, density, slump, air-content, compressive breaking strength and type of break for both 7 day tests and 28 day tests.

D. Additional Tests:

1. Additional tests of in-place concrete will be made when test results indicate possible concrete deficiency as judged and directed by the Architect.
2. Compression tests on cored cylinders complying with ASTM C42, or load testing specified in ACI 318, or other acceptable non-destructive testing methods will be used. The Contractor shall pay for such tests conducted, and any other additional testing as may be required, whether or not concrete is accepted.

E. Evaluation of Quality Control Tests:

1. Compressive strength test for laboratory-cured cylinders will be considered satisfactory if the averages of all sets of three consecutive compressive strength tests results equal or exceed the 28-day design compressive strength of the type of class of concrete; and no individual strength tests falls below the required compressive strength by more than 500 psi.
2. If the compressive strength tests fail to meet the minimum requirements specified, the concrete represented by such test will be considered deficient in strength and subject to additional testing as herein specified, or removal and replacement of the concrete which the test represents.

3.2 SLAB FINISHING TOLERANCES:

- A. Trowel Finish: Typically Class AX not exceeding 3/16" in 10' or not exceeding  $F_F$  of 25-30 (flatness) and  $F_L$  of 20 (levelness) per ASTM E1155. Do not exceed 1/16"  $\pm$  where indicated on the structural drawings.
1. Location: All slabs exposed to view and surfaces that are to be covered with carpet, resilient flooring, paint, or other thin-film finish coating system.
- B. Trowel and Fine Broom Finish: Apply trowel finish specified above then immediately follow by slightly scarifying surface with fine brooming.

1. Location: Surfaces to receive mortar setting beds, cementitious flooring or special flooring.
  - C. Repairs: Cut down high spots and fill low spots. Grind surface defects smooth such that defects will not telegraph through applied floor system.
  - D. Testing: Slabs will be considered acceptable if slabs meet specified tolerances using one of the two following methods. The Owner may require that either one of the following methods be utilized for the project.
    1. ACI 117: Per required Class finish when tested with a 10' straightedge placed on the surface at not less than two different right angles.
    2. ASTM E1155: Tolerances as specified.
- 3.3 CURING (ACI 301 12.1):
- A. General: Apply specified curing compounds immediately after final finishing of slabs. Apply in quantities recommended by the manufacturer.

END OF SECTION 03300

## SECTION 03740 - STRUCTURAL ANALYSIS/VIBRATION CRITERIA

### PART 1 – GENERAL

#### 1.1 SUMMARY:

- A. The purpose of this standard is to identify structural submittal requirements, as well as identify vibration design criteria for campus buildings.

#### 1.3 SUBMITTAL REQUIREMENTS

- A. During Schematic Design, the design engineer shall submit:

Code and Loadings:

State the governing code used for design. State the live loading to be used, including floor loads, wind, snow, and seismic, together with data to justify any difference from established criteria. Seismic design shall be in accordance with IBC. State the seismic zone and values used for K and C.

Structural System:

Provide a comparative description of feasible structural systems for the building, i.e., consider wood, steel, concrete, masonry. Give a description of the type of construction proposed and reasons therefore, including the structural framing system. The structural design should be carried only to the point where the total framing systems are determined and a realistic cost estimate can be made.

Foundation Design:

Describe the type of foundation proposed and define the basis for selection. Include bearing capacity, anticipated settlement, alternatives considered, and other pertinent design factors. Also include the depth of excavation, disposition of excavated material, whether in-place foundation material will be compacted, whether imported fill is required, whether compacted backfill will be utilized as foundation, and the frost penetration. State ground water level and method of waterproofing. State needs for drainage or vapor barrier. Describe pertinent corrosion control methods. Refer to the Soils Report included in the supplements.

Vibratory Design:

The structural design engineer shall submit a summary report of the vibration criteria that will be used in the structural design of the building.

- B. During the Design Development phase the following plans shall be submitted:

Structural drawings should include:

- Foundation plan
- Floor(s) and roof framing plans: The majority of the framing members and columns shall have sizes indicated.
- Some typical foundation details. Foundation plan shall show type of foundation

proposed, depths, sizes and reinforcing of footings, relationship of walls and floor slab to foundation system, overall dimensions, column spacing, joint pattern in slab-on-grade, tie beams, grade beams, etc.

- Some typical roof framing details

C. During the Construction and Contract Documents phase, the following shall be submitted:

Full or representative computations (depending on the size of project)

Present complete structural calculations covering all parts of the structure and miscellaneous facilities. Calculations shall be bound and indexed. When a computer is utilized to perform design calculations, the analysis will include, but not be limited to, the following information.

- Design methods will be described, including assumptions, theories, and technical formulas employed in design solutions.
- Present copies of computer input data and output summaries in user friendly language, accompanied by diagrams which identify joints, members, areas, etc., according to the notations used in the data listings, will form integral parts of the design analysis in lieu of manual computations otherwise required. Complete listing of all computer output will be provided in a separate binding when it is too voluminous for including in the design analysis. These listings will be augmented with intermediate results where applicable, so that sufficient information is available to permit manual checks of final results.
- Live loads shall be placed to produce maximum stresses and minimum stresses where there is a possibility of stress reversal.
- Vibrational criteria and supporting calculations demonstrating compliance with UCB vibrational criteria.
- If special methods of solution, tables, etc., are employed, references shall be made in the calculations to the sources of such material.
- Adequacy of existing structure, where applicable, to account for new functional loads or new criteria.

Drawings

All drawings shall be complete and represent coordination by the architect with all disciplines. Evidence of this coordination shall be provided by the Architect at the Final Design Review.

#### 1.4 WIND LOADING DESIGN CRITERIA

- A. Wind Speed: The University of Colorado at Boulder campus is designated a special wind region by ASCE 7-05. The University of Colorado at Boulder defers to the City of Boulder for their determination of the applicable design wind speed for the campus. Currently the City of Boulder's design wind speed is 110 mph.
- B. Exposure Factor: The design engineer shall use Figure C6-8 and Figure C6-9 of ASCE 7-05 to determine the appropriate exposure factor for a building.
- C. Topography Factors: The design engineer shall consider wind speed-up effects at isolated hills, ridges, and escarpments per ASCE 7-05, Section 6.5.7. The design engineer shall state the  $K_z$  factor on the construction drawings.
- D. Air Density: In calculating velocity pressures using Eq. 6-15 in ASCE 7-05, the numerical constant, 0.00256, may be reduced to account for air density. Any reduction shall comply

with ASCE 7, Section C6.5.10, but in no case shall the reduction in the numerical constant exceed fifteen percent (15.0%).

- E. Deflection: The design engineer shall follow the deflection requirements as stated in the Brick Industry Association. For masonry veneer backed by steel studs, the design engineer shall calculate deflection using the unreduced wind pressure of the 50-year wind event and maintain deflections under 1/600 (Reference BIA Technical Note 28B).

## 1.5 VIBRATION DESIGN CRITERIA FOR BUILDINGS

- F. In order to minimize building construction costs associated with increased vibration control, laboratory areas and areas of sensitive equipment shall be designed to be located at-grade or below in the proposed building or addition.
- G. Facilities Management may require that a vibration consultant be employed to analyze both overall building structure and specific placement and isolation of machinery and equipment with moving parts. The structural engineer, mechanical engineer, electrical engineer, and the architect will be required to coordinate their work with this consultant and to follow Facilities Management direction based upon the recommendations of the vibration consultant.
- H. Vibration analysis shall conform to industry standards, such as American Institute of Steel Construction's *Design Guide 11*.
- I. General office spaces shall be designed to meet a recommended floor vibration velocity limit of 400 micrometers per second (Residential Day Criterion Curve, see Figures 1 & 2).
- J. Classrooms and computer lab spaces shall be designed to meet a recommended floor vibration velocity limit of 200 micrometers per second (Residential Day Criterion Curve, see Figure 1).
- K. General laboratory/research areas, where optical microscopes or other similarly sensitive equipment will be operated, shall be designed to meet a recommended floor vibration velocity limit of 50 micrometers per second (VC-A Criterion Curve). Figure 2 shall be used as a basis for vibration velocity limits when the sensitive equipment manufacturer's recommendations are not available.
- L. Precision instrument spaces shall be designed according to the sensitive equipment manufacturer's recommendations. These areas should be designed considering the effects of adjacent equipment, other sources of vibration, and operations. The use of a consultant specializing in vibration analysis and control is required for both new construction and renovations.
- M. The above criteria may be relaxed on a case-by-case basis provided the relaxed velocity limit will not affect the current and future utility of the space.

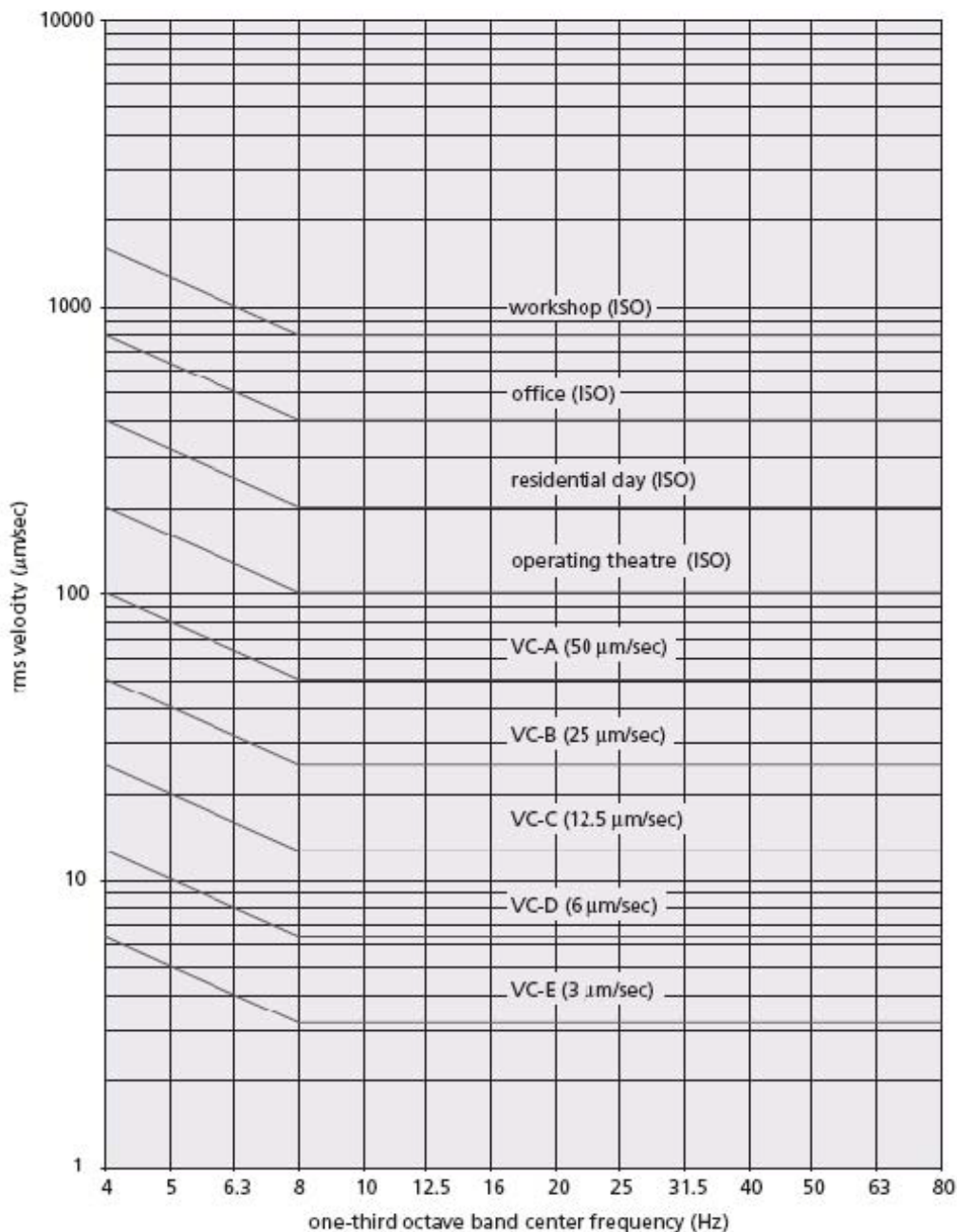
## 1.6 VIBRATION CONTROL ON MECHANICAL EQUIPMENT

- A. Provide vibration isolation devices for limiting transmittance of vibration from vibration-producing equipment to the structure on which it is supported or attached. The type of

vibration isolation device is a function of building uses, size of mechanical equipment, and the frequency at which the equipment operates. The mechanical engineer or a vibration consultant shall consider these factors when designing the vibration isolation system.

- B. Provide the types of vibration isolation devices as recommended by the respective mechanical equipment manufacturers or vibration consultant, to isolate vibrations for each particular piece of equipment. Include a schedule of equipment (i.e. pumps and fans) to be isolated listing the required isolation devices in the Construction Documents.

FIGURE 1: Taken from Colin Gordon's *Generic Vibration Criteria for Vibration-Sensitive Equipment*



**Table 1: Application and interpretation of the generic vibration criterion (VC) curves (as shown in Figure 1)**

Criterion Curve (see Figure 1)	Max Level (1) micrometers/ sec,rms	Detail Size (2) microns	Description of Use
Wrkshop (ISO)	800	N/A	Distinctly feelable vibration. Appropriate to workshops and nonsensitive areas.
Office (ISO)	400	N/A	Feelable vibration. Appropriate to offices and nonsensitive areas.
Residential Day (ISO)	200	75	Barely feelable vibration. Appropriate to sleep areas in most instances. Probably adequate for computer equipment, probe test equipment and low-power (to 20X) microscopes.
Op. Theatre (ISO)	100	25	Vibration not feelable. Suitable for sensitive sleep areas. Suitable in most instances for microscopes to 100X and for other equipment of low sensitivity.
VC-A	50	8	Adequate in most instances for optical microscopes to 400X, microbalances, optical balances, proximity and projection aligners, etc.
VC-B	25	3	An appropriate standard for optical microscopes to 1000X, inspection and lithography equipment (including steppers) to 3 micron line widths.
VC-C	12.5	1	A good standard for most lithography and inspection equipment to 1 micron detail size.
VC-D	6	0.3	Suitable in most instances for the most demanding equipment including electron microscopes (TEMs and SEMs) and E-Beam systems, operating to the limits of their capability.
VC-E	3	0.1	A difficult criterion to achieve in most instances. Assumed to be adequate for the most demanding of sensitive systems including long path, laser-based, small target systems and other systems requiring extraordinary dynamic stability.

**Notes:**

(1) As measured in one-third octave bands of frequency over the frequency range 8 to 100 Hz.

(2) The detail size refers to the line widths for microelectronics fabrication, the particle (cell) size for medical and pharmaceutical research, etc. The values given take into account the observation that the vibration requirements of many items depend upon the detail size of the process.

**FIGURE 2:** Taken from Colin Gordon's *Generic Vibration Criteria for Vibration-Sensitive Equipment*

END OF SECTION 03740



## SECTION 05500 - METAL FABRICATIONS

### PART 1 - GENERAL

#### 1.1 SUMMARY:

A. Section Includes:

1. Items scheduled at the end of this section.

B. Related Sections:

1. Section 03600 - Grout: Grouting Under Base Plates and Bearing Plates.
2. Section 05120 - Structural Steel.
3. Section 05210 - Steel Joists.
4. Section 05300 - Metal Decking.
5. Section 05400 - Cold Formed Metal Framing.

#### 1.2 REFERENCES:

- A. Campus Open Space Development Plan, University of Colorado, Boulder (COSDP).
- B. Steel: Meet requirements of AISC "Specifications for Architecturally Exposed Structural Steel", latest edition.
- C. Welding: Meet requirements of AWS "Structural Welding Code", D1.1, latest edition.
- D. Stairways: Meet requirements of standard construction details of "Metal Stairs Manual" of the National Association of Architectural Metal Manufacturers.
- E. All railings, stairs, and ladders shall meet requirements of OSHA, UBC, and UFAS.

#### 1.3 DEFINITIONS:

A. Metal Fabrications:

1. Synonymous with miscellaneous metals.
2. Metal fabrications for items fabricated from iron and steel shapes, plates, bars, strips, tubes, pipes and castings which are not a part of structural steel or other metal systems specified elsewhere.

- B. Architecturally Exposed Structural Steel: As used under this section, includes all metal fabrications exposed to view.

#### 1.4 SUBMITTALS:

##### A. Shop Drawings:

1. Submit shop drawings for custom fabricated items, including:
  - a. Profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners and accessories.
  - b. Erection drawings, elevations and details.
  - c. Welded connections using standard AWS welding symbols.

##### B. Product Data: Submit product data for manufacturer's stock items.

##### C. Certifications:

1. Submit current welder's certification qualified in accordance with AWS D1.1.
2. Submit certification by fabricators that handrails and stairs have been designed by a structural engineer licensed in the State of Colorado.

##### D. LEED MRc5: Regional Materials

Provide a statement from the manufacturer stating the materials provided were manufactured within a 500 mile radius of the project. Include location.

##### E. LEED MRc4: Recycled Content

Provide a statement from the manufacturer including recycled content percentage, by weight, and whether the recycled content is post-consumer or post-industrial.

#### 1.5 QUALITY ASSURANCE:

##### A. Fabricator Qualifications: Experienced in fabrication of miscellaneous steel.

##### B. Welder Qualifications: Welding shall be done only by certified welding operators currently qualified according to AWS D1.1.

##### C. Engineer Qualifications:

1. Professional engineer licensed to practice in the State of Colorado and experienced in providing engineering services of the kind indicated that have resulted in the successful installation of metal fabrications similar in material, design, and extent to that indicated for this project.

##### D. Design Criteria:

1. Refer to University's campus standard details, following this section.
  - a. Exterior railings.
2. Steel stairs:

- a. Minimum Uniform Load: 100 psf.
  - b. Minimum Concentrated Load: 300 lbs at any point.
  - c. Engineer of Record shall approve/design connections.
3. Handrails:
- a. Minimum Uniform Load: 50 plf.
  - b. Minimum Concentrated Load: 200 lb at any point.
  - c. Engineer of Record shall approve/design connections.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURED ITEMS:

#### A. Steel Lintels:

1. Masonry openings over 16" in width shall have steel lintels.

#### B. Steel Opening Frames:

1. Openings in metal floor and roof decks greater than 10" in any direction, shall be supported on all four sides by a steel frame spanning between steel joists or other deck supports.

#### C. Steel Stairs:

##### 1. Pan Tread Channel Stringer Stairs:

- a. 14 Gage Pans (minimum): Fill sub-treads and platforms with concrete topping.

##### 2. Grate Tread Channel Stringer Stairs: Industrial-type steel tread stairs.

- a. 14 gage, 2" depth channel "Grip Strut Safety Grating" as manufactured by McNichols Co. or approved substitute.

#### D. Tubular Steel Railings:

1. Size: Fabricated from 1-1/4" NPS round steel pipes with steel balusters.

##### 2. Railings:

- a. Balusters Set in Concrete: Pipe sleeves 6" long and 1/4 inch clear of balusters.
- b. Set balusters in sleeves, pack with non-shrink, non-metallic grout.
- c. Weld balusters to steel stringers.

##### 3. Brackets:

- a. Secure to walls with malleable iron wall brackets and end fittings.
- b. Brackets with 1-1/2" wall clearance. Installed railing shall conform to UFAS requirements.

c. Space brackets 5 feet o.c., maximum, or as required to support design loads.

B. Steel Ladders:

1. Side Rails: Fabricated from 3/16-inch steel bar.
2. Rungs: 1-inch steel pipe at 12" o.c., minimum, welded to side rails.
3. Width: 20-inches minimum width, spaced 7-inches minimum from wall.
4. Maximum unbraced vertical length is 6 feet.
5. Comply with ANSI A14.3 requirements.

C. Floor Grating:

1. Support grating on galvanized steel angles with universal clip fastener. Clip bolt shall be galvanized.
2. Type: Welded carbon steel grating capable of supporting 150 psf at a span to be determined by the design consultant and agreed to by the University for each particular application. Galvanize after fabrication with G90 coating per ASTM A386.

2.2 FABRICATION:

- A. General: Fabricate in accordance with details and reviewed shop drawings, all miscellaneous items of metal work indicated or as necessary to complete the work. Verify dimensions on site prior to shop fabrication.
- B. Welding: Comply with latest American Welding Society standards. Miter and cope intersections and weld all around. Remove spatter, grind exposed welds to blend, and contour surfaces to match those adjacent.

2.3 SHOP PAINTING:

- A. Clean ferrous metal of scale, rust, oil, moisture, and dirt before applying paint.
  1. Paint all metal black unless otherwise noted.
- A. Apply one shop coat of Tnemec 10-99 long-oil alkyd primer or approved substitute to ferrous metals after fabrication. Apply two shop coats to ferrous metals that will be inaccessible after erection.
- B. Painting specified here does not count as a coat for finish painting.
- C. Omit shop painting on surfaces embedded in concrete or requiring field welding.
- D. LEED EQc4.2: Low-Emitting Materials  
Paint applied after metal fabrication is on site must not have VOC levels that exceed the VOC and chemical component limits of Green Seal's Standard GS-11 requirements.

PART 3 - EXECUTION

3.1 SCHEDULE:

- A. This section includes, but is not specifically limited to metal fabrications and components listed in the following schedule:
1. Miscellaneous anchor slots, sleeves, bolts, brackets, clips, inserts, imbeds, gratings, tubing, bar stock, plates and other items not distinctly specified under other sections.
  2. Loose steel angle lintels.
  3. Steel stairs.
  4. Handrail brackets, handrails, and guard rails.
  5. Steel ladders.
  6. Angle bracing for hollow metal door and window frames.
  7. Steel opening frames.
  8. Expansion control items.

END OF SECTION 05500



## SECTION 06200 - FINISH CARPENTRY

### PART 1 - GENERAL

#### 1.1 SUMMARY:

##### A. Section Includes:

1. Miscellaneous exposed wood members commonly known as "Finish Carpentry" or "Millwork".
2. Interior trim.
3. Plastic laminate.
4. Window stools.

##### B. Related Sections:

1. Section 06100 - Rough Carpentry.
2. Section 06400 - Architectural Woodwork.
3. Section 08100 - Metal Doors and Frames.
4. Section 08210 - Wood Doors.
5. Section 08710 - Finish Hardware.
6. Section 09260 - Gypsum Board Systems.
7. Section 10100 - Visual Display Boards.
8. Section 12304 - Plastic Laminate Faced Casework.

#### 1.2 REFERENCES:

- A. American National Standards for Making Buildings and Facilities Accessible to and Usable by Physically Handicapped People ANSI A117.1.
- B. Uniform Federal Accessibility Standards (UFAS).
- C. Architectural Woodwork Institute (AWI) "Quality Standards", latest edition.

#### 1.3 SUBMITTALS:

##### A. Shop Drawings:

1. Submit Shop Drawings for:
  - a. All millwork items.
  - b. Countertops.
  - c. Shelving.

##### B. Samples:

1. Samples Required Include:
  - a. Wood veneers and solid wood.
  - b. Plastic laminate.
  - c. Cabinet hardware.

#### 1.4 QUALITY ASSURANCE:

- A. Quality Standards: For the following types of architectural woodwork, comply with the Architectural Woodwork Institute (AWI) "Quality Standards" as applicable. In event of dispute as to performance under AWI standards, Owner may call upon AWI for an inspection and report by AWI Quality Certification Program. All parties agree to abide by AWI decisions. Costs for this service will be paid by Owner unless AWI determines that specified standards have not been met, in which cases costs will be paid by Contractor.
  1. Standing and Running Trim: AWI Section 300, Custom Grade. Custom grade will be considered for special application areas with the specific consent of the university.
  2. Shelving: AWI Section 600, Custom Grade.
  3. Miscellaneous Work: AWI Section 700, Custom Grade.
  4. Plastic Laminate Casework and Countertops: AWI Section 400, Custom Grade.
  5. For remodeling work, match existing, adjacent woodwork in color, species and grade quality.
- B. Grading and Marking: Lumber shall be marked on each piece, located on surfaces which will not be exposed after installation. Grade marks to be of the association under whose rules it is graded. Bundle marking or Certificate of Inspection issued by the association will be permitted in lieu of marking each individual piece.

## PART 2 - PRODUCTS

### 2.1 PLASTIC LAMINATE MANUFACTURERS:

- A. Provide plastic laminate for all laminate work, and casework manufactured by:
  1. Formica Corporation.
  2. Nevamar.
  3. Wilson Art.
  4. Approved substitute under provisions of Section 01600.

### 2.2 PLASTIC LAMINATE MATERIALS:

- A. Laminated Countertops and Edges:
  1. All custom countertops (vanities, and other tops for mill-built cabinets, etc.) shall be pressure laminate.
  2. Selection, will be made from all available manufacturer's patterns, wood grains, solid colors and standard finishes.

3. Countertops: 1" particleboard with 1/2" overhang. Finish front and sides with the countertop materials.
4. Backsplashes shall be 3/4" thick, finished with high pressure laminated material on the front, top edge and side edges.

B. Plastic Laminate Applications:

1. Plastic Laminate for Horizontal Surfaces: Type 2, 0.050" thick, General-Purpose Type (high pressure).
2. Plastic Laminate for Post-Forming: Type 3, 0.042" thick, Post-Forming Type (high pressure).
3. Plastic Laminate for External Vertical Surfaces: Type 4, 0.028" thick, General-Purpose Type (high pressure).
4. Plastic Laminate for Cabinet Linings: 0.020" thick, Lining Type (high pressure). At surfaces where high pressure balancing sheet is not required, 0.020" thick low pressure melamine may be used.
5. Plastic Laminate for Concealed Panel Backing: 0.020" thick, Backer-Type (high pressure).

2.3 BOARD PRODUCTS:

- A. Particleboard: Medium density (45 lbs./cu. ft. minimum) board fabricated from wood chips and phenolic resin binders, compressed board, 3/4" thickness unless otherwise indicated complying with ANSI A208.1, Grade 1-M-1.

LEED IEQc4: Low-Emitting Materials

Urea-Formaldehyde resin binders are unacceptable.

- B. Hardboard: PS 58, Class 1 (tempered), smooth one side or both sides where indicated, 1/4" thickness unless otherwise indicated.

LEED IEQc4: Low-Emitting Materials

Urea-Formaldehyde resin binders are unacceptable.

- C. Solid Stock: Selected for color and graining. Unless otherwise shown, provide solid material of the same species as adjacent or abutting exposed, transparent finished veneer.

PART 3 - EXECUTION

3.1 APPLICATION OF PLASTIC LAMINATE:

- A. Plastic laminate joints shall be staggered from substrate joints.
- B. Plastic laminate joints shall be hair-line, flush butt joints.
- C. Number of plastic laminate joints shall be kept to a minimum.

3.2 APPLICATION OF HARDWARE:

- A. Receive, store and be responsible for all finished hardware.
- B. Apply hardware in accordance with manufacturer's instructions and UFAS requirements.
- C. The location of hardware in connection with doors shall be as follows:
  - 1. Center door levers 38 inches above finished floor.
  - 2. Space center hinges equal distance between top and bottom hinges.

END OF SECTION 06200

## SECTION 06400 - ARCHITECTURAL WOODWORK

### PART 1 - GENERAL

#### 1.1 SUMMARY:

##### A. Section Includes:

1. Custom millwork.
2. Custom cabinets.
3. Cabinet hardware.
4. Wood paneling.
5. Shop and job site application of millwork finishes.

##### B. Related Sections:

1. Section 06200 - Finish Carpentry: Plastic laminates and countertops; wood trim; window stools; shelving.
2. Section 06650 - Solid Polymer Fabrications.
3. Section 12304 - Plastic Laminate Faced Casework.
4. Section 12345 - Metal Laboratory Casework.
5. Section 12346 - Wood Laboratory Casework.
6. Section 12348 - Laboratory Tops, Sinks and Accessories.

#### 1.2 REFERENCES:

- ##### A. Applicable Publications: The publications listed below form a part of the Specification to the extent referenced.
1. Architectural Woodwork Institute (AWI) "Quality Standards", latest edition.

#### 1.3 SUBMITTALS:

- ##### A. Submit shop drawings, product data, and samples under provisions of Section 01300.

##### B. Shop Drawings:

1. Submit Shop Drawings for all millwork items required.

##### C. Samples:

1. Plastic Laminate (three 2" x 3" samples):
  - a. Each color specified
2. Cabinet Hardware:

a. Each type and finish required.

3. Other materials as required per project.

D. LEED MRc7: Certified Wood

All wood based products shall come from "FSC Certified Wood" sources certified by the Forest Stewardship Council. Certificates and chain of custody documentation must be provided.

E. LEED EQc4: Low Emitting Materials

Provide documentation from the manufacturer identifying the VOC and chemical component limits for the adhesives provided.

1.4 QUALITY ASSURANCE:

A. Standards:

1. Except as otherwise shown or specified, comply with specified provisions of the Architectural Woodwork Institute (AWI) "Quality Standards". In event of dispute as to performance under AWI standards, Owner may call upon AWI for an inspection and report by AWI Quality Certification Program. All parties agree to abide by AWI decisions. Costs for this service will be paid by Owner unless AWI determines that specified standards have not been met, in which cases costs will be paid by Contractor.
  1. Wood Casework: AWI Section 400, Custom Grade. Premium grade will be considered only in specific applications with the recommendation of the design consultant and with the concurrence of the university.
  2. Plastic Laminate Casework: AWI Section 400, Custom Grade.
  3. Wood Paneling: AWI Sections 200 and 500, Custom Grade. Premium recommendation of the design consultant and with the concurrence of the university.
  4. Sop Finishing: AWI Section 1500, Custom Grade.
  5. Installation: AWI Section 1700, Custom Grade.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

- A. As indicated for various products hereunder.
- B. Approved substitutes under provisions of Section 01600.

2.2 MATERIALS:

- A. Veneers:

1. Plain sliced, narrow heart. Architectural panel grade veneer.
    - Matching between adjacent veneers: Bookmatch.
    - Matching between individual panel faces: Balanced to panel.
    - Matching or adjacent panels: Sequenced.
  2. Species: As scheduled.
  3. Sapwood not acceptable.
  4. LEED MRc7: Certified Wood  
The source of wood based materials must be certified by the Forest Stewardship Council, and wood must be classified as "certified wood."
- B. Hardwood Lumber:
1. Graded in accordance with AWI grading standards for Premium Grade Solid Stock.
  2. Species: Design Consultant selection.
  3. Sapwood not acceptable.
  4. LEED MRc7: Certified Wood  
The source of wood based materials must be certified by the Forest Stewardship Council, and wood must be classified as "certified wood."
- C. Hardwood Plywood:
1. Comply with PS 51, Premium Grade hardwood face veneers.
  2. Face and back veneers grade selected in accordance with AWI Standards for Premium Grade, select for color.
  3. Species: Design Consultant selection.
  4. LEED MRc7: Certified Wood  
The source of wood based materials must be certified by the Forest Stewardship Council, and wood must be classified as "certified wood."
- D. Particleboard:
1. Medium density (45 lbs./cu. ft. minimum) board fabricated from wood chips and phenolic resin binders, compressed board, 3/4" thickness unless otherwise indicated complying with ANSI A208.1, Grade 1-M-3.  
  
LEED EQc4: Low-Emitting Materials  
Urea-Formaldehyde resin binders are unacceptable.
- E. Hardboard:
1. PS 58, Class 1 (tempered), smooth one side or both sides where indicated, 1/4" thickness unless as otherwise indicated.  
  
LEED EQc4: Low-Emitting Materials  
Urea-Formaldehyde resin binders are unacceptable.
- F. MDO Plywood:
1. Medium Density Overlay (MDO) plastic faced plywood.
  2. Finish: One face finish, smooth paint grade.

3. LEED MRc7: Certified Wood

The source of wood based materials must be certified by the Forest Stewardship Council, and wood must be classified as "certified wood."

G. Plastic Laminate:

1. Provide plastic laminate for all cabinet work complying with Section 06200 requirements.

2.3 MISCELLANEOUS ACCESSORIES:

A. Nails:

1. Do not use nails for gluing pressure.
2. Nails may be used only for temporary, concealed anchorage.

B. Wood Screws:

1. Exterior: Brass, Fed. Spec. FF-S-111D.
2. Interior: Steel, ANSI B18.6.1.

C. Adhesives:

1. Adhesive for plastic laminate and hardwood veneer shall conform to the recommendations of AWI 100-G-12.
2. LEED EQc4: Low-Emitting Materials  
All adhesives must meet or exceed the VOC limits of South Coast Air Quality Management District Rule #1168. Provide low VOC, FS MMM-A-125C, Type II, water and mold resistant adhesives.

2.4 MOISTURE CONTENT:

- A. At the time lumber and other materials are delivered and when installed in the work, their moisture content shall be 19 percent maximum for treated and untreated lumber 2 inches or less in thickness.

2.5 CUSTOM CABINETS:

- A. Custom (Mill Built) Cabinetry: AWI Section 400, Premium Grade.

B. Cabinet Work Surfacing:

1. Interior sides of particleboard core doors shall be faced with balancing sheets.
2. Cabinet doors and drawer edges shall be edged to match veneer.

- C. Frame cabinets in a substantial manner with all necessary blocking, braces, bottoms, etc.

1. Cross supports under countertops shall be sufficiently heavy to carry a 200 pound

- weight without sagging.
2. Frame shall be pinned, glued, or screwed together in accordance with AWI Standards indicated.

- A. Some cabinet backs not exposed to view may be hardboard.

## 2.6 CABINET HARDWARE:

- A. 3/4" Doors: Invisible type, self closing overlay 120 degree opening similar to Grass America, Inc. model # VS8-3800 with 2 hinges per door. Anchor with 1000 Series baseplate and 5.2 mm sleeve screws. Other Approved Manufacturers: Prameta or Hafele.

- B. Adjustable Shelf Standards:

1. Knape and Vogt No. 255 with No. 256 supports.
2. Predrilled holes at 32 mm o.c. with 2 pin self-locking nylon clips capable of supporting a minimum of 250 lbs. each. Provide four per shelf.

- C. Drawer Slides:

1. Typical Drawer Slide:

- a. Grass 6610, 100 pound capacity.
- b. Blum No. 230E, 100 pound capacity.

2. File Drawer and Lateral File Drawer Slide:

- a. Accuride No. 3832, 100 pound capacity.
- b. Blum No. 430E, 100 pound capacity.

- D. Cabinet Locks:

1. Provide cabinet locks for doors and drawers as required by the Owner.
2. Locks shall accept cylinders keyed to master key system.

## 2.7 WALL PANELING:

- A. Construct wall paneling from 1/4", 1/2" or 3/4" resin-wood panels or 3/4" thick exterior grade plywood, scarf-jointed at the mill to make one piece integral panel. Panels shall have a UL flame spread rating of 75 or less.

- B. Construct face veneers to AWI Custom Grade.

- C. LEED EQc4: Low-Emitting Materials  
Urea-Formaldehyde resin binders are unacceptable.

- A. Natural Finish:

1. AWI Finish System No. TR-4 Catalyzed Vinyl (Custom Grade).

- a. Filler (For Open Grain Woods: Filled finish).
  - b. Washcoat.
  - c. Stain (To be selected by the Architect).
  - d. Sealer.
  - e. Sand (220 grit stearated paper).
  - f. Topcoat.
  - g. Sand (220 grit sandpaper).
  - h. Topcoat.
2. Satin-medium rubbed effect.
- B. Waterproof Finish:
1. AWI Finish System No. TR-6 Catalyzed Polyurethane (Premium Grade).
    - a. Filler (For Open Grain Woods: Filled finish) used only in tabletops.
    - b. Washcoat.
    - c. Stain.
    - d. Sealer.
    - e. Sand (220 grit stearated paper).
    - f. Topcoat.
    - g. Sand (220 grit sandpaper).
    - h. Topcoat.
- C. Paint: Refer to Section 09900.
- D. All indoor sealant and paint shall meet the limits of Green Seal's Standard GS-11 requirements for VOC and chemical components.  
(Applies to LEED EQc4: Low-Emitting Materials)

### PART 3 - EXECUTION

#### 3.1 PREPARATION:

- A. Verify all dimensions in the field and take particular care to align with all joints and recesses, where required, with the building module lines.

#### 3.2 FABRICATION:

- A. Workmanship shall equal in all respect to the standards of Premium quality furniture work as described by AWI. Perform all work by qualified and fully competent workmen.
- B. Allow sufficient additional material to permit.
1. Accurate scribing to walls and related work.
  2. Provide for shrinkage that may develop after installation.
  3. Scribe casework edge panels to walls.

3.3 APPLICATION OF HARDWARE:

A. Fit hardware for drawers and doors:

1. To permit items to close without forcing or rattling.
2. Carefully fit and adjust as required to ensure smooth and noiseless operation.
3. Remove and replace hardware items necessary to prevent damage, soiling and staining during finishing operation.

3.4 APPLICATION OF FINISHES:

A. Visual Tests Applicable to Exposed Surfaces:

1. Variations in Color: Must match approved samples.
2. Orange Peel:
3. Runs: None.
4. Sags: None.
5. Finish Sanding Scratches: None.
6. Blistering: None.
7. Glue Spots: None.
8. Checking, Crazeing or Cracking: None.
9. Filled Nail Holes:

3.5 INSTALLATION:

- A. Custom Grade per AWI Standards, Section 1700.

END OF SECTION 06400



## SECTION 06650 - SOLID POLYMER FABRICATIONS

### PART 1 - GENERAL

#### 1.1 SUMMARY:

##### A. Section Includes:

1. Solid polymer fabrications of cast synthetic polymers.

##### B. Related Sections:

1. Section 06400 - Architectural Woodwork.

#### 1.2 QUALITY ASSURANCE:

##### A. Installer/Fabricator Qualifications:

1. Engage a fabricator for cast synthetic polymer material meeting the following:
  - a. Who is licensed by the manufacturer.
  - b. Who has successfully completed fabrications of the type required for this project.
  - c. Who has been continuously engaged in this type of work for not less than three years.
2. Arrange for installation by the same firm as fabricated the material for sole source responsibility.

#### 1.3 WARRANTY:

- A. Submit manufacturer's 10-year warranty agreeing to replace solid polymer fabrications which are defective in materials or workmanship.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS:

- A. "Corian" by DuPont, Inc.
- B. "Avonite"

C. Approved substitute.

## 2.2 MATERIALS:

A. Cast Synthetic Polymer: Translu-cent cast synthetic polymer material with methyl-methylacrylate binders.

1. Minimum Thickness: 1/2".
2. Exposed Corners: Ease with 1/16" radius.
3. Seams and Joints: Solid and inconspicuous.

## PART 3 - EXECUTION

Not Used

END OF SECTION 06650

## SECTION 07110 - SHEET MEMBRANE WATERPROOFING

### PART 1- GENERAL

#### 1.1 SUMMARY:

A. Section Includes:

1. Sheet membrane waterproofing application.
2. Protection for the membrane application.

B. Related Sections:

1. Section 03300 - Cast-in-Place Concrete: Finishes on concrete slab on grade to receive waterproofing.

#### 1.2 SUBMITTALS:

A. Submit test data from manufacturer on proposed waterproofing system.

B. Submit complete manufacturer's data including suggested installation procedures and details.

C. Submit shop drawings showing penetrations, sheet layout, special conditions and details not standard with the manufacturer.

#### 1.3 QUALITY ASSURANCE:

A. Applicator Qualifications:

1. Not less than 5 years successful experience on projects of similar size and scope using materials of the type specified.
2. Submit letter from manufacturer stating that the applicator is certified to apply the system specified in this section.
3. Provide certification letter on manufacturer's letterhead and signed by an officer of the company.

B. Vapor barrier waterproof membrane products used on this project shall be of one manufacturer, unless noted specifically otherwise herein. Manufacturer must have not less than 3 years successful experience in the manufacture of required materials.

C. Pre-Installation Conference:

1. Meet at the project site and review requirements for the work and conditions which could possibly interfere with the successful performance of the work. Require every party who is concerned with the work, or required to coordinate with it or to protect it thereafter, to attend the conference.

2. Require manufacturer's technical representative to participate in the conference.

1.4 WARRANTY:

- A. Manufacturer shall supply a five year materials warranty for this application.
- B. Waterproofing applicator shall supply a two year workmanship warranty and acceptable surety.

PART 2 - PRODUCTS

2.1 MANUFACTURERS/MATERIALS:

- A. "Bituthene" by W.R. Grace
- B. "Jiffy Seal" by Protecto Wrap
- C. "Miradri" by Mirafi
- D. "Polyguard" by Polyguard Products, Inc
- E. "Polyken 660" by Polyken Technologies
- F. Approved substitute.

2.2 ACCESSORIES:

- A. Provide accessories including expansion joints, primers, fillers, sealers, joint tapes, and other items recommended by the manufacturer of the primary waterproofing system.
- B. Protection Course: Provide laminated protection board, board insulation, drainage composite board, or other protection board as recommended by the primary waterproofing system manufacturer.

PART 3 - EXECUTION

3.1 FIELD QUALITY CONTROL:

- A. Horizontal Surface Flood Test:
  1. Prior to placing of the finish concrete slab on horizontal surfaces, the areas shall be given 48 hour 1" deep minimum flood test.
  2. Drains shall be plugged and barriers placed to contain the water.

3. 24 hours prior notification of the test shall be given to the Architect and manufacturer of the fluid-applied membrane.

END OF SECTION 07110



## SECTION 07210 - BUILDING INSULATION

### PART 1 - GENERAL

#### 1.1 SUMMARY:

##### A. Section Includes:

1. Blanket batt insulation.
2. Safing insulation.

##### B. Related Sections:

1. Section 07270 - Firestopping.
2. Section 15250 - Mechanical Insulation: Pipe and duct insulation.

#### 1.2 SUBMITTALS:

- ##### A. Provide manufacturer's written certification that insulation products meet specified requirements for the use intended.

#### 1.3 QUALITY ASSURANCE:

##### A. Performance Limitations:

1. Certain cellular plastics used in building construction, though tested in conformance under ASTM and NFPA criteria, have been considered by the Federal Trade Commission as performing differently under actual fire conditions than under test conditions. Such products, if allowed to remain exposed or unprotected, may produce rapid flame spread, quick flashover, toxic or flammable gases, dense smoke and intense and immediate heat and may present a serious fire hazard. Architects are cautioned to thoroughly investigate these materials and their installation prior to specifying insulation products.
2. Materials used to insulate and fireproof buildings shall contain no asbestos.

##### B. Thermal Conductivity:

1. Insulation values are for a thermal conductivity (k-value) measured at 75° F.
2. Adjust thicknesses as required when using material having a different thermal conductivity or tested at a different temperature.
3. Where insulation is specified to have a specific "R" value, furnish manufacturer's standard thickness required to equal or exceed the specified value.

#### 1.4 DELIVERY, STORAGE AND HANDLING:

- A. Do not deliver plastic insulation materials to the project site prior to time of installation. Protect at all times against ignition. Complete the installation and concealment of plastic materials as rapidly as possible.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS:

#### A. Foil Faced Thermal Batt Insulation:

- 1. Owens-Corning Fiberglass.
- 2. U.S. Gypsum.
- 3. Schuller International, Inc.
- 4. Certain Teed Corp.

#### B. Unfaced Acoustical Batt Insulation:

- 1. Owens-Corning Fiberglass
- 2. U.S. Gypsum.
- 3. Schuller International, Inc.
- 4. Certain Teed Corp.

### 2.2 MATERIALS:

#### A. Foil Faced Batt Insulation:

- 1. Resilient glass fibers bonded with thermosetting resin to foil facing.
- 2. Batts shall have minimum R-Value of 3.0 per inch of insulation thickness.
- 3. Vapor Transmission: Not more than 0.1 perms.
- 4. Comply with ASTM C665, Type III.
- 5. Install foil faced insulation in such a way to ensure integrity of vapor barrier. Tape all joints, penetrations, and at top and bottom of walls.
- 6. Where not covered with a 15 minute thermal barrier, provide batts, including vapor barrier, not exceeding a flame spread of 25 or smoke developed of 50 per ASTM E84; and rated noncombustible per ASTM E136.

#### B. Acoustical Unfaced Batt Insulation:

- 1. Resilient glass fiber batt insulation installed in stud wall cavities or above ceilings for acoustical sound absorption.

#### C. Safing Insulation:

- 1. Conform to ASTM C612, Class 1 and 2, (melt point of over 2,000<sup>o</sup> F.). Provide USG "Thermafiber Safing Insulation", or approved substitute, thickness as required.
- 2. Contract Documents must clearly show locations and detail.

PART 3 - EXECUTION

Not Used

END OF SECTION 07210



## SECTION 07270 - FIRESTOPPING

### PART 1 - GENERAL

#### 1.1 SUMMARY:

##### A. Section Includes:

1. Through-penetration firestopping in fire-rated barriers including both empty openings and openings containing cables, pipes, ducts, conduits and other penetrating items.
2. Construction-gap firestopping at connections of the same or different materials in fire-rated construction using fire-resistant sealants.
3. Construction-gap firestopping occurring within fire-rated walls using fire-resistant sealants.
4. Construction-gap firestopping occurring at the top of fire-rated walls.

##### B. Related Sections:

1. Section 07210 - Building Insulation: Fibrous fire safing insulation.
2. Section 07253 - Sprayed Fireproofing.
3. Section 07900 - Joint Sealers.
4. Division 15 - Mechanical: Fire dampers and manufactured mechanical devices.
5. Division 16 - Electrical: Raceway seals, cable trays and manufactured electrical devices.

#### 1.2 SYSTEM PERFORMANCE REQUIREMENTS:

##### A. General:

1. Provide firestopping systems that are produced and installed to resist the spread of fire and the passage of smoke and other gases.

##### B. F-Rated Through-Penetration Firestop Systems:

1. Provide through-penetration firestop systems with F ratings required, as determined per ASTM E814, but not less than that equaling or exceeding the fire-resistance rating of the constructions penetrated.

##### C. T-Rated Through-Penetration Firestop Systems:

1. Provide through-penetration firestop systems with T ratings, in addition to F ratings, as determined per ASTM E814, where systems protect penetrating items exposed to contact with adjacent materials in occupiable floor areas. T-rated assemblies are required where the following conditions exist:

- a. Where firestop systems protect penetrations located outside of wall cavities.
- b. Where firestop systems protect penetrations located outside fire-resistive shaft enclosures.
- c. Where firestop systems protect penetrations located in construction containing doors required to have a temperature-rise rating.
- d. Where firestop systems protect penetrating items larger than a 4-inch-diameter nominal pipe or 16 sq. in. in overall cross-sectional area.

D. Fire-Resistive Joint Sealants:

1. Provide joint sealants with fire-resistance ratings required, as determined per ASTM E119, but not less than that equaling or exceeding the fire-resistance rating of the construction in which the joint occurs.
2. LEED EQc4: Low Emitting Materials  
All sealants shall meet or exceed the VOC limits of South Coast Air Quality Management District Rule #1168 and all sealants used as fillers must meet or exceed the requirements of the Bay Area Quality Management District Regulation 8, Rule 51.

E. Exposed-to-View Firestopping Materials:

1. For firestopping exposed to view, traffic, moisture, UV radiation, and physical damage, provide products that do not deteriorate when exposed to these conditions.
  - a. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems.
  - b. For floor penetrations with annular spaces exceeding 4 inches or more in width and exposed to possible loading and traffic, provide firestop systems capable of supporting the floor loads involved either by installing floor plates or by other means.
  - c. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.
2. For firestopping exposed to view, provide products with flame-spread values of less than 25 and smoke developed values of less than 450, as determined per ASTM E84.

1.3 SUBMITTALS:

A. Certifications:

1. Submit manufacturer's certification that materials supplied are in accordance with the specifications and requirements of the authorities having jurisdiction.
2. Submit certification that materials supplied are VOC compliant and are nontoxic to building occupants.

B. Test Reports:

1. Submit product test reports from, and based on tests performed by, a qualified testing and inspecting agency who is acceptable to ICBO and the University of Colorado at Boulder Department of Environmental Health and Safety evidencing compliance of firestopping with requirements based on comprehensive testing of current products.

C. Penetrations Schedule:

1. Submit a schedule showing typical penetrations of each penetrating material type, firestopping type to be used, F ratings, T ratings, UL or other acceptable testing agency reference numbers, and other pertinent data.

1.4 QUALITY ASSURANCE:

A. Fire-Test Response Characteristics:

1. Provide firestopping that complies with the following requirements and those specified under the "System Performance Requirements" article:
  - a. Perform firestopping tests by a qualified testing and inspecting agency. A qualified testing and inspecting agency is UL, Warnock Hersey, or another agency performing testing and follow-up inspection services for firestop systems that is acceptable to the University of Colorado at Boulder Department of Environmental Health and Safety.
  - b. Through-penetration firestop systems must be identical to those tested per ASTM E814 under conditions where positive furnace pressure differential of a least 0.01" of water is maintained at a distance of 0.78" below the fill materials surrounding the penetrating items in the test assembly. Provide rated systems complying with the following requirements:
    - 1) Furnish products bearing classification marking of qualified testing and inspecting agency.
    - 2) Furnish firestop systems corresponding to those indicated by reference to system designations listed by UL in their "Fire Resistance Directory" or by Warnock Hersey.
  - c. Fire-resistive joint sealant systems must be identical to those tested for fire-response characteristics per ASTM E119 under conditions where the positive furnace pressure differential is at least 0.01 inch of water, as measured 0.78 inch from the face exposed to furnace fire. Provide systems complying with the following requirements:
    - 1) Fire-Resistance Ratings of Joint Sealants: As indicated by reference to design designations listed by UL in their "Fire Resistance Directory."
    - 2) Furnish joint sealants, including backing materials bearing classification marking of qualified testing and inspection agency.

B. Information on Drawings:

1. Drawings refer to specific design designations of through-penetration firestop systems intended to establish requirements for performance based on conditions that are expected to exist during installation. Any changes in conditions and designated systems require the Architect's prior approval. Submit documentation showing performance of proposed substitutions equals or exceeds that of systems they would replace and are acceptable to authorities having jurisdiction.
- C. Standards:
1. Conform to applicable standards, including, but not limited to:
    - a. ASTM E119 Method for Fire Tests of Building Construction and Materials.
    - b. ASTM E814 Test Method of Fire Tests of Through-Penetration Firestops.
- D. Installer Qualifications:
1. Installer who has successfully completed within the last three years at least three firestopping applications similar in type and size to that of this project.
- E. Single Source for Materials:
1. Obtain firestopping materials from a single manufacturer for each different product required.
- F. Preconstruction Laboratory Tests:
1. Submit substrate materials representative of actual joint surfaces to be sealed to manufacturer of firestopping products for laboratory testing of firestop materials for adhesion to primed and unprimed substrate joints and for compatibility with secondary seals, if required, as indicated below:
    - a. Use test methods standard with manufacturer to determine if priming and other specific substrate preparation techniques are required to obtain rapid, optimum adhesion of firestopping to substrate joints under environmental conditions that will exist during actual installation.
    - b. Testing will not be required when firestopping manufacturer is able to submit preparation data required above which is based on previous testing of current firestopping products for adhesion to, and compatibility with, substrates matching those submitted.
- G. Detectable Asbestos:
1. Provide firestopping products containing no detectable asbestos as determined by the method specified in 40 CFR Part 763, Subpart F, Appendix A, Section 1, "Polarized Light Microscopy."

1.5 WARRANTY:

- A. Submit 2 copies of written 2-year warranty agreeing to repair or replace firestopping which fails to perform as airtight and watertight joints; or fails in joint adhesion, cohesion, abrasion resistance, weather resistance, extrusion resistance, migration resistance, stain resistance, or general durability; or appears to deteriorate in any other manner not clearly specified by submitted manufacturer's data as an inherent quality of the material for the exposure indicated.
- B. Provide warranty signed by the Installer and Contractor.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

- A. Provide products by one of the following for each different product required:
  - 1. 3M Fire Protection Products
  - 2. Bio-Fireshield Inc.
  - 3. General Electric Company
  - 4. Tremco, Inc.
  - 5. Hilti Inc.
  - 6. Other approved manufacturer's offering UL listings will be considered.

2.2 MATERIALS:

- A. Compatibility:
  - 1. Provide firestopping, joint fillers, dams and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by testing and field experience.
- B. Accessories:
  - 1. Provide components for each firestopping system that are needed to install fill materials and to comply with "System Performance Requirements" article in Part 1. Use only components specified by the firestopping manufacturer and approved by the qualified testing and inspecting agency for designated fire-resistance-rated systems. Accessories include but are not limited to the following items:
    - 2. Permanent forming/damming/backing materials including the following:
      - a. Semirefractory fiber (mineral wool) insulation.
      - b. Ceramic fiber.
      - c. Sealants used in combination with other forming/damming materials to prevent leakage of fill materials in liquid state.
        - 1) Fire-rated formboard.
        - 2) Joint fillers for joint sealants.

- d. Fire-Rated Back-up for Fire-Resistant Joint Sealers: "Ultra Block" by Backer Rod Manufacturing and Supply Co.
  - e. Temporary forming materials.
  - f. Substrate primers.
  - g. Collars.
  - h. Steel sleeves.
- C. Applications:
1. Provide firestopping systems composed of materials specified in this Section that comply with system performance and other requirements.

### PART 3 - EXECUTION

#### 3.1 PENETRATION SCHEDULE:

- A. General:
1. Prepare a schedule showing typical penetrations of each penetrating material type and other information as follows:
    - a. Project Name.
    - b. Construction Type.
    - c. Occupancy.
    - d. Firestop Applicator.
- B. Construction Assemblies:
1. Gypsum Board Walls
  2. CMU and Concrete Walls
  3. Concrete Floors
  4. Floor/Ceiling Assemblies
  5. Roof/Ceiling Assemblies
  6. Chases
  7. Curtain Walls
  8. Construction Joints
  9. Expansion Joints
- C. Fire Resistive Rating Requirements:
1. Furnish the following information for each type of construction assembly listed above:
    - a. Hourly fire rating.
    - b. "F" Rating.
    - c. "T" Rating.
    - d. Qualified testing agency Design No.
    - e. Penetrating item.
    - f. Penetrating material and size.
    - g. Minimum annular space.

- h. Maximum annular space.
- i. Architect's detail and sheet number.
- j. Shop drawing detail or sheet number.

END OF SECTION 07270



## SECTION 07900 - JOINT SEALERS

### PART 1 - GENERAL

#### 1.1 SUMMARY:

##### A. Section Includes:

1. Joints between dissimilar materials
2. Joints in cast-in-place concrete.
3. Penetrations of floors, walls and roofs.
4. Expansion joints.
5. Door, window and louver frames.

##### B. Related Sections:

1. Section 03300 - Cast-in-Place Concrete.
2. Section 07270 - Firestopping.
3. Section 08100 - Metal Doors and Frames.
4. Section 08800 - Glazing.
5. Section 09260 - Gypsum Board Systems.
6. Divisions 15 and 16.

#### 1.2 SUBMITTALS:

- A. Submit manufacturer's surface preparation and installation instructions under provisions of Section 01300.
- B. LEED EQc4: Low-Emitting Materials  
Provide documentation from the manufacturer identifying the VOC and chemical component limits for the materials provided.

#### 1.3 QUALITY ASSURANCE:

##### A. Applicator Qualifications:

1. Application shall be done by a Joint Sealant Subcontractor with five years experience. Submit documentation to the Architect and Owner.

##### B. Manufacturer Technical Assistance:

1. Materials shall be supplied by manufacturer who will provide qualified technical assistance at the project site.

#### 1.4 WARRANTY:

- A. Submit 2 copies of written 2-year warranty agreeing to repair or replace joint sealers which fail to perform as airtight and watertight joints; or fail in joint adhesion, cohesion, abrasion resistance, weather resistance, extrusion resistance, migration resistance, stain resistance, or general durability; or appear to deteriorate in any other manner not clearly specified by submitted manufacturer's data as an inherent quality of the material for the exposure indicated.
- B. Provide warranty signed by the Installer and Contractor.

## PART 2 - MATERIALS

### 2.1 MANUFACTURERS:

- A. Tremco Manufacturing.
- B. Dow Corning.
- C. General Electric.
- D. Pecora Corporation.
- E. Mameco International.
- F. Sika Corporation.
- G. Sonneborn Building Products.

### 2.2 SEALANTS:

- A. One-Component Acrylic Sealant:
  - 1. Acrylic emulsion sealant, one-part, mildew resistant and paintable, complying with ASTM C834, recommended by manufacturer for general use as an exposed building construction sealant, Pecora AC-20 or approved substitute.
  - 2. LEED EQc4: Low Emitting Materials  
All sealants shall meet or exceed the VOC limits of South Coast Air Quality Management District Rule #1168 and all sealants used as fillers must meet or exceed the requirements of the Bay Area Quality Management District Regulation 8, Rule 51.
- B. Interior Silicone Rubber Sealant:
  - 1. Silicone rubber-based, one-part elastomeric sealant, complying with ASTM C920, Type S, Class 25, Grade NS.
  - 2. Use acid-type for non-porous joint surfaces, and non-acid type where one or both joint surfaces are porous.

3. For wet areas use type compounded specifically for mildew resistance.
  4. Use for interior joints between equipment or counters and walls.
  5. LEED EQc4: Low Emitting Materials  
All sealants shall meet or exceed the VOC limits of South Coast Air Quality Management District Rule #1168 and all sealants used as fillers must meet or exceed the requirements of the Bay Area Quality Management District Regulation 8, Rule 51.
- C. Two-Component Polyurethane Sealant:
1. Polyurethane-based, 2-part elastomeric sealant, complying with ASTM C920, Type M, Class 25, Grade NS (non-sag), Tremco "Dymeric", Pecora "Dynatrol II".
  2. Optional Sealant: Contractor may, at his option, provide 1-Component Silicone Sealant, "Silpruf" by General Electric or #790 by Dow-Corning in lieu of above.
  3. For exterior and interior sidewalk and floor joints, polyurethane as above except Grade P (self-leveling), Tremco "Dymeric", Pecora "Urexpam NR-200".
  4. LEED EQc4: Low Emitting Materials  
All sealants shall meet or exceed the VOC limits of South Coast Air Quality Management District Rule #1168 and all sealants used as fillers must meet or exceed the requirements of the Bay Area Quality Management District Regulation 8, Rule 51.
- D. Backer Rod: Compressible, closed cell non-gassing type compatible with required sealant.

## PART 3 - EXECUTION

### 3.1 INSTALLATION:

- A. Joints:
1. Install sealants to depths as recommended by the sealant manufacturer but within the following general limitations, measured at the center (thin) section of the bead:
    - a. For sidewalks, pavements and similar joints sealed with elastomeric sealants and subject to traffic and other abrasion and indentation exposures, fill joints to a depth equal to 75% of joint width, but neither more than 0.625" deep nor less than 0.375" deep.
    - b. For normal moving joints sealed with elastomeric sealants, but not subject to traffic, fill joints to a depth equal to 50% of joint width, but neither more than 0.5" deep nor less than 0.25" deep.
    - c. For joints sealed with non-elastomeric sealants and calking compounds, fill joints to a depth in the range of 75% to 125% of joint width.

### 3.2 SCHEDULE OF SEALANT APPLICATION:

- A. At joints in vertical planes on exterior of building and interior face of through expansion or control joints, provide non-sag type polyurethane or silicone sealant.
- B. At joints in horizontal planes on interior and exterior of building, provide self-leveling type polyurethane sealant.
- C. At joints on interior of building, except as indicated in item A above, provide acrylic type sealant.
- D. At perimeter of plumbing fixtures, and kitchen equipment provide silicone type sealant.
- E. Set all thresholds in full bed of urethane type caulking.
- F. See drawings for typical locations.
- G. Humidity and temperature controlled fMRI and Control Rooms:
  - 1. All walls fully sealed to the structure top and bottom.
  - 2. Sealant around all electrical outlets, panel boxes, etc.
  - 3. Expandable foam around sides and back of all electrical outlets, panel boxes, etc.
  - 4. All openings, into computer room, into access floor space, and into space above ceiling shall be completely sealed.

END OF SECTION 07900

## SECTION 08100 - METAL DOORS AND FRAMES

### PART 1 - GENERAL

#### 1.1 SUMMARY:

##### A. Section Includes:

1. Fabricated non-rated and fire-rated rolled steel door frames.
2. Interior light, side-light and window frames.

##### B. Related Sections:

1. Section 08210 - Wood Doors.
2. Section 08710 - Finish Hardware.

#### 1.2 SYSTEM DESCRIPTION:

##### A. Doors:

##### 1. Normal Door Sizes as Follows:

##### a. Exterior Openings:

- 1) 3'-0" x 7'-0" for single openings.
- 2) 6'-0" x 7'-0" for double openings.

##### b. Interior Doors:

- 1) Classrooms and Public Assembly Rooms (capacity requirements as determined by code): 3'-0" x 7'-0" for single openings and 6'-0" x 7'-0" for double openings.
- 2) Offices and Secondary Rooms (including Custodial Work Stations): 3'-0" x 7'-0".
- 3) Toilet Rooms and Service Rooms: 3'-0" x 7'-0".
- 4) Closets: 2'-8" x 7'-0".

##### 2. Reinforce doors for all required hardware.

##### B. Frames:

##### 1. Interior Frames:

- a. Metal frames, 16 gage minimum, heavier if doors are wider than 3'. Continuously weld and grind smooth all corner joints and contact edges once joints are closed tight.

2. Anchoring: Securely anchor all frames to the floor. Minimum three wall anchors on each jamb.
3. Reinforce frames for all required hardware.
4. "Knock-down" type frames are not acceptable except when approved by the university in exceptional situations such as remodeling projects.
5. Grout: Fill with mortar all metal door frames in masonry walls.

C. Clearances:

1. Between doors and frames at head and jamb, 1/8".
2. At sill where no threshold is used, 1/2". Where threshold is used, 1/8" between door and threshold.
3. Between meeting edge of doors in pairs, 1/8".
4. Bevel edges of single acting doors 1/8" in 2".
5. Coordinate door height with floor covering thickness.

### 1.3 SUBMITTALS

A. Shop Drawings:

1. Submit shop drawings for the fabrication and installation of hollow metal work. Include details of each frame type, elevations of door design types, conditions at openings, details of construction, location and installation requirements of finish hardware and reinforcements, and details of joints and connections tied to a schedule.

B. LEED MRc5: Regional Material

Provide a statement from the manufacturer stating that the materials provided were manufactured within a 500 mile radius of the project. Include location.

C. LEED MRc4: Recycled Content

Provide a statement from the manufacturers including recycled content percentage, by weight, and whether the recycled content is post-industrial or post-consumer.

### 1.4 QUALITY ASSURANCE:

A. Standards:

1. Conform to SDI 100, grade III or NAAMM Standard HMMA 861 except where more stringent requirements are specified.

B. Fire-Rated Assemblies:

1. Provide fire-rated hollow metal doors and frames that comply with NFPA 80 and tested as a fire door assembly, complete with type of fire door hardware to be used, in accordance with ASTM E152.
2. Identify each fire door and frame with either UL or Warnock Hersey labels, indicating applicable fire rating of both door and frame.

3. Temperature Rise Rating: At stairwell enclosures, provide doors which have Temperature Rise Rating of not more than 450<sup>o</sup> F. maximum to 30 minutes of fire exposure.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS:

- A. Gateway.
- B. Southwestern Hollow Metal.
- C. NCS Manufacturing Co.
- D. Rocky Mountain Metals.
- E. CECO.
- F. Curries.
- G. Fenestra.
- H. Kewanee.
- I. Republic
- J. Steelcraft.
- K. NCS
- L. Approved substitute.

### 2.2 MATERIALS:

- A. Frames:
  1. Minimum Gages:
    - a. All other interior door and window frames: 16 gage.
    - b. Loose glazing stops: 18 gage.
    - c. LEED MRc4: Recycled Content  
Material shall contain recycled content.
  2. Stops:
    - a. 5/8" deep door and glazing stops.
    - b. Rolled steel sections for fire-rated openings.

3. Anchors:
  - a. Fire-Rated Openings: UL rated.
  - b. Steel or Wood Stud: Minimum 16 gage "Z" shape.

### 2.3 PREPARATION FOR FINISH HARDWARE:

- A. Doors and Frames: Spot weld all reinforcement at the factory. Drill and tap for mortise template hardware.
- B. Frame Reinforcement (Minimum):
  1. Butt Hinges: One piece 7 gage plate 12" long by full width of jamb at each hinge.
  2. Closers: 10 gage channel section 12" long and full width of frame trim.
  3. Strikes, Flush Bolts, and all Other Surface Mounted Hardware: 12 gage.
  4. Reinforce frames in direct proportion to the size and weight of door.
- C. Door Reinforcement (Minimum):
  1. Butt Hinges: 7 gage plate 9" long welded to 16 gage interior edge channels at each hinge.
  2. Surface Applied Closers: 12 gage box section minimum 4" deep and 12" long.
  3. Locksets, Deadbolts, Panic Devices: 12 gage.
  4. Pull Plates, Flush Bolts, and Surface Mounted Hardware: 12 gage.

### 2.4 FINISH:

- A. Interior Locations: Zinc coating complying with ASTM A525, G01.

## PART 3 - EXECUTION

Not Used

END OF SECTION 08100

## SECTION 08210 - WOOD DOORS

### PART 1 - GENERAL

#### 1.1 SUMMARY:

A. Section Includes:

1. Wood Doors and Panels: Fire-rated and non-fire-rated.
2. Flush wood doors and panels with veneer facings.
3. Prefitting and premachining for fire-rated and 20 minute wood doors.

B. Related Sections:

1. Section 06200 - Finish Carpentry: Wood door frames.
2. Section 08100 - Metal Doors and Frames: Steel frames and doors.
3. Section 08710 - Finish Hardware.
4. Section 08800 - Glazing.
5. Section 09900 - Painting: Site finishing of doors.

#### 1.2 SUBMITTALS:

A. Submit shop drawings and samples.

B. LEED MRc7: Certified Wood

Provide certification and chain of custody documentation from manufacturer stating that all wood based materials came from Forest Stewardship Council certified sources.

#### 1.3 QUALITY ASSURANCE:

A. Conform to requirements of AWI Quality Standard Section 1300, Custom Grade, and NWWDA I.S. 1 "Industry Standard for Wood Flush Doors". Where conflicts occur the AWI Quality Standard shall govern.

B. Installed Doors and Panels: Conform to NFPA 80 for fire-rated doors as indicated. Test fire-rated door assemblies in accordance with ASTM E152. Provide doors labeled by UL or Warnock Hersey.

#### 1.4 WARRANTY:

A. Specific Product Warranty: Submit 2 copies of written agreement on door manufacturer's standard form signed by Manufacturer, Installer and Contractor, agreeing to repair or replace defective doors which have warped (bow, cup or twist) or which show telegraphing of core construction below in face veneers, or do not conform to tolerance limitations of referenced quality standards.

- B. The warranty shall also include refinishing and reinstallation which may be required due to repair or replacement of defective doors.
- C. Warranty for solid core flush interior doors shall be in effect for the lifetime of the installation.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS:

- A. Weyerhaeuser Co.
- B. Algoma Hardwoods, Inc.
- C. Eggers Industries

### 2.2 MATERIALS:

- A. Doors: AWI "PC-5" type, solid particleboard core with solid stiles. Provide mineral core doors with fire-rating as scheduled.

LEED EQc4: Low-Emitting Materials

Urea-Formaldehyde resin binders are unacceptable.

- B. Faces: AWI Premium Grade plain sliced red oak or birch veneers, both sides. Match existing, adjacent veneers in remodel work.

LEED MRc7: Certified Wood

Wood based materials shall come from sources certified by the Forest Stewardship Council and be classified as "certified wood."

- C. Edge Stiles: Solid hardwood to match face veneers without finger jointing.

- D. Adhesives: NWWDA IS. 1.6 Type I

LEED EQc4: Low-Emitting Materials

All adhesives must meet or exceed the VOC limits of South Coast Air Quality Management District Rule #1168.

- E. Glazing Stops: 20 gage cold-rolled steel channel. For fire-rated doors, provide glazing stops with UL or Warnock Hersey label.

### 2.3 PREFITTING AND PREPARATION FOR HARDWARE:

- A. Prefit and premachine fire-rated and 20 minute wood doors at the factory or at a labeling agency licensed machiner.
- B. Comply with the tolerance requirements of AWI for prefitting.

PART 3 - EXECUTION

3.1 CLEARANCES:

- A. Non-Fire-Rated Doors: Provide 1/8" at jambs and heads, 1/8" (1/16" per leaf) at meeting stiles on pairs of doors and 1/2" from bottom of door to top of floor finish or covering. Provide 1/4" clearance at thresholds. Bevel doors 1/8" in 2" at lock and hinge edges.
- B. Fire Rated Doors: Comply with NFPA 80. Provide proper fit and uniform clearance.

END OF SECTION 08210



## SECTION 08305 - ACCESS DOORS

### PART 1 - GENERAL

#### 1.1 SUMMARY:

##### A. Section Includes:

1. Fire resistive rated and non-rated access doors and frames.

##### B. Related Sections:

1. Section 03300 - Cast-in-Place Concrete: Openings in concrete.
2. Section 04200 - Unit Masonry: Openings in masonry.
3. Section 09200 - Lath and Plaster
4. Section 09260 - Gypsum Board Systems: Openings in partitions.
5. Section 09300 - Tile: Openings in ceramic tile walls.
6. Section 09510 - Acoustical Ceilings: Openings in ceilings.
7. Section 09900 - Painting: Field paint finish.
8. Section 15000 - Mechanical
9. Section 16000 - Electrical

#### 1.2 QUALITY ASSURANCE:

- A. Where fire-rated assemblies are required, provide assemblies complying with NFPA 80 and tested in accordance with ASTM E152.
- B. Provide units labeled by UL or Warnock Hersey.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS:

##### A. Provide wall and ceiling access doors by one of the following:

1. Nystrom, Inc. (specified to establish level of quality).
2. Bar Co., Inc.
3. J.L. Industries.
4. Karp Associates, Inc.
5. Milcor.
6. The Williams Brothers Corp.
7. Approved substitute.

#### 2.2 WALL AND CEILING ACCESS UNITS:

- A. Access Panels - Gypsum Board Walls and Ceilings: Flush, Style WB by Nystrom, 16 gage frame, 14 gage panel, galvanized steel drywall bead, concealed spring hinges.
- B. Sizes:
  - 1. Hand Access: 18" x 18" minimum; 24" x 24" preferred.
  - 2. Person Access: 24" x 24" minimum.
- C. Finish: Phosphate dipped with baked on rust inhibitive gray primer; final field applied finish to match finish of adjacent wall surface.
- D. Locking:
  - 1. Non-Rated Areas: Flush, screw-driver operated cam latch.
  - 2. Fire-Rated Areas: Raised knob cam locks.
  - 3. Special Areas as Designated: Cylinder locks with all units keyed alike. Verify cylinder locking locations with UCB staff.

### 2.3 ACCESS HATCHES:

- A. Design:
  - 1. Installation: Recessed.
  - 2. Finish: To receive floor or ceiling finish as scheduled, if in a public area.
- B. Location: Accessible in a non-public location if possible.

### PART 3 - EXECUTION

Not Used

END OF SECTION 08305

## SECTION 08710 - FINISH HARDWARE

### PART 1 - GENERAL

#### 1.1 SUMMARY:

##### A. Section Includes:

1. Items known commercially as finish hardware or builders hardware, required for swing doors.
2. Types of finish hardware:
  - a. Hinges.
  - b. Lock cylinders and keys.
  - c. Lock and latches.
  - d. Bolts.
  - e. Exit devices.
  - f. Closers.
  - g. Overhead holders.
  - h. Door trim units.
  - i. Protection plates.
  - j. Sound stripping for interior doors.
  - k. Thresholds.

##### B. Related Sections:

1. Section 06200 - Finish Carpentry: Installation of finish hardware.
2. Section 08100 - Metal Doors and Frames.
3. Section 08210 - Wood Doors.
4. Section 08740 - Electro-Mechanical Hardware.
5. Hardware for Special Door Units: Refer to applicable special door sections.
6. Divisions 6 and 12: Casework hardware.

#### 1.2 REFERENCES:

- A. American National Standards for Making Buildings and Facilities Accessible to and Usable by Physically Handicapped People ANSI A117.1 and Uniform Federal Accessibility Standards.
- B. Fire-Rated Openings:
  1. National Fire Protection Association (NFPA) Standard No. 80. This requirement takes precedence over other requirements for such hardware.
  2. Underwriters Laboratory (UL).
  3. Warnock Hersey International (WHI).
- C. Emergency Exit Devices:

1. Fire-Rated Doors: Provide UL or WHI label on exit devices indicating "Fire Exit Hardware".

### 1.3 SUBMITTALS:

- A. Manufacturer's technical product data of each item of hardware.
- B. Hardware Schedule:
  1. Organize hardware schedule into "hardware sets" indicating complete designations of every item.
  2. Include specific hardware directions for every door opening.
- C. Templates:
  1. Hardware templates to fabricators of other work which is to receive finish hardware.

### 1.4 QUALITY ASSURANCE:

- A. Supplier Qualifications:
  1. Recognized builders hardware supplier, with warehousing facilities, who has been furnishing hardware in the Denver-Metro area for a period of not less than 3 years.
  2. Employs an experienced AHC certified hardware consultant, available for consultation during the course of the work.

### 1.5 WARRANTY:

- A. Mechanical failure on door closers for 5 years.
- B. Blanket coverage on locksets for 5 years.
- C. Failure on parts of all hardware except door closures for 2 years.

## PART 2 - PRODUCTS

### 2.1 HINGES:

- A. Manufacturers:

<u>Stanley</u>	<u>Hager</u>	<u>Lawrence</u>	<u>McKinney</u>
FBB179	BB1279	BB4101	TA2714
FBB199	BB1199	BB5101-A	T4B3386
FBB168	BB1168	BB5101	T4B3786

- B. Five knuckle, button tip, full mortise template type with non-rising loose pins and ball or oilite bearings.
- C. Interior Doors: Ball bearing type, wrought steel construction, with .134 or .145 gage.
  - 1. Doors to 36" Width: 4.5" x 4.5" hinges.
  - 2. Doors over 36" Width: 5" x 5" hinges.
- D. Number of Hinges:
  - 1. Minimum 3 hinges per door leaf for doors 84" or less in height.
  - 2. One additional hinge for each 24" of additional height.

## 2.2 LOCKS:

- A. Manufacturers:
- B. Heavy duty mortise type.
- C. Supply all locks with construction cylinders to secure the building until replaced by Owner with "Medeco" cylinders at job completion. All locks must accommodate "Medeco" cylinders.
- D. Lock Throw: 3/4" minimum throw of latch and 1" minimum throw of deadbolt.
- E. Trim: Cast lever and cast escutcheon, Schlage Lock Co. #03L (no substitutions).
- F. Finish:
  - 1. Match finish of existing hardware in adjacent areas.

## 2.3 DOOR CLOSERS:

- A. Manufacturer:
  - 1. LCN (no substitutions).
  - 2. Closer Series is 4040 or 4041, may be used with "CUSH" arm if required.
    - a. Provide EDA arm (Extra Duty Arm) on parallel arm applications.
    - b. Provide "CUSH" arm where required.
  - 3. Through bolted on all doors unless otherwise directed by Owner.
  - 4. Surface Mounted Closers: Product of a single manufacturer.
  - 5. Delayed action and conform to UFAS requirements.
- B. Size of Units:
  - 1. Adjust closers to comply with the manufacturer's recommendations for size of door control unit, depending upon size of door, and anticipated frequency of use.

2.4 EXIT DEVICES:

- A. Manufacturer:
  - 1. Von Duprin, Inc. (no substitutions).
  - 2. Vertical rods shall be *surface mount only*.
  - 3. Series shall be Von Duprin #99 (or #33 if necessary).
- B. Exit Device Dogging: Except on fire-rated doors, wherever closers are provided on doors equipped with exit devices, equip the units with allen-key dogging device to hold the push bar down and the latch bolt in the open position.
- C. Fire Rated Exit Devices: Provide with U.L. Label showing listing for "Fire Exit Hardware."
- D. Through-bolt on all doors including center cases, end cases, rod guides and latches.

2.5 DOOR TRIM, STOPS, AND HOLDERS:

- A. Manufacturers:
  - 1. Hager
  - 2. Trimco
  - 3. Rockwood
  - 4. Quality
  - 5. Master Manufacturers, Inc.
  - 6. Glynn-Johnson
  - 7. Approved substitute.
- B. Door Stops:
  - 1. Locate in position to permit maximum door swing but not to present a hazard or obstruction.
  - 2. Provide solid blocking in walls for wall mounted stops to prevent "punch through" by door action.
- C. Kick Plates:
  - 1. Manufacturer's standard exposed fasteners.
  - 2. Trim Plates: .050" in thickness.
  - 3. Protection Plates (armor, kick, or mop): Minimum 2" less than door width on stop side and minimum 1/2" less than door width on pull side.
  - 4. Wheelchair Entries: Kickplates shall be a minimum 12" high.
- D. Thresholds:
  - 1. Height and slope shall conform to ANSI A117.1 and UFAS requirements.
- A. Overhead Holders:

1. Use surface mounted devices unless otherwise approved by the Owner.
2. Through bolt mount on all doors unless otherwise approved by the Owner.

2.6 DOOR STRIP UNITS:

A. Manufacturers:

1. Pemko.
2. Reese.
3. Zero.
4. Master Manufacturers, Inc.
5. National Guard.
6. Approved substitute.

B. Smoke Seal Applications: As required to meet all applicable codes.

1. Provide only National Guard No. 2525.
2. Silicone rubber seal; vinyl not acceptable.

C. Fasteners:

1. Manufacturer's standard ex-posed fasteners for door trim units (kick plates, edge trim, viewers, and similar units).
2. Noncorrosive fasteners as recommended by manufacturer for application indicated.

2.7 FINISHES:

- A. Match the finish of the locksets.
- B. Closers: Paint to match locksets.
- C. Thresholds and Weatherstrip Housing: Aluminum with natural aluminum finish.
- D. Coordinate all the various manufactured items furnished on this work to ensure an acceptable uniform finish.

2.8 KEYING:

- A. Final cylinders and keying shall be "Medeco" purchased by the Owner and installed by the Contractor.

PART 3 - EXECUTION

Not Used

END OF SECTION 08710



## SECTION 08800 - GLAZING

### PART 1 - GENERAL

#### 1.1 SUMMARY:

A. Section Includes:

1. RF shielded glass.
2. Wire glass.
3. Tempered glass.

B. Related Sections:

1. Section 08100 - Metal Doors and Frames.
2. Section 08210 - Wood Doors.
3. Section 08520 - Aluminum Windows.

#### 1.2 SUBMITTALS:

- A. Submit manufacturer's product data showing thermal performance characteristics of tinted, coated, insulating glass units, or heat mirror insulating glass units.

LEED EQc8: Daylighting and Views  
Highlight Tvis values.

- B. Submit two samples of each type of glass specified, 12" x 12" in size, illustrating glass, unit, and coloration. Indicate range of variation to be expected for color and "waviness" in final position.

- C. LEED EQc4: Low-Emitting Materials  
Provide documentation from the manufacturer identifying the VOC and chemical compound limits for each sealant provided.

#### 1.3 QUALITY ASSURANCE:

- A. Installer shall have a minimum of 5 years experience in projects of similar size and complexity.
- B. Conform to Flat Glass Marketing Association (FGMA) "Glazing Manual" and "Sealant Manual" for glazing standards.
- C. Safety Glass: Comply with Colorado State Statutes, IBC and ANSI Z97.1 with certifying label on each piece.
- D. Prime (Float) Glass: ASTM C1036.

- E. Heat-Treated Glass: ASTM C1048.
- F. Elastomeric Sealant Standard: Comply with ASTM C920 requirements for Type, Grade, Class and Uses.
- G. Manufacturers: Provide each type of glass and primary sealant/gasket from a single manufacturer with not less than 5 years of successful experience in the production of materials similar to those required.

## PART 2 - PRODUCTS

### 2.1 PRIME (NON-PROCESSED) GLASS:

- A. Manufacturers:
  - 1. AFG Industries, Inc.
  - 2. Ford Glass Div.
  - 3. Guardian Industries.
  - 4. LOF Glass, Inc.
  - 5. PPG Industries, Inc.
  - 6. Viracon
- B. RF Shielded Glass:
  - 1. As provided by Owners shielding contractor for fMRI Control Room view window.
- C. Clear Wired Glass:
  - 1. Type II, Quality q8, Class 1, complying with ANSI Z97.1
  - 2. 1/4" thick, wired and polished both faces.
  - 3. Use for UL label door lights, fire-rated corridor openings, stair and other UL label openings.

### 2.2 PROCESSED GLASS:

- A. Tempered Glass:
  - 1. Prime glass of color and type indicated, which has been heat-treated to strengthen glass in bending to not less than 4.5 times annealed strength. Fully temper glass by horizontally heat treating with minimal waviness or distortion and with all areas free of tong marks.
  - 2. Provide tempered and/or laminated glass where safety glass is indicated or where required by applicable laws and safety Codes.

2.4 GLAZING COMPOUNDS:

A. Containing no asbestos.

B. LEED EQc4: Low-Emitting Materials

All sealants VOC content must meet or exceed the South Coast Air Quality Management District rule #1168 and sealants used as fillers must meet the requirements of the Bay Area Air Quality Management District Regulation 8, Rule 51.

PART 3 - EXECUTION

Not Used

END OF SECTION 08800



## SECTION 09260 - GYPSUM BOARD SYSTEMS

### PART 1 - GENERAL

#### 1.1 SUMMARY:

##### A. Section Includes:

1. Metal framing required for gypsum board.
2. Gypsum board.
3. Acoustical insulation.
4. Acoustical sealant.

##### B. Related Sections:

1. Section 06100 - Rough Carpentry: Wood furring and blocking.
2. Section 05400 - Cold Formed Metal Framing.
3. Section 07210 - Building Insulation: Thermal insulation.
4. Section 08100 - Metal Doors and Frames: Hollow metal frames.
5. Section 09900 - Painting.

#### 1.2 SUBMITTALS:

##### A. Manufacturer's Data:

1. Certification Requirements:
  - a. Certify that products furnished for this project are asbestos free.
  - b. Certify that products meet or exceed specification requirements.
2. Indicate compliance with specified fire or sound ratings.
3. Indicate stud height limitations.
4. LEED MRc4: Recycled Content  
Provide a statement from the manufacturer including recycled content percentage, by weight, and whether the recycled content is post-consumer or post-industrial.

#### 1.3 QUALITY ASSURANCE:

- A. Industry Standard: Comply with applicable requirements of ASTM C840, "Application and Finishing of Gypsum Board" by the Gypsum Association, except where more detailed or more stringent requirements are indicated, including the recommendations of the manufacturer.
- B. Allowable Tolerances: 1/16" offset between planes of board faces and 1/4" in 8'-0" for plumb, level, warp, and bow.

- C. Manufacturer: Obtain each type of gypsum board and related joint treatment materials from a single manufacturer.
- D. Comply with applicable requirements of Mountain States Bureau of Lath, Plaster and Drywall, Inc.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS:

- A. Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include the following:
  - 1. Metal Support Materials:
    - a. Dale Industries, Inc.
    - b. Dietrich Industries, Inc.
    - c. Gold Bond Building Products Div., National Gypsum Co.
    - d. USG Interiors, Inc.
  - 2. Direct Suspension Systems:
    - a. Domtar Gypsum.
    - b. Donn Corporation.
    - c. National Rolling Mills Co.
    - d. USG Interiors, Inc.
  - 3. Gypsum Board and Related Products:
    - a. Domtar Gypsum.
    - b. Georgia-Pacific Corp.
    - c. Gold Bond Building Products Div., National Gypsum Co.
    - d. United States Gypsum Co.
- B. All catalog numbers and trade names used in this Section are those of United States Gypsum, unless otherwise noted, and are to establish continuity and a standard of quality.

### 2.2 MATERIALS:

- A. Gypsum Board:
  - 1. 5/8" regular, tapered edge Type X gypsum board complying with ASTM C36. Use in largest possible dimensions - minimize joints.
  - 2. 5/8" Type X gypsum sheathing board, square edges complying with ASTM C79.
  - 3. LEED MRc4: Recycled Content  
Include recycled content in material.

- A. Partitions:
1. Studs: ASTM C645; 25 gage x 3.625" deep, except as otherwise indicated, or required by height. Maintain deflection of L/240 or less without gypsum board applied.
    - a. Use 18 gage or heavier studs at tile backing and at door jambs. Use stitch welded double studs at door jambs.
  2. Space all studs 16" o.c. maximum, unless specifically approved otherwise.
  3. Double studs to structure at doors and as needed at corners to stiffen and support.
- B. Ceilings:
1. ASTM C754. Use 1.5" steel channels, 0.475 lb. per ft., cold-rolled.
- C. Furring Members: ASTM C645; 25 gage, hat-shaped or z-shaped as required.
- D. Acoustical Sealant: Non-shrinking, non-drying, non-migrating and non-staining type formulated for acoustical use.
- LEED EQc4: Low-Emitting Materials.  
Sealant shall meet or exceed the VOC limits of South Coast Air Quality Management District rule #1168 and sealants used as fillers must meet the requirements of the Bay Area Air Quality Management District, Regulation 8, Rule 51.
- Use one of the following:
1. Pecora BA-98.
  2. Tremco Acoustical Sealant.
  3. U.S. Gypsum Acoustical Sealant.
  4. Approved substitute.
- E. Sound Attenuation Blankets: ASTM C665, Type I, semi-rigid mineral or glass fiber blanket without membrane, Class 25 flame-spread. Provide 1.5" mineral fiber 3.0 lb. density or full thickness of 1.0 lb. density glass fiber.
- F. Joint Treatment: Durabond 90 by U.S. Gypsum Co. or approved substitute.
- G. Accessories: ASTM C840 as follows:
1. Provide corner beads at all external corners, CB-118 x 118.
  2. LC-58 at all termination edges exposed to view.
  3. L-58 at all termination edges abutting another material.
  4. Expansion/control joints as recommended by manufacturer to be located by Architect in field approved substitute to No. 093 by U.S. Gypsum.

## PART 3 - EXECUTION

### 3.1 ACOUSTICAL SEALANT:

- A. Explain clearly where sealant is to be used.
- B. Provide sealant at all joints between drywall system and adjoining materials.
- C. Set gyp board sheet at floor in continuous bead of acoustical sealant.
- D. Seal around all recessed elements or devices or penetrating elements with acoustical sealant.

### 3.2

- A. Gypsum Board Finish Levels: Finish panels to levels indicated below, according to ASTM C 840, for locations indicated:
  - 1. Level 1: Embed tape at joints in ceiling plenum areas, concealed areas, and where indicated for fire-resistance-rated assemblies and sound-rated assemblies.
  - 2. Level 2: Embed tape and apply separate first coat of joint compound to tape, fasteners, and trim flanges where panels are substrate for thin set ceramic tile, acoustical tile, and where indicated.
  - 3. Level 3: Embed tape and apply separate first and fill coats of joint compound to tape, fasteners, and trim flanges. Level 3 is suitable for surfaces receiving medium or heavy textured finishes before painting of wall covering in conditions where lighting conditions are not critical.
  - 4. Level 4: Embed tape and apply separate first, fill, and finish coats of joint compound to tape, fasteners, and trim flanges. Level 4 is suitable for surfaces receiving light-textures finish, wall coverings, and flat paints. It is generally the standard exposed finish.
  - 5. Level 5: Embed tape and apply separated first, fill, and finish coats of joint compound to tape, fasteners, and trim flanges, and apply skim coat of joint compound over entire surface. Level 5 is suitable for surfaces receiving gloss enamels and surfaces subject to severe lighting. It is considered a high quality gypsum board finish reserved for only special applications.

#### ACCESSORIES:

- A. Explain clearly where gypsum drywall and accessories must allow for sealant joints.

END OF SECTION 09260

## SECTION 09510 - ACOUSTICAL CEILINGS

### PART 1 - GENERAL

#### 1.1 SUMMARY:

A. Section Includes:

1. Acoustical tile and panel ceiling quality standards.
2. Acoustical tile and panel ceiling manufacturers.

B. Related Sections:

1. Section 09260 - Gypsum Board Systems: Substrate for acoustical tile.

#### 1.2 SUBMITTALS:

A. Manufacturer's Data:

1. Certification Requirements:

- a. Certify that products furnished for this project are asbestos free.
- b. Certify that products meet or exceed specification requirements.

2. Maintenance:

- a. Submit instructions for proper maintenance and cleaning.
- b. Provide instructions for refinishing.
- c. Provide recommendations on precautions against materials and methods which may be detrimental to finishes and acoustical performance.

B. Samples:

1. Refer to finish schedule and submit three 12" square samples of each type of acoustical material to illustrate color and range of appearance to be expected in completed work.

#### 1.3 QUALITY ASSURANCE:

A. Manufacturer: Company specializing in the manufacture of acoustical ceiling tile and panels with three years minimum experience.

B. Installer: Company with three years minimum experience and approved by manufacturer of acoustical units.

C. Terminology and Performance: Applicable publications by the Ceilings and Interior Systems Contractors' Association (CISCA), including former Acoustical Materials Association Standards issued by CISCA.

- D. Acoustical Materials: ASTM E1264 and Cisca publications
- E. Fire Hazard Classification: UL tested, listed and labeled as "Class O-25", smoke developed of 50 or less per ASTM E84.
- F. Fire Resistance Rating: UL tested, listed and labeled for the UL design and hours of resistance as indicated, with each panel bearing UL label.

#### 1.4 MAINTENANCE MATERIALS:

- A. At time of completing the installation, deliver stock of maintenance materials to the Owner. Furnish full size units matching the units installed, packaged with protective covering for storage, and identified with appropriate labels.
- B. Acoustical Units: Furnish an amount equal to 2.0% of the amount installed of each type, pattern, color, but not less than 10 units. Do not use for replacement of damaged units prior to building occupancy or substantial completion whichever occurs later.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS:

- C. Products offered by manufacturers to comply with requirements include the following:
  - 1. Armstrong World Industries, Inc.
  - 2. Celotex Building Products Div.
  - 3. USG Interiors, Inc.
- B. Suspension Grid System:
  - 1. Comply with ASTM C635 for Intermediate Duty Systems.
  - 2. Grid Module: 24" by 24".
  - 3. Coordinate with Divisions 15 and 16 to ensure proper type of diffuser and light fixture mounting to match panels and suspension system. Independently suspend light fixtures.
  - 4. Hanger Wires: ASTM A641, soft temper, pre-stretched, yield-stress load of at least 3 times the design load, but not less than 12 gage.

### PART 3 - EXECUTION

Not used

END OF SECTION 09510

## SECTION 09650 - RESILIENT FLOORING

### PART 1 - GENERAL

#### 1.1 SUMMARY:

##### A. Section Includes:

1. Resilient flooring quality assurance.
2. Resilient tile materials.
3. Sheet vinyl materials.
4. Stair treads.

##### B. Related Sections:

1. Section 03300 - Cast-in-Place Concrete: Finish trowelling of floor slab.
2. Section 09680 - Carpet.
3. Section 01710 - Final Clean Up

#### 1.1 SUBMITTALS:

##### A. Manufacturer's Data:

##### 1. Certification Requirements:

- a. Certify that products furnished for this project are asbestos free.
- b. Certify that products meet or exceed specification requirements.

##### 2. Maintenance:

- a. Instructions for proper maintenance and cleaning.

##### B. Samples:

1. Submit a minimum of 3 samples of each type and color or pattern of resilient flooring and base material. Provide full size tiles, 12" square pieces of sheet vinyl, and 6" minimum lengths for base.

#### 1.2 QUALITY ASSURANCE:

##### A. Installer Qualifications:

1. Minimum 3 years experience installing resilient floor covering material.

##### B. Codes/Standards:

1. Conform to the following fire test data:

- a. Flame Spread: 75 or less per ASTM E84.
  - b. Smoke Density: 450 or less per ASTM E662.
  - c. Critical Radiant Flux: Not less than  $0.45 \text{ watts/cm}^2$  per ASTM E648.
- C. Provide each type of resilient flooring, installation compounds, and accessories produced by a single manufacturer.

### 1.3 MAINTENANCE:

- A. Extra Materials:
1. Furnish materials at the rate of 2% of total square footage installed, but not less than one carton for each color and pattern of flooring.
  2. Furnish materials at the rate of 120 lineal feet (one carton) for each color and type of base installed.
  3. Maintenance materials must be from the same manufactured lot as materials installed.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS:

- A. Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:
1. Vinyl Composition Tile:
    - a. Armstrong World Industries, Inc.
    - b. Azrock Industries, Inc.
    - c. Kentile Floors, Inc.
    - d. Tarkett, Inc.
  2. Wall Base:
    - a. Flexco Company
    - b. Johnsonite
    - c. Burke
    - d. Roppe Corporation

### 2.2 TILE MATERIAL:

- A. 12" x 12" x 1/8" vinyl composition tile, ASTM F1066, Composition 1 (asbestos free).
- B. Refer to finish plan for pattern and finish schedule for specific VCT product and color.

### 2.3 SHEET VINYL:

- A. Comply with FS L-F-475, Type II, Grade A, 0.080 minimum gage.

2.4 BASE:

- A. Resilient base, 1/8" x 4" high, complying with FS SS-W-40A, Type I, roll stock rubber. Provide straight base without cove for carpet and topset style with coved base for all other locations. Provide preformed or molded internal and external corner units. Set base level along top edge  $\pm 1/16"$  in 20 ft.

PART 3 - EXECUTION

Not Used

END OF SECTION 09650



SECTION 09680 - CARPET

PART 1 - GENERAL

1.1 SUMMARY:

- A. Section Includes:
  - 1. Carpet quality assurance
  - 2. Direct glue-down application.
- B. Related Sections:
  - 1. Section 03300-Cast-in-Place Concrete.
  - 2. Section 09650 - Resilient Flooring
  - 3. Section 01710 - Final clean up

1.2 REFERENCES:

- A. American National Standards for Making Buildings and Facilities Accessible to and Usable by Physically Handicapped People ANSI A117.1.
- B. Uniform Federal Accessibility Standards.
- C. The Carpet and Rug Institute "Standard for Installation of Commercial Textile Floorcovering Materials" (CRI 104).

1.3 SUBMITTALS:

- A. Product Data:
  - 1. Include certified laboratory test reports for flammability and static tests.
  - 2. LEED EQc4: Low-Emitting Materials  
Provide documentation from the manufacturer including VOC and chemical component limits for carpets, pads and sealants.
- B. Samples:
  - 1. Submit 18" x 27" samples of each type, color, texture and pattern of carpet required and 6" long samples of carpet edge guard stripping.
- C. Shop Drawings:
  - 1. Submit layout drawings showing seam locations, pattern, nap direction, and location and type of edge treatment.

D. Maintenance:

1. Submit instructions for proper maintenance and cleaning.

1.4 QUALITY ASSURANCE:

A. Qualifications:

1. Installer: Firm with not less than 5 years of carpeting experience on projects of similar size and type to work of this section.
2. Manufacturer: Firm (carpet mill) with not less than 5 years of production experience with carpet manufacturing, and whose published product literature clearly indicates general compliance of products with requirements of this section.

1.5 WARRANTY:

- A. Provide special warranty, signed by Contractor, Installer and Manufacturer (Carpet Mill), agreeing to repair or replace defective materials and workmanship of carpeting work during 2-year warranty period following the date of the Notice of Acceptance. Attach copies of product warranties.
- B. Furnish manufacturer's written warranty agreeing to supply replacement carpet if face weight loss in any area exceeds 10% in 10 years.

1.6 MAINTENANCE MATERIAL:

- A. The Owner will review all carpet scraps and retain chosen pieces for future repairs. Selected remnants, usable scraps and overage shall be packaged and identified. The balance shall be removed from the job site.
- B. In addition to remnants and scraps, provide an additional 2% of each type, color, texture and pattern for future use, in full width roll.

PART 2 - PRODUCTS

2.1 CARPET PERFORMANCE:

A. Flammability:

1. ASTM D2859: Passing me-thenamine pill test.
2. ASTM E648: Minimum critical radiant flux of 0.45 watts per sq. cm.

B. Electrostatic Propensity:

1. Static Generation: 3.0 KV or less, 20% RH at 70 degrees F. per AATCC 134.

- C. Turf Bind:
  - 1. Unitary type backing.
  - 2. Not less than 20 lb. average, ASTM D1335.
- D. Pile Height:
  - 1. Conform to UFAS or ANSI A117.1 for maximum height, whichever is stricter; 3/16" minimum.
- E. Yarn and Construction Method:
  - 1. 30 oz. per sq. yd. minimum face weight using solution dyed material, cut pile or level loop style.
  - 2. Stitches and Gage: Stitches per inch equal to or greater than gage.
- F. Primary and Secondary Backings:
  - 1. Synthetic type.
- G. VOC Limits:
  - 1. LEED EQc4: Low-Emitting Materials  
Carpet and Carpet Padding shall meet or exceed the requirements of the Carpet and Rug Institute's Green Label Indoor air Quality Test Program.

## 2.2 ADHESIVE:

- A. Adhesive shall be water-resistant, mildew-resistant, non-staining, non-gassing (low VOC) type as recommended by the manufacturer for products and subfloor conditions indicated and shall be approved by the Owner. Comply with flammability requirements for installed carpet.
- B. LEED EQc4: Low-Emitting Materials  
All indoor adhesives shall meet or exceed VOC limit requirements of South Coast Air Quality Management District Rule #1168.

## PART 3 - EXECUTION

### 3.1 PREPARATION:

- A. Prior to installation, all minor surface irregularities shall be repaired and the floor shall be thoroughly cleaned with all grit and dirt removed. Start of work constitutes acceptance of floor and responsibility for finished result.

### 3.2 INSTALLATION:

- A. Comply with CRI 104.

- B. Lay carpet on floors with run of the pile in same direction as traffic flow.
- C. Lay carpet on stairs with run of the pile in opposite direction of traffic to avoid peaking of backing on nosings.
- D. Center seams under doors.
- E. Do not seam in traffic direction at doorways.
- F. Final Clean-Up – Vacuum floors thoroughly.

END OF SECTION 09680

## SECTION 09900 - PAINTING

### PART 1 - GENERAL

#### 1.1 SUMMARY:

##### A. Section Includes:

1. Complete painting of all surfaces throughout the interior and exterior of the buildings, except as otherwise specified or indicated in the finish schedule.
2. Field painting of exposed bare and covered pipes, conduits, hangers, exposed steel and iron work, and primed metal surfaces of equipment installed under the mechanical and electrical work. Coordinate with Division 15 and 16 Installers and UCB staff for color coding.
3. Mechanical grilles, registers, louvers (except aluminum), panel covers and frames for electrical work.
4. Paint exterior roof, wall-mounted or ground mounted equipment including aluminum and factory finished items with color approved by UCB.

##### Work Not Included:

1. Shop priming of ferrous metal items and fabricated components included under their respective sections.
2. Pre-finished items.
3. Integrally colored CMU or face brick.
4. Metal toilet partitions.
5. Acoustic materials.
6. Anodized aluminum.
7. Stainless steel.
8. Bronze.
9. Do not paint over any:
  - a. Moving parts of operating units.
  - b. Equipment identification.
  - c. Performance rating data.
  - d. Name or nomenclature plates.
  - e. Code-required labels.

##### C. Related Sections:

1. Section 08210 - Wood Doors: Factory finish on doors.
2. Section 15190 - Mechanical Identification: Identification and stenciled painting of mechanical products specified under Division 15.
3. 15856 packaged rooftop heating/cooling units, 15855 air handling units with coils, and 15575 breechings, chimneys, stacks and flues.
4. Section 16195 - Electrical Identification: Identification of electrical products specified under Division 16.

5. Sections 16370 medium voltage transformers (liquid filled), 16321 medium voltage transformers (dry type), 16345 medium voltage switch gears, 16620 standby power generation systems

## 1.2 SUBMITTALS:

- A. Submit 3 sets of samples with scheduled color product type, color formula and texture to simulate actual conditions on 12" x 12" hardboard for Architect and UCB Project Manager review.
- B. Resubmit samples, if requested, until required sheen, color and texture is achieved.
- C. On actual wood surfaces, provide 4" x 8" samples of each natural and stained wood finish.
- D. On actual wall surfaces and other building components, duplicate painted finishes of acceptable samples, as directed by UCB Staff.
- E. At beginning of project, provide a complete summary list of specific manufacturer's products, color identification numbers, manufacturer technical data sheets and MSDS Sheets that will be applied in this project. List shall compare each color number with each specified or selected color number. A copy of this list shall be given to the appropriate UCB Project Manager, and Structural Analyst in Work Management Group.
- F. LEED EQc4: Low-Emitting Materials  
Provide documentation from the manufacturer identifying the VOC and chemical component limits for all indoor paints and finishes.

## 1.3 QUALITY ASSURANCE:

- A. Conform to Painting and Decorating Contractors of America "Architectural Specification Manual".
- B. All materials shall be applied free from runs, sags, wrinkles, streaks, shiners and brush marks.

All materials shall be applied uniformly. If any reduction of the coating's viscosity is necessary, it shall be done in accordance with the manufacturer's label directions.

New plaster and other masonry surfaces shall not be primed until it has been determined these substrates have dried sufficiently to safely accept paint. Unacceptable moisture content should be reported to the architect or the project manager.

A minimum interior temperature of 65° F shall be maintained during the actual application and drying of the paint, and until occupancy of the building occurs. Adequate ventilation shall be maintained at all time to control excessive humidity which will adversely affect the curing of coatings. The Contractor is solely responsible for maintaining suitable temperature and ventilation.

Before painting begins, all other crafts shall have completed their work, and shall have removed all dirt and debris resulting therefrom. The rooms or areas are to be left in broom clean condition.

Enamel and varnish undercoats are to be sanded smooth prior to the recoating. Tops and bottoms of doors are to be finished in the same manner as door facing, after the carpenters complete fitting of them.

#### 1.4 MAINTENANCE :

##### A. Extra Materials:

1. Leave on premises, where directed by the UCB Project Manager, not less than 1 gallon of each standard color and 1 gallon of each accent color.
2. All material shall be in 1 gallon containers, tightly sealed and clearly marked with manufactures name, color number or formula, base number and sheen.

##### B. Removal

1. Remove all trash, empty cans, solvents and all painting related materials.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURES:

- A. Benjamin Moore & Company
- B. Diamond Vogel
- C. The Glidden Company
- D. KWAL-Howells, Inc.
- E. PPG Industries
- F. Sherwin-Williams Company
- G. ICI
- H. Substitutions must be pre-approved by UCB project manager and UCB paint shop. Any proposed substitution must be available in the Boulder Metro area.

#### 2.2 MATERIALS:

*Materials submitted for approval may be asked to match CU's standard off white color sample for testing. Testing shall include, but is not limited to, accurate color match, hiding capabilities, touch-up capabilities, sheen match and other performance characteristics. Materials submitted for approval by UCB staff of exterior finishes shall be weather resistant with colors approved by UCB staff.*

A. Quality:

1. Provide the **best quality Contractor grade or better** of the various types of coatings as regularly manufactured by acceptable paint material manufacturers.
2. Materials not displaying the manufacturer's identification as a standard, best-grade product will not be acceptable.
3. If project is asking for LEED Certification, materials must comply with the Green Seal Standard, for paints, GS-11, requirements for voc and chemical component limits. [www.greenseal.org/standards/paints.html](http://www.greenseal.org/standards/paints.html)

Type	VOC (g/l = grams/liter)
Interior Non-Flat	150 g/l
Exterior Non-Flat	200 g/l
Interior Flat	50 g/l
Exterior Flat	100 g/l
All Types	Contain not more than 1.0% by wt. of the sum total of Aromatic Compounds.

4. Waterborne or latex acrylic coatings shall be used unless prior approval for substitution is obtained.
5. Material Safety data sheets and technical product data sheets must be included with O&M Manuals for all products used.

2.3 VOLUME SOLID CONTENTS

When applied at a rate of 400SF per gallon-obtaining a MIL thickness when dry of a minimum of 1.3 MILS, the minimum acceptable Volume Solid Content must be A (see list below) minimum and angular specular sheen should be B (see list below).

	A	B
-For Flat finish	38%	0-5 @ 60°
-For Eggshell or Satin finish	36%	16-32 @ 60°
-For Semi-Gloss finish	34%	30-60 @ 60°
-For Gloss finish	34%	60-80 @ 60°

These could apply to both interior and exterior products, with the possible "satin" or "pearl" addition.

PART 3 - EXECUTION

3.1 SCHEDULE:

A. Areas requiring specific paint finish are as follows:

1. Baseboard Radiation Covers:
  - a. Area Inside Metal Covers: Paint flat black or appropriate color to match.

2. Wall and Ceiling Return Air Grilles:
    - a. Space Behind Grilles: Paint flat black for a distance of 24" from face of grille or appropriate color to match.
  3. Non-Galvanized Iron Pipes: Color to match background.
  4. Roof, Wall, or Ground Mounted Equipment: Color approved by UCB Staff.
- B. For all paint finishes:
1. New surfaces shall have 1 primer coat and 2 finish coats.
  2. Existing surfaces shall have minimum 2 finish coats.
  3. If sprayed, all walls except mechanical rooms, storage areas, closets and ceilings, must be backed rolled on final coat.
  4. All walls must be painted with a paint that meets CU's sheen standards for the 16-32 measurement at 60°, and volume solid's ratings.
  5. All trim is to be painted with semi-gloss paint that meets CU's sheen and volume solids ratings.
  6. Patch Painting will not be acceptable, total affected area shall be painted. Terminate painting only at corners or joints.

END OR SECTION 09900



## SECTION 10100 - VISUAL DISPLAY BOARDS

### PART 1- GENERAL

#### 1.1 SUMMARY:

- A. Section Includes:
  - 1. Coated steel markerboards.
  - 2. Tackboards.
- B. Related Sections:
  - 1. Section 09260 - Gypsum Board Systems: Drywall back-up.

#### 1.2 SUBMITTALS:

- A. Manufacturer's Data:
  - 1. Certification Requirements:
    - a. Certify that products furnished for this project are asbestos free.
    - b. Certify that products meet or exceed specification requirements.
  - 2. Maintenance:
    - a. Instructions for proper maintenance and cleaning.
- B. Submit shop drawings under provisions of Section 01300.
- C. Provide sample of each type of visual display board, minimum size 12" x 12" with 12" length of applicable trim and chalkthrough in specified colors and finish.

#### 1.3 QUALITY ASSURANCE:

- A. Furnish all visual display boards by one manufacturer for the entire project.
- B. Fire Hazard Classification: Provide tackboards which have been tested in accordance with ASTM E84 and shown to have flame spread of 25 or less, fuel contributed and smoke developed of 25 or less.

#### 1.4 WARRANTY:

- A. Provide written 25 year warranty, signed by manufacturer, agreeing to replace porcelain enamel visual display boards which delaminate, sag, do not retain original writing and erasing qualities, defined to include surfaces which become slick and shiny, or exhibit

crazing, cracking or flaking; provided manufacturer's instructions for handling, installing, protecting and maintaining boards have been adhered to during the warranty period.

- B. Replacement is limited to material replacement only and does not include labor for removal and reinstallation after the first year.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS:

- A. Claridge Products and Equipment, Inc.
- B. Ghent Manufacturing, Inc.
- C. Greensteel Division of IDT, Inc.
- D. Lemco Corp.
- E. Nelson-Adams, Division of A. Lawer Corp.
- F. APCO

### 2.2 MARKERBOARDS:

- A. Boards shall be minimum 24 gage Porcelain Steel Board on medium density fiberboard core complying with ANSI A208.1, Grade 1-M-1, with aluminum trim. Do not use aluminum trim between sections of markerboards.
- C. Colors: White.
- D. Unit Thickness: 1/2" minimum.

### 2.3 TACKBOARDS:

- A. Surface: 1/4" cork.
- B. Backing: Fiberboard.
- C. Unit Thickness: 1/2" minimum.

## PART 3 - EXECUTION

### 3.1 INSTALLATION:

- A. Surface mount markerboards with chalk rail.

- B. Install markerboards to place chalk tray at 36" above finished floor with top no higher than 7'-0".
- C. Avoid "T" astragal or trims that break-up the writing surface.

END OF SECTION 10100



## SECTION 10500 - LOCKERS

### PART 1 - GENERAL

#### 1.1 SUMMARY:

- A. Section Includes:
  - 1. Metal locker units.
- B. Related Sections
  - 1. See Appendix Z of UCB Standards for lockers in custodial workstations.

#### 1.2 SUBMITTALS:

- A. Submit shop drawings and product data under provisions of Section 01300.
- B. Submit listing for combination locks and their respective locker numbers. Coordinate with shop drawing submittal.
- C. Submit two 3" x 6" samples of each color selected on actual base material.

#### 1.3 QUALITY ASSURANCE:

- A. Installer Qualifications:
  - 1. Installer shall be a firm regularly engaged in the installation of metal lockers and shall have a minimum of two years successful experience.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS:

- A. Standard KD Wardrobe Lockers:
  - 1. List Industries, Inc.
  - 2. Lyon Metal Products, Inc.
  - 3. Penco Products, Inc.
  - 4. Republic Storage Systems Company, Inc.

#### 2.2 LOCKING:

- A. Built-in, key controlled lock with non ferrous keys.

PART 3 - EXECUTION

Not Used

END OF SECTION 10500

## SECTION 10520 - FIRE PROTECTION SPECIALTIES

### PART 1 - GENERAL

#### 1.1 SUMMARY:

- A. Section Includes:
  - 1. Fire extinguishers.
  - 2. Fire extinguisher cabinets.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS:

- A. J.L. Industries/Samson Products.
- B. Larsen's Manufacturing Company.
- C. Modern Metal Products by Muckle.
- D. Potter-Roemer Division of Smith Industries, Inc.

#### 2.2 FIRE EXTINGUISHERS:

- A. MRI Safe Fire Extinguishers: 10 lbs., multi-purpose dry chemical, with pressure indicating gauge.
- B. Class: 4A:60B:C; UL approved.
- C. Color: Red.

#### 2.3 FIRE EXTINGUISHER CABINETS:

- A. Mounting Type: "Semi-Recessed" whenever possible.
- B. Style: As selected by the Architect and approved by the Owner - rounded corners preferred.
- C. Door Type: Clear acrylic glazing.
- D. Door Hardware: Pull handle with roller catch; continuous, stainless steel hinge.
- E. Finish: Manufacturer's standard white epoxy or baked enamel coating.

PART 3 - EXECUTION

3.1 INSTALLATION:

- A. Install in locations and at mounting height required by applicable codes.
- B. Unless otherwise required, mount top of fire extinguisher at 5'-0" above finished floor.

END OF SECTION 10520

## SECTION 11452 - RESIDENTIAL APPLIANCES

### PART 1 - GENERAL

#### 1.1 SUMMARY:

- A. Section Includes:
  - 1. Quality standards for residential appliances.
  - 2. Manufacturers For:
    - a. Refrigerators.
- B. Related Sections:
  - 1. Section 12304 - Plastic Laminate Faced Casework.

#### 1.2 REFERENCES:

- A. American National Standards for Making Buildings and Facilities Accessible to and Usable by Physically Handicapped People ANSI A117.1.
- B. Uniform Federal Accessibility Standards (UFAS).

#### 1.3 SUBMITTALS:

- A. Product Data:
  - 1. Submit manufacturer's product information and installation instructions for each appliance item.
  - 2. Include data on power characteristics, rough-in dimensions and sizes.
  - 3. Provide maintenance manuals, operating instructions, spare parts lists, precautions against hazards, manufacturer's warranties and similar information.
  - 4. Mark each data sheet with the applicable project equipment number.

#### 1.4 QUALITY ASSURANCE:

- A. Certification Labels:
  - 1. Provide residential appliances which comply with standards and bear certification labels as follows:
    - a. UL Standards: Provide residential electrical equipment with UL labels.
    - b. Energy Ratings: Provide energy guide labels with energy cost analysis (annual) and efficiency information as required by FTC.

- B. Uniformity:
  - 1. Provide products of same manufacturer for each type of residential appliance required.
  - 2. To greatest extent possible, provide residential appliances by single manufacturer for entire project.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS:

- A. Frigidaire Co.
- B. General Electric Co.
- C. Hotpoint.
- D. Kenmore.
- E. Whirlpool Corp.

## PART 3 - EXECUTION

### 3.1 FIELD QUALITY CONTROL:

- A. Operation Instructions and Parts Lists:
  - 1. Collect, package, and identify by product and room number.
  - 2. Deliver to Owner.
- B. Manufacturer's Warranty:
  - 1. Fill in applicable data on warranty for proper validation.
  - 2. Deliver to Owner.

END OF SECTION 11452

## SECTION 12304 - PLASTIC LAMINATE FACED CASEWORK

### PART 1 - GENERAL

#### 1.1 SUMMARY:

A. Section Includes:

1. Plastic laminate faced casework.
2. Countertops, backsplashes, filler panels and scribe.
3. Hardware and accessory items.

B. Related Sections:

1. Section 06200 - Finish Carpentry.
2. Division 15 - Mechanical: Service fittings, fixtures and connections.
3. Division 16 - Electrical: Electrical fixtures and connections.

#### 1.2 REFERENCES:

- A. AWI (Architectural Woodwork Institute) Quality Standards.
- B. NEMA (National Electrical Manufacturer's Association) LD3-High Pressure Decorative Laminates.

#### 1.3 SUBMITTALS:

- A. Submit shop drawings, product data, and samples under provisions of Section 01300.

#### 1.4 QUALITY ASSURANCE:

- A. Manufacturer: Company specializing in manufacture of institutional and commercial plastic laminate casework with minimum of five years experience.
- B. Installer Qualifications: Installer with 5 years experience who has successfully completed installations of plastic laminate faced casework similar in material, design, and extent to that indicated for this project.
- C. Mock-Up:
  1. Provide half-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.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS:

- A. LSI Corporation of America, Inc.
- B. Sidney Millwork Company.
- C. TMI Systems Design Corporation.
- D. Approved substitution.

### 2.2 MATERIALS:

- A. Vertical Surface High Pressure Plastic Laminate:
  - 1. High pressure plastic laminate for exterior cabinet surfaces shall meet NEMA GP-28 standard for vertical grade.
- B. High Pressure Plastic Laminate Balancing Sheet:
  - 1. Heavy gage high pressure plastic laminate backing sheet shall be textured surface and meet NEMA CL-20 or BK-20 standards.
- C. Countertop High Pressure Plastic Laminate:
  - 1. High pressure plastic laminate, satin or textured finish, minimum .050" thickness, meeting NEMA GP-50 standard.
  - 2. Heavy gauge, neutral colored backing sheet for balanced construction meeting NEMA BK-20 standard.
- D. Polyester Laminated Particleboard:
  - 1. Thermosetting polyester resin impregnated decorative overlay or low pressure melamine liner bonded to 45 lbs. density particleboard.
  - 2. Particleboard shall be of balanced construction with moisture content not to exceed 8 percent.
  - 3. Polyester laminate shall be 9 to 11 mils in thickness, 62 percent resin content and colorfast.

### 2.3 HARDWARE:

- A. Provide manufacturer's standard, complying with ANSI A156.9, epoxy finish hardware units, unless otherwise indicated.
- B. Hinges: Institutional type, 5 knuckle. Provide two hinges for each door up to 4 ft. high and three hinges for each door over 4 ft. high.

- C. Pulls: Recessed ABS plastic for drawers and swing doors, mounted from back. Provide 2 pulls for drawers over 24" wide.
- D. Magnetic Catch: BHMA B03162 or B43162, double type. Provide 2 catches on doors over 4 ft. high.
- E. Drawer Guides:
  - 1. Accuride No. 2037-A, 50 pound capacity, Blum 230E, 100 pound capacity, or approved substitute bottom mount type of correct size for drawer depth.
  - 2. Accuride No. 4032, 150 pound capacity, Blum 430E, 100 pound capacity, or approved substitute full extension type for file drawers, lateral file drawers, knee space drawers, and where indicated.
  - 3. Provide 1 pair for each drawer.
  - 4. Include life time warranty.
- F. Adjustable Shelf Supports:
  - 1. Knappe and Vogt No. 255 with No. 256 supports.
  - 2. 4 per shelf. Provide predrilled holes in cabinet sides spaced at 1.25" o.c. and not more than 1.5" from shelf edges, 2 pin, self-locking shelf clip.
- G. Index Followers: Steel rod and plate. Provide for all file drawers.
- H. Drawer and Cupboard Locks: Half-mortise type, disc tumbler and cam bolt, round cylinder only exposed, plated finish, with strike.
  - 1. Provide National Lock "RemovaCore" or approved substitute with a minimum of 50 lock changes.
- I. Coat Rods: 1.25" diameter chrome plated or stainless steel tubing.
- J. Label Holders: Provide where indicated, size to receive standard label cards approximately 1" x 2" nominal size, finished to match other exposed hardware.

## 2.4 FABRICATION:

- A. Sub-Base:
  - 1. Integral base or continuous base of 3/4" unfinished fir plywood.
  - 2. Resilient base shall be furnished and applied by others.
- B. Cabinet Top and Bottom - Wall and Base:
  - 1. Base Cabinet Bottoms: Particleboard, 3/4" thick with phenolic neutral colored backer sheet on concealed side.
  - 2. Wall cabinet bottoms and tops are 0.75" thick.
  - 3. Continuous 3/4" subtop for all lower base cabinets shall be phenolic overlay neutral color.

C. Edging:

1. Exposed edges of door and drawer fronts and countertops shall be covered with 3mm P.V.C., hot melt glue applied.
2. Exposed edges of cabinet box, front edge of shelves and top of drawer boxes shall be covered with 1mm P.V.C., hot melt glue applied.

D. Cabinet Ends:

1. Polyester or low pressure melamine laminated particleboard interior side, 3/4" thick with phenolic neutral colored backer sheet on concealed side.
2. Exposed Ends: GP-28 with CL-20 high pressure laminate on interior for balanced construction.

E. Fixed and Adjustable Shelves:

1. Polyester or low pressure melamine laminated particleboard two sides.
2. Thickness: 3/4" thick for shelving up to 30" wide. 1" thick for shelving 30" wide and over.

F. Cabinet Backs:

1. Standard Cabinet Back: 1/4" thick putty colored prefinished hardboard for use on all cabinets with or without doors.
2. Rear, unexposed, side of back shall be mechanically fastened or to receive continuous hot melt glue at joint between back and sides/top/bottom for sealing against moisture and vermin.

G. Doors and Drawer Fronts:

1. Plastic Laminated Doors and Drawer Fronts: 13/16" thick for all hinged doors.
2. Core Material: 3/4" thick, 45 lb. density particleboard bonded on exterior with high pressure laminate and with putty colored heavy gauge balancing sheet on interior face.

H. Drawers:

1. Drawer fronts shall be applied to drawer sub-front. High pressure plastic laminate exterior side with heavy gage backing sheet on face. Total thickness of 13/16".
2. Sides and back of drawers to be 1/2" thick putty colored polyester or low pressure melamine laminated particleboard.
3. Drawer sides to be dadoed or dowelled to receive front and back, glued and pinned together.
4. Drawer bottom shall be prefinished putty color 1/4" thick hardboard, housed and glued, into front, sides and back, or 1/2" thick particleboard mechanically fastened to front.

- I. Countertops:
  - 1. High pressure plastic laminate bonded to particleboard core.
  - 2. Interior side to be properly balanced with heavy gauge neutral colored backing sheet.
  - 3. Edge Banding: 3mm PVC hot melt glue applied.

## 2.5 WORKMANSHIP:

- A. Exterior Exposed Vertical Surfaces:
  - 1. Finished with high pressure plastic laminate as indicated. Laminate plastic to particleboard core with balancing sheet using a rigid type adhesive.
  - 2. Fabricate using cold press method. Use properly tempered material under controlled humidity and temperature conditions prior to gluing.
- B. Cabinet Parts:
  - 1. Accurately machine with interlocking dados and rabbets or dowels.
  - 2. Glue and screw or dowel all joints.
- C. End panels shall be dadoed and rabbeted or doweled to receive bottom and top. Back shall be housed into cabinet sides, top and bottom or mechanically fastened to ensure rigidity and a fully closed cabinet.
- D. Drawer bottom shall be fully housed into sides, back and subfront or mechanically fastened. Sides of drawers to be fully dadoed or doweled to receive drawer back, locked in fully to sides, fastened with glue and mechanical fasteners or doweled.
- E. Hanging rails shall be applied to back side of all wall, base and tall cabinets for extra rigidity and to facilitate installation.
- F. All cases shall be square, plumb and true.
- G. Provide removable back panels and closure panels for plumbing access.

## PART 3 - EXECUTION

### 3.1 TOLERANCES:

- A. Install the work plumb and level with no distortions to a tolerance of 1/8" in 8 feet from plumb and level (including countertops) and with 1/32" maximum offsets in revealed adjoining surfaces.
- B. Shim as required.

3.2 ADJUSTING:

- A. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Doors and drawers with distortions or which do not fit openings properly after alignment are not acceptable.

END OF SECTION 12304

## SCHEMATIC DESIGN NARRATIVE

### I. MECHANICAL

#### A. GENERAL

The proposed mechanical systems for the University of Colorado MRI addition at the CINC building will attempt to balance occupant usage requirements with other factors such as first costs and operating costs with respect to energy and maintenance. Within this narrative, the mechanical system characteristics for the building will be addressed. System design characteristics will include:

Design Criteria and Mechanical Utility Services Loading  
Heating System  
Cooling System  
Air Systems  
Temperature Controls  
Plumbing Systems  
Fire Protection Systems  
Mechanical Space Requirements

The mechanical design will comply with the 2006 International Building, Mechanical, Plumbing Codes, UCB Standards, and NFPA Standards. It has been brought to our attention that the state is recognizing the 2009 I-Codes, at this time we are basing this narrative around the 2006 versions of the aforementioned codes. However, during the design phase, we will look to the owner to clarify which codes this building shall adhere to.

#### B. DESIGN CRITERIA

Outdoor Design Conditions: Consistent with ASHRAE Design Standards and UCB Standards the heating design temperature of -10°F, and cooling design temperature of 98°F dry bulb temperature, and 62°F mean coincident wet bulb temperature will be used in sizing mechanical system components.

**Indoor Design Conditions: Indoor temperature used for sizing mechanical equipment will be 75°F cooling temperature and 72°F heating temperature.**

Room noise criteria RC(N) for the occupancies listed will be used as the Basis of Design in accordance with ASHRAE recommendations for mechanical systems unless specifically requested by the Program Plan.

Ventilation Standard: Per 2004 ASHRAE 62 Guidelines

Anticipated Mechanical Utility Loads: Based on the preliminary building plans, construction characteristics and usage, we have approximated the loads:

1. Heating Load:

The heating load for this project will consist primarily of preheating the required ventilation air. Upon emergency exhaust purge of the MRI room, the AHU may go to 100% outside air intake, and 100% exhaust – this sequence of operation could happen at heating design outside air temperature, therefore the preheat coil at the air handler has been sized to accommodate this scenario. Terminal boxes will also have hot water reheat coils for zone temperature control.

2. Cooling Load:

The total building cooling load is a combination of cooling provided by the new air handling unit serving the MRI exam room, and the control room, plus the computer room air conditioning unit (CRAC) used to condition the MRI equipment room. The total peak cooling load for this project is approximately 12 tons of cooling.

3. Central Building Utilities:

Based on conversations with UCB, it is understood that building heating, and chilled water are available year-round, and capacity is available for this project to tie into those utilities. No head end equipment modifications are anticipated as a part of this project.

4. MRI Utilities:

This project will require an outdoor air cooled water chiller to be installed adjacent to our project area on the exterior of the building. The chiller will be provided by the MRI equipment manufacturer, but installed by the contractor. MRI chilled water lines will be provide by the contractor in accordance with the installation instructions provided by Siemens. MRI chilled water lines will be routed from the location of the exterior chiller into the MRI equipment room.

### C. HEATING, VENTILATING, AND AIR CONDITIONING DESIGN CRITERIA AND SYSTEM

1. Heating and Cooling System

Outside Air: Conditioned outside air must be provided to each space to meet the ventilation requirements outlined in ASHRAE 62.1. Ventilation air will be delivered via the new air handler being provided as a part of this project. Humidification will be provided via a point of use steam generator and in duct distribution unit downstream of the air handler in the medium pressure ductwork. The new AHU will have the following components:

- Return/Exhaust Fan
- Prefilters (Merv 8)
- Minimum Outside Air Damper
- Supply Fan
- Preheat Coil
- Cooling Coil
- Direct Evaporative Section (8" thick media)
- Final Filters (Merv 13)

Terminal Variable Air Volume Units: Each zone; the MRI exam room, and the MRI control room will be provided with dedicated variable air volume units with terminal reheat. The

thermostat will modulate the terminal box volume damper, and hot water valve to maintain temperature setpoint. 2' x 2' air terminals will be provided as necessary. Air terminals within the MRI exam room will be aluminum and be provided with waveguides as necessary. All return grilles installed as a part of this project will be ducted to the AHU.

Point of Need / Auxiliary Cooling Terminal Units: A computer room air conditioning unit (CRAC) will be provided to accommodate the cooling requirements for the MRI equipment room. The CRAC will be a packaged unit containing; a fan, filters, chilled water cooling coil, a humidifier, reheat, and packaged controls.

Air Distribution: Medium pressure supply air duct mains will be distributed from the new air handling unit to the terminal boxes. Downstream of the terminal boxes, low pressure ductwork will be utilized for distribution and air device runouts. The CRAC unit will distribute air via low pressure ductwork, and return through a return air plenum. The ductwork will be spiral round, or rectangular construction where exposed to view or concealed within architecturally provided soffits. Low-pressure ductwork will be rectangular (unlined) where concealed and round (unlined) where exposed. Duct liner will be utilized in areas where sound attenuation is required by the program plan. All ductwork will be fabricated in accordance with SMACNA standards. Flexible ductwork will be limited to diffuser run outs, with a maximum 5 ft. length.

Exhaust Air: No general building exhaust is anticipated for the scope of this project. The exhaust requirements set forth by the purge function of the MRI equipment will be handled by switching the new air handling unit to 100% outside air/100% exhaust upon alarm.

Quench vent for the MRI equipment shall be installed in accordance to the MRI equipment manufacturer's site specific drawings.

#### **D. TEMPERATURE CONTROLS**

The heating, ventilating, and air conditioning (HVAC) system controls will include all direct digital controls (DDC). Specific sequences of controls will not be defined until the Construction Document phase, but the following general control sequences will be incorporated to provide temperature control and reduced energy usage:

- High humidity lockout of direct evaporative section on the AHU to avoid over-humidification of space.
- Emergency MRI purge. Upon alarm in MRI exam room, AHU shall switch to 100% outside air, 100% exhaust to purge the MRI exam room of harmful gas. Visual and audible alarms shall be enabled upon execution of this sequence.
- AHU supply temperature reset to minimize reheat at terminal boxes.
- All Major mechanical equipment will be controlled through a DDC controller.
- Zone thermostats are to be 24 Volt or line voltage per manufacturer's installation instructions.
- Damper and valve actuation will be electric.

## **E. PLUMBING**

### Domestic Water Service:

Modifications of the domestic water service will not be required for this project. Domestic water requirements for HVAC equipment will require modifications of the existing water lines in the area of work.

### Domestic Hot Water:

We do not anticipate domestic hot water requirements for this project.

### Plumbing Fixtures

No plumbing fixtures are being added/alterd as a part of this project.

### Sanitary Sewer Load:

Minimal drainage will be added to the sanitary sewer load in the form of condensate drain, and evaporative cooling drain down from the mechanical equipment. These drains will be routed to the nearest existing floor drain and air gapped to drain.

### Storm Drainage System:

Existing storm drainage system will not be altered as the scope of this project does not modify the exterior of the building.

### Specialty Gas Systems:

O2 and CO2 piping systems will be provide from a point outside of the exam room to non-ferrous medical gas outlets to be installed inside the MRI exam room. Users will provide code acceptable gas containers at the time of experiments to hook up to the system.

## **F. FIRE PROTECTION**

A wet fire suppression system is currently provided throughout the building conforming to NFPA and local code requirements. The system shall be modified to accommodate the new floor plan. High temperature head shall be provided in the MRI exam room.

## **G. MECHANICAL SPACE REQUIREMENTS**

The AHU and CRAC units will require space above the ceiling for installation, and then additional clear space for maintenance access. The AHU will require coordination of supply, return, relief, and outside air ducts. All coordination of the plenum space will have to take into account the existing unit located above the project space serving the adjacent NMR.

Terminal boxes will require ceiling space over the corridors adjacent to the zone being served. These units will also require access to the coils, and controls.

## II. ELECTRICAL

### A. SERVICE ENTRANCE

The existing electrical service consists of a 2000kVA pad mounted utility transformer serving a 4000-amp, 480/277V, 3-phase, 4-wire main distribution center (MDC). The existing pad mounted utility transformer also serves the super computer addition to the existing CINC building, currently under construction. An existing 100-kW photovoltaic system is located on the roof with the inverter located on the North side of the building. The MDC is located in the existing main electric room.

### B. ELECTRICAL DISTRIBUTION

The MDC serves an existing 800-amp, 480/277V, 3-phase, 4-wire distribution panelboard (HDP1) located in the main electric room.

A new surface mounted, 200-amp, 480/277V, 3-phase, 4-wire branch circuit panelboard, located in the main electric room, is anticipated to be fed from HDP1 with new 200-amp, 3-pole circuit breaker installed in the existing space. The new branch circuit panelboard is anticipated to serve the new mechanical equipment, MRI chiller, and MRI Control Room lighting loads.

A new enclosed, shunt-trip circuit breaker equipped with isolated ground and non-isolated ground busses is anticipated to be located in the MRI equipment room to serve the MRI equipment. The circuit breaker will be fed from HDP1 with a new 175-amp, 3-pole circuit breaker installed in the existing space. An isolated ground conductor is anticipated to be routed from the circuit breaker isolated ground bus to the main ground bus located in MDC.

HDP1 serves an existing 120/208V, 3-phase, 4-wire distribution panel (LDP1) through a 225kVA transformer.

A new flush mounted, 150-amp, 120/208V, 3-phase, 4wire branch circuit panelboard, located in the new MRI Control Room, is anticipated to be fed from LDP1 with a new 100-amp, 3-pole circuit breaker installed in the existing space. The new branch circuit panelboard is anticipated to serve receptacles located in the MRI Control Room, MRI Room, MRI Support Rooms and MRI Room lighting.

Refer to attached Electrical One-Line Diagram for additional information.

### C. LIGHTING AND CONTROLS

MRI Control Room: New 2'x4' fluorescent luminaires, equipped with electronic dimming ballasts and 4100-K, T-8 lamps, are anticipated for the MRI Control Room. Lighting control is anticipated to consist of two 3-way dimmer switches located at the entrance to the control room and at the MRI technician's workstation. The dimmer switches will control the front and back half of the control room separately.

MRI Room: New 12"x12" recessed incandescent downlights are anticipated. Lighting control is anticipated to consist of three dimmer switches located within the MRI Control Room. Two dimmer switches will control the front and back of the MRI Room separately. A third dimmer

switch will control a group of four downlights located directly over the MRI table. The MRI Room lighting will be fed from the DC side of MRI distribution equipment. As an optional solution, LED downlights will be evaluated as a possible alternative to incandescent lighting within the MRI Room.

Family Viewing and Computer Room: Existing recessed fluorescent luminaires and local controls are anticipated to remain in these areas.

Screening Rooms, Changing Rooms and TMS Room: Existing recessed fluorescent luminaires are anticipated to be relocated in this area as necessary to accommodate the architectural modifications. New ceiling mounted, line voltage occupancy sensors are anticipated to provide automatic control of the luminaires in these spaces.

Existing, relocated fluorescent luminaires are anticipated to be provided with new, 4100-K, T-8 lamps.

Refer to attached First Floor Lighting Plans for additional information.

Refer to MRI manufacturer's site specific drawings for additional electrical requirements.

#### **D. GENERAL POWER**

MRI Control Room: Surface mounted, dual-channel raceway with receptacles at 2-ft on center is anticipated to be installed above the MRI control room workstations. Technology devices are anticipated to be provided in the surface mounted raceway system.

MRI Room and Support Rooms: Convenience receptacles are anticipated to be installed within the MRI Room and two MRI Support Rooms.

RF filters shall be provided where electrical circuits penetrate the shielded perimeter of the MRI Room. Electrical back boxes located within the MRI Room shall be constructed of a non-ferrous material. Refer to MRI equipment manufacturer's drawings for additional information.

Family Viewing and Computer Room: Existing receptacles will remain in these areas. Additional receptacles are anticipated based on the User's requirements.

Screening Rooms, Changing Rooms and TMS Room: Existing receptacles are anticipated to be removed as necessary to accommodate the architectural modifications. New receptacles are anticipated to be installed on new walls and connected to existing receptacle branch circuits.

#### **E. FIRE ALARM SYSTEM**

New fire alarm devices are anticipated to be connected to the existing Simplex-Grinnell #4020 fire alarm system.

Photoelectric type smoke detectors are anticipated in the MRI Control Room and MRI Equipment Room. Duct smoke detectors are anticipated to be at the return air duct leaving the MRI Room and on the return air side of the new air handling unit. The duct smoke detector located at the return air duct leaving the MRI Room will initiate a general building alarm upon activation.

Whereas, the duct smoke detector located on the return air side of the air handling unit will initiate fan shutdown procedures.

Fire alarm notification appliances are anticipated to be located in the MRI Control Room and surrounding corridor as required by current NFPA Code requirements. Additionally, notification appliances are anticipated to be provided in the new Changing Rooms, Screening Rooms and TMS Room.

Fire alarm initiating and notification appliances will not be located within the MRI Room per the MRI equipment manufacturer's recommendations.

### III. TELECOMMUNICATIONS AND LOW VOLTAGE SYSTEMS

#### A. TELECOMMUNICATIONS

Each standard communications outlet configuration location shall have two Category 5E jacks within a single faceplate. Each wireless access point location shall have one Category 5E telecommunications outlet. Surface mounted outlets shall be provided for wireless access points. Cable slack shall be provided at each to accommodate adjustments in the locations during coverage testing.

Plenum rated CAT5E cable shall be provided from each jack to the existing Telecommunication Room on the same level. Cable runs shall be limited to 90 meters in length. All cabling shall be routed above the ceiling through J-hooks on hangers and wire mesh cable tray as the cable support system throughout the facility. Each device outlet box shall be a four square box with a single gang mud ring and 1" conduit stubbed to above accessible ceiling, convenient to the cable path. The conduit shall be fitted with an appropriate plastic bushing. The J-hooks shall be provided with a color coding for separation of system cables and spaced no more than 5 feet apart. Conduit sleeves shall be provided through rated walls for all system wiring not specified being in conduit. Conduit segments between endpoints/pull boxes shall not exceed 100-feet, nor contain more than a total of 180 degrees of bends. All fire-rated wall penetrations must be properly made and sealed using approved methods and materials.

Terminations shall be provided at jack locations and patch panels in the existing Telecommunications Rooms mounted in standard 7 foot equipment racks. All voice and data copper cable shall be tested, and test results shall comply with the ANSI/EIA/TIA specifications. Test results shall be provided to the Owner. Labeling shall follow ANSI/TIA/EIA 606 recommendations and be consistent with the existing campus labeling scheme. Patch cords for both the workstation and network switch shall be provided for 50% outlet density.

Telecommunications infrastructure shall be designed in accordance with the latest ANSI/EIA/TIA standards, CU telecommunications standards, and the National Fire Protection Association (NFPA) – all applicable standards.

#### B. SECURITY SYSTEMS

Access Control shall be provided at the Control Room door. The card reader shall be connected to the existing access control system. Pathways shall be provided from the device location to the existing access control termination panel.

#### C. AUDIO/VISUAL SYSTEMS

A ceiling mounted projector shall be provided in the Shared Office with a connection point provided under the screen location. A high resolution projector shall be provided to project images into the magnet. This projector shall connect to an 8x8 A/V matrix switch. Input devices for connection to the matrix switch shall be provided by the Owner. All cabling required for the A/V devices shall be provided by the contractor. Pathways shall be provided for these systems from the device location to the system headend location.

**D. TELEVISION DISTRIBUTION**

A television outlet shall be provided in the Family Viewing room. The coax cable shall route to the distribution location for the building. A raceway system shall be provided to support the coax cabling.

