

CONDITIONS, SPECIFICATIONS AND RELATED DOCUMENTS FOR  
UNIT F - PHARMACY AND NURSING FACILITY

UNIVERSITY OF MINNESOTA - MINNEAPOLIS CAMPUS  
HEALTH SCIENCES EXPANSION  
PROJECT NOS: MINN. BHRD-HP-5C-063  
BHRD-NU-5C-077

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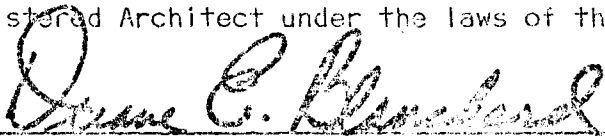
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As to Architecture:  
I hereby certify that these plans, specifications or reports were  
prepared by me or under my direct supervision, and that I am a duly  
Registered Architect under the laws of the State of Minnesota.



Date: August 15, 1973

Reg. No. 8397

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## PART 1: GENERAL

1.1 SCOPE

A. Conditions of Contract and Division 1 - General Requirements, apply to all work of this section. Refer to Article 12 of the Instructions to Bidders, Article 7 of the General Conditions and Section 01600 - Materials and Equipment, for requirements on pre-bid and post-bid evaluation of proposed substitute products, methods and other conditions.

B. Work under this section includes all earthwork required by the Construction Documents within the defined construction limits as well as outside the construction limits as may be required to accomplish all phases of work under the General Construction Contract. The following broadly outlines the intent of work under this section; do not construe as describing all phases, operations, details, methods or requirements. Perform, provide and accomplish all similar and related items to complete the work, except work included under the previous Unit F Early Contract Excavation (PN-ECF) contract and Unit F Early Contract Foundation (P/N-ECF)

1. Removal and disposal of existing and temporary paving, walls, utilities and miscellaneous structures.
2. Removal and disposal of excavated materials which are excess or not suitable for fill, backfill or topsoil.
3. Earth excavations required for construction and site development including excavations for footings.
4. Backfilling and compacting against footings and walls.
5. Placing and compacting of fills, backfills and cushions.
6. Grading of site within the construction limits.
7. Grading of temporary drives for construction operations.
8. Protection of buildings, structures, streets, paving, curbs, manholes, walks, utilities and underground services and other new or existing items to remain from damage.
9. Provide to site all materials of kinds required to accomplish work shown and specified, unless available at the site.
10. Removal and disposal of abandoned, or to be abandoned, underground services uncovered in the course of excavation, except do not remove services to be abandoned until they have been capped and are no longer used.
11. Mechanical and Electrical Contractors are generally responsible for excavations and trenching necessary solely for their own work, such as pipe trenches, including backfilling and compaction. The General Contractor shall examine their work as it progresses, particularly backfilling in and about the building, to determine the quality of materials, methods and compaction are consistent with the requirements of general construction.

C. Work excluded from this Section:

1. Work to be accomplished under previous Unit F Early Contract Excavation (F-ECX) contract, including lowering, maintenance and removal of the existing excavation support walls.

D. Related work specified elsewhere.

1. Demolition and Removal Work: 01700.
2. Protection, Excavation Support Walls: Section 02400.
3. Cast-in-Place Concrete: Section 03300.

1.2 CONDITIONS AT THE SITE

A. Refer to General Conditions and Section 01010 - Summary of Work and Special Requirements for information on the previous Unit F Early Contract Excavation (P/N-ECX) contract and Unit F Early Contract Foundation (P/N-ECF). Bidders shall completely familiarize themselves with the site and the drawing sheets showing the conditions as they are expected to exist at the completion of the P/N-ECX and P/N-ECF contracts and the finished site conditions at the completion of the work under the General Contract. No extra compensation will be allowed for unforeseen conditions that can be determined from a careful examination of the site, drawings and specifications.

1.3 TESTING

A. The Owner will retain the services of qualified engineers employed by an independent testing laboratory to analyze the soils and perform tests, report findings and determine whether the required soil values are obtained.

B. The Contractor shall extend full cooperation to these engineers in obtaining samples for field and laboratory use.

1.4 INSPECTIONS AND APPROVAL

A. The methods of excavation for footings, shall be subject to the approval of the Owner and Architect.

B. The final conditions at the bottoms of the excavations will be inspected by the Owner and testing laboratory. Tests shall be made where necessary and probing of drill holes performed where specified. Approval of conditions found must be obtained from the Owner before concrete is placed.

PART 2: MATERIALS

2.1 EARTHWORK MATERIALS

A. Granular fill and backfill. Reasonably well graded pit run granular materials, sand or sand-gravel, clean course and sharp in character, free of debris, cobbles and boulders, free of clay and silt, free of organic material or other material which will prevent compaction and support for heavy loading (3000 psf) without displacement or flowing. Use material classified under ASTM D2487-69 and D2488-69 as SW, SP, GW, GP or GM-SM. Suitable material from site may be used after analysis and classification by soil laboratory. Use for:

1. General fill and backfill within buildings, including "bulk" fill.

2. Backfill at foundations interior and exterior.
3. Backfill at underground ducts, trenches and similar excavations.
4. Fill and sand cushion under exterior concrete walks.
5. Fill under bituminous, or concrete drive areas.
6. Compacted fill under footings and foundations.

B. Gravel Cushion: Use as a free draining cushion under basement floor. Gravel cushion to be in accordance with the 1978 Minnesota Standard Specifications for Highway Construction, Section 3601.2B, Type I Filter Aggregate.

C. Site Fill: For general fill at site, use best classes of materials available at the site, using coarse grained soils as far as possible and avoiding use of silty and other poor soils. Use fill material free from debris and organic matter. Use for general site fill at unsurfaced areas.

D. Topsoil: The University will provide all topsoil.

E. Laboratory tests on types of materials to be used for topsoil, general fill and backfill and granular cushion will be provided by the Soils Engineer, retained by the Owner in accordance with Article 1.3 and 3.4. Two tests to be provided for each type of soil. Contractor shall consult with the Soils Engineer, who shall make a recommendation of optimum moisture content, method of providing this moisture and methods of compaction for each type of fill. Contractor shall moisten or dry out fill and provide and accomplish compaction as recommended by laboratory. Copies of tests shall be provided to Architect, University and Contractor.

## 2.2 THICKNESS OF MATERIAL

A. Sand or sand-gravel cushions under exterior concrete drives and walks: 8".

B. Gravel cushion under basement floor: 8".

C. Topsoil at all areas cut, filled or disturbed except at building, roads parking areas and walks: 6" minimum thickness at grass areas and to thickness as noted on the drawings at planting beds.

## PART 3: EXECUTION

### 3.1 DEMOLITION AND SITE CLEARANCE

A. Demolish existing foundations, paving, drives, curbs, and utilities as necessary to excavate and grade on the site. Remove all debris and legally dispose away from the site. Where debris is mixed with soil, both the soil and the debris shall be removed. Remove all trees, shrubs, plantings, root systems and stumps not scheduled to remain. Protect existing adjacent buildings, trees, shrubs, and areas, features, and property. Replace any sidewalks, curb, gutter and other structures broken as result of operations under this Contract which are to remain within the construction limits. Provide utilities indicated to remain in service.



### 3.2 EXCAVATION

A. Plan Grades: All new grades shown on the grading plans (Sheets A2-1, A2-2, and A2-3) are "Finish" grades. Grades at points between spot elevations or contours are to be determined by interpolation between given grades or elevations. (See Article 3.3.E, Grading).

#### B. Soil Excavation:

1. Perform no excavation adjacent to existing features until proper precautions or protection have been provided or will be provided as excavations progress. Immediately replace any damage and restore services.

2. Within areas of building, parking, drives, walks and concrete or bituminous paved areas, excavate and remove all black soils, soil with organic content, fill materials or soft soil materials as may be found which are unsuitable for loads. No footings or similar loads are to bear on fill or soil with inadequate bearing capacity.

3. Excavate to lines, levels, dimensions shown and required with allowances for slabs, cushions and other features. Hand excavate lower levels (at least 10") of footing and trench excavations and work adjacent to existing utilities, pipes and buildings.

4. Keep footing trenches level and free of loose dirt, debris or water. Provide excavations for footings and walls wide enough to accommodate forms as all concrete shall be formed.

5. Remove all frost from ground such that no building feature is placed on frozen ground.

6. Fill any excavations made below required level with mass concrete, 2000 psi minimum.

C. Excavated Material: Excavated material, if suitable as determined by Soil Testing Laboratory, shall be retained on the site for use as described under Article 2.1. All unsuitable material and other excess earthwork materials shall become the property of the Contractor and shall be disposed by him off the limits of the University at no further cost to the Owner. Conduct operations such that excavation material and material used for fill shall not be subject to erosion and he shall be responsible for any damage to adjacent properties, because of erosion, or diversion of surface water drainage.

#### D. Water:

1. Refer to General Conditions and Section 01010 for site management responsibilities, including dewatering. The General (Prime) Contractor shall have the responsibility for maintaining the existing excavations and new general construction excavations dewatered, unless a specific agreement is reached between the General Contractor and/or the Subcontractor for this Section.

2. All footing excavations must be kept free of surface water by grading the surface adjacent to the excavation to divert water.

3. Provide pumping of ground water or other water to keep excavations free of water, including time of placing and curing concrete and compaction or other work subject to water damage.

### 3.3 BACKFILLING

#### A. Backfilling Methods:

1. All excavated areas of the site shall be thoroughly cleaned of all debris before backfill operations are begun.
2. All backfill material shall be in accordance with Article 2.1.
3. Backfill shall be placed in uniform, successive layers approximately 6" in compacted thickness. Each layer shall be level, smooth and thoroughly compacted by appropriate means over the entire surface before placing successive layers.
4. Embankments shall not be constructed during periods when the soil will freeze while being placed and compacted, nor shall any embankment material be placed on soil that is frozen. Frozen soil shall not be placed in embankments. All embankments more than 2 feet in thickness shall be compacted by mechanical means.
5. The Contractor shall provide the necessary vibratory or rolling equipment to obtain the required compaction.
6. Compaction by grading equipment shall not be considered adequate for uniform compaction.
7. Small vibratory or hand tamping compactors shall be required wherever fill or backfill is placed adjacent to walls or around footings and columns.
8. Where fill or backfill materials are placed on both sides of walls, they shall be placed in layers alternately on opposite sides of the walls to maintain levels that will avoid displacement of, or damage to, the walls.
9. Where fill or backfill materials are placed on one side of a wall the wall shall be adequately shored and braced or the material shall not be placed until the supporting floor slab has been poured and set.
10. Any trenches dug in the compacted fill or backfill materials shall be backfilled firmly in uniform layers not exceeding eight inches in loose depth with each layer being compacted with a small vibratory or hand tamping compactor to the density specified in Article 3.4.
11. Fills and backfills shall be formed and maintained to provide proper drainage.
12. The finished subgrade surfaces shall be reasonably smooth, compacted and free from irregular surface changes.
13. Where excavation to proper subgrade exposes unstable soil, remove the unstable materials and replace with satisfactory materials as directed by the Supervising Engineer.

B. Drainage: As necessary during the progress of work, provide adequate temporary drainage facilities that will prevent erosion damage or unnecessary delay of the work, and shall restore original drainage as soon as the work will permit. Provide and maintain drainage away from any building or work area during the construction period.

C. Removal of Water: Dispose of any water entering the excavation and at all times maintain the excavation in a clean and dry condition. Provide sufficient storm water drainage, construct temporary sumps as required and pump to permanent drainage structures on or off the site. Water shall not be conducted onto adjacent property.

D. Inspection:

1. The Architect and University will inspect all excavations, fills and backfills prior to the placement of footings. Footings and slabs on grade shall not be placed until inspections of excavation or tests of fills and backfills are completed.

2. Laboratory tests (sieve analysis, density tests, etc.) of the fill and backfill materials and the methods or compaction must be accepted by the University before starting work.

E. Grading:

1. All grades shown on the grading plans (Sheet A2-1, A2-2 and A2-3), are finish grades. All grading shall be worked such that smooth contours will result and that the subgrade shall be reasonably smooth and free from lumps, boulders, branches, etc. Hand level around all obstructions.

2. Grade the site at areas which are to be paved (concrete) making allowances for aggregate base course, gravel cushions and thickness of pavement.

3.4 FIELD AND LABORATORY TESTS

A. Laboratory and field testing of soils prior to and during excavation, filling backfilling and compaction operations shall be done in accordance with the following:

1. The Owner shall retain an independent testing laboratory which shall provide inspection of excavations, soils evaluation tests and soil density tests.

2. Tests of compacted fills and/or backfills shall be made every second layer and at intervals of not over 50'-0" center to center in both directions of the areas of fills and/or backfills to assure compliance with these specifications.

3. The independent testing laboratory shall submit to the Owner, in triplicate, plus a copy to the Architect and Contractor, complete written reports of all inspections and tests performed as soon as practical after they are made.

4. No fill or backfill materials shall be placed until the necessary tests have been made and approval obtained by the Architect and Owner.

5. Field Density Tests of the compacted fills and/or backfills shall be performed in accordance with ASTM D1556.

6. All material to be used for granular fill, backfill and gravel cushion shall be tested by Mechanical analysis (AASHTO) to determine conformance with specifications.

7. Compaction of the following shall meet or exceed the following percentages of Proctor Density (ASTM D698):

- 102% for: Compacted fill under footings and foundations.
- 96% for: All fill and backfill within building; backfill against building foundations and other backfill and cushions under all concrete slabs (interior or exterior); all backfill within 25 feet of building.
- 92% for: General site fill which is more than 25 feet from building and not under slabs or paved areas.

8. In addition to the above, all compacted soils below footings and foundations shall be verified in writing by the soil testing laboratory as having a minimum design bearing capacity value of 4000 pounds per sq. ft. to meet footing and foundation design requirements.

B. If tests indicate that the materials specified have not been furnished, placed and compacted in compliance with these specifications, the materials shall be removed, replaced, recompactd and retested and the entire cost of this additional work, including the costs of the retests, shall be paid for by the Contractor.

### 3.5 PROSECUTION AND CLEAN-UP

A. Be aware of and comply with work priorities outlined in these specifications and other adjustments in work schedule, as may be required to properly coordinate the construction work with other Contractors or the Owner's requirements.

B. Leave the site in an orderly condition free of all debris. All areas outside the Contract limits which have been disturbed shall be restored to their original condition.

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## PART 1: GENERAL

1.1 SCOPE

A. Conditions of Contract and Division 1 - General Requirements, apply to all work of this section. Refer to Article 12 of the Instructions to Bidders, Article 7 of the General Conditions and Section 01600 - Materials and Equipment, for requirements on pre-bid and post-bid evaluation of proposed substitute products, methods and other conditions.

B. Work under this section includes all permanent and temporary concrete caissons and underpinning, excavation support walls, tieback anchorages, shoring, bracing and other protection structures required by the Contract Documents as necessary for the safe and proper execution of this work. The below listing of work is furnished for the Contractor's convenience. Do not construe this list to be a complete description of work or operations required:

1. Shoring
2. Bracing
3. Barricades
4. Installation, maintenance and removal of temporary works.

C. Related work specified elsewhere:

1. Earthwork: Section 02200.
2. Concrete Reinforcement: Section 03200.
3. Cast-in-Place Concrete: Section 03300.

D. Furnished under other Contracts:

1. The Unit F Early Contract Excavation (P/N-ECS) contract includes the following provisions relating to the work required under this contract.

a. The maintenance of the excavation support walls provided under the P/N-ECX contract remains the responsibility of the P/N-ECS contractor.

E. Bidders are expected to examine the site and may review the P/N-ECS drawings and specifications in the Architect's office.

PART 2: PRODUCTS - Not used.

## PART 3: EXECUTION

3.1 PROTECTION - GENERAL

A. Provide the necessary bracing, shoring, sheet piling, retaining walls, slopes and/or other protection as required to maintain grades outside the area of excavations, for any existing adjacent construction, service lines, utilities, streets, drives, walks, etc., which may be subject to damage during the earthwork and construction operations and for the safety of personnel.

B. Remove all temporary protections before backfilling is completed, unless noted or specified otherwise, but not until permanent supports are in place.

- C. All protective methods and temporary earth retaining structures provided shall be based on sound, proven engineering principles and which will not disturb the soil supported existing structures and utilities, will prevent soils from settling or flowing out from under the structures and utilities and will not disturb soils on which new construction will bear.
- D. Wherever side slopes in soils are required, but not indicated on the drawings, they shall be cut on stable angles, but in no case shall they be steeper than a ratio of 1½ horizontal to 1 vertical.
- E. Protect bottoms of excavations from frost and do not place foundation walls, footings, or slabs on frozen ground.
- F. Any damage to existing items that are to remain shall be repaired, or the damaged items shall be replaced, by the Contractor without cost to the Owner.
- G. All barricades and work protections shall conform to the requirements of the rules of the National Board of Fire Underwriters, Laws of the State of Minnesota, OSHA, and applicable ordinances and codes.
- H. All work shall comply with the recommendations of the Manual of Accident Prevention in Construction, published by the Associated General Contractors of America and the Construction Standards and Interpretations of the US Department of Labor Occupational Safety and Health Administration (OSHA), current edition.
- I. Protect existing buildings from stain damage resulting from the protective materials and operations of installation, including oil from driving hammer apparatus if used.
- J. Control the grading around the new building area so the ground is pitched to prevent water from running into excavated areas or damaging existing structures.
- K. Furnish all pumping required to keep excavated areas clear of water during construction.

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## PART 1: GENERAL

1.1 SCOPE

- A. Conditions of Contract and Division 1-General Requirements, apply to all work of this section. Refer to Article 12 of the Instructions to Bidders, Article 7 of the General Conditions and Section 01600 - Materials and Equipment for requirements on pre-bid and post-bid evaluation of proposed substitute products, methods and other conditions.
- B. Work under this section includes all formwork for cast-in-place concrete, except flat structural steel floor plates and metal decking.
- C. Related work specified elsewhere:
1. Concrete Reinforcements: Section 03200.
  2. Cast-in-Place Concrete: Section 03300.
  3. Structural Precast Concrete: Section 03420.
  4. Architectural Precast Concrete: Section 03450.
  5. Metal Decking: Section 05302.
  6. Structural Steel: Section 05122.

1.2 REFERENCE STANDARDS

- A. American Concrete Institute, (ACI), ACI 347-68, "Recommended Practice for Concrete Formwork."
- B. ACI 301-72, "Specifications for Structural Concrete for Buildings."
- C. ACI 318-77, "Building Code Requirements for Reinforced Concrete".

1.3 SUBMITTALS

- A. Samples: Submit samples of form ties and spreaders for acceptance.
- B. Submit shop drawings for the permanent metal forms in accordance with Section 03100.

## PART 2: PRODUCTS

2.1 MATERIALS FOR REMOVABLE FORMS

- A. Construct forms of wood, metal or other material to the following requirements.
- B. For exposed concrete, use BB Plyform Class I or II Exterior, HD Overlay Plyform Class I or II Exterior, Exterior Plyron with smooth tempered hardboard faces or 1/4" thick Tempered Presdwood Masonite form liners, free of torn grain, worn edges, hole patches or other defects.

C. Metal forms may be used, upon approval of the Owner and Architect, and shall produce surfaces equal to those of wood forms specified.

D. Sound boards, plank or metal forms may be used where concrete is not exposed.

E. Suitable moldings or chamfer strips shall be placed in the corners of column, beam and wall forms where the concrete will be exposed to view. Refer to architectural drawings.

F. Positive means of adjustment (wedges or jacks) of shores and struts shall be provided.

G. Form Oil: Non-staining paraffin-based which will not prohibit adherence of finishes and meeting Federal Specification P-0-361.

H. Form accessories to be partially or wholly embeded in the concrete, such as ties and hangers, shall be a commercially manufactured type. Nonfabricated wire is not acceptable. The portion remaining within the concrete shall leave no metal within one inch of the surface when the concrete is exposed to view. Spreader cones on ties shall not exceed one inch diameter. Ties for walls below grade shall be snap ties or have cones and shall incorporate a water-seal washer.

I. Plastic pipe weep holes: Fabricate to proper length and cut angles from Schedule 40 PVC pipe as manufactured by Cabot Corporation or approved equal. Remove burrs and sand cut ends smooth but maintain flush square edge at outside of pipe. Set firmly in form to hold pipe end flush with concrete and avoid displacement in concreting.

J. PVC Waterstop:

1. Split type (vertical joint): Sonneborn - Contech Vinyl stop 4316S or equivalent of Williams Products Co., or W.R. Meadows, Inc., or approved equal.
2. Bulb type (horizontal joint): Sonneborn - Contech Vinyl stop 6380 or equivalent of Williams Products Co. or W.R. Meadows, Inc., or approved equal.

K. PVC Reglet: Superior Concrete Accessories, Inc., Cushion-Lock Reglet Type B-4, or approved equal.

### PART 3: EXECUTION

#### 3.1 REMOVABLE FORMWORK

A. Construction: Construct forms to shapes, lines and dimensions called for on drawings, true to line, plumb and level, with joints mortar tight. Provide proper bracing and supports of sufficient strength to carry, without appreciable deflection and with absolute safety, the dead load of concrete as a liquid together with live loads of men, equipment and materials.



1. Provide sufficient forms so that work can be carried out without delay. Build forms of material of sufficient strength to hold concrete without bulging or sagging between supports. For concrete to be exposed to the weather, the edges shall be glued or otherwise sealed to prevent loss of any of the matrix. Edges of form panels in contact with concrete shall be flush within 1/16" and forms for plane surfaces shall be such that the concrete will be plane within 1/16" in four (4) feet.

2. Construct forms for beams and other horizontal concrete with proper camber resulting in level construction when the concrete has been placed in the forms.

3. Construct forms for exposed concrete with particular care to avoid appreciable deflection and to eliminate bulges, offsets or other unsightly features in the finished surfaces.

4. Design forms so they may be removed in the proper sequence and without damage to the concrete.

5. Provide side forms for beams and slabs which are removable without disturbing the bottom forms or the shoring beneath them.

6. Provide satisfactory foundations for formwork supported on the ground to carry the loads imposed during and after construction, without appreciable settlement.

7. Adjust shores and struts to take up all settlement during concrete placing operations.

8. Forms for walls and columns shall have removable panels where required for cleaning, inspection and application of bonding paste.

9. Design and construct formwork to insure that concrete surfaces will conform to the following tolerances.

a. Variation from the plumb:

- 1. In the lines and surfaces of columns, piers and walls:
  - In any 10 feet of length - - - - - 1/4 in.
  - In any story or 20 feet maximum - - - - - 3/8 in.
  - Maximum for entire length - - - - - 1 in.
- 2. For exposed corners, control-joint grooves and other conspicuous lines:
  - In any bay or 20 foot length - - - - - 1/4 in.
  - Maximum for entire length - - - - - 1/2 in.

b. Variation from the level or from the grades indicated on the drawings:

- 1. In slab soffits, ceilings, beam soffits:
  - In any 10 feet - - - - - 1/4 in.
  - In any bay or 20 foot length - - - - - 3/8 in.
  - Maximum for entire length - - - - - 3/4 in.
- 2. In exposed lintels, sills, parapets, and other conspicuous lines:
  - In any bay or 20 foot length - - - - - 1/4 in.
  - Maximum for entire length - - - - - 1/2 in.

- c. Variation of the linear building lines from established position in plan and related position of columns, walls & partitions.  
 In any bay or 20 foot length - - - - - 1/2 in.  
 Maximum for entire length - - - - - 1 in.
- d. Variation in the size and locations of sleeves, floor openings and wall openings - - - - - + or - 1/4 in.
- e. Variation in cross-section dimensions of columns and beams and in the thickness of slabs and walls:  
 Minus - - - - - 1/4 in.  
 Plus - - - - - 1/2 in.
- f. Footings:
  - 1. Variations in dimension in plan  
 Minus - - - - - 1/2 in.  
 Plus - - - - - 2 in.
  - 2. Misplacement or eccentricity  
 2% of the footing width in the direction of misplacement but not more than - - - - - 2 in.
  - 3. Reduction in thickness  
 Minus - - - - - 5% of specified thickness
- g. Variation in steps
  - 1. In a flight of stairs  
 Rise - - - - - + or -1/8 in.  
 Tread - - - - - + or -1/4 in.
  - 2. In consecutive steps  
 Rise - - - - - + or -1/16 in.  
 Tread - - - - - + or -1/8 in.

B. Soil Supported Forms: If soil supporting forms is not suitable to carry loads imposed without compressing, provide trussed supports.

C. Openings: Form all openings, chases, recesses, etc. shown on the drawings.

D. Cleaning and Oiling: Sweep, clean and oil coat forms before reinforcing is placed.

E. Re-use: Before form material is re-used, all surfaces that are in contact with the concrete shall be thoroughly cleaned, all damaged places repaired, and all projecting nails withdrawn. Re-use of form material shall be subject to specific approval of the Architect and Supervising Engineer.

F. Joints: Provide expansion and contraction joints where shown on the drawings. Provide construction joints as detailed and where required. Construct joints in accordance with ACI 301-72.

G. Wetting Forms: In hot weather, wet down forms with hose immediately before placing concrete.

H. Built-In Items: Cooperate with all trades for the installation of reinforcement, inserts, anchors, sleeves, and other built-in items.

1. Edge Forms and Screeds: Set edge forms and screed accurately to produce the designed elevations, slopes in the finished surfaces. Provide required slope to drains.

### 3.2 REMOVAL OF FORMS

A. Forms shall be removed in accordance with requirements of the ACI Building Code Requirements for Reinforced Concrete, No. 318-71, Chapter 6, and the ACI publication "Recommended Practice for Concrete Formwork," No. 347-68, except as modified below, without damage to concrete and in a manner to insure complete safety of the structure. Leave shoring in place until concrete member will safely support its own weight plus any live loads that may be placed upon it.

B. All shores under slabs having 16'-0" or less clear span shall remain for a minimum of 7 days providing the 7 day test cylinder shows at least 3/4 of the 28 day compressive strength requirement. Add 1/2 day shoring time per foot for each foot over 16'-0" span to maximum of 14 days. Refer to Section 03300, Article 3.10.

C. In all weather, all concrete slabs having 16'-0" or less clear span shall have had 3 days of 70°F and 4 days of 50°F before shore removal. Spans over 16'-0" shall have had 3 days of 70°F and 50°F for the remaining days providing that the 7 day test cylinder shows at least 3/4 of the 28 day compressive strength requirement. In cold weather (below 40°F) an extra 7 day test cylinder shall be job cured under the same conditions as the concrete. Refer to Section 03300, Article 3.10.

D. Shoring under beams shall remain a minimum of 28 days and the concrete must have achieved full 28 day strength prior to stripping. Forms shall be built so that column forms can be removed first, then the sides of beams where they occur, than the slab forms. Shoring for beams must be placed on the column center lines and the beam bottoms and their shoring shall be so constructed that they can be left in place after the rest of the forms have been removed.

E. Removal of Shores and Reshoring: After form removal at slabs, "back-post" within four hours after original shores are removed. Backposting shall remain in place a minimum of 28 days and longer when required to carry added loads on the slab from forms supporting newly cast concrete and other loads from the construction of floor or floors above.

F. Upon removal of forms, the Architect shall be notified by the Contractor in order that an inspection of the newly stripped surfaces may be made prior to patching.

G. Freshly stripped surfaces shall not be pointed up or touched in any manner before having been inspected by the Owner and Architect.

H. At cast-in-place concrete window sills, remove forms at sloping surface as soon as concrete has started to set up. Fill and trowel surface as required to eliminate any and all pockets and voids. Cure as specified.

I. Until completed installation of windows and precast panels, protect concrete window sills and exposed concrete edges from damage.

### 3.3 INSPECTIONS OF CONCRETE SURFACES

A. The Owner and Architect will inspect the completed concrete work after the forms have been removed. Work that does not conform to the shapes, lines and dimensions shown on the drawings, within the tolerances specified under Article 3.1.A.9 as determined by the Owner and Architect, shall be repaired and/or removed and replaced by the Contractor at his own expense.

## PART 1: GENERAL

1.1 SCOPE

- A. Conditions of Contract and Division 1 - General Requirements, apply to all work of this section. Refer to Article 12 of the Instructions to Bidders, Article 7 of the General Conditions and Section 01600 - Materials and Equipment for requirements on pre-bid and post-bid evaluation of proposed substitute products, methods and other conditions.
- B. Work under this section includes furnishing and installing all concrete reinforcement for cast-in-place concrete including all accessories required. Cast-in-place concrete to be reinforced includes all footings, caissons, columns, piers, walls, slabs, beams, curbs, underpinnings, and all other locations shown or noted on the drawings. Welded wire fabric reinforcement in slabs placed over flat steel floor plates and metal decking and wrappings for structural steel beams, girders and columns are included under this section.
- C. Related work specified elsewhere:
1. Concrete Formwork: Section 03100.
  2. Cast-in-Place Concrete: Section 03300.
  3. Structural Precast Concrete: Section 03410.
  4. Architectural Precast Concrete: Section 03450.
  5. Masonry Reinforcement: Section 04200.
- D. Furnished but not installed under this section:
1. Reinforcing for concrete filled lintels and bond beams: installed under Section 04200.

1.2 REFERENCE STANDARDS

- A. The following specifications and standards are incorporated by reference:
1. American Concrete Institute, Manual of Standard Practice for Detailing Reinforced Concrete, ACI 315-65.
  2. American Concrete Institute, Building Code Requirements for Reinforced Concrete, ACI 318-77.
  3. American Concrete Institute, Specifications for Structural Concrete for Buildings, ACI 301-72.
  4. Concrete Reinforcing Steel Institute, Placing Reinforcing Bars, 2d Edition, 1975.
  5. Concrete Reinforcing Steel Institute, Manual of Standard Practice, 1973.

1.3 SUBMITTALS

- A. Shop Drawings: Submit fabrication and placing drawings in accordance with Section 01300.

B. Samples: Submit samples of supports and accessories for acceptance.

PART 2: PRODUCTS

2.1 MATERIALS

A. Welded wire fabric: ASTM A185.

B. All reinforcing bars: ASTM A615, Grade 60, except dowels, Grade 40.

C. Supports and Accessories: Conform to ACI 315-65. Where concrete surface is exposed to view or weather, use plastic supports, include all spaces, chairs ties, slab bolsters, clips, chair bars and other devices for properly assembling, placing, spacing, supporting and fastening the reinforcement. Metal supports shall be of such a type as not to penetrate the surface of the formwork and show through the surface of the concrete. Individual and continuous slab bolsters and chairs shall be of a type to complement the various conditions encountered and must be capable of supporting a 300-pound load without crushing.

2.2 DETAILING

A. Detail concrete reinforcement in accordance with ACI 315-65 and ACI 318-77.

2.3 FABRICATION

A. Shop fabricate to size, dimension and shape shown on approved shop drawings and within tolerances specified in ACI 301-72. After fabrication, sort, bundle, and metal tab reinforcement before delivery to the job site.

B. Concrete slabs on grade shall be reinforced as follows, unless noted or detailed otherwise on the drawings:

Slabs 4" or less in thickness	- - - - -	6 x 6	-	10/10	welded wire fabric
Slabs 5" thick	- - - - -	6 x 6	-	8/8	welded wire fabric
Slabs 6" thick	- - - - -	6 x 6	-	6/6	welded wire fabric

C. Cast-in-place concrete walls shall be reinforced in accordance with Chapter 14 of the American Concrete Institute Building Code (ACI 318-71), unless noted or detailed otherwise on the drawings.

PART 3: EXECUTION

3.1 PLACEMENT

A. Place concrete reinforcement in accordance with the approved placing drawings, CRSI recommendations and CRSI Manual of Standard Practice and in accordance with tolerances specified in ACI 301-72.

B. Place only reinforcement that is free of mill scale, excessive rust, or other coating that would prohibit proper bond with the concrete.

C. Support reinforcement and guard against displacement during concreting.

3.2 FIELD QUALITY CONTROL

- A. Notify the Owner when all reinforcement is in place for each pour at least 24 hours in advance of placing concrete. Allow no placing of concrete until the Owner has inspected concrete reinforcement in place in forms.
- B. Corrections shall be made by the Contractor at his expense.
- C. Exposed reinforcing steel in finished work, indicating the bars are not properly located, will be sufficient cause for the rejection, removal and replacement of the concrete section.

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## PART 1: GENERAL

1.1 SCOPE

- A. Conditions of Contract and Division 1 - General Requirements, apply to all work of this section. Refer to Article 12 of the Instructions to Bidders, Article 7 of the General Conditions and Section 01600 - Materials and Equipment for requirements on pre-bid and post-bid evaluation of proposed substitute products, methods and other conditions.
- B. Work under this section includes all cast-in-place concrete work. Provide reinforced concrete pipesumps and ducts as indicated on drawings.
- C. Related work specified elsewhere:
1. Concrete Formwork: Section 03100.
  2. Concrete Reinforcement: Section 03200.
  3. Structural Precast Concrete: Section 03410.
  4. Architectural Precast Concrete: Section 03450.
  5. Structural Steel Erection: Section 05122.
  6. Metal Decking Erection: Section 05302.
- D. Furnished by Owner:
1. Retain and pay for testing agency for field quality control only. (Contractor shall retain and pay for testing agency for materials testing and mix design.)
- E. Furnish but not installed under this section:
1. Concrete bond beam and lintel fill: Installed under Section 04200.
- F. Installed but not furnished under this Section:
1. Certain imbedded items: See other sections.

1.2 REFERENCE STANDARDS

- A. The following specifications and codes are incorporated by reference:
1. American Concrete Institute Publications:
    - a. ACI 301-72, "Specifications for Structural Concrete for Buildings".
    - b. ACI 318-77, "Building Code Requirements for Reinforced Concrete".
    - c. ACI SP-15, Field Reference Manual.
    - d. ACI 613, "Recommended Practice for Selecting Proportions for Concrete".
    - e. ACI 613A, "Recommended Practice for Selecting Proportions for Structural Lightweight Concrete".
  2. National Ready Mixed Concrete Association Publications: "Concrete Plant Standards and Truck Mixer and Agitator Standards".
  3. Portland Cement Association Publications:
    - a. "Design and Control of Concrete Mixtures", 11th edition
    - b. "Construction Joints" (AC 19.3)
    - c. "Curing Concrete" (ST 95)
    - d. "Specification for Vibrating Concrete" (ST 26)



B. The Contractor shall at all times keep available on the site for reference the above codes and standards.

### 1.3 QUALIFICATIONS

A. Mix design: Mix designs and aggregates testing shall be performed by an independent testing agency approved by the Owner and paid by the Contractor.

B. Testing Agency: Testing agency for field quality control will be selected and paid by the Owner.

### 1.4 SUBMITTALS

A. Mix Design: Submit reports in triplicate of all concrete mix designs and aggregate reports to the Architect for approval at least 14 days prior to pouring concrete.

### 1.5 SAMPLE PANELS

A. Within a reasonable time after execution of the Contract Agreement, the Architect will furnish to the Contractor a description of cements and aggregates to be used in sample exposed aggregate concrete panels. Such panels to establish color of concrete and the character of the exposed aggregate finish intended for the job.

B. Within a reasonable time after receipt of the description, and before any exposed aggregate concrete work is begun, the Contractor shall construct for the Architect's approval, a sample panel approximately 2'-0" x 2'-0" x 3" thick, for the prescribed materials in proportions similar to those anticipated in the design mix and using finishing methods proposed for the exposed aggregate work required. The panel will be reviewed by the Architect and instructions for adjustments in colors of cement and aggregates and finish will be made. If required, the Contractor shall then construct and submit new panels in accordance with these instructions.

C. The sample panel shall be of workmanship, forming, placing, and finishing as specified for equivalent concrete work in the finished building. The approved panel shall establish final standards of workmanship, color, and finish for all subsequent exposed aggregate concrete work, and shall remain at the job until all exposed aggregate concrete work is completed.

D. Remove rejected panels from the site when directed by the Architect. Upon completion of concrete work, remove approved panel. Legally dispose of all items after removal from site.

## PART 2: PRODUCTS

### 2.1 CONCRETE MATERIALS

#### A. Portland Cement:

1. Cement shall be American-made Portland Cement, free from water soluble salts or alkalis which will cause efflorescence on exposed surfaces. Portland Cement should be an approved brand conforming to ASTM C150-Type 1. Cement for

all exposed aggregate concrete, shown on the Architectural Drawings, shall be: light burn of Penn-Dixie; Universal Atlas Cement, Northwestern or Lehigh and shall be of same manufacture and burn as that used in Section 03410.

NOTE: Only one brand of cement shall be used throughout the work. The Contractor shall be responsible for whatever steps are necessary to insure that no visual variations in color will result in exposed concrete, and shall place on order a sufficient quantity of this cement to complete the concrete work.

B. Regular Weight Concrete Aggregates:

1. Fine Aggregate: Washed inert, natural sand conforming to the requirements of ASTM C33.

a. Fine aggregate for exposed, unpainted concrete shall be specially selected for light color as approved by the Architect, and shall come from a single source. Stockpile adequate amounts of fine aggregate during warm months to assure continuous supply when source pit is frozen.

2. Coarse Aggregate: Well graded crushed stone or washed gravel conforming to the requirements of ASTM C33 as follows:

a. <u>Location</u>	<u>Maximum Size</u>
Footings, caissons, and underpinning. . . . .	.1-1/2"
Topping mix . . . . .	.3/8"
All other concrete. . . . .	.3/4"

b. Coarse aggregate for exposed unpainted concrete shall be specially selected for light color as approved by the Architect and shall come from a single source. Stockpile sufficient quantities during summer months to assure continuous supply when source pit is frozen.

c. Coarse Aggregate shall be subjected to sodium sulfate soundness test according to ASTM C88 and shall have an average loss of no more than 12% after 5 cycles of alternate immersion and drying.

C. Lightweight Concrete Aggregates:

1. Aggregates: Well-graded expanded shale, clay or slate conforming to ASTM C330. The nominal maximum coarse aggregate size shall be 3/8".

D. Exposed Aggregates:

1. Aggregates for exposed aggregate concrete shall be the same as selected for architectural precast concrete panels to include color and gradation. Coordinate with Section 03410.

2. Refer to Section 03410 for base specification.

3. Where exposed aggregate concrete is indicated, substitute this aggregate for the coarse aggregate in the concrete mix.

E. Water: Clean, free of deleterious amounts of acids, alkalies or organic materials.

#### F. Admixtures:

1. Water Reducing Agent: ASTM C494, W.R. Grace WRDA, Master Builders Pozzolith 100N, Plastocrete 161, or approved equal.
2. Air Entraining Agent: ASTM C260, W.R. Grace Darex AEA, Master Builders MB-VR, Sika AER or approved equal.
3. Admixtures (e.g., calcium chloride) causing accelerated setting of cement in concrete shall not be used without written approval of the Architect.
4. Admixtures retarding setting of cement in concrete shall be used if ordered by the Architect, especially in hot weather for high wall lifts.
5. Admixtures shall be premixed in solution form and dispensed as recommended by the manufacturer. The water in the solution shall be included in the computation of water-cement ratio.
6. Admixtures containing chloride salts shall not be used in concrete placed over metal decking or flat structural steel floor plates.
7. Grout: Pre-mixed, nonshrinking grout, Master Builders Embecco Grout, U.S. Grout Company Five Star Grout, Sonneborn Ferrolith G "D.S.", or approved equal.
8. Latex Concrete: Brock-White Latex Liquid, Sonneborn Contech Sonocrete or approved equal. Mix with sand, gravel and Portland Cement as recommended by manufacturer for specific thickness application. Use for bonding, for patching concealed concrete, for thin section toppings, feathered edges and where "latex concrete" or "epoxy cement grout" is indicated on the drawings.

#### G. Surface Treatments:

1. Curing Compounds and Floor Sealer: Brock-White Crete-Seal, A.C. Horn Clear Seal 150, Sonneborn Kure-N-Seal, Master Builders Company's Masterseal or Protex Triple Seal.
2. Non-slip Aggregate: Sonneborn Frictex NS, Grace Durafax, Norton Alundum or approved equal, graded to pass a 1/8" mesh and be retained on a 1/32" mesh.
3. Bonding agent: W.R. Grace Hornbond, Larson Weldcrete, Sonneborn Sonobond, or approved equal.
4. Surface Retarder: W.R. Grace Ruffup L, Sida Rugasol C/S, Brock White Product 3366, or approved equal.

#### 2.2 CONCRETE RELATED MATERIALS

- A. Vapor barrier: 6 mil polyethylene, black, vapor permeance rating not exceeding 0.5 perm as determined by ASTM E96, Procedure E, fungi resistant.
- B. Polyethylene tape: Brock-White 3322, Seamless Rubber Company 670, or Dow Polyethylene Tape, black.
- C. Expansion joint fillers: Performed, non-extruding type.

1. Non-bituminous type, ASTM D1752 where used with a sealant.
2. Bituminous type, ASTM D1751, where sealant is not required.

D. Slab Joint Key: Pre-formed asphalt hard board, Brock-White Tongue and Groove Joint, or approved equal, 1/4" thick.

E. Waterstops: New stock extruded polyvinyl chloride, 4" wide with center bulb; Electrovert, Meadows, Durajoint Type 2 or equivalent, B.H. Goodrich, W.R. Grace, or approved equal. Continuity in water stops shall be accomplished by making a fused butt splice using a heating element specifically designed for that purpose.

F. Cast-in weep holes, drain tubes, etc.: Polyvinyl chloride pipe or tubing of size shown on drawings; cut and fit neatly to job conditions.

G. Reinforced Concrete Pipe: ASTM C76 (Class IV) complete with rubber gaskets and cast-in ladder rungs for the sumps and ASTM C76 (Class II) complete with rubber gaskets for the underground duct from Mayo Hospital to the garage.

### 2.3 CONCRETE MIXING

A. Mix Design: Employ and pay for the services of an independent testing laboratory, acceptable to Owner, to test the proposed aggregate and design mixes for each type and strength of concrete required. Design mixes shall be proven by preliminary tests prior to concreting in accordance with ASTM C192. Such tests shall show 28 day average strengths at least 25% greater than strengths specified.

2. The Contractor shall make available to the Testing Agency all materials and mixtures for the concrete mix designs as well as sufficient samples of fine and coarse aggregates for qualitative acceptance tests. All samples shall be available at least five (5) weeks before the Contractor proposes to use them in the work. Duplicate small samples shall be plainly and neatly labeled with the source, where proposed to be used, date and name of the collector, and presented to the Architect for permanent reference. The materials acceptance tests, trial mix data, and recommended job mixtures shall be presented to the Architect for approval as soon as possible and at least five (5) working days prior to the proposed beginning of concreting. Materials shall not be delivered to the site or used until the samples shall have been approved, and as used they shall in all respects be equal to the approved samples.

3. Sample and test each type of aggregate in accordance with applicable ASTM procedures.

4. Design regular concrete mixes in accordance with ACI 301, except as modified herein.

5. Design Lightweight concrete mixes in accordance with the foregoing and ACI 613A.

B. Types, Strengths and Locations.

1. All concrete and topping used for this construction shall be regular weight concrete and topping except for concrete placed over metal decking, flat structural

steel floor plates and for construction of the sloped lightweight concrete fills where lightweight concrete shall be used.

2. All regular weight concrete and topping used for this construction shall have a minimum compressive strength of 4000 pounds per square inch at 28 days of age.

3. Exterior exposed concrete used for curbs, curb and gutters, walks, slabs, and stairs shall contain not less than 4-1/2% nor more than 7-1/2% entrained air.

4. All lightweight concrete used for this construction shall have a minimum compressive strength of 3000 pounds per square inch at 28 days of age and shall contain not less than 4% nor more than 7% entrained air.

5. The air dry unit weight of the lightweight concrete shall not exceed 110 pounds per cubic foot at 28 days of age.

C. Minimum Cement Content:

1. The laboratory designed concrete mixes shall have minimum cement contents for each type and strength of concrete as follows:

4,000 lbs. per sq. inch (regular weight) - without water reducing admixture

6.25 sacks per cubic yard for the 3/4" maximum size aggregate.

6.00 sacks per cubic yard for the 1-1/2" maximum size aggregate.

4,000 lbs. per sq. inch (regular weight) - with water reducing admixture

5.75 sacks per cubic yard for the 3/4" maximum size aggregate.

5.50 sacks per cubic yard for the 1-1/2" maximum size aggregate.

4,000 lbs. per sq. inch (regular weight) - with air-entraining admixture

6.25 sacks per cubic yard for the 3/4" maximum size aggregate.

4,000 lbs. per sq. inch (regular weight) - with air-entraining & water-reducing admixtures

5.75 sacks per cubic yard for the 3/4" maximum size aggregate.

4,000 lbs. per sq. inch topping mix - without admixtures

6.75 sacks per cubic yard for the 3/8" maximum size aggregate.

4,000 lbs. per sq. inch topping mix - with water-reducing admixture

6.50 sacks per cubic yard for the 3/8" maximum size aggregate.

3,000 lbs. per sq. inch (light weight) - with air-entraining admixture

6.50 sacks per cubic yard for the 3/8" maximum size aggregate.

D. Slump and Workability:

1. Slump:

1. For regular weight concrete the slump shall be not less than 1" nor more than 4".

b. For the topping concrete the slump shall be not less than 1" nor more than 2".

c. For light weight concrete the slump shall be not less than 3" nor more than 4".

d. The amount of slump shall be determined by the standard test method ASTM C143.

## 2. Workability.

a. Workability shall be such that when adequately vibrated with high cycle internal vibrators the concrete will consolidate completely without segregation.

## E. Mixing and Delivery of Concrete:

1. All concrete shall be ready mixed concrete provided by a central mixing plant. All concrete shall be completely plant mixed in a stationary mixer and the mixed concrete shall be transported to the job in agitating type trucks in accordance with ASTM Specification C94.

2. Deliveries shall be timed to insure that all concrete can be placed within one (1) hour after initial mixing water is added.

3. Batching, mixing and delivery equipment, operation and procedures shall conform to the recommendations of the National Ready Mixed Concrete Association.

4. Attention is called to the importance of scheduling and dispatching trucks from the batching point so that they shall arrive at the site of the work just before the concrete is required, thus avoiding excessive mixing of concrete while waiting or delays in placing successive layers of concrete in the form.

5. Partially hardened concrete shall not be retempered or used.

6. Concrete placed in air temperatures below 40°F shall have a temperature of 60°F. Temperature of individual materials, including mixing water, shall not exceed 140°F.

7. Adding water to mix: No water shall be added after the initial introduction of the mixing water for the batch, except under special conditions. When on arrival at the jobsite it is found that the slump of the concrete is less than specified under such conditions, additional water to bring the slump within limits may be added only with the approval of the University's representative. It shall be injected into the mixer under such pressure and direction of flow that the requirements for mix uniformity are met. The drum or blades shall be turned an additional 30 revolutions or more if necessary, at mixing speed, until uniformity of the concrete is within these limits. When water is added to the batch upon arrival at the jobsite, it must be noted on the delivery ticket and signed by the University's representative. Water shall not be added to the batch at any later time.

## F. Changes in materials:

1. If, during the progress of the work, the Contractor desires to use materials other than those approved (originally) or if the materials from the source originally approved change in characteristics, additional tests shall be made with new materials which will produce concrete meeting with the stated requirements and not cause objectionable change in the color or appearance of the structure. These additional tests shall be made by the Testing Agency, at the expense of the Contractor. No concrete made from such different materials shall be used in the work until the Architect has given his approval.

2. If, during the progress of the work, it is impossible to secure concrete of the required workability and strength with the materials being furnished by the Vendor, the Architect may order such changes in the proportions or materials, or both, as may be necessary to secure the desired properties, subject to the stated requirements. Any changes so ordered shall be made at the Contractor's expense, and no extra compensation will be allowed by reason of such changes.

## PART 3: EXECUTION

### 3.1 CONCRETE PLACEMENT (Except topping)

A. Inspection of Forms and Reinforcing: At least 24 hours prior to placing of concrete, notify the University's representative so that he may inspect forms and reinforcing in place.

B. Placing: Prepare, convey and deposit concrete in accordance with ACI 301, except as modified herein.

1. Unless otherwise permitted, the work shall be so executed that a section begun on any one day shall be completed in daylight of the same day.

2. Remove water and foreign matter from forms and excavations and, except in freezing weather or as otherwise directed, sprinkle porous subgrade and wood forms just prior to placing concrete to eliminate suction. Place no concrete on frozen soil and provide protection against frost action.

3. Deposit concrete continuously and in layers of such thickness that no concrete will be deposited on concrete which has hardened sufficiently to cause the formation of seams and planes of weakness within the section.

4. Deposit concrete so as to maintain, until the completion of the unit, a plastic surface approximately horizontal. In thin sections (such as walls and columns) of considerable height, concrete shall be placed in such a manner as will prevent segregation, rehandling or flowing and accumulations or hardened concrete on the forms or reinforcement above the mass of concrete being placed. To achieve this end, suitable hoppers, spouts with restricted outlets, tremies, etc., shall be used as required. Openings in the side of the walls will not be permitted. Vertical free drops shall not exceed four feet. Place concrete in layers not exceeding 12" in depth, each layer compacted by mechanical vibrating equipment.

5. All concrete shall be thoroughly compacted and consolidated following procedures recommended by ACI 609, "Consolidation of Concrete".

6. After depositing concrete in columns or walls, at least 2 hours must elapse before depositing in beams, girders or slabs supported thereon.

7. Chutes, hoppers, spouts, adjacent work, etc., shall be approved type, thoroughly cleaned before and after each run and the water and debris shall not be discharged inside the form.

8. Contractor shall provide sufficient labor and equipment to thoroughly compact all freshly placed concrete by internal mechanical vibration. Before each concrete placing operation is started, the Contractor shall have on hand at the project two complete high cycle vibrator outfits in good operating condition of each size and type of vibrator needed to adequately consolidate the concrete scheduled to be placed. All concrete shall be compacted with the aid of high cycle internal electrical mechanical vibrators for a sufficient durations and intensity to fill all voids, thoroughly consolidate and compact the concrete in place, to produce a dense mass of smooth surface concrete without honeycomb and a minimum of bug holes.

9. Vibration of concrete shall meet the requirements of the American Concrete Institute's latest publication titled "Consolidation of Concrete, ACI 609".

10. Contractor shall provide on the job site a spare vibrator at all times when placing of concrete for emergency use.

C. Grouting structural steel: Install a full bed of non-shrinking mortar grout under all steel base plates and bearing plates.

### 3.2 CONCRETE TOPPING

A. Concrete topping shall be placed over structural cast-in-place and precast concrete slabs where noted and detailed on the drawings.

B. Preparation:

1. Just prior to placing topping, remove all laitance and loose particles of sand and dirt with a stiff wire broom.

2. Remove oil and grease spots by washing with a 10% solution of muriatic acid or strong washing soda.

C. Placement:

1. After cleaning, hose down the slab with a pressure hose and keep the slab wet for at least 12 hours.

2. Then allow the slab to dry until free water has disappeared.

3. On the wet slab surface, apply a thin, fresh, neat cement grout, broomed into the slab surface, immediately ahead of the topping mixture.

4. Spread topping over the slab evenly and float and trowel to a smooth, dense finish.

5. Do not add cement or sand to any of the topping surfaces during finishing.

6. Replace finished topping areas which sound hollow or otherwise indicate separation of topping and base slab.



### 3.3 EMBEDDED ITEMS AND FASTENING DEVICES FOR OTHER WORK

A. Provide for installation of inserts, hangers, metal ties, anchors, bolts, and other fastening devices required for attachment of other work. Properly locate in cooperation with other trades and secure in position before concrete is poured. Do not install sleeves in any concrete beams or columns except upon approval of the Architect.

B. Embed no pipes other than galvanized electrical conduit in concrete. Embed conduit only under the following conditions:

1. Do not cut or displace reinforcement.

2. In slabs restrict conduit diameter to  $1/3$  of slab thickness and locate within middle half of slab.

3. Run conduit larger than  $1/6$  of slab thickness approximately parallel or at right angles to reinforcing, not diagonally.

4. Place parallel conduits apart at least six times conduit diameter.

C. Install slab lift handles in removable concrete slabs noted on details.

D. Install abrasive inserts in concrete ramps as detailed.

### 3.4 MISCELLANEOUS CONCRETE ITEMS

A. Construct equipment foundations, pads, bases, trenches, pits, receptors, and other miscellaneous concrete items noted and shown on the drawings as detailed. Obtain precise dimensions from manufacturers of equipment. Provide and install anchors and bolts in concrete where directed and required. Use appropriate concrete mix.

### 3.5 COORDINATION WITH OTHER TRADES

A. Include installation of anchors, sleeves, ties, angles, etc., furnished by trades responsible for the facilities to be attached to these devices. Such trades shall be notified by the Contractor and their work done before concreting. Leave openings in walls, for pipes, ducts, etc., required for the ventilation, heating, electrical and plumbing work. Provide concrete pads and conduits for outside pipes and utilities as required. Notify all trades concerned with sleeves, inserts, etc., to check their work before concrete is cast.

### 3.6 CONSTRUCTION JOINTS

A. Vertical construction joints in walls shall be located where noted on the drawings and constructed as detailed.

B. Install polyvinyl chloride waterstops in all vertical construction joints in exterior walls and in other joints where noted or detailed on the drawings.

- C. Vertical construction joints in composite slabs over metal decking and slabs supported on steel framing shall be located over the structural steel supports.
- D. Vertical construction joints in other concrete slabs shall be located at the center of spans and shall be constructed as detailed.
- E. Construction joints in concrete slabs-on-grade shall be constructed as detailed.
- F. Horizontal joints in concrete walls shall occur where shown on the drawings. Should additional horizontal construction joints be necessary, they shall be so made and located as to least impair the strength of the walls and their locations shall be approved by the Architect. Where additional horizontal wall construction joints are approved, they shall be constructed as bonded joints in accordance with the requirements of ACI 301, Section 6.1 and 8.5.
- G. Unless detailed otherwise, all reinforcing steel and welded wire fabric shall be continued across joints.
- H. Keys and dowels at construction joints shall be provided as detailed or directed by the Architect.
- I. Aggregate Feature Strips. Where control joints are not defined, they should be located approximately 12'-4" o.c., located at the building grids.

### 3.7 CONCRETE FINISHING

#### A. General:

1. The intent of this Specification is to secure for the job materials and workmanship of such quality that only nominal finishing will be required to produce concrete surfaces equal to the best obtainable with the concrete and forming materials specified. Surfaces which reveal, upon removal of forms, imperfections of such magnitude as to seriously impair the appearance of the structure, in the opinion of the Architect, shall be deemed cause for rejection, and concrete members containing such imperfections shall be entirely removed and replaced without damage to adjacent material or extra expense to the Owner. Lesser imperfections of concrete surfaces shall be patched and finished in accordance with the procedures hereinafter specified. For slabs with trowelled finish, in addition to ACI 301, Chapter 11 tolerances, the maximum tolerance from the true level plane over the entire area shall be plus or minus 3/8". Screeding, placing and finishing shall take into account the possible variations in the elevations of supports and forms to provide floor slabs within these tolerances. Prior to laying out partitions and grids by the Contractor, the University will inspect the floors for level tolerances. The Contractor shall advise the University of his schedule start to layout partitions on each floor after concrete is placed and allow the University reasonable time to check the floor levels.

2. Finish only properly set concrete. Under adverse weather conditions, finish only under proper protection.

3. The Contractor, at his own expense, shall do all leveling and grinding of depressed and high spots in concrete surfaces in excess of the tolerances specified herein. In areas where leveling materials are required to provide the proper surface, such materials shall be of a type approved by the Architect.

4. Protect all concrete work against injury from heat, cold and defacement of any nature during construction operations.

B. Repairing and finishing of formed surfaces:

1. It is the intent of this Specification to require forms, mixtures of concrete and workmanship so that concrete surfaces, when exposed, will require no patching except for plugging of tie holes. Repairable defective areas, as determined by the Architect, and all tie holes shall be repaired in accordance with the procedure outlined in the ACI 301, Chapter 9, except as modified herein.

2. As soon as the forms have been stripped, fins and projections shall be removed and the areas smoothed out with wet carborundum stones or power grinders to the extent directed, in areas where the concrete surfaces will be exposed.

3. Efflorescence, stains, oil, grease, or any unsightly accumulation of foreign materials visible on the exposed surface of finished concrete will require remedial action to remove these blemishes. Such action may cover all exposed concrete, or, when irregular lapping can be avoided, only such parts as are affected by the stains or other unsightly appearances.

4. Finishing of concealed concrete surfaces: At surfaces to receive waterproofing membranes or dampproofing coatings, chip off fins and other projections and trowel patch all voids, honeycombs and air pockets exceeding 1/2" in any dimension. Patch voids formed by tie-rod cones flush with adjacent surfaces. At other concealed surfaces, patching, if any, shall be as directed and shall, in general, be only such as is required to assure or protect the structural integrity of concrete or reinforcing.

5. Concrete surfaces to receive paint or plaster directly shall be scrubbed with washing soda and then thoroughly rinsed with water. Repeat this operation until all form oil and other foreign materials which would prevent proper adhesion of the above specified materials are removed.

6. Where finish is indicated to match exposed aggregate precast concrete, this may be accomplished by light sandblasting or use of retarders. See Section 03410, Article 2.11.A.4.

C. Flatwork and flatwork finishes:

1. Flatwork placing and finishing shall comply with the procedures and requirements of ACI 301, Chapter 11, except as modified herein.

2. No dry cement or mixture of sand and cement shall be applied to surfaces of any concrete slab to absorb moisture.

3. Protect floors from damage until completion of job.

4. Finishes:

a. Floated Finish:

1. Provide a floated finish on the following surfaces:

a) Slabs to receive mortar set or thin mortar set ceramic tile, quarry tile, paver tile or brick pavers.

b) Slabs to receive built-up roofing.

c) Roof slabs to receive sloping gradient fill.

d) Slabs to receive concrete topping.

b. Troweled Finish:

1) Provide a troweled finish on the following surfaces:

a) Slabs to receive membrane waterproofing.

b) Slabs to receive carpeting.

c) Tops of parapets, sills and exposed walls, unless otherwise noted.

d) Interior slabs to be left exposed.

e) Slabs to receive resilient flooring or seamless flooring.

f) Slabs to receive ceramic tile, except depressed slabs for mortar set or thin mortar set tile or pavers.

g) Interior stairs and landings.

h) Receptors.

c. Broom Finish:

1) Provide a broom finish on the following surfaces:

a) Curb and gutter sections.

b) Sidewalks.

d. Non-Slip Finish:

1) Provide a non-slip finish on the following surfaces:

a) Exterior stairs, landings and ramps.

b) Interior ramps.

c) Floors of rooms noted in Architectural Room Finish Schedule.

2) Install abrasive strips in ramps where noted on details.

3) Procedure: Allow the concrete surface to harden until it bears the weight of workmen standing on boards. At this time, the specified non-slip aggregate, previously soaked in clean water for not less than 10 minutes, but free of excessive moisture, shall be broadcast and imbedded and the slabs trowel finished in accordance with ACI 301. Sand blast non-slip finished surfaces lightly in accordance with approved samples. Apply non-slip aggregate at the rate of 20 pounds per 100 square feet of area.

e. Exposed Aggregate Slab Finishing: Before concrete has reached initial set, apply liquid surface retarder to slab in accordance with manufacturer's instructions to achieve surface penetration not to exceed 1/8". Wash off surface cement, exposing aggregate, with clear water hose spray and stiff brushes as recommended by the retarder manufacturer.

f. At interior concrete feature strips, exposed aggregate by grinding, leaving smooth surface flush with surrounding materials.

### 3.8 CURING AND PROTECTION

A. Curing and protection shall be performed in accordance with ACI 301, Chapter 12 and the following additions:

1. Freshly deposited concrete shall be protected from premature drying and excessively hot or cold temperatures, and shall be maintained with minimal moisture loss at a relatively constant temperature for the period of time necessary for the hydration of the cement and proper hardening of the concrete.

2. Immediately after placing or finishing, all concrete surfaces not covered by forms shall be protected from loss of moisture by the use of one of the following materials or methods:

a. Covering with waterproof paper or polyethylene film conforming to ASTM C171.

b. Applying specified curing compound conforming to ASTM C309.

3. Sheets of waterproof paper or polyethylene film shall be lapped a minimum of six (6) inches at edges and ends and maintained in place by sealing laps with pressure-sensitive tape and weighting down as necessary.

4. Curing compounds shall be applied within two hours after the concrete has been finished.

5. Curing compounds shall be applied in accordance with the manufacturer's recommendations and shall not be used on any surface against which additional concrete or other cementitious materials are to be bonded, nor on concrete surfaces to receive hardening treatment or conductive flooring.

6. If forms are to be removed during the curing period, one of the curing materials or methods specified for concrete surfaces not covered by forms shall be employed immediately and continue for the remainder of the curing period.

7. The curing period shall continue until the accumulative number of days not necessarily consecutive, during which the temperature of the air in contact with the concrete is above 50°F has totaled seven days.

8. Rapid drying at the end of the curing period shall be prevented.

B. Cold weather protection:

1. Adequate equipment shall be provided for heating the concrete materials and protecting the concrete during freezing weather and near freezing weather. Concrete materials and reinforcements, fillers, forms and ground with which the fresh concrete is to come in contact shall be free from frost.

2. Arrangements for heating, housing covering, and insulation shall be made in advance of pouring concrete and shall be adequate to maintain the required temperature and moisture conditions without injury to the concrete due to concentration of heat or carbon dioxide flue gases. In general, except as herein specified, follow the recommendations of ACI 306 "Recommended Practice for Cold Weather Concreting".

3. When the temperature of the surrounding air is below 40°F fresh concrete, when placed, shall have a minimum temperature of 60°F and a maximum temperature of 80°F depending on the existing conditions.

4. Special precautions must be taken to protect concrete floor slabs and steps scheduled to receive a troweled finish, from cooling too rapidly or from surface freezing during the finishing operations. Slabs to be troweled shall not be cast during cold windy weather unless an enclosed heated shelter is provided above the area to be cast and finished.

5. Curing temperature for structural concrete shall be maintained as follows:

a. Regular concrete made with Type 1 regular Portland Cement shall be maintained at not less than 70°F for the first 72 hours and 50°F for the next 3 days.

b. High early strength concrete made with regular Portland Cement may be obtained by the addition of 25% more cement to the mix or by adding 1% calcium chloride in standard solution dissolved in a part of the mixing water, according to directions of the Calcium Chloride Institute. Sikacrete may be used as recommended by the manufacturer. Accelerators are not to be considered as a substitute for any type of protection from freezing. Calcium chloride shall not be used in concrete placed over metal decking, permanent metal forms or concrete that will be permanently exposed to the weather.

c. High early strength concrete made by adding 25% more cement as an accelerator shall be maintained at 70 F for the first 24 hours and 50°F for the next three days.

6. At the end of any curing period, the concrete shall be allowed to cool gradually (approximately 1°F per hour) by leaving the covering protection in place and intact for a minimum of 24 hours. In no case shall structural concrete be exposed to freezing for a full 6 days after it has been cast and has developed strength required to support itself and any superimposed loads that may be placed on the concrete.

7. High early strength concrete shall not be used for casting thick sections of concrete. Specific approval must be obtained from the Architect and the University before using any high early strength concrete.

8. During freezing weather, the Contractor shall take the temperature of the concrete at regular intervals during the curing period and maintain temperature records of the various concrete sections at locations as directed by the University to insure proper curing temperatures are being maintained.

#### C. Hot Weather Concreting:

1. Care shall be exercised during hot weather to keep concrete temperatures and mixing and placing time to a minimum.

2. Transport trucks shall be dispatched to avoid delays and the work shall be organized to use the concrete promptly to prevent unnecessary additional mixing at the jobsite.

3. When necessary, arrangements for installation of windbreaks, shading, spraying, sprinkling or wet covering of a light color shall be made in advance of placement, and such protective measures shall be taken as quickly as concrete hardening and finishing operations will allow.

4. Production, delivery, placement and protection shall comply with the American Concrete Institute Standard entitled "Recommended Practice for Hot Weather Concreting" (ACI 605), except that concrete shall be placed within one hour after the initial mixing water is added.

D. Wet Weather: Unless adequate protection is provided do not place concrete in rain, sleet, or snow.

### 3.9 FLOOR SEALING

A. Partitions shall be laid out, as specified in Section 01010, as soon as possible after concrete floors have hardened and cured for 7 days.

B. All interior concrete floors, stairs and landings, with the exception of the areas receiving non-slip finish, shall be treated with specified sealer as follows, which shall be in addition to any curing compound coating previously used:

1. Floors receiving finish materials (carpet, V.A.T. composition). Note: CONFIRM COMPATIBILITY OF SEALER WITH FINISH:

a) Clean floors and apply one coat as soon as possible after partition layout is complete, but not less than 28 days after concrete is finished.

b) Clean floors and apply the second coat of sealer immediately in advance of flooring, allowing sufficient time for complete curing of sealer before applying covering.

2. All exposed concrete floors, which will not receive finish covering, including in shell spaces and where finish is omitted by alternate:

a) Clean floors and apply first coat sealer as soon as possible after partition layout is complete, but not less than 28 days after concrete is finished.

b) Clean floors thoroughly and apply two additional coats of sealer immediately before final inspection.

### 3.10 FIELD QUALITY CONTROL (TESTING)

A. Slump Tests: Make slump tests whenever concrete is being poured at the direction of the Owner in accordance with ASTM C143.

B. Compression Tests:

1. The casting of concrete test cylinders shall be performed by the Contractor at times selected by the University and under his direct supervision. The

Contractor shall arrange and pay for all transportation of concrete test cylinders to the testing laboratory at the proper time as specified.

2. The University will select the testing laboratory for delivery and compression testing of concrete cylinders and will pay for these tests.

3. Prepare standard test cylinders during the placing of concrete in accordance with ASTM 31 and ASTM 172 in sets of two. One set (two cylinders) is required for each day's pour. If the day's pour exceeds 25 cubic yards, prepare an additional set of cylinders for each additional 50 cubic yards or fraction thereof.

4. The test cylinders shall be laboratory tested and shall be stored at the site in 60-80°F temperature range, and so no injury to cylinders will occur, for 24 to 48 hours. After this time the Contractor shall deliver the two cylinders to the testing laboratory, taking care not to freeze, crack or damage the specimens. These cylinders shall be laboratory cured and tested at 7 and 28 days of age with tests indicating concrete strengths for compliance with the specifications. Report results of seven day test immediately to Contractor. See Section 03100, Article 3.2, paragraphs B and C.

5. During freezing, or near freezing, weather (or for special conditions where early removal of forms is requested by the Contractor, and approved by the Owner) concrete test cylinders shall be taken in sets of three. One of the three cylinders shall be a "field condition" cylinder to be placed as near as possible to the final location of the concrete from which the sample was taken and shall receive the same curing and protection as adjacent concrete. The Contractor shall deliver this "field condition" cylinder to the laboratory 28 days after casting or at an earlier age when an earlier field strength data is desired. The other two cylinders shall be stored at the site and delivered to the laboratory for curing and testing as outlined in paragraph 4.

6. Each cylinder shall be marked by the Contractor with the job name, location of pour, date of pour, slump, mix number and strength of concrete specified. In addition, the air content shall be marked on the cylinder where an air-entraining admixture is specified.

#### C. Entrained Air Tests:

1. When air entrained concrete is used, the first batch of each pour shall be tested for air content at the Project by the Contractor as directed by the University and as often thereafter as required to insure that the air content is within the specified limits.

2. Testing shall be performed in accordance with ASTM C173 or ASTM C231.

#### D. Evaluation of Test Results and Failure to Meet Strength Requirements:

1. Test results shall be evaluated according to the "Recommended Practice for Evaluation of Compression Test Results of Field Concrete," ACI214.

2. Evaluations shall be valid only if the samples have been taken and tests have been conducted in accordance with ACI and ASTM specifications and methods as applicable.



3. If strength tests performed on concrete cylinders, cast at the time the concrete is placed, fail to meet the specified 28 day value, or if the samples have not been taken and tests conducted as specified, the concrete represented by such tests shall be considered questionable and shall be subject to further testing at the expense of the Contractor.

4. These additional tests of questionable concrete shall be performed by an independent testing laboratory, approved by the Architect, and shall be conducted in accordance with ACI 301, Chapter 17 when concrete cores may be obtained in the field or by load tests conducted and results evaluated in accordance with ACI 318, Chapter 20.

5. If the additional tests fail to demonstrate strengths adequate for the intended purpose of the member, or members, in question, as determined by the University and the Architect, all the questionable concrete shall be removed and replaced with concrete meeting the specifications at the expense of the Contractor.

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## PART 1: GENERAL

1.1 SCOPE

- A. Conditions of Contract and Division 1 - General Requirements, apply to all work of this section. Refer to Article 12 of the Instructions to Bidders, Article 7 of the General Conditions and Section 01600 - Materials and Equipment for requirements on pre-bid and post-bid evaluation of proposed substitute products, methods and other conditions.
- B. Work under this section includes the furnishing and installation of the structural precast concrete units at the locations, and in accordance with the details, shown on the drawings including the grouting of keyways.
- C. Related work specified elsewhere:
1. Cast-in-Place Concrete: Section 03300.
    - a. Concrete topping mix design requirements and installation procedures to be followed where topping is required over the precast concrete slabs as noted on the drawings, is included in Section 03300.
  2. Concrete Reinforcement: Section 03200.
    - a. Dowels required at the precast concrete slab grout joints are included in Section 03200.
  3. Architectural Precast Concrete: Section 03450.
  4. Unit Masonry: Section 04200.

1.2 REFERENCE STANDARDS

- A. The following standard is incorporated by reference.
1. ACI, Building Code Requirements for Reinforced Concrete, ACI 318-71.

1.3 SUBMITTALS

- A. Shop Drawings: Submit complete shop drawings in accordance with Section 01300.
1. Shop drawings shall show setting plans, erection details, connection and anchorage details, section identification marks and design loads.
  2. Identify each unit with a mark, list on an erection plan, and place legibly on each unit at the manufacturer's plant.

1.4 HANDLING, STORAGE AND DELIVERY

- A. Handle, transport and store in a manner that will avoid damage or deformation and in accordance with fabricator's recommendations. Store off the ground.

## PART 2: PRODUCTS

### 2.1 PRECAST CONCRETE DECK SYSTEMS

A. Structural precast concrete units shall be standard 6" and 8" thick cored slabs designed and manufactured by one of the following, or approved equal.

Spancrete Midwest Company, Osseo, Minnesota  
Bladholm Bros., Osseo, Minnesota  
Molin Concrete Products Company, Lino Lakes, Minnesota  
Fabcon, Inc., Savage, Minnesota

1. All concrete and reinforcing materials shall conform to the ASTM specifications noted in ACI 318-71.

2. Provide structural steel headers where required at openings in the slabs.

3. Provide bearing pads below ends of slabs as required.

4. Openings shown on the drawings as required in the precast slabs shall be provided during fabrication.

B. Grout:

1. The grout mixture used for grouting of keyways shall consist of not less than 1 part Portland Cement to 3 parts fine sand.

C. Design:

1. Structural precast concrete slabs shall be designed in accordance with ACI 318-71 to safely support the design live loads noted on the drawings without excessive stress or deflection. For slabs to receive a concrete topping the design live load shall be in addition to the weight of the topping.

D. Fire Rating:

1. Deck units shall have a fire resistive rating of 2 hours without a concrete topping and a fire resistive rating of 3 hours with a 1-3/4" concrete topping placed over the units.

2. Deck units shall be labeled with the appropriate label of the Underwriters' Laboratories, Inc.

3. See plans for areas of deck units requiring a concrete topping.

## PART 3: EXECUTION

### 3.1 ERECTION OF DECK SYSTEMS

A. Erection of the precast concrete slabs shall be in accordance with the approved erection drawings and the manufacturer's current specifications. Line up adjoining units within 1/16" with no deviation of more than 1/8" in any 3 foot length and 1/4" in the entire slab length.

B. Erection of the precast concrete slabs shall include the installation of the dowels shown in the slab joints and the grouting of the keyways. Remove grout that

has seeped through to the underside of the slab units before it cures.

C. Erected members shall be neatly and fully finished with the slabs free of all stains, dirt, blemishes, drips and grout seepage.

D. Any openings in the precast concrete slabs to be cut in the field shall be core drilled and they shall not be made until the opening sizes and locations are approved by the precast concrete manufacturer.

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## PART 1: GENERAL

1.1 SCOPE

A. Conditions of Contract and Division 1 - General Requirements, apply to all work of this section. Refer to Article 12 of the Instructions to Bidders, Article 7 of the General Conditions and Section 01600 - Materials and Equipment for requirements on pre-bid and post-bid evaluation of proposed substitute products, methods and other conditions.

B. Work under this section includes all architectural precast concrete, including precast panels, benches, all precast concrete panel connections indicated on the drawings, all support assemblies which are welded, embedded or engaged with the architectural precast concrete and structural components of precast concrete panel connections which are not provided under P/N ECS Contracts.

1. Precast Concrete Subcontractor may, at his option, reuse existing precast concrete panels removed from Unit "A" to accommodate the new construction - see Article 3.4 herein for specific requirements.

C. Related work specified elsewhere:

1. Cast-in-Place Concrete: Section 03300
2. Precast Structural Concrete: Section 03410.
3. Insulation: Section 07220.
4. Sheet Metal Flashing: Section 07600.
5. Caulking and Sealants: Section 07900.

D. Work under other contracts:

1. Certain Structural Components and Certain Precast Concrete Panel Connections: P/N-ECS Contract.

1.2 REFERENCE STANDARDS

A. The following specifications, codes and standards are incorporated by reference. If the provisions of any of the referenced documents are at variance with these project specifications, the requirements of these specifications shall govern:

1. American Concrete Institute (ACI) Specifications for Structural Concrete for Buildings, ACI 301-72.
2. ACI Building Code Requirements for Reinforced Concrete, ACI 318-77.
3. ACI Recommended Practice for Concrete Formwork, ACI 347-68.
4. ACI Recommended Practice for Consolidation of Concrete, ACI 309-72.
5. Portland Cement Association, (PCA) Design and Control of Concrete Mixtures, 11th Edition.

B. The following manual, where it does not conflict with these project specifications, shall govern the fabricator's and erector's work relating to design, detailing handling and placement of panels.

1. Prestressed Concrete Institute (PCI), Architectural Precast Concrete 1973.

1.3 QUALIFICATIONS

- A. Fabricator shall be the operator of an established plant with a minimum of 5 years successful experience in fabricating architectural precast concrete and he shall have had work in place which has weathered satisfactorily in a climate similar to the place of building for a period of not less than 5 years.
- B. Plant and personnel of fabricator shall be sufficient to produce the specified quality of work in the quantities necessary to serve the project without delay.
- C. Erector shall be experienced in the erection of architectural precast concrete and he shall have installations in place which are representative of the quality of work specified.
- D. Testing shall be accomplished and reported, at the expense of the fabricator, by an independent testing laboratory approved by the Owner.

1.4 SUBMITTALS

- A. Shop Drawings. Submit fabrication and erection drawings in accord with Section 01300. Include design calculations and details of reinforcement.
- B. Selection Samples. Submit for Architect's selection, samples of aggregates, cements and other materials affecting appearance of color and finish. It is intended that new work match the adjacent existing (Unit A) building.
  - 1. Submit a minimum of six (6) cast samples 12" by 12" by 2", at the direction of the Architect, showing different gradations, cements, aggregates and combinations thereof until the Architect has selected aggregate gradations and cement combination.
  - 2. After Architect has selected aggregate, gradation and cement, fabricate and erect in place a full size type D-14 panel using the selected materials. This panel shall be erected where directed by the University.
- C. Quality control samples: After all materials have been selected and confirmed as in B above and after mix designs have been approved, cast and deliver to job site a minimum of two (2) samples panels 18" by 18" by 2" showing selected materials and finishes for Architect's approval. Such samples shall use only those materials selected and shall utilize the mix design for surface concrete and shall be representative of the workmanship of the fabricator. Submit new sample panels until approval is obtained. Return one approved sample panel to the plant and maintain the other at the job site for the Architect's and University's use in quality assurance. All architectural pre-cast concrete shall equal or exceed the approved samples in quality of color, finish and workmanship.
- D. Test Reports. Submit test reports in triplicate to the Architect.
- E. Petrographic Analyses: With first set of selection samples and with any subsequent change in quarry or pit, submit complete petrographic analysis made on gravel rock in the immediate part of the pit from which surface aggregates will be mixed.

## 1.5 PACKAGING, HANDLING, STORAGE

A. Package, handle, transport and store at the jobsite in a manner that will avoid damage. Staining which cannot be removed by specified cleaning methods and/or damage classified as "major defects" will be cause for rejection of members. Major defects pertaining to handling are:

1. Lifting or anchoring devices or panel connections loose or not flush.
2. Broken edges.
3. Damage or defects affecting serviceability or appearance.

B. Remove and replace any members rejected because of stains or other damage. Legally dispose of rejected material away from the jobsite.

C. Precast concrete panels shall be handled in a nearly vertical plane at all times. Panels shall be stored vertically and leaned against proper supports until used. Chipped, spalled or stained pieces shall be redressed only with approval of the Architect and such redressing shall be guaranteed by the precast concrete fabricator.

## PART 2: PRODUCTS

### 2.1 QUALITY OF MANUFACTURE

A. 1. The products, fabrication, techniques, colors and finishes specified herein are intended to produce high grade architectural precast concrete to match color, finish and texture of the architectural precast concrete panels furnished on Unit A of the Health Sciences Expansion, University of Minnesota.

2. The products of other approved fabricators meeting the qualifications required by Article 1.3 above are acceptable subject to the products meeting or exceeding the requirements of these specifications as approved by the Architect.

3. The equivalent products of American Artstone Company, Gage Brothers Concrete Products, Inc., Inland Concrete Company Precast Division, Midwest Concrete Industries, Inc. Hufschmidt Engineering Co., and Wilson Concrete Company are acceptable subject to the approval by the Architect of products furnished.

### 2.2 MATERIALS

A. Portland Cement: ASTM C150, Type I or Type III, natural gray. All cement used for exposed work shall be of the same manufacturer, burn and type, light burn of Northwestern. Cement of Lehigh, Penn-Dixie, Universal Atlas or Marquette may be acceptable subject to approval of color match samples to precast concrete at Unit A of the Health Sciences Expansion. See Article 1.4, above.

B. Air Entraining Agent: ASTM C260.

C. Basic Aggregates: ASTM C33.

D. Surface Aggregate: Janesville (Wisconsin) gravel rock, small #6. It is intended that panels match existing Unit A panels. See Article 1.4, above.

E. Reinforcement:

1. Standard bars: ASTM A615, grade 40 minimum.
2. Welded wire fabric: ASTM A185.

3. All reinforcement located within 1 1/4 inch of weather-exposed surface shall be hot-dip galvanized after fabrication, ASTM A123.

F. Cast-in Headers, Anchors, Accessories, etc.: manufacturer's standard items designed to carry required loads; connections as detailed on the drawings.

1. Cramp anchors, split tail anchors and dowels shall be non-magnetic stainless steel.

2. Cast-in inserts, slots and bolts shall be hot dip galvanized. ASTM A153 or ASTM A123 are applicable.

G. Precast Concrete Panel Connections, Weld Plates, etc.: ASTM A36.

H. All ferrous metal items under this section, except those imbedded in concrete, shall be shop painted with Tnemec 99 Red Metal Primer, Devco Quick Dry Red Lead Primer or Pratt and Lambert Noxide Fast Drying Red Primer. All areas of steel which have been welded in the field and/or abraded shall be touched up with prime paint as specified above.

I. Cast-in reglets, flashing inserts (in general, provide only at tops of parapets others shall be saw cut or California reglet) Superior Type A PVC, high impact, rigid type II or approved equal.

J. Weepholes: Hohmann and Barnard, Inc. plastic tube weepholes No. 341.

### 2.3 DETAILING FOR FABRICATION

A. Detail architectural precast concrete, its reinforcement, lifting and anchoring devices and panel connections in accord with the drawings, the best standards of the industry and the applicable provisions of ACI standards and codes and PCI Manual.

B. Reinforce as required to provide strength adequate to withstand handling, installation and performance in place. Reinforcement shall be designed and placed to prevent cracking by the supports and spans.

C. Cover of Reinforcement. A minimum concrete cover of 1 1/4" shall be maintained over reinforcing steel for exterior exposed aggregate surfaces. A minimum of 3/4" concrete cover shall be maintained for exterior smooth surfaces. A minimum of 1/2" concrete cover shall be obtained for interior surfaces.

D. Fabricator shall design and provide all devices required for lifting, tying and anchoring of panels and to panels including cast-in inserts, bolts to fit inserts, dowels, split tail anchors, cramp anchors, lewis bolts, etc. Fabricator will not be required to redesign all panel connections detailed on the drawings. However, he shall design anchorages for connections.



E. Anchorage and panel connection devices shall allow for field erection and field adjustments. Anchors shown are an indication of what will be required minimum, but the fabricator shall verify and show all anchoring methods. All devices shall be approved by the Architect.

F. At precast concrete wall caps and benches, where joints are not defined on the drawings, locate joints approximately 6'-2" o.c. in line with the building grid where a grid occurs in the immediate vicinity.

#### 2.4 FORMWORK

A. Formwork shall comply with applicable requirements of ACI 347, and with Portland Cement Association's "Forms for Architectural Concrete." Forms may be of HDO Plywood, fiberglass reinforced polyester, concrete or steel, provided that finished units match panels on Unit A as specified.

B. Forms shall be true, straight, and square and entirely without twists and bends. Where joints in forms occur, the interior surface must be flush. Forms shall be rigidly braced during placement of concrete.

C. Coating: Before each pour, forms shall be coated with approved non-staining form release agent which will not interfere with chemical retarders or adhesion of sealants, glazing compound, insulation adhesives or applied finishes.

D. Forms shall be designed sufficiently rigid to withstand vibration during placement of concrete.

#### 2.5 FABRICATION

A. Fabricate architectural precast concrete in accord with the approved shop drawings, the best standards of the industry and these specifications.

B. Sizes must be accurate, with proper allowances for fitting to each other and to building features.

C. Sections shall be accurately cast to size and shape, with exposed faces true and straight edges.

D. Edges, reveals, grooves, drips, etc., shall be sharp and straight with sharp and whole arrises. Back sides shall also be smooth and true to straight edge.

E. All surfaces shall be dense and firm and shall withstand vigorous cleaning and scrubbing with a stiff fiber brush with or without using diluted muriatic acid of proper strength if required for cleaning. See Article 3.4.D.

#### 2.6 MIXING AND PLACING

A. Concrete shall be mixed until there is uniform distribution and shall be discharged completely before the mixer is recharged. The mixer shall be rotated at a speed recommended by the manufacturer and be equipped with meter for measuring water. All aggregates shall be preweighed before placing in mixer.

B. Temperature of concrete shall be not less than 45°F nor more than 70°F and ambient temperature in casting area shall be not less than 45°F and rising.

C. Concrete shall be conveyed from the mixer to the form by methods which will not permit separation or loss of materials.

D. Concrete shall be deposited as near to its final position as possible to avoid segregation in rehandling and flowing. High frequency, low amplitude vibration shall be used and shall be continuous to produce the required density and surface finish. When concreting is once started, it shall be carried on as a continuous operation until the casting of the panel or unit is completed.

E. No concrete that has hardened or been contaminated by foreign materials shall be used.

## 2.7 CURING

A. Curing: Units shall be cured by use of heat and moisture until the required strength for handling is obtained. During this time keep all surfaces continuously moist. No surface shall be exposed to direct sunlight or direct wind.

B. Temperature Control: Provide temperatures of not less than 60°F, for the concrete during curing and washing. During winter months, these activities shall be carried out in enclosed and heated areas, including moist curing specified above. After placing and vibrating, the concrete shall attain its initial set before heat is applied. If the air temperature is below 50°F, enough heat shall be applied to maintain the concrete at its placing temperature between 60°F and 70°F. Then the ambient temperature within the casting enclosure may be increased uniformly at a rate of approximately 40°F, per hour. In no case shall the curing temperature exceed 160°F. In severe winter conditions the ambient temperature within the casting enclosure shall be decreased at a rate not to exceed 60°F, per hour.

C. Curing before removal from forms: Shall consist of covering concrete with an impervious blanket upon completion of casting, and until unit is removed from the form to provide 100% relative humidity. Curing temperature shall be 60°F to 160°F. Avoid staining and drip damage.

D. Removal from forms: Remove from forms only after concrete has attained sufficient strength to withstand lifting and handling without damage or deformation.

E. Handling and lifting: Shall only be done when the material is strong enough to withstand loads imposed on it, and as specified herein. Take care to avoid damaging units when removing from forms. Handle and store units using proper supports, bolsters, separators, and protectors to avoid staining, damage to arrises, and stress concentration. Cast lifting hooks or other devices into the panels to insure proper handling of panels at all times.

F. Curing after removal from forms: Shall start without delay to provide continuous moist curing of all surfaces for not less than a total of 350 day-degrees, allowing no part of the concrete to become dry during that period. Membrane or intermittent curing shall not be used. Periodic sprinkling is not effective in curing and will not be accepted as meeting curing requirements. Protect surfaces from direct exposure to sun.

## 2.8 PHYSICAL QUALITIES

A. Compressive Strength, Slump and Entrained Air:

1. Monolithic Cast Panel Strength: 6500 PSI; the average of any three consecutive cylinder strength tests shall equal or exceed the specified strength and no test shall fall below the specified value by more than 500 psi.

2. Slump 3 1/2", plus or minus 1/2".

3. Entrained Air: 5%, plus or minus 1/2%.

B. It shall be the responsibility of the precaster to submit a concrete mix design to satisfy the Project requirements. For this purpose he shall engage the services of a concrete technician approved by the Architect and having access to suitable laboratory facilities, if adequate, and the services of a technician regularly in his employ for such duties. Mixes so designed shall be confirmed as suitable by tests on trial mixes made with the proposed materials. Mix design and trial mixes shall be made sufficiently in advance so that 28-day tests will be available before the first production of concrete units is required.

C. For information purposes to obtain as close a match as possible, following is the design mix as used for architectural precast panels furnished on Unit A of the Health Sciences Expansion, University of Minnesota.

Mix Proportions:	(1 Cubic Yard Baiss)
Cement	799# (NWS Type III)
Fine Aggregate	685# (N. Star Concrete Co. Maple River Pit)
Course Aggregate	2055# (Janesville Sand & Gravel Company)
Admixtures	200-N Pozzolith 24 ounces
	12 to 30 ounce MBVR (varies) 1.6# Stearox

D. All testing under this Article shall be accomplished using 3" sample cubes or standard test cylinders.

## 2.9 QUALITY CONTROL

A. All materials and workmanship furnished under this Section shall be subject to inspection and testing in the plant and field by the Architect, the University and by an independent testing agency, approved by the Architect and University, selected and paid by the fabricator. However, such inspection and testing shall no relieve the Contractor of his responsibility to furnish materials and workmanship in accordance with the requirements of the Contract Documents.

B. Control: It shall be the responsibility of the fabricator to supply and place concrete of the specified strengths and quality. Compression tests shall be made by the testing agency and the costs of such tests shall be submitted in the Contract Sum. Results of tests shall be submitted to the Architect and University. A minimum of one (1) test shall be made for each day's pour. Each test shall consist of four (4) cylinders, one (1) of which shall be tested at 7 days, two (2) at 28 days, and one (1) at a time selected by the fabricator. Sampling, molding, curing and testing of the cylinders shall be done in conformance with ASTM C31 and C39, under laboratory conditions. See Article 2.10.

C. Inspection: The Architect and University shall have the right to inspect placing of concrete; to make slump tests of concrete as placed; and to test concrete cylinder samples for compressive strength. The Architect will review for acceptability all materials proposed for use by the precaster, and he may, to the extent deemed advisable, inspect from time to time batching operations at the plant.

## 2.10 TESTING AND INSPECTION

A. Fabricator shall cooperate with the testing agency and inform it of schedules pertaining to the fabrication and erection of precast concrete units. Inspection of precast concrete in place on the building will be done by the Owner. Fabricator will not be required to pay testing agency for on-site inspection.

B. Tests shall be made by the testing agency to determine if the materials proposed for use in the precast concrete units comply with the requirements of the Contract Documents. These tests shall be performed prior to the use of the materials in the actual units. The Contractor shall coordinate his work with the testing agency to insure that materials are supplied, samples, and tested so as not to delay the progress of the Project.

C. The Fabricator shall notify the Architect, University and testing agency at least 10 days before the start of the initial and subsequent precast concrete fabrication operations.

D. During the progress of the work. Fabricator shall provide free and safe access to the work at all times both in the plant and in the field to the Architect, University and testing agency so as to make possible proper inspection of all the work.

E. The testing agency shall report immediately to the Architect, University and Contractor any non-compliance with the Contract Documents and all pertinent facts noted in the testing agency's regular reports.

F. The testing agency shall inspect the forms; placing of reinforcing steel, inserts, and other embedded items; and mixing, transporting, placing, protection and curing of concrete.

G. The testing agency shall make a minimum of four (4) test cubes (3") for every ten (10) cubic yards of each type concrete cast. Of each set of four cubes, two shall be tested at 7 days and two at 28 days. Specimens shall be cast, vibrated and cured in a manner identical to that used for the actual precast concrete units.

H. The Architect will reject units which have the following defects or which in any other way fail to comply with requirements on the Contract Documents:

1. Steel exposed, or steel with coverage less than one inch (1").
2. Honeycombing, non-uniformity of finish, and other surface flaws.
3. Any cracks or fractures, or loosening of any insert or anchor.
4. Incorrect proportioning of materials, and use of water in excess of the quantity specified.
5. Visual appearance not in accordance with approved sample.
6. Compressive strength; panels under 6,000 PSI.

I. All material and workmanship rejected by the Architect either at the plant or at the job site, shall be replaced promptly by the Contractor to the satisfaction of the Architect.

J. The fact that work has been accepted at the plant shall not prevent its final rejection at the jobsite, even after it has been erected, if it is found to be defective in any way.

K. All testing under this Article shall be accomplished using 3" sample cubes.

## 2.11 FINISHES

A. Architectural precast concrete shall match finish of precast concrete work on Health Sciences Expansion, Unit A as follows:

1. Exposed Aggregate, Type II Mosaic. Facing aggregate shall be exposed over approximately 85% of the surface by means of chemical retarders and brushing only.

2. Aggregate may be exposed by water etching at the fabricator's option.

3. Once samples are approved and production commences, no change may be made in finishing techniques without approval of the Architect.

4. Finish indicated as "smooth" shall be lightly sandblasted. Finish shall match "smooth" finish on precast concrete on Health Science Unit A.

B. Backside finish shall be wood float.

C. No coating of any type which would prohibit proper adhesion of sealants or gasket will be allowed on any surface to receive sealant. Verify compatibility of any forming material, bond breaker or other coating with the sealant specified in Section 07900.

## 2.12 FABRICATION TOLERANCES

A. Position of Cast-in Items

Inserts, bolts, plates, angles, etc.	$\pm$ 3/8"
Flashing reglets	$\pm$ 1/4"
Electrical outlets, hose bibs, etc.	$\pm$ 1/2"

B. PLACEMENT OF REINFORCEMENT

Bars and mesh to be  $\pm$  1/2" of position shown on approved shop drawings and never to encroach on the specified minimum cover.

C. CASTING TOLERANCES

Over-all height and width measured at the face adjacent to the mold when cast:

10'-0" or under	$\pm$ 1/8"
10'-0" to 20'-0" -3/16"	+ 1/8"
20'-0" to 30'-0" - 1/4"	+ 1/8"
Each additional 10'-0"	$\pm$ 1/16" per 10'-0"
Angular deviation of plane of side mold but at least 1/16"	1/16" per 6" depth

Thickness + 1/4"  
- 1/8"

Out of square (difference in length of the two diagonal measurements).

1/8" per 6'-0" or  
1/4" total, whichever  
is greater.

D. After Casting Tolerances - Bowing and Warping

Without intermediate support

1/240 panel dimension

With intermediate support

1/360 panel dimension

PART 3: EXECUTION

3.1 SETTING ARCHITECTURAL PRECAST CONCRETE

A. Architectural precast concrete shall be set by experienced mechanics in accord with the approved setting drawings. Thoroughly clean panel then sponge with clean water just before setting. When setting in cold weather, clean by brushing instead of sponging.

B. Set each unit plumb, level and true to line.

C. All joints shall be 1/2" wide, plus or minus 1/8", unless otherwise indicated.

D. Panels shall be lowered in place and support assemblies adjusted, as many times as necessary, so that panels are true horizontally and vertically.

E. Each panel shall be securely braced until all its assembly connections have been secured.

F. All anchorages and/or dowels shall be accurately adjusted and the holes and sinkages filled with the approved mortar, as shown on the drawings.

G. Welding shall be done in accordance with the Standard Code for Arc and Gas Welding in Building Construction of the American Welding Society, AWS 1.0-69.

H. After all parapet panels are set permanently anchored, sawcut reglets (except at inside corners) of dimension and at locations shown on the drawings.

3.2 ERECTION TOLERANCES

A. Precast panels shall be located in the center of their theoretical location on the building and adjusted to accommodate adjacent elements, proper joint width, and alignment with adjacent precast members.

1. Face width of joint

Panel dimension (normal to joint)  
10'-0" or under  $\pm$  3/16"

Panel dimension (normal to joint)  
10'-0" to 20'-0"  $\pm$  3/16"  
- 1/4"

Each additional 10'-0" (normal to joint)	± 1/16"
2. <u>Joint Taper</u>	
Panel edges not parallel length with maximum length of taper of 10'.	1/40" per foot
3. <u>Panel alignment</u>	
Job in alignment of edge	1/4" maximum
Offset in face of panel (exterior face unless otherwise noted)	1/4"

### 3.3 CLEANING

A. After completion of setting and after all danger of stains or damage from other operations on the building has passed, the architectural precast concrete work shall be carefully cleaned down, removing all dirt, mortar stains and other defacements, by using soap powder, boiled in water, and the panels rinsed with clean water. Cleaning work shall not start until all the panels are erected and sealant installed in all the joints. Cleaning shall commence at the top and continue progressively down the face of the building.

B. Rinse all surfaces thoroughly with clean water.

C. Do not use wire brushes.

D. Do not use acid solutions except for minor areas, and then only after approval of the Architect.

### 3.4 REUSE OF EXISTING PRECAST CONCRETE PANELS (Contractor's Option)

A. Contractor may, at his option, reuse existing precast concrete panels from Unit "A" that are removed to accomodate the new construction, subject to the following requirements:

1. Refer to drawings for locations where units may be re-used. Do not use elsewhere.

2. Finish of new units shall match finish of existing units to be reused. Approved samples per Unit "A" are available at Architect's office for Contractor's inspection. University reserves the right to reject up to 10% of the existing removed units for poor finish match.

3. Procedure for reusing precast panels shall be as follows:

- a. Carefully remove units and protect, conform to Article 1.5 herein.
- b. Clean thoroughly at edges. Remove all sealant residue.
- c. Modify existing connections and fabricate into assemblies as required.

(Verify with Owner for adequate finish match, prior to installation.)

- d. Install precast panel assemblies in new construction.
- e. Furnish and install new sealants as per details.
- f. Replace any broken or otherwise damaged panel and any that do not fit properly.
- g. Clean down with new work as per Article 3.3 herein.

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## PART 1: GENERAL

1.1 SCOPE

A. Conditions of Contract and Division 1 - General Requirements, apply to all work of this section. Refer to Article 12 of the Instructions to Bidders, Article 7 of the General Conditions and Section 01600 - Materials and Equipment for requirements on pre-bid and post-bid evaluation of proposed substitute products, methods and other conditions.

B. work under this section includes mortar for all unit masonry.

C. Related work specified elsewhere:

1. Concrete for bond beams and lintels: Section 04200.
2. Unit masonry: Section 04200.

D. Furnished but not installed under this section:

1. Mortar is installed under Section 04200.

1.2 SUBMITTALS

A. Test Reports: Submit information copies of all test reports in duplicate to the Architect.

1.3 PRODUCT HANDLING

A. Handle, transport and store mortar materials in a manner that will prevent damage or deterioration from the elements.

## PART 2: PRODUCTS

2.1 MATERIALS

A. Conform to ASTM standard specifications as follows:

1. Portland Cement: ASTM C150, Type I.
2. Quick Lime: ASTM C5.
3. Hydrated Lime: ASTM C207, Type S.
4. Aggregates: ASTM C144.
5. Water: Clean and free of deleterious amounts of acids, alkalis, or organic materials.
6. Colored Mortar: Colored mortar shall be produced using color additives with Type M mortar. Colors will be selected by the Architect to match grout used with brick covers and quarry tile: Ricketson's Mortar Colors or approved equal color additive; any standard color or mixture of colors may be selected.

## 2.2 MEASURING AND MIXING

A. Measure and mix in accordance with ASTM C270 and the following:

1. Shovel measurement is prohibited.

2. Mix mortar as required for immediate use only and discard any mixed for a period exceeding 2½ hours.

3. MORTAR PROPORTIONS BY VOLUME

Mortar Type	Parts by Volume of Portland Cement	Parts by Volume of Hydrated Lime or Lime Putty	Aggregate measured in a damp, loose condition
M	1	$\frac{1}{4}$	Not less than 2½ times and not more than 3 times the sum of the volumes of the cement and lime used.
S	1	over $\frac{1}{4}$ to $\frac{1}{2}$	

4. Lime Putty: A stiff mixture of lime and water. Keep moist until used. Putty made from quick lime shall be slaked and allowed to soak at least 72 hours before using. Putty made from 92% hydrated lime may be used after mixing.

5. Plain grout: Type M mortar to which water is added to produce consistency for pouring without segregation of the constituents of the mortar. After adding water, stir and work all grout at frequent intervals.

6. Control and accurately maintain the specified proportions of mortar materials during the entire progress of the work.

7. Thoroughly mix cementitious materials and aggregates with the amount of water to produce workability. Machine mix all mortar.

## 2.3 MORTAR PROPERTIES

A. Conform to the property specifications of ASTM 270 and the following:

1. Compressive Strength: The average compressive strength of three 2" cubes of mortar shall not be less than the strength given in the following table for the mortar type specified:

<u>Mortar Type</u>	<u>Average Compressive Strength</u> <u>at 28 days - psi</u>
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## PART 3: EXECUTION

### 3.1 TYPE OF MORTAR REQUIRED

A. Type: Use type M for masonry in contact with earth and Type M or S for all other masonry.

B. Tempering: Adjust the consistency of the mortar to the satisfaction of the mason by adding only as much water as is necessary to obtain workability.

C. Use mortar within two and one half ( $2\frac{1}{2}$ ) hours after mixing. Mortar that has stiffened within this time may be retempered with the minimum amount of water necessary to obtain the desired workability.

### 3.2 TESTING MORTAR

A. Owner will select an independent testing laboratory to perform testing as follows:

B. Determine the water retentivity and compressive strength of mortar in accordance with the Test Procedures described in ASTM C91 with the exceptions noted in ASTM C270. Contractor shall pay for these tests.

C. Before starting masonry work make tests on trial mortar mix. Mix mortar for testing in the laboratory from representative samples of mortar materials and proportions to be used in the construction. Contractor shall pay for these tests.

D. Make compressive strength tests on one set of samples from first mortar batch and as the work progresses for each lot of 1,000 concrete block masonry units of each type of mortar or 5,000 brick masonry units or as directed by the University. Owner will pay for these tests.

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## PART 1: GENERAL

1.1 SCOPE

A. Conditions of contract and Division I- General Requirements, apply to all work of this section. Refer to Article 12 of the Instructions to Bidders, Article 7 of the General Conditions and Section 01600 - Materials and Equipment for requirements on pre-bid and post-bid evaluation of proposed substitute products, methods and other conditions.

B. Work under this section includes furnishing and installing all unit masonry shown on the drawings and specified herein.

C. Related work specified elsewhere:

1. Precast Concrete: Sections 03410, 03450.
2. Mortar: Section 04100.
3. Insulation: Section 07220.
4. Sealants, Gaskets, etc: Section 07900
5. Grout pointing of brick pavers: Section 09300.

D. Installed but not furnished under this section:

1. Mortar: Section 04100
2. Brick pavers: Section 04260.
3. Bearing plates, anchors, etc. for work of other trades: Applicable Sections.
4. Steel lintels, jamb angles, etc: Section 05500.
5. Sound isolation panels for masonry partition, where indicated: Section 13800.

1.2 SUBMITTALS

A. Test Reports: Submit test reports in duplicate indicating compliance with applicable specifications for compressive strength, absorption, weight, moisture content and dimensions for each type of masonry unit. Reports on manufacturer's normal quality control will be acceptable for all units for initial acceptance.

B. See Article 2.1 for test reports of units at job.

### 1.3 PRODUCT HANDLING

- A. Handle, transport and store at the job site in a manner that will avoid damage.
- B. Protect concrete masonry units from wetting prior to use. Cube units on pallets at the time of manufacture and deliver to the job with waterproof coverings. Make sure that units remain covered on the job.

### 1.4 ENVIRONMENTAL CONDITIONS

- A. In freezing weather, lay no masonry when the temperature of the outside air is below 40°F, or is anticipated to fall below 40°F, unless suitable means are provided to heat the masonry materials and protect the completed work from freezing.
- B. Heat the masonry materials to at least 40°F and maintain an air temperature above 40°F on both sides of masonry for at least 48 hours if Type M mortar is used, and 72 hours if Type S mortar is used.
- C. In order to avoid "thermal shock" in concrete block walls, turn heat (either temporarily, or permanently) on or off at a rate not to exceed 2°F per hour or approximately 50°F per 24 hours.

## PART 2: PRODUCTS

### 2.1 MASONRY UNITS

A. Concrete masonry units shall be of modular dimensions and shall be high pressure steam cured in an Autoclave at a temperature of 350°F to 365°F and a pressure of 120 to 150 psi and shall conform to the ASTM specifications and the modifying and additional requirements as indicated below:

- 1. Hollow load-bearing units: ASTM C90, grade U-1. Use for all concrete masonry units unless otherwise indicated or specified.
- 2. Hollow non-loadbearing units: ASTM C129, type 1. Use only for 4" thick partitions.
- 3. Solid load-bearing units: ASTM C145, grade U-1. Use only where solid or filled block is indicated or specified.
- 4. Concrete building brick: ASTM C55, grade U-1.
- 5. Normal weight units shall be made of approved sand and gravel aggregates and shall have an oven-dry weight of not less than 125 lb. per cubic foot. Use only in basement level.
- 6. Lightweight units shall be made of expanded clay or shale or other lightweight aggregates conforming to ASTM C331 and shall have an oven-dry weight of less than 105 lb. per cu. foot. Use wherever concrete block is indicated except in basement.
- 7. Face shell and web thicknesses shall conform to Table IV of ASTM C90 except that twelve (12) inch wide units shall have a face shell thickness of not less than one and one-half (1½) inches.

8. The lineal shrinkage tested by the modified British Method (ASTM C426) shall not exceed the following:

Normal weight sand and gravel units	.020%
Lightweight units	

9. Fire-resistance rated units shall meet requirements of the Underwriters' Laboratories, Inc. as to minimum face shell and web thickness to produce fire ratings as indicated on the drawings.

10. Provide special shapes of ordinarily available types such as bullnose units, header units, jamb units, cap blocks, etc.

11. General Appearance Requirements: Units shall be light in color, with uniform fine texture, free of face smears. Broken units shall not be used and chipped or other defective units will not be acceptable or used where exposed. Not over 5% of units will be permitted to have chips and chips shall not exceed 3/8" in any dimension. Exposed concrete unit walls to have units uniform in size, texture and color, including all shapes. Architect reserves right to reject a unit masonry manufacturer, if in Architect's opinion, unit quality, color or texture is unacceptable with design intent. Appearance requirements may be waived by University (at its option) for concealed units.

12. Tentative Acceptance: For tentative acceptance of blocks (or brick) provide tests and reports on minimum of five units, from current stock to provide proof of ability to conform to ASTM Standards. Texture, dimension, tolerance, appearance and test reports will be basis for tentative acceptance of supplier of blocks. Provide samples to Architect for appearance approval.

13. Tests of Units at Job: Provide units which match accepted samples as to texture and general character. Upon delivery of first units to job, submit at least five samples (taken at random) from units at jobsite to independent testing laboratory from stock at job (selected at random) for next 2,000 units, five samples for series of tests for following 5,000 units and five for every 10,000 units thereafter. In the event any series of tests indicate non-conformance, additional tests may be ordered. If units continue to be below requirements, entire lot will be rejected and supplier rejected, at Architect's option. Appearance will be an element considered for conformance. Contractor shall arrange for all tests, for delivery to laboratory, and pay for tests.

B. Precast splash blocks: Molin Type B, or approved equal. Provide one splash block on roof beneath each scupper, where scupper spills on to the roof.

C. Facing brick and glazed brick for patching existing brick walls or noted to match clay brick ASTM C216, Grade SW; color, size and texture shall match brick in wall being patched, as approved by the University. Salvaged face brick from the demolition requirements of any existing building, may be reused for patching existing brick walls in that building. Brick to be reused must be sound and clean, free of all existing mortar.

D. Brick Pavers: Furnished under Section 04260.

## 2.2 ANCHORS, TIES, ACCESSORIES

- A. Zinc coating of anchors and ties: ASTM A153, Class B-2.
- B. Zinc coating of wires: ASTM A116, Class 3.
- C. Wire mesh ties: 22-gauge galvanized sheet steel, 7/8" wide, not less than 6" in length.
- D. Concrete block wall reinforcing: galvanized, butt welded truss design, formed from #9 gauge wire with deformed side rods. Provide in widths of manufactured standards for each wall thickness. Dur-O-Wall or AA Wire Products.
- E. Brick Block Vents: Dual face block vents of size indicated. Construction Specialties, Inc. or approved equal.
- F. Wall anchorage: Brock-White #4211 Ankortite, or approved equal.
- G. Anchorage to Steel: Dur-O-Wal triangular ties with column anchors.
- H. Adjustable wall ties: AA, Dur-O-Wal, Lox-all, or approved equal, rectangular type, galvanized.
- I. Bond Breaker: Asphalt-saturated building felt 15 lb. per 100 sq.ft.
- J. Preformed fillers: W.R. Grace semi-rigid Rodofoam, or approved equal.

## 2.3 BITUMINOUS SETTING BED FOR BRICK PAVERS

- A. The bituminous setting bed shall consist of 7% hot asphalt with a penetration at 77°F of between .85 and 1.00 centimeters, mixed with fine, clean, dry sand which is free from all alkali salts and organic matter. The mix shall be heated to approximately 300°F at an asphalt plant. Each ton shall be proportioned as follows: 145 lbs. asphalt to 1855 lbs. sand.

## 2.4 BLACK MASTIC

- A. Material for laying brick pavers shall be highly adhesive asphalt cement consisting of crude asphalt, carefully refined, mixed with hydrocarbon solvent and long-fiber asbestos, components homogenized to a uniform consistency to the following approximate proportions:

- Asphalt content 60%
- Hydrocarbon solvent 30%
- Long-fiber asbestos 10%

- B. Acceptable product: SS-1 by Sickels Co.

## PART 3: EXECUTION

### 3.1 PROTECTION OF EXTERIOR WORK

- A. Protect all facing material, sills, ledges, etc., against staining and keep top of walls covered with non-staining waterproof coverings when work is not in progress.
- B. During erection keep walls dry by covering at the end of each day or shutdown period. Protect partially completed walls not being worked on similarly at all times. Overhang coverings at least 2 feet down each side of wall, and securely anchor.
- C. When work is resumed, clean off all loose mortar from top surface.

### 3.2 MORTAR

- A. Mortar proportioning and mixing is specified in Section 04100.
- B. Tempering: The consistency of mortar may be adjusted to the satisfaction of the mason, but only as much water shall be added as is necessary to obtain desired workability.
- C. Mortar shall be used within two and one-half (2½) hours after mixing. Mortar that has stiffened within this time may be retempered with the minimum amount of water necessary to obtain desired workability.
- D. Type: All masonry shall be laid in mortar of the type specified in the table below:

#### TYPE OF MORTAR REQUIRED

<u>Kind of Masonry</u>	<u>Mortar Type</u>
Masonry in contact with the ground	M
Masonry above grade	S

### 3.3 LAYING CONCRETE BLOCK

- A. Lay concrete block in straight, uniform courses, plumb and true to line and plane in running bond pattern unless otherwise indicated on the drawing.
- B. Use face shell bedding with full coverage of face shells for hollow units, full bed for solid units.
- C. Cut flush all joints in block for tooling as specified in paragraph 3.7.
- D. Cut flush all joints in concealed spaces. Fill solid with concrete, two courses under bearing plates, top course of all bearing walls and under beam and lintel bearings. Provide control joints as shown on the drawings.
- E. Hollow masonry units shall be filled solid with mortar or concrete at following locations:
1. The first two cells of units abutting door frames.
  2. All cells of units of course immediately above head of door frames.
  3. All cells of units where called for on Architectural Drawings.
  4. Where necessary for embedment of anchors, bolts, bearing of steel members, and where shown.
- F. Wherever metal items, anchors, bolts, etc., are embedded in mortar or concrete within the concrete unit masonry, provide screen wire stops of galvanized steel insect screening to prevent mortar, or crete from dropping through the voids below.
- G. Reinforce all concrete block masonry work with wall reinforcing starting at second course and at every second course thereafter. Bond facing units to backing with tabtie reinforcing and metal ties. Wall reinforcing splices shall have 6" laps. Corners shall be formed by cutting and bending to fit or by use of above and below openings or recesses where possible. Terminate reinforcing on each side of control joints.



H. Unless otherwise shown, bond each course at corners and intersections, and break vertical joints at least 4". Fill in with concrete brick where units cannot be used. Provide recesses for built-in items.

I. Horizontal Control Joints: All full height non-loadbearing walls and partitions shall be finished 3/8" below concrete slab above for filler and caulking under Section 07900.

J. Vertical Control Joints: Construct as detailed (35/11-4).

K. Partitions that abut exterior walls and columns shall be bonded thereto at least once every two feet in height. Use rigid steel anchors where bonding is not possible.

L. Provide reinforced concrete block lintels over all square head openings unless otherwise noted on the drawings and as detailed. Use bond beam (8" high only) units to construct lintels at exposed locations. Fill lintels solid with concrete and reinforce with steel rods as shown on the drawings and as specified in Section 03200. Provide a minimum of 8" bearing at ends. Provide shoring for at least 7 days after setting, or precast at least 7 days before setting.

M. Construct bond beams as detailed. Concrete fill is furnished under Section 03300, installed under this section.

N. When flashing is to be laid on or against masonry, the surface of the masonry shall be smooth and free from projections which might puncture the flashing material. Weep holes spaced not more than 24" on center shall be provided in the bed joints in the first course immediately above all flashings.

O. Build in properly all anchors, ties, plates, joists, beams, lintels, flashings, inserts, etc., which come in contact with masonry work. Consult other trades in advance and make provisions for installation of their work in order to avoid cutting and patching. Build in work specified under other sections of these specifications as the work progresses. Grout hollow metal frames full of mortar.

P. Set steel lintels in full beds of mortar. Fill solid with mortar around jambs and heads of metal door bucks and frames as walls are laid.

Q. Provide all necessary openings and chases in walls or partitions to take the work of other trades and build in all sleeves, hangers, supports or forms furnished by and placed by them providing such openings are located and such necessary items are furnished and placed by the other subcontractors in advance of construction. No cutting or drilling shall be done without the permission and instruction of the General Contractor and the University.

R. Where new brickwork is laid in existing brick walls it shall be properly bonded or tied with metal ties and shall be toothed in as required to provide a plane surface. Bond, joint, and pattern shall match existing.

S. Fill all vertical and longitudinal joints with mortar by back parging the facing or by pouring full with grout.

T. Use solid units or fill hollow units with mortar or concrete wherever flashing reglets in new masonry are indicated.

U. Start all block walls with 4" coursing unless otherwise indicated, and terminate a minimum 4 inches above ceiling, unless otherwise indicated.

V. Install sound isolation panels for isolated masonry partitions in accord with the details and the instructions of the isolation materials manufacturer.

### 3.4 LAYING BRICK AND BRICK PAVERS

#### A. Wetting Clay Masonry Units:

1. All brick having absorption rates (determined in accordance with ASTM Specifications C67) in excess of 0.025 oz. per sq. in. per min. shall be wetted sufficiently so that the rate of absorption when laid does not exceed this amount.

2. The method of wetting shall be such as to insure that each unit is nearly saturated, surface dry when laid. During freezing weather, units that require wetting shall be sprinkled with warm water just before laying.

B. Pattern Bond: Exposed masonry shall be laid in center bond or in the bond pattern indicated on the plans. In unexposed masonry, all vertical joints shall be bonded by at least 2".

C. Joining of Work: Where fresh masonry joins masonry that is partially set or totally set, the exposed surface of the set masonry shall be cleaned and lightly wetted so as to obtain the best possible bond with the new work. All loose brick and mortar shall be removed.

#### D. Workmanship:

1. All masonry shall be laid plumb and true to lines. Brick shall be laid with completely filled mortar joints. The ends of brick shall be buttered with sufficient mortar to fill the end joints. The vertical, longitudinal joints in all except cavity walls shall be completely filled by parging the back of the facing or by pouring the vertical joint full of grout. Closures shall be rocked into place with the head joints thrown against the two adjacent bricks in place.

2. In laying brick the mason shall avoid over-plumbing and pounding of the corners and jambs to fit stretcher units after they are set in position. Where an adjustment must be made after the mortar has started to harden, the mortar shall be removed and replaced with fresh mortar.

#### E. Anchoring:

1. Exterior brick walls facing against or abutting concrete members shall be anchored to the concrete by the use of dovetailed flat-bar or wire anchors inserted in slots built into the concrete. Anchors shall be spaced not more than 18" vertically and 24" horizontally.

2. A space not less than  $\frac{1}{2}$ " width shall be maintained between masonry wall and concrete members. This space shall be kept free of mortar or other rigid material so as to permit differential movement between concrete and masonry.

#### F. Flatwork (Brick Pavers):

1. Installing Setting Bed: Place  $\frac{3}{4}$ " deep depth control bars directly over the base. If grades must be adjusted set wood chocks under depth control bars to proper grade. Set two bars parallel to each other approximately 11' apart to serve as guides for striking board (12' long 2" x 6" board). The depth control bars must be set carefully to bring the pavers, when laid, to proper grade. Place some bituminous bed between the parallel depth control bars. Pull this bed with the

striking board over bars several times. After each passage, low or porous spots shall be showered with fresh bituminous material to produce a smooth, firm and even setting bed. While hot, roll bituminous course to a dense, compact surface with a one ton steel roller. While placing and rolling, maintain asphalt temperature to not let than 220°F. As soon as this initial panel is completed, and rolled, advance the first bar to the next position in readiness for striking the next panel. Carefully fill up depressions that remain after removing the depth control bars and wood chocks. One ton of bituminous bed should provide approximately 225 sq. ft. of setting bed 3/4" thick.

2. At snow melting mat locations under brick pavers, install base course layer, similar to above. Coordinate installation of snow melting mat by Electrical Contractor. Then carefully install second layer (setting bed) as above, so as not to damage the mat.

3. Setting Brick Pavers: Trowel or spray a black mastic to a depth not to exceed 1/16". When dry to the touch lay brick pavers in basket weave pattern in accordance with drawings. Set brick pavers immediately after rolling and tamp into place in uniform plane.

4. While setting bed is still flexible, lay plywood over the set brick and roll with 300 lb roller moving plywood in increments which will provide for true surfaces from feature strip to feature strip. Edges of panels of pavers shall be set flush with surrounding surfaces. After rolling and removing plywood, individual pavers set below surrounding units shall be removed, raised, reset and pounded or rolled to level of surrounding units.

5. At perimeters of all panels of brick pavers, at other locations shown on the drawings, and as required to provide that the maximum dimension of any panel is approximately 24' - 8", set preformed expansion joint filler in joint and through setting bed to concrete substrate. Top of filler shall be 1/4" below the surface of brick pavers.

6. Fill voids between brick pavers with plain grout and rake back to a depth of 1/2". Grout shall be ASTM C270 Type N mortar containing 1 to 3/4 parts of hydrated lime to one part Portland cement and aggregate with volume equal to 2 1/2 to 3 times the sum of the combined volumes of cement and lime.

7. Grout pointing of joints is a requirement of Section 09300. Sealant at expansion and control joints is specified under 07900.

### 3.5 JOINTS

A. Where fresh masonry joins masonry that is partially set or totally set, the exposed surface of the set masonry shall be cleaned so as to obtain the best possible bond with the new work.

B. If it becomes necessary to "stop off" a horizontal run of masonry, this shall be done only by racking back one half unit length in each course, and, if grout is used, stopping group 4" back of the rack. Tothing will not be permitted, except upon written approval of the University.

C. Where cutting of exposed units is necessary, the cuts shall be made with a motor-driven saw.

D. Exposed mortar head and bed joints in block walls shall have a thickness equal to the difference between the actual dimension and the nominal dimension of the unit either in height or in length, but in no case less than  $\frac{1}{4}$ " nor more than  $\frac{1}{2}$ ". Joints shall be as uniform as possible.

E. Exposed mortar joints in brick work shall be raked back to a depth of  $\frac{1}{2}$ " after the joints have begun to set, in preparation for pointing with colored mortar.

F. Where flashing reglets are indicated in new or existing masonry, cut such reglets using a motor driven masonry saw.

### 3.7 POINTING, TOOLING, CLEANING

A. Exposed joints in walls of concrete masonry units shall be, unless otherwise noted, tooled with a round or other approved jointer when thumb-print hard. The jointer shall be slightly larger than the width of the mortar joints so that complete contact is made along the edges of the units, compressing and sealing the surface at the joint. Wipe joint, if necessary, to remove all excess mortar, so no rough edges remain.

B. Joints in new brickwork in existing walls shall be tooled to match existing joints.

C. Point up mortar joints in vertical masonry (except brick pavers) with the specified colored mortar. Press colored mortar well into raked joint and when thumbprint hard compress joint as for other masonry.

D. Cleaning: (including brick pavers)

1. Upon completion, cut out defective mortar joints, cut out cracked, broken, chipped or badly scratched brick or block and replace with matching units. Point up all exposed masonry.

2. Clean test panels to test cleaning method before actual cleaning is begun. Test or protect all surrounding non-masonry surfaces from cleaning materials or fumes.

3. Remove all excess mortar spots, drips and smears from face brick and exposed concrete block.

4. A minimum curing and drying period of twenty-eight (28) days shall elapse between topping out of a masonry wall section and the start of the cleaning operation.

5. Following the curing period, all face brick, exterior and interior shall be cleaned with specified cleaning solution. Clean, potable water shall be readily available for cleaning operations.

6. Pre-soak prior to cleaning operations.

7. Saturate masonry with clean water and flush off loose mortar and dirt. Scrub do walls with a solution of  $\frac{1}{2}$  cup trisodium phosphate (Calgon) plus  $\frac{1}{2}$  cup household detergent dissolved in one gallon of clean water. Scrub with a stiff fiber brush only. Thorough wash off all cleaning solution, dirt and mortar crumbs using clean pressurized water. Sonneborn-Contech and Sure-Klean masonry cleaners will be acceptable.

8. Do not use muriatic acid or proprietary cleaning compounds without the prior written approval of the Architect. Do not use metal cleaning tools and brushes or abrasive powders.

## PART 1: GENERAL

1.1 SCOPE

A. Conditions of Contract and Division 1 - General Requirements, apply to all work of this section. Refer to Article 12 of the Instructions to Bidders, Article 7 of the General Conditions and Section 01600 - Materials and Equipment for requirements on pre-bid and post-bid evaluation of proposed substitute products, methods and other conditions.

B. Work under this section includes the furnishing of brick pavers.

C. Furnished but not installed under this section:

1. Brick Pavers: Installed under Section 04200.

1.2 HANDLING, DELIVERY AND STORAGE

A. Handle, transport and store at the jobsite in a manner that will avoid damage. Broken or chipped brick shall not be used.

B. Protect brick tile from the elements until ready to use. Store on wood pallets, off the ground or stack on building floors.

C. Where danger of soiling brick with other materials which would interfere with proper bond with mortars or would otherwise stain faces, provide non-staining coverings.

## PART 2: PRODUCTS

2.1 MATERIALS

A. Brick Pavers: To match existing pavers in Unit "A", Endicott Clay Products Company's Manganese - approximately 70% dark blend and 30% medium blend Ironspot Blend Floor Brick, modular 4" x 8" x 2 $\frac{1}{4}$ " thick.

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## PART 1: GENERAL

1.1 SCOPE

A. Conditions of Contract and Division 1 - General Requirements, apply to all work of this section. Refer to Article 12 of the Instructions to Bidders, Article 7 of the General Conditions and Section 01600 - Materials and Equipment for requirements on pre-bid and post-bid evaluation of proposed substitute products, methods, and other conditions.

B. Work under this section includes the following:

1. The unloading and erection of all structural steel and related items, including the structural components (connections for precast panels), furnished under the Unit F Early Contract Steel P/N contract.

2. Structural steel and related items include trusses, shapes, plates, slide bearings flat steel floor plates, checkered floor plates, end connections, connection bolts, expansion bolts, anchor bolts, headed anchor studs, shear connector studs and other structural steel items shown on the drawings.

C. Related work specified elsewhere:

1. Precast Concrete Panel Connections, except for structural components (connections for precast panels) furnished under the Unit F Early Contract Steel (P/N-ECS) contract: Section 03450.

2. Metal Decking Erection: Section 05302.

3. Fireproofing of Steel: Section 09841.

D. Furnished by Owner:

1. Retaining and paying for Testing agency.

E. Furnished and delivered under other Contracts:

1. The structural steel and related items including the structural components (connections for precast panels), included under the Unit F Early Contract Steel (P/N -ECS).

2. Sufficient copies of the approved fabrication and erection drawings of the structural steel and related items included under the Unit F Early Contract Steel (P/N-ECS) contract for use in field erection.

1.2 REFERENCE STANDARDS

A. The following specifications and standards are incorporated by reference:

1. American Institute of Steel Construction (AISC), Specification for the Design Fabrication and Erection of Structural Steel for Buildings, February 12, 1969 and Supplements 1 through 3.

2. AISC, Code of Standard Practice for Steel Buildings and Bridges, adopted effective July 1, 1970.
3. AISC, Specification for Structural Joints using ASTM A325 or A490 Bolts.
4. American Welding Society, Code for Welding in Building Construction D1.1-72.
5. Steel Structures Painting Council Manual, Volume 2, Systems and Specifications, Second edition, 1969.

B. Where ASTM standards or specifications or other recognized trade or industry standards or specifications are referenced in this specification, such standards or specifications shall be the latest editions effective at the time of bidding.

### 1.3 QUALIFICATIONS

A. Welding procedures, welders, welding operations and tackers shall be qualified in accordance with AWS Building Code. Inspection of such qualifications shall be in accordance with Article 604 of AWS Code.

### 1.4 PRODUCT HANDLING

A. Handle, store and erect structural steel and related items in a manner that will avoid damage or deformation.

B. Storage of Materials:

1. Structural steel members which are stored at the project site shall be above ground on platforms, skids or other supports.

2. Other materials shall be stored in a weathertight and dry place, until ready for use in the work.

3. Packaged materials shall be stored in their original unbroken package or container.

## PART 2: PRODUCTS

### 2.1 MATERIALS

A. With the exception of a portion of the precast concrete panel connections specified to be provided under Section 03410, all structural steel and related items, including the remainder of the structural components for precast concrete panel connections, will be furnished and delivered to the site under the Unit F Early Contract Steel (P/N- ECS) contract.

B. Grout: Pre-mixed, nonshrinking grout, Master Builders Embraco Grout, U.S. Grout company Five Star Grout, Sonneborn Ferrolith G "D.S.", or approved equal.

C. Welding Electrodes: #70XX.

D. Touch up paint for galvanized steel shall be Z.R.C., Cold Galvanizing Compound, or approved equal.

## PART 3: EXECUTION

### 3.1 ERECTION

A. Erect structural steel as shown on approved erection drawings and in accordance with the AISC Specification and AISC Code of Standard Practice.

B. There is no available storage on site for structural steel. Erection shall be accomplished directly from the trucks.

C. Bolted connections: Use ASTM A325, or ASTM A490 bolts as shown or noted on the drawings.

D. Welded connections: Make welded connections as shown on the structural drawings and in accordance with AWS Code for Welding in Building Construction.

E. Bracing: Provide temporary bracing and connections in accordance with Article 1.25 of the AISC Specification.

F. Touch-Up Painting: Where steel is shop painted touch-up connections and abraded spots with specified primer after erection. Where steel is galvanized use touch-up paint specified under 2.1.D.

G. Column Bases and Bearing Plates:

1. Bearing Plates shall be aligned with wedges or shims.

2. Column base plates shall be aligned with jack screws.

H. Erection Tolerances: The structural steel framing shall be erected to be within the tolerances specified in Article 7(h) of the AISC Code of Standard Practice for Steel Buildings and Bridges, except that the displacement of the center-lines of exterior columns and columns adjacent to elevator shafts, from the established column lines, shall not be more than  $\frac{1}{2}$  inch at any point.

I. Field Assembly:

1. Structural steel frames shall be accurately assembled to the lines and elevations indicated, within the specified erection tolerances.

2. The various members forming part of a complete frame or structure after being assembled shall be aligned and adjusted accurately before being fastened.

3. Fastening of splices of compression members shall be done after the abutting surfaces have been brought completely into contact.

4. Bearing surfaces and surfaces which will be in permanent contact shall be cleaned before the members are assembled.

5. Install slide bearings as noted and detailed on the drawings.

6. Splices shall be permitted only where indicated.

7. Field connections shall be as specified on the drawings.



8. Report to the Architect any construction deviation that prevents the proper assembling, fitting or connecting of structural steel and obtain his approval of all reaming, chipping, cutting, welding, shimming or any other method of correction to be used

9. Do not cut openings in the field through structural steel members for the passage of conduit, pipes, ducts, etc., without obtaining prior approval of the Architect. Whenever approval to cut openings in the field is obtained, provide openings and additionally reinforce the member as directed by and under the supervision of the Architect.

J. Headed stud type shear connectors and Headed Anchor Studs: Automatically end weld in the field in accordance with Articles 431 and 432 of AWS Building Code; spaced as indicated.

K. Gas Cutting: Field correcting of fabrication by gas cutting shall not be permitted on any major member in the structural framing without prior approval of the Architect.

L. Grouting: Install a full bed of the specified mortar grout under all structural steel bearing on concrete. Proportion, mix and place in accordance with the manufacturer's instructions.

M. Checkered Floor Plates: Install floor plates for the Mezzanine Floor at elevation 1021'-1", as shown on Drawing Sheet S-40, in accordance with the approved fabrication and erection drawings and fasten plates in place by field welding to the supporting members using intermittent welds spaced not over 3'-0" center to center on the underside of the plates.

### 3.2 FIELD QUALITY CONTROL

A. Testing Agency retained and paid by Owner will perform the following:

1. Inspection of erected structural steel work for conformance with the requirements specified.

2. Inspection of Field Assembled High Strength Bolted Connections shall be in accordance with Section 6, AISC Specifications for Structural Joints.

3. Inspection of Field Welds shall be in accordance with Section 6 of AWS Code and as follows:

a. Ultrasonic inspection of the field welds indicated in accordance with Appendix C of AWS Code.

B. Stud welding inspection of field welded studs in accordance with Article 433 of AWS Code.

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## PART 1: GENERAL

1.1 SCOPE

A. Conditions of Contract and Division I-General Requirements, apply to all work of this section. Refer to Article 12 of the Instruction to Bidders, Article 7 of the General Conditions and Section 01600 - Materials and Equipment for requirements on pre-bid and post-bid evaluation of proposed substitute products, methods, and other conditions..

B. Work under this section includes the following:

1. The unloading and erection of all metal decking and accessory items.

C. Related work specified elsewhere:

1. Concrete Formwork: Section 03100.
2. Concrete Reinforcement: Section 03200.
3. Cast-in-Place Concrete: Section 03300.
4. Structural Steel Erection: Section 05122.
5. Decking at Intermediate Stair Landings: Section 05500.
6. Sprayed Fireproofing: Section 09841.

D. Furnished and delivered under other contracts:

1. The metal decking and accessory items furnished under Unit F Early Contract Steel (P/N-ECS).

2. Approved fabrication (four copies) and erection (six copies) drawings of the metal decking and accessory items for use in field erection furnished under the Unit F Early Contract Steel (P/N-ECS) contracts.

1.2 REFERENCE STANDARDS

A. The following standards or specifications are incorporated by reference:

1. Steel Roof Deck Design Manual published by the Steel Deck Institute.
2. American Welding Society (AWS), Code for Welding in Building Construction D1.1-72.
3. Metal Roof Deck Technical Institute Code.

B. Where ASTM Standards of specifications or other recognized trade or industry standards or specifications are referenced in this specification, such standards or specifications shall be the latest editions effective at time of bidding.

1.3 QUALIFICATIONS

A. Welding procedures, welders, welding operations and tackers shall be qualified in accordance with AWS Code. Inspection of such qualifications shall be in accordance with Article 604 of AWS Code.

#### 1.4 PRODUCT HANDLING

A. Handle and store metal decking in a manner that will avoid damage or deformation.

B. Storage of Materials:

1. Metal decking which is stored at the project site shall be above ground on platforms, skid, or other supports with one end elevated for drainage, and protected from the elements with a waterproof covering.

2. Other materials shall be stored in a weathertight and dry place, until ready for use in the work.

3. Packaged materials shall be stored in their original unbroken package or container.

C. The decking shall not be used for storage of materials or as a working platform until the sheets have been securely fastened in position and shall not be damaged or overloaded during the entire construction period.

#### PART 2: PRODUCTS

##### 2.1 MATERIALS

A. All metal decking and accessory items shall be furnished and delivered to the site, under the Unit F Early Contract Steel (P/N-ECS) contract.

#### PART 3: EXECUTION

##### 3.1 CUTTING AND DRILLING STEEL SUBFLOORS

A. Where large predetermined openings for stairs, elevators, work of other trades, etc. are shown on drawings and where subfloors must fit over or to structural fittings and components, the steel subfloors shall be engineered by the manufacturer to fit these conditions. The structural support and reinforcing required for these openings is specified under Section -5121.

B. Refer to structural notes for field cutting of openings through the metal decking and for the requirements of additional reinforcing at these openings.

C. Supports at columns, and any other miscellaneous supports required to carry the metal decking are noted and detailed on the drawings and specified under Section 05121.

##### 3.2 ERECTION

A. Erection of the metal decking shall be performed according to the manufacturer's standards and as noted on Sheet S31.

B. There is no available on site storage for metal decking. Erection shall be accomplished directly from the trucks.

C. Units shall be placed on supporting steel framework and adjusted to final position before being permanently fastened. Each unit shall be brought to proper bearing on the supporting beams. If the supporting beams are not in proper alignment or at proper level, Contractor shall have corrections made.

- D. Install and properly space lip hanger tabs 1'-0" o.c. in all side joints of composite units except at stair landings.
- E. Units shall be placed in straight alignment for the entire length of the deck; and with minimum of space between ends of abutting units.
- F. Panels shall be fastened to the steel framework at ends and at intermediate supports by weld. Where two units abut, each unit shall be so fastened to the steel framing. Weld deck to insure sound and permanent welds to supporting steel. Use methods which will insure welds occurring entirely over supporting steel; burn no holes off the supporting steel. Replace any panel where weld hole is visible from below. Reweld any unsound, inadequate, broken or otherwise defective weld. Where beams are parallel to deck span, weld deck to beam at 2'-0" o.c.
- G. End closures of the panel are to be fastened by tack welding or sheet metal screws not more than 4'-0" on center.
- H. Side laps of the panels are to be fastened by tack welding not more than 3'-0" on center. Sheet metal screws shall not be used.
- I. All welding shall be done by competent experienced welding mechanics.
- J. Access holes provided for welding of floor units to steel framing shall be covered with recessed cover caps secured into position.
- K. Cut and place column closures as indicated on erection drawings.

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## PART 1 GENERAL

1.1 SCOPE

- A. Conditions of Contract and Division 1-General Requirements, apply to all work of this section. Refer to Article 12 of the Instructions to Bidders, Article 7 of the General Conditions and Section 01600 - Materials and Equipment for requirements on pre-bid and post-bid evaluation of proposed substitute products, methods and other conditions.
- B. Work under this section includes furnishing and installing all utilitarian miscellaneous metal and ornamental metal items manufactured, fabricated or otherwise specially modified to meet requirements of this Project and not specified under other sections of this specification or provided under other contracts. In general, this includes field applied (welded, embedded, bolted, anchored, etc.) metal items adjacent to other materials. "Field-weld" is the key term used to identify miscellaneous metal items in relation to main structural steel members indicated on architectural drawings. Use the following listing only as general guide to clarify the intent of work provided under this Section as to general type. Do not construe as listing or describing all required items.

The extent of metal fabrications work is shown on drawings and includes items fabricated from iron and steel shapes, plates, bars, strips, tubes, pipes and castings and certain aluminum and non-ferrous metal products which are not a part of structural steel or other metal systems in other Sections of these specifications.

## C. Related Work Specified Elsewhere:

1. Architectural Precast Concrete (including anchorage and panel connections as noted): Section 03410.
2. Structural metal: Sections 05121 and 05122.
3. Metal Decking: Sections 05301 and 05302.
4. Special formed metal (including formed metal handrails and formed metal guardrails): Section 05750.
5. Preformed metal siding: Section 07411.
6. Caulking and Sealing (including aluminum retained plate at gasket seal at expansion joints): Section 07900.
7. Hollow metal doors and frames: Section 08110.
8. Curtainwall Systems (including reinforcing and support steel at bridges and where noted): Section 08900.
9. Preformed metal soffits and ceilings: Section 09541.
10. Service Columns: Section 11611, Division 16.
11. Ceiling service panels and other metal occurring at ceiling: Section 13500.

## D. Furnished under other contracts:

1. Structural steel under ECS Contract.

1.2 QUALITY ASSURANCE

- A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication, where possible. Do not delay job progress; allow for

trimming and fitting wherever taking field measurements before fabrication might delay work.

B. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordination.

C. Quality of Work: Miscellaneous and ornamental metals have been combined in one metal fabrications section as result of close relationship of various elements and since similar end products would be provided under separate sections. Do not construe the combining of two sections as relieving Contractor of furnishing and installing exposed work, where appearance is a prime consideration, in any other manner than to highest quality of work. Deliver, store and protect such items (where first and highest quality work is required for appearance) and any in unsatisfactory condition will be rejected.

D. Subcontractor: All work shall be fabricated and provided by a fully qualified, experienced firm with a history of providing satisfactory metal work of the types included herein, and which is acceptable to Architect. If necessary to insure meeting of quality requirements, all work of this Section shall be provided by a fabricator specializing in ornamental work.

E. Standards in General: Conform to standards of Architectural Metal Manufacturers Association in absence of project specification or drawing requirement.

F. Exposed Work: Appearance is a prime consideration for items similar to those designated above. For such exposed items, all aluminum shall have fine satin and uniform finish, all stainless steel shall have #4 finish, unless otherwise specified. Steel shall be smooth surfaces, cold formed, cold rolled or drawn steel that is free from blemishes. Where necessary to use structural steel shapes for "finished" items, exposed surfaces shall be finished to provide surfaces similar to cold formed work.

### 1.3 SUBMITTALS

A. Manufacturer's Data, Metal Fabrications:

1. For information only, submit 2 copies of manufacturer's specifications, anchor details and installation instructions for products to be used in the fabrication of miscellaneous metal work, including paint products. Indicate by transmittal that copy of instructions has been distributed to Installer.

B. Shop Drawings, Metal Fabrications:

1. Submit shop drawings for fabrication and erection of miscellaneous metal fabrications. Include plans, elevations, and details of sections and connections. Show anchorage and accessory items. Provide templates for anchor and bolt installation by others.

C. Samples; Metal Fabrications:

1. Fabrication: 12" long sample of all various types of railing including vertical supports and a sample of each wall mounting bracket. Submit sample of each grating and foot grille.

2. Aluminum Finishes: Submit three range samples for each alloy to indicate maximum permissible color variation. Minimum sample size shall be 12" long. After selection by the Architect of two samples establishing maximum acceptable color range, such samples shall be used for visual comparison in natural outdoor light at fabrication and erection. Members determined to be outside the acceptable range shall be rejected.

## PART 2 PRODUCTS

### 2.1 STANDARD MATERIALS AND COMPONENTS

- A. Metal Surfaces, General: For fabrication of miscellaneous metal work which will be exposed to view, use only materials which are smooth and free of surface blemishes including pitting, seam marks, roller marks, rolled trade names and roughness.
- B. Where appearance is of prime consideration, provide cold rolled steel and non-structural shapes of mild steel which has been cleaned or pickled and rolled or drawn through dies producing a material free from scale and accurate to size or gauge, equal to samples in Architect's office. Structural shapes, where appearance is a prime consideration (and shapes noted or specified as cold rolled but not so made) shall be sand blasted as necessary to achieve unblemished smooth surface, essentially equivalent to cold rolled steel. Select steel for exposed work to eliminate dented, bent, crooked, warped or otherwise damaged steel and to provide best possible appearance. Provide full length pieces, no built-up lengths, crops or stubs. Provide tube and pipe steel that is straight, with proper wall thickness, free of dents, warps, twist or similar defects.
- C. Steel Plates, Shapes and Bars: ASTM A36.
- D. Steel Plates to be Bent or Cold Formed: ASTM A283, Grade C.
- E. Steel Tubing: Hot-formed, seamless, ASTM A501.
- F. Steel Bars and Bar-Size Shapes: ASTM A306, Grade 65, or ASTM A36.
- G. Cold-Finished Steel Bars: ASTM A108, grade as selected by fabricator.
- H. Cold-Rolled Carbon Steel Sheets: ASTM A366.
- I. Galvanized Carbon Steel Sheets: ASTM A526, with ASTM A525, G90 Zinc coating.
- J. Malleable Iron Castings: ASTM A47, grade as selected.
- K. Steel Pipe: ASTM A53; type as selected; Grade A; black finish unless galvanizing is required; standard weight (Schedule 40), unless otherwise indicated.
- L. Concrete Inserts: Threaded or wedge type, galvanized ferrous castings, either malleable iron ASTM A47 or cast steel ASTM A27. Provide bolts, washers and shims as required, hot-dip galvanized, ASTM A153.
- M. Nonshrink Nonferrous Grout: CE ORD C588.

N. Aluminum: Extruded shapes or alloy required to obtain specified finish, tempered to strength required. Structural shapes 6061-T6 or 6062-T6. Provide square root shapes where indicated. Other work to be of alloy as recommended by Alcoa for purpose and use for which it is intended. At exposed aluminum, provide fine satin finish, uniform for all work, equal to hand rub with fine wool, unless otherwise noted. Mill finish aluminum may be used for all concealed work. Prefabricated items may have standard finish of specified manufacturers, if not damaged or discolored.

O. Stainless Steel: 1808 type 304, with #6 polished finish where exposed, unless otherwise specified.

P. Galvanized Sheet Metal: ASTM 361-71, G-90 coating designation. No damaged or dented metal.

Q. Paste Solder: Fill exposed non-welded field joints with hard setting paste solder of approved type. Apply smooth, flush, completely filling joint. File when hard to smooth surface free of file marks, flush with adjacent surfaces. Touch up with paint.

R. Caulking Tape (by Erector): Provide caulking tape where indicated and/or where steel abuts other materials. Furnish and install extruded ribbons of non-shrinking, non-staining, non-bleeding and paintable tape equal to Tremco's #440. Use proper size to fill and seal joint by compressing tape in joint.

## 2.2 FASTENERS

A. General: Best, most appropriate type for connections to be made, of sufficient number and strength for intended use. Provide all fastenings and holes for joining work of this section together and to other building components. Provide stainless steel screws at aluminum work and non-ferrous (not galvanized) screws or bolts at exterior work and at areas where moisture is present.

B. Provide zinc-coated fasteners for exterior use or where built into exterior walls. Select fasteners for the type, grade and class required.

C. Bolts and Nuts: Regular hexagon head type, ASTM A307, Grade A.

D. Lag Bolts: Square head type, FS FF-B-561.

E. Machine Screws: Cadmium plated steel, FS FF-S-92.

F. Wood Screws: Flat head carbon steel, FS FF-S-111.

G. Plain Washers: Round, carbon steel, FS FF-W-92.

H. Masonry Anchorage Devices: Expansion shields, FS FF-S-325.

I. Toggle Bolts: Tumble-wing type, FS FF-B-588, type, class and style as required.

J. Lock Washers: Helical spring type carbon steel, FS FF-W-84.



## 2.3 PAINT

A. Metal Primer Paint: Red lead mixed pigment, alkyd varnish, linseed oil point, FS TT-P-86, Type II; or red lead iron oxide, raw linseed oil, alkyd paint, Steel Structures Painting Council (SSPC) Paint 2-64; or basic lead silico chromate base iron oxide, linseed oil, alkyd paint, FS TT-P-615, Type II.

1. Primer selected must be compatible with finish coats of paint. Coordinate selection of metal primer with finish paint requirements specified in Division 9.

B. Galvanizing Repair Paint: High zinc dust content paint for regalvanizing welds in galvanized steel, complying with Military Specifications MIL-P-21035 (Ships).

## 2.4 STOCK MANUFACTURED ITEMS

A. Aluminum Foot Grille: "Pedigrid" Model 100V-DP by Construction Specialties, Inc., or "Perfec-Seal" by Reese Metal Weather Strip Co. Grille surface to be vinyl treads in a raised pyramid pattern, standard color as selected by Architect. Vinyl treads to be firmly secured into extruded aluminum tread rails. Key-Lock tread rails into bars spaced 12" o.c. Extruded frame to have adjustable masonry anchors. Miter frames and assemble with "clamp-tile" corner locks. Provide continuous vinyl cushion on both frame and structural support members. Provide one-piece 16 gauge aluminum waterproof pan, complete with 4" I.P.S. drain and chrome plated strainer. Aluminum to have mill finish. Provide shop coat of zinc chromate for surfaces in contact with concrete.

B. Non-Slip Nosings: Type XH-330 by Balco, Inc., heavy duty, solid surface, two component type, tread cover 3/8" thick by 3" wide, secured with surface screws. Provide full width of tread.

C. Metal Divider Strips: Flat Strip by Rudel Floor Strip Company, Inc., or Standard Gauge Type P. The American Terrazzo Strip Company, Inc. Provide continuous length strips of white alloy zinc, 16-gauge, 1-1/4" depths. Provide at floors where divider strip is indicated.

E. Floor Expansion Joint Covers: Of extruded aluminum with flexible filler strip key-locked into adjacent extrusion. All exposed metal shall have mill finish. Surfaces in contact with concrete shall have shop coat of zinc chromate primer. Expansion joint covers shall be as manufactured by Architectural Art Mfg. Co., Series T-300 (for 2 way) and B-200 (for 4 way) of type for specific condition shown. Equivalent expansion joint covers by Construction Specialties, Balco, or by Argile J. May Mfg. & Distr. Corp. will be acceptable. Cut cork insert and fit into expansion joint, just prior to project completion. Provide complete with metal anchoring devices, anchor bolts, filler strips, screws and other accessories.

F. Metal Grating: Steel all welded construction. Fabricate so sections are removable in panels with bearing bars spanning short dimension unless otherwise indicated. Where indicated, edge and end band removable panels with a bearing bar.

Unless otherwise indicated, space bearing bars 1-3/16" o.c. and cross bars 4" o.c. Provide bearing bars 3/16" thick, depth as indicated. If bearing bar size is not indicated, provide size as necessary to safely span indicated area according to manufacturer's safe load table but not less than 1-1/4" bearing bar depth unless specifically indicated. Provide non-ferrous hold-down devices and bolts for all gratings, without the devices projecting above grating face. Where access panel or area is indicated, provide hinged grating panel. Unless gratings are indicated as galvanized, provide shop prime coat finish. Gratings by Reliance as specified herein as standard. Gratings by Borden, Kerrigan, Irving, Garry and Dravo which conform to these specifications will be acceptable. Hot-dip galvanized where indicated.

G. Concrete Inserts: Hokler threaded inserts, 5/8" diameter, Heckmann Star No. 444.

H. Continuous Inserts: Unistrut P-3300 channel, complete with anchors for casting in. Provide in continuous lengths. Equivalent Powerstrut or Globestrut channels are acceptable.

I. Steel Floor Deck at Stair Landing: Robertson 1-1/2" QL-UKX 18-20 galvanized or Inland-Ryerson 1-5/8" NF i8-20 galvanized.

J. Safety Treads: Metal grating treads, same minimum bar size and spacing and same materials, construction and manufacturer's as specified under typical metal grating. Provide with checkered plate nosing.

K. Aluminum Foundation Vents: Extruded aluminum construction, 4" depth, louver blades across face with 7 x 7 .028 mesh aluminum screen behind. Provide aluminum in mill finish. Vents shall be modular type as manufactured by Construction Specialties, Inc., or equivalent by Andco Building Specialty, Inc., Riesner Vent Brick Corp., or Sylro Products, Corp.

L. Access Panels, Metal Door: Prime painted steel, flush panel, Inland-Ryerson Milcor style M, K or L as appropriate to the surface, or comparable products of Nystrom, American Hatch, Maimi-Carey, U.S. Gypsum, or approved equal. Unit complete with frame, hardware and locks. Refer to Architectural, Mechanical and Electrical.

1. Standard Locations:

a. Nominal size, 8" by 12". Locations: Access to sink traps at concealed sink traps.

b. Similar conditions in ceilings and walls where access panels are indicated on drawings, size 16" by 16" (unless noted) for walls and 24" x 24" (unless noted) for ceilings.

M. Floor access hatch and frame to be Bilco Type JD or equivalent, Babcock-David, Dur-Red, or Milcor. Double leaf, watertight 1/4" thick steel diamond plate doors complete with steel frame, heavy hinges, spring operators, automatic hold-open arm with release handle, and snap lock with removable handle. Hardware to be cadmium plates and all steel to have factory applied red oxide prime coat.

N. Basement manhole frame and cover to be Neenah R-1915-J, for 27" clear opening with anchor bolt holes and bolts.

O. Components for core access door safety chains:

1. Peerless coil-proof 3/16" zinc-plated chain.
2. FOK #2 zinc plated, tap to frame reinforcement.
3. Covert Manufacturing Co. #232 Cadmium plated snap hook.

P. Tree Grates: Neenah Foundry Co. \$-8642, 180° Square.

Q. Checkered Plate: Inland's "4-way" or similar approved pattern of other manufacturers, 1/4" thick unless noted.

## 2.5 FABRICATION, GENERAL

### A. Workmanship:

1. Use materials of size and thickness shown or, if not shown, of required size and thickness to produce strength and durability in finished product. Work to dimensions shown or accepted on shop drawings, using proven details of fabrication and support. Use type of materials shown or specified for various components of work.

2. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges. Ease exposed edges to a radius of approximately 1/32" unless otherwise shown. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

3. Weld corners and seams continuously, complying with AWS recommendations. At exposed connections, grind exposed welds smooth and flush to match and blend with adjoining surfaces.

4. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type shown or, if not shown, Phillips flat-head (countersunk) screws or bolts.

a. Provide for anchorage of type shown, coordinated with supporting structure. Fabricate and space anchoring devices to provide adequate support for intended use.

b. Cut, reinforce, drill and tap miscellaneous metal work as indicated to receive finish hardware and similar items.

### B. Galvanizing:

1. Provide a zinc coating for those items shown or specified to be galvanized, as follows:

a. ASTM A153 for galvanizing iron and steel hardware.

b. ASTM A123 for galvanizing rolled, pressed and forged steel shapes, plates, bars and strip 1/8" thick and heavier.

c. ASTM A386, Class B, for galvanizing assembled steel products.

C. Clean, degrease and pickle steel prior to galvanizing. Clean, remove drips or teats on exposed work. Galvanize after fabrication, no cutting or welding after galvanizing. Prevent warping, distortion or similar defects; conform to ASTM A-384-76 and A-385-76 as applicable.

D. Shop Painting:

1. Shop paint miscellaneous metal work, except members or portions of members to be embedded in concrete or masonry, surfaces and edges to be field welded, and galvanized surfaces, unless otherwise specified.

2. Remove scale, rust and other deleterious materials before applying shop coat. Clean off heavy rust and loose mill scale in accordance with SSPC SP-2 "Hand Tool Cleaning", or SSPC SP-3 "Power Tool Cleaning", or SSPC SP-7 "Brush-Off Blast Cleaning".

3. Remove oil, grease and similar contaminants in accordance with SSPC SP-1 "Solvent Cleaning".

4. Immediately after surface preparation, brush or spray on primer in accordance with manufacturer's instructions, and at a rate to provide uniform dry film thickness of 2.0 mils for each coat. Use painting methods which will result in full coverage of joints, corners, edges and exposed surfaces.

5. Apply one shop coat to fabricated metal items, except apply 2 coats of paint to surfaces inaccessible after assembly or erection. Change color of second coat to distinguish it from the first.

E. Paint:

1. On ferrous metal: Approved rust inhibitive paint. Use red lead type, zinc chromate iron oxide type, Rust-Oleum #769 or Pratt and Lambert's Noxide Primer.

2. On galvanized metal: 80% metallic zinc dust primer, Federal Specification TT-P-641B, paint all galvanized work that is exposed unless noted herein.

3. On aluminum (where painted): Zinc chromate formulated to adhere to aluminum. Provide painted aluminum where metal is in contact with masonry or concrete and on aluminum failing work.

F. Anodized Aluminum "Hardcoat" integral color of architectural class 1, AAM10 C22 A42 designation, Alcoa Duranodic, Kaiser Kalcolor, Reynolds Reynocolor, dark bronze color to match metal finished under Section 08900.

2.6 FABRICATED ITEMS

A. The work of this section includes but is not limited to the following typical fabricated items. Do not construe as being complete. Furnish and install as many of each type item as is required to complete the Work:

Stairs  
Ladders  
Railings  
Potting Bench Base  
Gratings  
Catwalks

Lintels  
Janitor Sink Nosing  
Steel Angle Frames  
Clip Angles  
Cable Passage Sleeves

## PART 3: EXECUTION

### 3.1 INSPECTION

A. Installer must examine the areas and conditions under which miscellaneous metal items are to be installed and notify the Contractor in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the Installer.

### 3.2 PREPARATION

A. Furnish setting drawings, diagrams, templates, instructions, and directions for installation of anchorages, such as concrete inserts, anchor bolts and miscellaneous items having integral anchors, which are to be embedded in concrete or masonry construction. Coordinate delivery of such items to project site.

### 3.3 INSTALLATION

#### A. Setting Loose Plates:

1. Clean concrete and masonry bearing surfaces of any bond-reducing materials, and roughen to improve bond to surfaces. Clean the bottom surface of bearing plates.

2. Set loose leveling and bearing plates on wedges, or other adjustable devices. After the bearing members have been positioned and plumbed, tighten the anchor bolts. Do not remove wedges or shims, but if protruding, cut-off flush with the edge of the bearing plate before packing with grout.

3. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

B. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction; including, threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws and other connectors as required.

C. Cutting, Fitting and Placement: Perform cutting, drilling and fitting required for installation of miscellaneous metal fabrications. Set work accurately in location, alignment and elevation, plumb, level, true and free of rack, measured from established lines and levels. Provide temporary bracing or anchors in formwork for items which are to be built into concrete, masonry or similar construction.

D. Fit exposed connections accurately together to form tight hairline joints. Weld connections which are not to be left as exposed joints, but cannot be shop

welded because of shipping size limitations. Grind exposed joints smooth and touch-up shop paint coat. Do not weld, cut or abrade the surfaces of exterior units which have been hot-dip galvanized after fabrication, and are intended for bolted or screwed field connections.

E. Field Welding: Comply with AWS Code for procedures of manual shielded metal-arc welding, appearance and quality of welds made, and methods used in correcting welding work.

F. Touch-Up Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting. Apply by brush or spray to provide a minimum dry film thickness of 2.0 mils.

G. Touch-Up Painting: Cleaning and touch-up painting of field welds, bolted connections and abraded areas of the shop paint on miscellaneous metal is specified in Division 9 of these specifications.

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## PART 1: GENERAL

1.1 SCOPE

A. Conditions of Contract and Division 1 - General Requirements, apply to all work of this section. Refer to Article 12 of the Instructions to Bidders, Article 7 of the General Conditions and Section 01600 - Materials and Equipment for requirements on pre-bid and post-bid evaluation of proposed substitute products, methods and other conditions.

B. Work under this section includes furnishing and installing custom fabricated special formed metal (S.F.M.) items, including the following:

1. Radiation enclosures including baffles, primary and secondary supports.
2. Convector covers.
3. Insulated closure panels over radiation where partitions occur.
4. Window side panels and interior SFM soffits, including supports.
5. Grille and blind pocket.
6. Snap-on base adjacent to radiation enclosures.
7. Metal guardrails at Stair A.
9. Steel tube handrail and handrail support posts and brackets at curtain wall.
10. Accessories for radiation enclosures and convector covers including sheet lead sound barriers, acoustical coating and aluminum bar grilles.
11. Accessories for insulated closure panels including sound gaskets, gaskets required at end of partitions walls (supply to partition subcontractor for installation) and insulation.
12. Fastenings for work of this section.
13. Shop finishing of items furnished under this section.

C. Related work specified elsewhere:

1. Metal Fabrications: Section 05500.
2. Insulation at wall: Section 07220.
3. Preformed metal siding: Section 07411.
4. Sheet metal work: Section 07600.
5. Hollow metal doors and frames: Section 08110.
6. Curtainwall systems (including aluminum covering at handrail bracket):  
Section 08900.
7. Preformed metal soffits and ceilings: Section 09541.
8. Resilient base (over metal base): Section 09650.

D. Furnished but not installed under this section:

1. Sound gasket and backing plate at ends of partitions abutting exterior walls; installed under Section 09100.

2. Provide and turn over to the Owner for future installation, the following complete assemblies (ready for installation):

- a. Closure panels - ten assemblies required.
- b. Base closures - ten assemblies required.
- c. Closure panels at glass - ten assemblies required.

E. Furnished under other contracts:

1. Elevator doors and frames.
2. Back panels for fin tube radiation carriers.

## 1.2 SUBMITTALS

A. Shop Drawings: Submit fabrication and installation drawings of special formed metal items in accordance with Section 01300. Show all features of construction, dimensions, gauges, fastening, welds, mechanical joinings, reinforcements, supports, cutouts, anchorage to adjacent construction, accessories, finishes and other pertinent data.

B. Samples: Submit to Architect as follows:

1. Fabrication: Provide one full size sample of each fabricated metal item at a joint condition. Sample to be approximately a 10" wide section, indicating joint construction as fabricated, complete with fastenings and accessories.

2. Finish and Color: Provide three (3) 8" x 8" samples of finish and color as selected, applied on typical Project metal. Provide for steel and aluminum.

C. Sound Gasket Material: Provide three 12" long samples, complete with fastenings and accessories.

D. Sample installation: After approval of individual small samples listed above - but prior to fabrication, provide a full size sample closure panel complete with sound gasket material for sample installation at the project, for appearance and performance approval by Owner. After written approval of sample installation, proceed with fabrication.

## 1.3 QUALIFICATION OF SPECIAL FORMED METAL FABRICATOR

A. Special formed metal fabricators will be considered for approval in accordance with Article 12 of the Instructions to Bidders.

B. The following manufacturers are acceptable as special formed metal fabricators subject to complying with the design requirements of drawings and conforming to the specifications herein:

1. Hofmeister Company
2. Mark Hot, Inc.
3. Standard Fin Pipe Radiator
4. C & R Metal Specialtes, Inc.
5. Reese Associates, Inc. (PVC gaskets only)



#### 1.4 QUALIFICATION OF SPECIAL FORMED METAL

A. All items under this section shall be erected or installed by the special formed metal fabricator or under his direct supervision and responsibility.

#### 1.5 PRODUCT HANDLING

A. Package, handle, deliver and store in a manner that will avoid damage or deformation.

#### 1.6 COORDINATION

A. Coordinate work directly with Contractor and other Subcontractors. Provide and obtain necessary dimensions, clearances and similar data for work related to items provided under this section.

### PART 2: PRODUCTS

#### 2.1 MATERIALS

A. Steel: Cold formed, prime quality, pickled, annealed stretcher leveled steel, free from scale, pitting or other surface defects. Unless otherwise indicated on drawings, provide not lighter than 16-gauge steel.

B. Fastenings: As indicated. Provide Phillips head screws where screws are indicated. Fabricate steel clips of spring steel.

C. Acoustical Coating: "Aquaplas F-102A" by H.L. Blackford, Inc., 1855 Stephenson Hwy., Troy, Michigan, 48084, or similar material by 3M Company, St. Paul, Minnesota, Sound Coat Company, 515 Madison Avenue, New York, New York or Sound off by Quaker State Oil Company.

D. Sheet Lead: "Acoustilead" sheet, 1/64" thickness, 1 lb/sq ft by Asarco, Federated Metals Division, American Smelting and Refining Company, 150 St. Charles Street, Newark, New Jersey.

E. Aluminum Grilles: Hofco Bar Grille Type HA, consisting of H-82 linear bars at 5/8" on centers with H-52 crossbars one inch from each end and equally spaced intermediate cross bars at maximum 6" o.c. Notch cross bars to fit around primary and secondary bracket. Provide turn catch (CAM) to secure grilles to primary bracket. Provide without border. Provide proper alloy required to produce integral "hardcoat" colors by architectural class 1, AA-A42 designation, color as selected by Architect. Provide grilles within a single unit in one-piece.

F. Sound Gasket Material: Closed cell polyvinyl chloride, approximately 35 pcf density, extruded to profiles and shapes as indicated, color as selected by Architect, as manufactured by Reese Enterprises, Inc.

G. Filler Material at Sound Gasket: Vinyl covered polyurethane foam road strip, "Foamedge" by Sterling Alderfer Division of Teledyne Monarch Rubber Company, Hartsville, Ohio, or equal. Foam rod to be minimum 3/4" diameter. Vinyl cover to be minimum 4 mil vinyl, color black, with minimum 3/8" self adhesive back tab.

H. Tape Sound Gaskets: Similar to paragraph G above, except shape, size and type shall be as indicated.

I. Insulation: "Thermafiber" Sound Attenuation Blanket, 1½" thickness, 3.0 pcf density mineral fiber by United States Gypsum or approved equal.

## 2.2 STEEL FINISHING

A. Material: M&T Coating B-65, vinyl organosol, by M&T Chemicals Inc., Subsidiary of American Can Company, Rahway, New Jersey, or approved equal.

B. Finish and Color: Satin finish, custom color as selected by Architect. Only one color will be selected for all finished metal, unless noted otherwise.

C. Metal Preparation: Phosphate treatment, providing surface free from grease, soil or residual salts.

D. Coating Procedure: In accordance with manufacturers instructions. Coat clean, phosphated surface with approximately 5 mils of spray applied coating; air-dry 1 to 5 minutes and bake 12 to 15 minutes at 250-300°F to obtain desired satin finish.

## 2.3 FABRICATION

A. General: Fabricate to profiles and dimensions as indicated. Consider and provide for erection procedures. Shop assemble to greatest extent possible, considering shipping and erection. Completely shop assemble and disassemble prior to shipment, marking pieces for proper field assembly. Provide all supports, anchoring devices, anchor bolts, screws, clips, seals and gaskets and other accessories.

B. Formed Corners: Neat, sharp, continuous, free of break marks. Corner radius shall be twice the metal thickness.

C. Flat Surfaces: Free of waves, buckles, dents, hollows, oil-canning.

D. Acoustical Coating: Where acoustical coating is indicated, apply in accordance with manufacturer's direction over clean surface, to thickness as indicated or a minimum of 1/8" thickness.

E. Sheet Lead: Apply vertically in radiation enclosure metal chase where partitions occur as indicated. Fit tightly to head, jambs and sill to retard the passage of sound.

F. Insulation: Completely fill interior of closure panels with insulation, adhesively adhered one side to panel to prevent settlement.

G. Welding: In accordance with appropriate recommendations of American Welding Society using proper procedures. Welds behind finished surfaces shall be accomplished so as to minimize distortion and discoloration from finished side. Remove weld spatter and welding oxides from finished surfaces by descaling and grinding. Grind and polish weld beads on exposed surfaces to match and blend with finish on adjacent parent metal.

PART 3: EXECUTION

3.1 INSTALLATION

A. General: Erect in accordance with approved erection drawings by workmen skilled and experienced with this type of metal installation.

B. Presentation: Erect plumb, level, rigid and in proper alignment complete with all fastenings secured. Use concealed anchorages. Form tight joints with gasket material in firm, uniform contact with adjacent surfaces to form effective sound barrier.

C. Touch-Up: Field touch-up all scratches and abrasions with specified finish to match finish of adjacent surface. Return items which cannot be refinished in the field to the shop, replace or make the required alternations and refinish the entire unit.

D. Protection: General Contractor shall provide protection from damage until building is occupied or accepted by Owner.

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## PART 1: GENERAL

1.1 SCOPE

A. Conditions of Contract and Division 1 General Requirements, apply to all work of this section. Refer to Article 12 of the Instructions to Bidders, Article 7 of the General Conditions and Section 0160 - Materials and Equipment - for requirements on pre-bid and post-bid evaluation of proposed substitute products, methods and other conditions.

B. Work under this Section: The following outline is a general listing of the type and character of work required under this Section. Do not construe as listing all work, materials or areas, nor describing each part of the work.

1. Wood framing, studs, fire blocking, plates, nailers, blocking, bucks, stripping, furring, backing, grounds, including: nailers, blocking, and edge at roof; roof curbs; control joints nailers and blocking for millwork, wood grounds (permanent and temporary) and similar wood and carpentry items.

2. Plywood and particle board not provided under other sections, as at column enclosures and elsewhere.

3. Plastic flashing and vapor barrier not specified under other sections.

4. Tempered hardboard, perforated at acoustical panels, to extent shown on drawings.

5. All other wood shown or required and not provided under other sections.

6. Install all items (millwork) furnished under Section 06400. Install wood doors furnished, ready-to-hang, under Section 08200.

7. Fireproofing and preservative treatment of wood as specified herein.

8. Furnish and install rough hardware, including framing anchors, nails, spikes, bolts, carriage bolts, nuts, washers, screws, toggle bolts, recessed grommets, etc. as required for work of this section. Bolts, nuts, washers for connecting wood framing to steel and concrete. Anchors for securing wood to masonry, steel or concrete.

9. Temporary enclosures required to protect work and public, temporary wood self-closing doors opening into heated spaces.

10. All other carpentry and miscellaneous work required.

C. Related work specified elsewhere:

1. Concrete Formwork: Section 03100.

2. Building Insulation: Section 07220.

3. Finish Hardware: Section 08700.

4. Sizing wood doors & preparing wood doors to receive hardware: Section 08200.

5. Lath, plaster and gypsum drywall: Section 09100.

6. Plastic laminate casework, including installation: Section 06412.

7. Metal laboratory casework, including installation of related plastic laminate work: Sections 11611, 11613.

8. Prefabricated Environmentally Controlled Rooms: Section 13713.

## 1.2 GENERAL INFORMATION

A. Wood Doors: Wood doors (Section 08200) are specified to be factory pre-fit to opening size, factory machined to receive applied hardware, factory marked for specific opening. Hardware location tolerances are specified to be  $\pm 1/64"$ .

## PART 2: MATERIALS

### 2.1 GENERAL LUMBER

A. Dimension and Framing Lumber: Douglas Fir, "Construction" and "Select Structural" as applicable. Where any piece may be exposed, it shall be clean and smooth (sand if necessary), sound and straight.

B. Other Non-Finish and Non-Framing Board Lumber: Douglas Fir, "Construction". Equivalent grades of Ponderosa Pine, Sitka Spruce or White Pine acceptable.

C. Grounds, Stripping and Furring: #1 Common Ponderosa Pine, or equivalent Idaho White Pine, Northern White Pine, KD, surfaced.

D. Exposed Wood indicated "Paint Black": Prior to installation, apply one coat of wood primer and at least one coat of flat black enamel to provide uniform well coated black finish. Apply to all surfaces.

E. Grading: All lumber graded according to WCLIB Standard 16, "Dry". Where part of a member may be exposed (i.e. at reveals), provide clean, sanded, smooth and sound members.

F. General: All lumber shall be dry material, surfaced 4 sides (unless otherwise indicated), each piece grade marked (except boards). Provide new wood for all lumber used at permanent part of the work (unused during construction).

### 2.2 PLYWOOD AND PARTICLE BOARD

A. Exposed Plywood for Paint: Douglas Fir Plywood with Medium Density Overlay manufactured under APA quality control program Product Standards PS 1-66, DFPA quality MDO-EXT-DFPA Overlay, with grade mark each piece. Under plies shall cause no defects to be visible through paint. Provide MDO at face of all exposed plywood unless otherwise indicated.

B. Concealed Plywood: Douglas Fir, manufactured under APA quality control program, Product Standard PS 1-66, DFPA quality. Provide Exterior Type.

C. Particle Board: Particle board, with Medium Density Overlay on exposed face, manufactured under APA quality control program. Thickness as called for, interior grade.

### 2.3 EXPANSION MATERIALS

A. Expansion Materials: "Ethafoam", or approved equal. Use where expansion joint material is noted and not installed under other sections.

### 2.4 TAPES, SEALANT, ADHESIVES AND MISCELLANEOUS

A. General Adhesive: All as recommended by manufacturer of the product to be applied for the surface material to which it is applied, guaranteed to give permanent adhesion, with material remaining flat to back surface.

B. Insulation Adhesive: Dow's insulation Mastic #7 or other adhesive recommended by insulation manufacturer. Adhesive shall dry (or set) rapidly and not attach or soften the insulation.

C. Sealant: As specified under Section 07900.

D. Sealing Tape: Tremco's tape 440, or approved equal polyisobutylene-butyl, reinforced.

E. Caulking Compound: Tremco's Curtain Wall Sealant, or approved equal, polybutene sealant for hidden or concealed applications. Use for setting all thresholds.

F. Plastic Flashing and Film Vapor Barrier: Heavy duty H-D Nervastral or equivalent thickness of BFG Water Barrier, or approved equal.

### 2.5 FIREPROOFING TREATMENT

A. General: Pressure impregnated with Koppers Company, Inc.'s "Non-Com" chemicals to comply with requirements of Underwriter's Laboratories, so marked or branded when delivered to site. Store indoors, completely protected from weather, moisture. Treat after cutting to shape.

B. Moisture Content: All material furnished fireproofed shall be kiln dried to an average of 18% or less.

C. Appearance: Fireproofed material used shall be without twist, warp, split, check or other defects resulting from fireproofing and re-drying process which would adversely affect work or function of any member. Discoloration will not be regarded as a defect.

D. Extent of Work: Fireproof treat all work used for furring strips and blocking at wood board paneling.

### 2.6 PRESERVATIVE TREATMENT OF WOOD

A. General: Treatment by vacuum or pressure method, using approved preservative that will not stain or bleed, is paintable and will not cause softening or deterioration of roofing where wood member is built into roof. Subcontractor performing treatment shall: Review all conditions; confirm applicability of treatment and advise Architect if change in treatment is recommended; submit

a proposed list of treatments for approval; dry thoroughly before installation; treat after cutting to shape, ends of preservative treated wood that are job cut shall be given two swab coats of Penta-WR.

B. Preservative Treatment, Exposed Wood: "Penta-WR" water repellent preservative meeting Federal Specification TT-W-572, accomplished by vacuum process, treated to refusal (approximately 2 lbs. of solvent per cubic foot).

C. Preservative Treatment Concealed Wood: For wood at roof, exterior and interior concealed wood, treat by pressure process using Wolman Salts, dried after treatment, retention about 3.5 lbs. dry chemical per cubic foot. Retention as recommended by manufacturer and treating plant for condition.

D. Extent of Preservative Treating: Treat all wood at (1) cant strips, nailers, burbs, blocking and other wood a permanent part of structure at roof (2) all permanent wood at exterior of building, (3) other wood subject to damp or humid conditions.

## 2.7 ROUGH HARDWARE, FASTENERS, ANCHORAGE DEVICES AND STEEL STUDS

A. Extent: Provide all rough hardware required, including nails, screws, bolts, lag screws, grommets, cinch anchors, joist hangers, toggle bolts, shot anchors, and similar items.

General: Provide proper size and type for use intended and for materials to be fastened. Install adequate hardware to insure substantial and positive anchorage. Use hot dip galvanized nails at exterior work. Anchor wood ground with toggle bolts or similar approved device. Nailing into wood plugs is not acceptable for any work. Where shot anchors are noted or specified of used, use Ramset of type and size recommended by manufacturer for conditions of use.

## PART 3: EXECUTION

### 3.1 FRAMING, NAILERS, BUCKS, CANT STRIPS

A. General: Install plumb, level, true and square to dimensions shown and required. Allow for finishes and proper clearances where necessary. Provide sound bearing, square cuts, full bearing surfaces. Framing to be 16" o.c. unless specifically noted otherwise. Set crown up for horizontal members. Provide double top plates and single bottom plates at stud partitions. Locate studs, horizontal members or backing behind all joists. Provide solid support under end joints. Shim and block where required. Eliminate crooked, twisted, cupped or bowed framing where such defects will interfere with or prevent highest finishing with other materials. Anchor in substantial, accurate manner to hold dimensions required. Shim and block where required. Accurately rip cant strips and other special shapes as shown and required. Provide blocking above ceiling for ceiling mounted items.

B. Anchorage: Adequately anchor, fasten and support all members in best, trade practice to form secure, substantial and accurate anchorage and to hold required dimensions and prevent twist. Exercise care at all hangers, ceiling frames and similar work to provide permanent support. Use bolts and screws to eliminate loosening up of joints, sagging or similar movement.

### 3.2 FURRING, STRIPPING, GROUNDS AND BACKING

A. Install plumb, level, true and square. Anchor substantially for permanent installation. Install stripping or furring for paneling 16" o.c. unless otherwise specified. Set and shim to a straight edge so finish wall is true and straight. Provide grounds and backing as shown or required. Allow for finishes and shim out to form level surfaces. Verify ground sizes and locations before installation. Firestop 8' o.c. each way.

### 3.3 PLYWOOD AND PARTICLE BOARD

A. Install according to applicable DFPA published recommendations including nailing. Use annular ringed nails generally. Miter at corners where exposed unless finish edge is called for. Securely nail with casing nails, set, cut and install so all pieces have clean edges and are free of hammer marks, other disfigurement that will show through paint. Edges (including at end joints) of all plywood shall be provided with and nailed to solid support.

### 3.4 FINISH HARDWARE

A. General: Refer to Article 1.1.C and Article 1.2, this section, for information relative to hardware. Carefully install hardware, using skilled finish carpenters. Fit before painter's finish is applied, remove and install after finish is complete. Install hardware so that all operating parts operate smoothly, close tightly and do not rattle. At all screw holes install proper screws, install hardware firmly anchored.

B. Doors: Hang doors so they will stand in any open position. At each door, install bumper, stop or holder. Set door stops so bumpers occur at reinforced areas of doors. Verify condition for stops prior to installation. Where conditions permit, doors shall swing over 90° and install for 180° swing wherever possible. Stops shall be securely anchored to guarantee permanent installation.

C. Closers: Adhere to manufacturer's directions for closers, including location at opening (as well as distance from door edge), closer size, anchorage and other factors affecting proper installation. Verify any questionable installations with hardware supplier prior to installing closers. All closer installations shall be done by thoroughly skilled and trained workmen. One trained workman shall adjust (and re-adjust) all closers after installation.

D. Thresholds: Set metal thresholds in full bed of specified caulking compound, forming tight seal between threshold and surface to which set. Securely, permanently anchor thresholds using countersunk non-ferrous screws to match color of threshold (stainless steel screws at aluminum thresholds).

### 3.5 MILLWORK

A. Workmanship: Install millwork in neat and workmanlike manner, free from hammer or tool marks, open joints, slivers and to best quality workmanship. Architect's and Owner's decision on quality of work will be final. General millwork requirements specified under Section 06400 must be reflected in finished installation.

B. General: Set plumb, level, square and true. Scribe to abutting surfaces as required. Miter corners (including at trim), countersink nails, drill holes for nails in hardwood. Install millwork after plaster is dry and building



humidity is at acceptable level. Anchor securely. Permanently and substantially anchor all work. Install to eliminate all exposed end grain. Set millwork to provide uniform and equal spaces and reveals, as indicated by details. Back primed or sealed under Section 09900.

C. Clearances and Coordination: Coordinate work with all other materials and verify clearances, hardware items and other related work prior to installation.

### 3.6 GENERAL WORKMANSHIP

A. Provide all workmanship to meet highest standards, accomplished by skilled mechanics. For finished millwork use experienced finished carpenters only. All exposed wood shall be free of hammer marks, abrasions, splinters, gouges, etc. Set all nails at exposed wood surfaces.

B. Board paneling, installation shall allow for expansion and contraction, minimum space 1/16".

### 3.7 WORK OF OTHERS

A. Examine all sections of specifications and drawings so as to properly anticipate work which must be built into, attached to, butted against, concealed by, etc. work of others and furnish and install such bucks, backing, supports, openings and other items as may be required.

### 3.8 PROTECTION

A. Protect all lumber and millwork at job site from exposure to moisture and weather. Protect millwork from damage, dust and dirt. Stack doors in flat position, with spacers as recommended by manufacturer.

B. Protect board paneling, General Contractor and Millwork Subcontractor (Section 06400) shall jointly be responsible to make certain that paneling is not delivered until the building area is sufficiently dry so that the paneling will not be damaged by excessive changes in moisture content. Maximum allowable, as outlined in "Forest Products Laboratory Handbook".

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## PART 1: GENERAL

1.1 SCOPE

A. Conditions of Contract and Division 1-General Requirements, apply to all work of this section. Refer to Article 12 of the Instructions to Bidders, Article 7 of the General Conditions and Section 01600-Materials and Equipment for requirements on pre-bid and post-bid evaluation of proposed substitute products, methods and other conditions.

B. Work under this section includes providing all millmade wood items not provided under other sections. In general, provide the following but do not construe this listing to be complete in all detail:

1. Hardwood board and batten paneling.
2. Redwood shelving, potting benches, planting benches.
3. Wood benches.
4. Plywood soil bins.
5. Standing and running trim.

C. Related work specified elsewhere:

1. Wood, lumber, plywood and installation of all millmade items: Section 06100.
2. Plastic Laminate Casework: Section 06412.
3. Wood doors: Section 08200.
4. Hardware and accessories: Section 08700.
5. Chalk and tackboard: Section 10100.
6. Metal Laboratory casework: Section 11611.
7. Wood countertops: Section 11611.

D. Furnished but not installed under this section:

1. All work of this section is installed under Section 06100.

1.2 SUBMITTALS

A. Shop Drawings: Submit shop drawings for all work in accordance with Section 01300. Show work in related and/or dimensional position with sections shown in not less than 3/4" or 1-1/2" scale except detail sections shall generally be shown in full size. Note species and quality grade of all wood and similarly identify other materials. Competent personnel shall neatly organize and produce drawings. Tracing of Architect's details will not be accepted as adequate shop drawings.

B. Samples: Ship to Painting Subcontractor samples of Project millwork woods to receive transparent and/or stain finish. Samples shall be uniform in size, approximately one square foot. Identify Project in ink directly on back surface

of sample. Provide sample pieces which will be representative of each species and from both solid and veneered wood. Provide up to six pieces (if requested) for each species.

### 1.3 DELIVERY, HANDLING AND STORAGE

A. Deliver woodwork under cover. General Contractor shall not permit delivery until job conditions, including humidity, are suitable. Except as otherwise required by relationships detailed on drawings, do not deliver interior millwork until building is sufficiently dry to insure no damage to millwork will result; as a minimum, plaster and similar moisture shall have been out of entire building for at least ten days, relative humidity shall be less than 50% and in cold weather, heat shall have been provided for at least ten days prior to delivery.

### 1.4 COORDINATION

A. Coordinate work directly with Contractor and other Subcontractors as necessary to insure proper fitting, joining to or clearance of other work. Obtain templates as required to insure proper fitting.

### 1.5 GENERAL REQUIREMENTS

A. Quality Standards: Except as otherwise shown on drawings or specified herein, comply with Quality Standards of Architectural Woodwork Industry (illustrated, copyrighted 1970) and by reference they are made a part of this specification.

B. Joinery details shown on drawings take precedence over AWI Standards and these specifications. AWI Section 600 shall not have any application unless specifically incorporated hereinafter.

C. Competence: Millwork shall be manufactured by a well established and experienced firm, acceptable to Owner and Architect, with satisfactory record of similar size and quality installations. Architect reserves right to reject any millwork Subcontractor if it is Architect's opinion that (1) shop capacity, experience of workmen, equipment or supply of material will not result in the required quality within time required for completion, or (2) previous performance by manufacturer has been unsatisfactory.

D. Cutouts and Holes: Provide cutouts and holes for items such as sinks, fittings, risers, ducts, and other features furnished into work of this section. Holes and openings for electrical features will be cut by Electrical Contractor under Division 16.

E. Millwork Assembly: Assembly work in mill so far as possible. If necessary to insure best results, complete units shall be assembled in mill and then partially disassembled into workable sections for shipping and job installation. Necessary joints for shipping shall be approved types. Mill assembly shall include, but not be limited to: laminated items, shelving assemblies, benches, and similar items. Prime Contractor, when installing items not shop assembled shall distribute, to best overall advantage, defects allowed by specifications.

F. Deviations: No deviations below quality grade, species and finish specified below under "Interior Woodwork for Transparent Finish" and "Interior Woodwork for Paint Finish" will be accepted for individual items or components unless explicitly

so detailed on drawings or explicitly so specified under the separate headings covering such items. Provide higher quality grade and finish or other species when so specified under the separate headings covering such items.

## PART 2: MATERIAL

### 2.1 QUALITY GRADE AND MATERIALS GENERAL REQUIREMENTS FOR INTERIOR WOODWORK

#### A. Interior Woodwork for Transparent Finish:

1. All interior woodwork, unless explicitly indicated for paint finish, shall be for transparent finish.

2. Material and workmanship of all woodwork for transparent finish shall conform to the premium grade requirements of AWI Quality Standards.

3. Wood species, all interior "solid" wood for transparent finish shall be plain sawn Red Oak.

4. Wood species for all laminated hardwood, plain sawn Red Oak.

5. All interior veneered work for transparent finish shall be plain sliced Red Oak.

### 2.2 HARDWARE AND ACCESSORIES

A. Provide hardware required for complete installation. Manufacturers named or approved equal will be acceptable.

### 2.3 MISCELLANEOUS ACCESSORIES

A. Provide all angles, anchors and accessories as indicated or required to provide all millwork items complete.

### 2.4 GENERAL FABRICATION REQUIREMENTS

A. Intent: It is intent of drawings and specifications to provide durable, serviceable millwork meeting highest standards and materials, methods, construction and assembly shall meet these standards.

B. Strength: Join and assemble work to provide durable, strong, rigid units that will not warp or rack including during shipping, installation. Where conditions of service and usage indicates need for heavier construction than is indicated on drawings, make adjustments as approved by Owner and Architect.

C. Thickness: Dimensions shown are to dressed, finished surfaces.

D. Laminating and Edge Gluing: Provide solid members from single piece of stock unless otherwise shown or approved. Where laminated work is shown, use laminations of thickness indicated, glue under pressure and provide concealed steel tie rods as shown on drawings or required.

E. Edge Banding: Build-in or plow-in band matching veneer full width of core at exposed edges of veneered work (including plywood) so band is covered by and does not read through veneer. Make band at least 3/4" deep except 1/2" deep acceptable at panels 3/4" thick or less. Fit band so snug, firm contact is made with panel on all surfaces and glue all contact surfaces. If detailed, miter corner intersections of edge bands to eliminate end grain showing when inter-

section is exposed to normal view.

F. Gluing: Glue all joints on all surfaces. Use highest grade glue in strict accordance with manufacturer's recommendations. Use Type I waterproof glue for all work exposed in any part to exterior, around sinks and at other locations where work is exposed to moisture, dampness that might affect glue bond. Use water-resistant glue equal to urea-formaldehyde resin glue at all other locations.

G. Provision for Work of Others: Make cutouts of proper size to accommodate other work as required by drawings and/or furnished by others. Provide, where not otherwise indicated or concealed, mouldings to cover exposed core of veneered work. Provide proper mountings for hardware including snuggers, catches. Closure panels at all openings.

H. Corners: Ease lightly with sandpaper (do not round or bevel) all corners not shown or specified rounded.

## 2.5 MILLWORK

A. Grade: Unless otherwise noted or specified, all millwork and casework shall conform to the Custom Grade requirements of the AWI Standards, for transparent finish, according to the applicable section.

B. Species: All wood exposed to view, including exposed backs and ends and shelves and inside of open cases, shall be hardwood for transparent finish as outlined herein.

## 2.6 OPENING FRAMES, STANDING, RUNNING TRIM, ETC.

A. Provide without warp or twist which cannot be easily straightened as installed. Furnish in single lengths as shown, or in long enough lengths to allow for job mitering of corners, etc. Rout to receive accessories where indicated.

## 2.7 HARDWOOD BATTENS AND BOARD PANELING

A. At wood under Article 2.1A, provide continuous length battens made up, in the shop, from 8'-0" lengths joined with a hardwood spline butt joint. Submit full sized sample of joint to Architect for approval. Battens will be cut to length in field and installed such that the joints at every other batten align. Offset the joints 4'-0" (vertically) at the alternating battens. Select wood at butted joints to match, as near as possible, grain and color.

1. In rooms with maximum ceiling height of 9'-0" or less, single length battens may be used (i.e., no butt joints in any battens).

2. In rooms with maximum ceiling height greater than 9'-0" battens with butt joints must be used on all walls.

## 2.8 GUARANTEE

A. For All Work: Guarantee all work against warping, racking, shrinkage opening of joints, cracking, delamination and other defects for a period of one year.

## 2.9 REDWOOD SHELVING, POTTING BENCH TOPS AND PLANTING TABLES

- A. Redwood:
- B. Fasteners: Aluminum or other corrosion-resistant metal nails and screws.
- C. Pipe frames: Furnished under Section 05500.
- D. Shelving Standards and Brackets: Knappe and Vogt 87 x 187, lengths as indicated and appropriate to shelf width.
- E. Fabrication: Fabricate redwood components in as large sections as practicable for assembly to bases in field.

## 2.10 PLYWOOD SOIL BINS

- A. Plywood: APA-MDO, medium density overlaid, exterior glue lines.
- B. Fasteners: Corrosion-resistant nails, screws, T-nuts, etc.
- C. Casters: Bassick #3619, zinc plated.

## PART 1: GENERAL

1.1 SCOPE

A. Conditions of Contract and Division 1, General Requirements, apply to all work of this section. Refer to Article 12 of the Instructions to Bidders, Article 7 of the General Conditions and Section 01600 Materials and Equipment for requirements on pre-bid and post-bid evaluation of proposed substitute products, methods and other conditions.

B. Work under this section includes furnishing and installing all plastic laminate casework indicated on the drawings and specified herein and all plastic laminate items not provided under other sections. The work includes, but is not limited to, the following:

1. Plastic Laminate casework including undercounter cabinets, floor mounted base cabinets, tall storage units, wall cabinets, wardrobes, lockers, face, end and back panels, filler panels and scribe members, and all other items indicated by "Plastic Laminate Casework" supplier. Drawers; doors, solid hinged and sliding. Hardboard where indicated.

2. All supporting members; including wood blocking to secure cabinets to studs, and all accessories required for anchorage.

3. Countertops, set on plastic laminage base cabinets, with backsplashes where shown, of laminated plastic on wood core, with backing sheet and edge banding.

4. Supports for sinks and other built-in equipment occurring in casework.

5. All hardware, including the following but not limited to: butts, pulls, catches, locks where noted; sliding door track, rollers and guides; drawer slides, adjustable shelf standards and brackets; rods for wardrobe units, and all accessories required to complete.

6. Provide the fixed, hinged and adjustable wall mounted plastic laminate shelving including standards and brackets in all rooms except where casework in the room is metal casework - See Article 1.3.E herein.

7. All other miscellaneous equipment and casework indicated, unless specifically omitted herein or in detailed requirements and required to complete the installation. All hardware, holes, brackets, reinforcing, closures, accessories, to complete work. Holes for fittings and fixtures and sinks, outlets, plumbing vents to atmosphere and similar items of casework subcontract and mechanical and electrical contractors. Other items of similar character to insure complete installation.

8. Fabrication, finishing, installation, cleaning of all items and all other required work to complete the installation.

9. Resilient base at casework on composition flooring - see Article 1.3.D herein.

C. Related work specified elsewhere:

1. Custom woodwork; for transparent and paint finish; and related

plastic laminate, cabinet tops, paneling and wood doors: Section 06400.

2. Metal laboratory casework: Section 11611.

3. The following work is specified under Division 15.

a. Sinks, in fixtures; supply serve and trim for all sinks. Remote control mixing valves.

b. Plumbing service fixtures including air and gas cocks and turrets and similar items.

c. Plumbing rough-in and piping, including piping occurring within casework, pipe chases behind casework. Pipe supports, brackets, bolts, clips and similar accessories for piping.

4. The following work is specified under Division 16.

a. Electrical outlets, switches, plug mold, pilot lights, conduit, wiring, boxes and similar electrical work.

5. Wardrobe Specialties (excluding custom fabricated units in Section 06412): Section 10900.

D. Furnished by Owner:

1. Refer to Equipment Schedule, Sheet A12-1, Group II, Equipment Furnished by the Owner, connected by the Contractor.

## 1.2 QUALIFICATIONS

A. Quality Standards: Except as otherwise shown on drawings or specified herein, comply with Section 0400, Premium Grade for Casework and Section 0500, Premium Grade for High Pressure Laminate Paneling, Architectural Woodwork Quality Standards of Architectural Woodwork Institute (illustrated copyrighted 1975), and by reference they are made a part of this specifications. AWI Section 0600 shall not have any application unless specifically incorporated hereinafter.

B. Competence: Casework shall be manufactured by a well-established and experienced firm, acceptable to Architect, with satisfactory record of similar size and quality installations. Architect reserves right to reject any Subcontractor if it is Architect's opinion that (1) shop capacity, experience of workmen, equipment or supply of material will not result in the required quality or within the time required for completion, or (2) previous performance by manufacturer has been unsatisfactory. Refer to Article 1.4.B herein for sample submittal prior to Award of Subcontract.

C. Owner must receive notification 10 days prior to the start of casework construction.

## 1.3 COORDINATION

A. Cooperate and coordinate work with all other contractors and subcontractors concerned, including coordination for installation of sinks, fixtures, fittings,



outlets, conduit and piping by others. During installation, cooperate with other contractors and allow sufficient time for connections, installation and service required, at proper time. Do not install or close up areas until utilities have been installed.

B. Except as noted herein, mechanical and electrical contractors are providing the sinks, fittings and fixtures. Subcontractor for this Section shall obtain all locations and size requirements for holes and other features directly from the other contractors.

C. At locations indicated on drawings, provide under counter openings for undercounter refrigerators. Refrigerators are furnished and delivered to project by University, request manufacturer's literature. Provide filler panels as required.

D. Resilient base on floor mounted casework (and plastic laminate panel partitions, doors and walls) shall be furnished and installed as follows:

1. At resilient flooring, install casework prior to installation of flooring. Resilient flooring (VAT) by Section 09650 will stop at the base of the casework and will not continue underneath. Resilient base will be applied to the casework base by Section 09650 (but not to walls concealed by casework).

2. At composition flooring, first install composition flooring and composition base at all areas and walls (including floor underneath and walls behind casework), and then install casework. The casework supplier shall apply a continuous toe bead of sealant at juncture of casework base and composition flooring. Sealant by casework supplier to be Tremco, or equal, non-hardening type, compatible with composition flooring. The casework supplier shall furnish and install the resilient base, in compliance with requirements of Section 09650. Seal and embed the toe of resilient base in sealant during installation. At completion, clean excess sealant and adhesive.

E. Wall-mounted fixed shelving (including anchorage) and adjustable shelving (including related brackets and standards) as follows:

1. Plastic laminate shelving, in rooms with metal laboratory casework, to be furnished and installed by Section 11613.

2. Plastic laminate shelving in all other rooms, including examination room shelves, to be furnished and installed by Section 06412.

3. Wood shelving, hardwood and softwood, in all rooms to be furnished by Section 06400 and installed by Section 06100.

4. Stainless steel shelving in all rooms, including animal areas to be furnished and installed by Section 11611.

5. Shelf standards to be extra heavy duty type - KV 87, or equal, and extra heavy duty type adjustable bracket - KV 187, or equal, complete with end rests - KV 212 (or 210 and 211); standards to be painted out with walls.

6. Fixed shelf brackets and anchorages as detailed or required.

#### 1.4 SUBMITTALS

A. Shop Drawings: Submit shop drawings in accordance with Section 01300.

1. Provide reproducible shop drawings for all work. Competent personnel shall neatly organize and produce drawings. Tracing of Architect's details will not be accepted as adequate shop drawings. Show layouts of each room complete with closures. Shop work in related and/or dimensional position with sections shown in not less than 3/4" or 1-1/2" scale except detail sections shall generally be shown full size. Identify all materials.

2. Take field measurements and verify field conditions as necessary. Indicate field measurements and other field conditions on shop drawings.

3. On first submission, indicate and locate (by dimension) all holes, cutouts, reinforcing, rough-in dimensions, etc., for items furnished by this Contractor or by others. Submit to other interested contractors, subcontractors (Section 09100) and Architect. From other contractors obtain lists, cuts of fixtures and descriptions for fixtures and fittings as necessary to properly fabricate work of this Section and assume responsibility to obtain such data directly from other contractors.

4. Submit manufacturer's literature on all manufactured items.

B. Samples:

1. Prior to acceptance of the proposed subcontractor (prior to award of subcontract) and prior to any preparation of shop drawings, the proposed subcontractor shall submit the following samples at no cost or obligation to the Owner or Architect. Deliver, uncrate and set up samples at a location in the Metropolitan Minneapolis-St. Paul area, designated by the Architect. Samples shall be of the quality and construction specified, and finished installation must compare with samples.

a. One (1) full size sample of base cabinet, completely finished, with hardware and interior finish.

b. One (1) full depth sample of laminated plastic counter top, by 1'-0" wide; complete with backsplash.

c. One (1) piece of each item of hardware.

#### 1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver under cover, store and handle laminated plastic casework, counter-tops and all accessories in a manner that will prevent damage. Repair or replace damaged material.

B. Coordinate delivery of laminated plastic casework with construction schedule and actual status of work at the site. If items of casework are too large to be moved through permanent openings in the building, deliver casework to its approximate final location, before access is restricted by surrounding construction, make arrangements with other contractors to provide temporary openings or ship casework in subassemblies which may be moved through permanent openings and then assembled. Protect casework from damage during storage.

## 1.6 CODES AND REGULATIONS

A. Provide all items necessary and in conformance with applicable codes. Where plumbing and electrical items and fittings are provided under this contract, they shall conform to National Electrical Code, National Plumbing Code, Minnesota Electrical Code, Minnesota Board of Health and other applicable codes and governing bodies.

## 1.7 FITTING OF WORK - HOLES AND OPENINGS

A. Be responsible for proper fitting of work, including items of equipment fittings to each other and fitting or equipment to building and room spaces where necessary. Obtain field dimensions where required to obtain proper fit. There shall be no open gaps between equipment or adjacent surfaces where shown as fitting to surface. Provide filler and scribe strips. Properly locate work with relation to rooms and spaces, as well as with other items of equipment, or other utilities and features which it must connect.

B. All exposed ends shall be returned and fit back to walls.

C. Casework subcontractor shall provide for field cut all holes and openings to accommodate features, fixtures and obstructions of casework of other building elements. This shall include openings for sinks, plumbing fixtures, piping, vents, ducts, equipment and similar. Where it may not be practical to pre-cut holes and where coordinated with field features may be uncertain or difficult, holes and openings shall be field cut.

## 1.8 CLEANING

A. Exercise care to keep items clean, unstained and free of debris. Upon completion clean all surfaces (including casework interiors) of all dirt, grease or other soil such that work is turned over to Owner in a clean, unstained and streak-free condition.

## PART 2: PRODUCTS

### 2.1 GENERAL

A. Quality Grade: Premium as defined in AWI Section 400 exceptions as follows: Provide casework doors shown 1-3/8" or thicker of same quality as specified in Section 08200. Construction details shall conform to the "Flush Overlay" design as shown in the AWI Publication Architectural Casework - details.

B. Exposed portions of Casework, plastic laminate panel partitions and walls and elsewhere: which includes all surfaces when doors and drawers are closed; includes all four edges and inside face of cases more than 48" above floors; all tops of cases; all visible members and surfaces in open cases or behind clear glass doors; exposed to view edges of divisions, back panels at areas open under drawers or tops; all countertops with backsplashes as indicated. All such surfaces and edges to receive laminated plastic finish.

C. Semi-exposed partitions of casework; which includes those members behind opaque doors, such as shelves, divisions, interior faces of ends, case backs; drawer slides, back and bottoms. Surfaces of semi-exposed portions finished as

Indicated herein.

1. Cabinets; with single backs, with exposed backs with laminated plastic exterior surfaces, interior surface shall have .025" cabinet liner grade (white).
2. Cabinets; with double backs, false backs or non-exposed backs; interior surface shall have polyester backing sheet, NEMA-Class II (vertical).
3. Cabinets; ends, bottoms and tops, with exposed surfaces with laminated plastic exterior surfaces, interior surface shall have .025" cabinet liner grade (white).
4. Cabinets; ends, bottoms and tops, with non-exposed exterior surfaces; interior surface shall have polyester backing sheet, NEMA-Class II (vertical).
5. Cabinets; shelves behind opaque doors, interior faces of divisions (exposed edges of divisions to have laminated plastic) and other interior surfaces that do not receive laminated plastic finish surface shall have polyester backing sheet, NEMA-Class II (Vertical).
6. Cabinets; back surface of drawer faces, where face and edges receive laminated plastic, shall have backing (0.030" thick) sheet.
7. Drawer sides and backs shall be hardwood, bottoms shall be hardboard or hardwood plywood. Finish all faces of drawer sides, backs, bottoms with one coat sanding sealer and one coat varnish semi-gloss.

D. Casework interior, not indicated to receive laminated plastic or other finish to have minimum medium density overlay with two coats of factory applied white, semi-gloss enamel paint.

## 2.2 CASEWORK AND SHELVING

- A. Layout: Make all sections (groups of doors) of equal width with sections in base cabinets lined up with wall cabinet sections unless otherwise shown. Verify sink dimensions and provide section with dimensions allowing adequate space for sink, frame and fasteners. Verify dimensions of built-in items furnished by others (obtain actual dimensions from Owner or General Contractor). Provide cutouts and cover panels to permit plumbing installation and to conceal piping.
- B. Doors: Guarantee 1-3/8" and thicker doors as outlined under Section 08200, door less than 1-3/8" for 2 years. Guaranty shall cover faulty workmanship, materials, delamination of laminated plastic, or warp in excess of 1/4" on 1-3/8" and thicker, 3/16" on 1-1/8" and 1/8" on 3/4" to 1-1/8" thick. General Contractor shall replace doors complete including fitting and hanging.
- C. Drawers: Member minimum thickness 3/4" front, 1/2" side and back, 1/4" bottom; drawers without backs shall have 1/2" bottoms. Reinforce bottoms over 20" wide at not over 20" o.c. Joint drawer sides to front with multiple dovetail or through dovetail stopped below top of front. Bottom shall be hardboard or hardwood plywood. Provide web frame between drawers and dust panel under drawers that are above doors. Install metal slides specified, block out as required. Install hardwood center guide as necessary to eliminate side sway.

Fit face of drawer snugly to adjacent elements, taper sides of front back slightly. Drawers shall operate smoothly, easily and not tip down when open. Minimum drawer dimensions: Inside width - 13-1/2", Inside height - 8-3/4".

D. Shelves: Unless noted otherwise, adjustable and 3/4" thick up to 36" span, 1" thick on 36"-42" span, minimum 1-1/8" thick over 42" span. Plywood or particle board, as shown, that are to receive paint, provide hardwood edge band with tongue-groove joint to shelf and miter at exposed ends. Provide plastic laminate on all sides of shelves where plastic laminate shelves are indicated.

E. Framing: Provide 1/4" plywood backs on all sections unless otherwise shown. Provide 3/4" concealed back frames for anchoring wall hung cabinets. Provide base frames or supports including for toe spaces. Provide supports running front to back at not over 18" o.c., unless otherwise shown. Provide all other framing shown or required including for shipping.

F. Hardboard: Thickness called for on drawing; tempered board equal to manufactured by Masonite or Insulite, smooth both sides. Provide where noted on drawings, or specified herein. Provide slots or cleats for divider or shelf supports.

G. Provide security panel above each locked drawer as well as between drawer space and cabinet behind doors wherever drawers occur above doors to be locked.

H. All particle board shall be 40 - 45 pounds density.

### 2.3 PLASTIC LAMINATE AND CORE

A. Quality Grade: Material and workmanship of plastic laminate work shall conform to Section 500, Premium Grade requirements of AWI Quality Standards.

B. Provide where shown on drawings and as specified herein.

C. Components:

1. Plastic Laminate: General purpose, 1/16" thick, General Purpose Grade, high pressure laminate plastic for all exposed surfaces, both horizontal and vertical.

2. Core: Thickness as noted on drawings, particle board (40-45 pound density), or hardwood faced, 5 ply core plywood.

3. Balancing Sheet; .025" Cabinet Liner Grade (white) as made by laminate manufacturer. Apply to surfaces as outlined under Article 2.1-C.

4. Backing Sheet: .030" thick, Backing Sheet Grade as made by laminate manufacturer. Apply to concealed side of all laminated work.

5. Adhesive: Modified ureaformaldehyde type, Urac-185, or approved equal and Wilson Art.

D. Plastic laminate: As manufactured by Formica, Micarta and Textolite or approved equal. Selected from full range of colors (including white), plain or other patterns, satin finish. FE cabinet doors shall be bright red as selected by Architect inscribed with white letters 1-1/2" Helvetica Medium, reading "Fire Extinguisher".

E. Fabrication: By experienced fabricator, approved by Architect. Eliminate joints where possible. Machine pressure bonded using waterproof adhesive, shear strength shall not be less than 200 pounds per square inch. Unless specifically shown otherwise, apply matching laminate to all exposed edges (including back edge not tight to wall) and providing approved bevel at edge. Seal all core surfaces not laminate-faced with clear synthetic resin sealer recommended by laminate manufacturer.

## 2.5 CASEWORK TOPS

A. Plastic Laminate Countertops and Backsplash:

1. Quality Grade: Comply with Section 400, Premium Grade, Quality Standards of AWI (illustrated, copyrighted 1975).

2. Plastic Laminate: General Purpose Grade, 1/16" thick, provide colors as selected by Architect from full range of patterns and solid colors, satin finish.

3. Balancing Sheet Grade: 1/16" thick as made by lamination manufacturer. Apply to concealed side of all work.

4. Core: 5 (or more) ply close grain hardwood veneer plywood or particle board, in 1-1/8" thickness (total top thickness - 1-1/4").

5. Adhesive: Modified ureaformaldehyde type (such as Ureac 185 glue) recommended by laminate manufacturer. Use as recommended by laminate manufacturer and adhesive manufacturer.

6. Fabrication: By experienced fabricator, using hot press method (no exceptions) in work area conditions conforming to adhesive manufacturer's specifications. Eliminate joints where possible. Glue joints in shop, using hardwood spline, except where field joints are necessary for shipping or placing in work, prepare counter field joints in shop using bolt-up Tite-joint fasteners at spacing recommended by fastener manufacturer. Unless specifically shown otherwise, apply matching laminate to all exposed edges (including back edge not tight to wall) and providing approved bevel edge at joint with face of top. Seal all core surfaces not laminate-faced with clear synthetic resin sealer recommended by laminate manufacturer.

## 2.6 HARDWARE

A. Provide and install all hardware required for complete installation. One manufacturer is named in each of the following items, approved equal which conforms to these specifications will be acceptable.

B. Finish: US26D.

C. Drawer Glides: Grande #329, full extension slide, positive mechanical stop. Drawers with drawer faces which are less than 20" wide and less than 5" high may have the #329 Grant slides or #328 Grant slides; drawers with faces which are 20" wide or wider, or 5" deep and deeper shall have the #329 slides.

D. Door and Drawer Pulls: at each drawer and door provide one pull, Colonial Bronze Company No. 752, US26D, except provide 2 pulls on drawers over 24" wide.

E. Recess Pulls at Cabinet Access Panels: Corbin Cabinet Lock Division, No. 1242.

F. Butts and Catches; unless noted otherwise, provide as follows:

1. Hinges for 3/4" to 7/8" cabinet doors.
  - Two pivot hinges; Stanley 331 or 332 as required, provide three pivot hinges for doors over 4'-0", 335. Finish US26D.
2. Hinges for 1-1/8" to 1-3/8" cabinet doors.
  - 1-1/2 pair hinges, Lawrence SCI224 x 2-1/2 for 1-1/8" doors, finish US26D.
  - 1-1/2 pair hinges, Lawrence SCI224 x 3 for 1-3/8" doors, finish US26D.
3. Catches for 3/4" to 7/8" cabinet doors; Ives 325.
4. Catches for 1-1/8" to 1-3/8" cabinet doors: Ives 326.

G. Hinge at countertops; Stanley #311 1/4, piano hinge, 1-1/16 x full length, finish US26D.

H. Sliding Door Track: Grant #6035, aluminum fascia track for two by-passing 3/4" doors; complete with two #6320 and two #6330 one wheel side mount carriers. Two aluminum angle guides at cabinet bottom. Two #1019 finger pulls. Anodized finish for all aluminum.

I. Cabinet Locks: where shown on drawings, provide at drawers and doors as indicated; Schlage #W26PI lock, with #361 or #362 strike to suit. Top strike all pairs of locked doors without center mullions, Corbin #28466.

J. Adjustable Shelf Standards and Supports in Casework; K&V #255 standards and #256 supports. Provide at adjustable shelves in casework. Standards behind solid (opaque) doors may be up to 6" shorter than total side height and surface mounted. Standards at open shelving or behind glass doors shall be full height, surface mounted. No staple fastenings, screw attached.

K. Adjustable Shelf Standard and Projecting Brackets in Casework: K&V #80 standards and #180 brackets (size as indicated on drawings). Provide where indicated. Standards behind solid (opaque) doors may be up to 6" shorter than total height, at open shelving or behind glass doors standards shall be full height, recess mounted unless otherwise noted. No staple fastenings, screw attached. For wall mounted adjustable shelves - see Article 1.3.F herein.

L. Fixed Shelf Brackets: K&V #204, finish US26D.

M. Hinged Shelf Brackets: K&V #1956, finish US26D.

N. Door locks: where shown on drawings at wardrobe or locker doors, provide Best Cabinet Lock Set No. 5L6RL3 (or 4), six pin tumbler, self latching locks, which only allow key to be withdrawn in locked position. Keying and master keying as directed by Architect. Provide three keys for each lock.

O. Door Vent: where shown on drawings at wardrobe or locker doors, provide fixed louver for lockers, 1 row slots - 3 slots high, 5-1/2" wide, similar to Harrington and King, page 169, Catalog 85.

P. Provide number plate with three (3) 3/4" high etched black number for each locker. Install on doors above top of door handle. Numbers shall be as directed by the Architect.

Q. Hardware for dressing room compartment doors - see 54/13-11, as follows: Latch - 1242 - Chigao Swing Latch with Keeper, Double-acting pivot - Stanley DAP-3, Emergency door stop - Stanley ES-1, Vision Seal - Zero Weatherstripping Co. #33m with adjustable felt sweep mortised into door edges at both jambs.

R. Metal card holders for all file drawers: Formed metal 3-1/2" x 2" high, finish to match hardware finish.

S. Dead Bolt: Ives 40 with Universal Strike, US26D. Provide 2 strikes at observation port lift-up door (one to hold in open position, and one to hold in closed position). See Article I.I.B.I.f. herein.

## 2.7 STEEL

A. Conform to ASTM A36-70.

## 2.8 PAINT

A. Surfaces indicated herein to receive paint, apply by brush or spray for full coverage of each coat. Paint, Pratt & Lambert, Devco or approved equal.

1. 1 - Coat P&L Interior Trim Primer
- 1 - Coat P&L Vitralite Enamel Eggshell

B. Touch up all scratched and damaged surfaces after installation.

## 2.9 PERFORATED HARDBOARD

A. Perforated Hardboard: Masonite, Weyerhaeuser, U. S. Plywood or approved equal, 1/4" thick tempered hardboard with 9/32" holes on 1" centers each way.

## 2.9 COAT RACKS

A. Hanging rod and shelf, Equipment Item M-114, custom fabricated plastic laminate assembly as detailed, complete with 1" diameter aluminum pipe rods (secured with set screws from top), and with wire hangers, 3" on contours or as indicated. Assembly to be maximum 3' module, with intermediate supports equally spaced (maximum 3' on centers). Use for all wall mounted coat rack shelf units not otherwise indicated, in lengths and in locations as indicated on drawings. Verify lengths in field prior to fabrication. Wire hangers to be 3/16" heavy plated wire, 17" adult size, with closed loop top for permanent attachment to tubular rails, equal to Vogel Peterson 316 CL17.

## 2.10 COAT HOOKS

A. Wall mounted coat hooks in dressing rooms, lockers, and where indicated, shall be Vogel-Peterson P-A27, or equal. Finish on hooks to be silver acrylic, or natural anodized aluminum finish.

B. Double prong coat hooks in lockers, where indicated, shall be top-mounted Vogel Peterson type P-A27, two thus bolted together back to back with drilled screw holes in upper leg for attachment to underside of self - or single unit



that meets this design intent. Finish to be silver acrylic, or natural anodized aluminum finish.

### PART 3: EXECUTION

#### 3.1 INSTALLATION

- A. Plastic laminate casework, plastic laminate panel partitions, doors and walls and accessories shall be installed by this manufacturer. Casework shall be installed by skilled mechanics experienced in this type of work.
- B. Coordinate installation with the Mechanical Contractor, Electrical Contractor and other contractors and subcontractors so that piping and wiring may be completed and sinks, service fixtures and equipment can be set in place and connected in the proper sequence.
- C. Erect casework plumb, true, square and level in a substantial manner in strict accordance to approved shop drawings and manufacturer's instructions. Fasten adjacent units together, and securely anchor casework to floors and walls as required. Install all doors, drawers, shelves and other accessories.
- D. Install scribe strips and filler panels accurately scribed to abutting construction.
- E. Level tops, and anchor in place.
- F. Adjust hardware for proper operation. Tag keys and turn over to Owner as directed.
- G. Touch up scratches and other damage to casework finish.
- H. Clean casework and leave ready for use.
- I. Install plastic laminate panel partitions and walls, plumb, level, straight and true to lines and eye. At all intersections of panels, the panels shall be flush and smooth across the joint. Panels shall be held snugly in place by the supporting steel. If necessary a dab of construction adhesive shall be placed on top of the posts as the panels are placed, as well as at bottom if required, to provide panels which are not loose on the steel posts.

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## PART 1: GENERAL

1.1 SCOPE

- A. Conditions of Contract and Division 1- General Requirements, apply to all work of this section. Refer to Article 12 of the Instructions to Bidders, Article 7 of the General Conditions and Section 01600 - Materials and Equipment for requirements on pre-bid and post-bid evaluation of proposed substitute products, methods, and other conditions.
- B. Work under this section includes all cold applied membrane waterproofing, plastic sheet waterproofing and lead pans.
- C. Related work specified elsewhere:
1. Cast-In-Place Concrete: Section 03300.
  2. Bituminous Dampproofing: Section 07150.
  3. Building Insulation: Section 07220.
  4. Insulated Membrane: Section 07511.
  5. Sheet Metal Work: Section 07600.
  6. Gaskets, Caulking and Sealants: Section 07900.
  7. Deck Waterproofing: Section 07570.
  8. Plaza and Floor Drains: Division 15.

1.2 GENERAL INFORMATION

- A. General: Following information is intended to complement and clarify the intent of the drawings but do not construe as outlining all required work. Provide all materials and installation to complete the work. Provide all work, flashing, and related materials to complete the entire installations and to provide complete water barrier integrity to the building spaces.
- B. Cold Applied Waterproof Membrane: Provide membrane at: (1) All interior locations where a waterproof membrane is indicated, noted, scheduled or otherwise required by the drawings or specifications (except which is part of Section 07570), which generally occurs between the structural slab and the concrete topping or other finish; (2) All exterior slabs, tunnels, and similar locations which have a space below, where the membrane typically is built into construction (not the roof areas where the built-up membrane and gravel is the surface); (3) Other exterior areas where shown on drawings; (4) Vertical surfaces of all foundation walls in contact with earth or backfill, including tunnels, where a space occurs on the interior side of the wall, minimum of 3'-0" above footing and carried a minimum of 1'-0" out onto footing. (Note: this foundation wall membrane generally is not indicated on the drawings). Use heavy duty membrane at locations where bituminous paving is laid directly on membrane.
- C. Plastic Sheet Membrane: Provide 30 mil plastic sheet membrane under sheet metal roofing over insulation.

D. Plastic Sheet Membrane of Flashing: Provide 60 mil plastic membrane flashing where the cold applied waterproof membrane may be exposed to ultra-violet light, traffic, or direct exterior weather exposure where the membrane is the weather surface and elsewhere as may be required to complete the total membrane work.

E. Plastic Vapor Stop: Provide 30 mil plastic vapor stop, of same material as plastic sheet membrane, where indicated on drawings, generally at bottoms of expansion joints at locations where a waterproof membrane is to be installed.

F. Protection Board: Provide 1/8" or 1/4", as indicated, pre-moulded protection board: over membranes at vertical surfaces in contact with earth (i.e., backfill); over exterior membranes under earth, concrete, deck insulation, pavers and similar material over interior membranes with concrete or similar topping; at other locations indicated; and where damage may occur to the membrane.

G. Slip Sheet: Provide polyethylene slip sheet over all membranes; under protection board or where concrete and similar materials may otherwise be in contact with the membrane.

H. Lead Pans: Provide lead pans as detailed.

I. Flashing: Provide all flashing and base flashing in conjunction with waterproofing including: up all walls, curbs and similar abutting surfaces, at joints and intersections, and elsewhere required to insure water integrity. Where flashing height requires the flashing to extend above the concrete topping slab or other wearing course, flashing is to be covered with metal counter flashing (with metal under Section 07600) as indicated (details may not fully indicate metal counter flashing thus, but all locations where flashing becomes exposed to the weather are to be so covered).

J. Compatibility: Where any flashing, membrane or other material, new or existing, (including sealants and gaskets) are to be built into, or be in contact with each other, verify the compatibility of the materials prior to commencing work. Do not use materials that are incompatible, will soften or cause deterioration to plastic or cold applied membranes or other materials. If necessary, provide and use alternate materials as approved, without additional cost.

K. Installation at covering materials: Coordinate and schedule all work with installation of insulation so that membrane is protected and cover provided without delay.

L. Notice: Give notice to University when materials are delivered to permit examination and testing. Give at least 7 days notice before starting any work to permit inspections to be scheduled.

M. Certificate: Provide manufacturer's certificates, prior to starting work, certifying all materials are in accordance with specified requirements.

N. Instructions: Conform to the material manufacturer's directions, instructions, or specifications, unless these project specifications are in excess of (but not in conflict with) the manufacturer's directions, in which case these specifications shall govern.

### 1.3 GUARANTEE AND INSURANCE

A. Guarantee: Provide manufacturer's standard 5 year written guarantee for work of this Section, except: annual inspections shall be limited to examining spaces below membrane work with a representative of the Owner to check for evidence of leaks; and the work with a representative of the Owner to check for evidence of leaks; and the work to repair any leaks shall include the removal and replacement of the surface (and other) materials above the membrane.

B. Insurance: The manufacturer of the cold applied waterproof membrane materials shall effect, and maintain throughout the life of this guarantee, such product liability insurance to cover bodily injury, cost of repairs and damage to property, under a comprehensive liability policy, with the following minimum amounts:

Bodily Injury, each person	\$ 250,000
Bodily Injury, each occurrence	\$1,000,000
Prop. Damage & Cost of Repairs, each occurrence	\$1,000,000

1. This insurance shall be renewable at Owner's option and cost for additional three-year periods.

### 1.4 SUBMITTALS

A. Guarantee: Submit specified membrane guarantee in duplicate to the Architect.

B. Certificates: Submit certificates specified in 1.2.M, herein, in duplicate to the Architect. Prior to starting work at the site, submit copies of certificates of insurance for the insurance specified under 1.3.B, above, to the Architect and Owner.

### 1.5 DELIVERY, STORAGE, HANDLING

A. Package, handle, deliver and store all materials at the jobsite in a manner which will avoid damage, contamination or spoilage.

B. Storage: Store all materials off the ground and keep under waterproof covering. Do not allow covering to be torn, displaced or otherwise damaged. Store rolls by stacking on end, with adequate platform and clearance to prevent penetration of moisture from grade. Do not pile materials to such weights as will damage deck or insulation.

## PART 2: PRODUCTS

### 2.1 COLD APPLIED WATERPROOFING MEMBRANE

A. Membrane: Rubberized asphalt, integrally bonded to polyethylene film .064" thickness, W. R. Grace & Co's. Bituthene. Use heavy duty Bituthene where bituminous pavement will be laid directly on membrane.

B. Primer: Bituthene Primer.

C. Mastic: Bituthene Mastic.

### 2.2 PLASTIC SHEET MEMBRANE AND FLASHING

A. General: Provide minimum 60 mil thickness, except where 30 mil thickness is specifically noted under Article 1.2 of this section.

Typical flashing or base flashing in connection with the Cold Applied Waterproof Membrane (Bituthene) shall be the same material as the membrane, except as otherwise specified.

B. Plastic Sheet Membrane and Flashing: Self-extinguishing, homogeneous, impermeable sheeting, flexible at low temperature (-20°). Materials of BFG Flexible Vinyl Flashing (or Water Barrier), Gates Contourflash, Nervastal, or Sonneborn Hydrocide Vinylflash. Where built into or in contact with other materials, confirm compatibility.

C. Plastic Membrane Joint Sealants and Adhesives: As recommended by membrane manufacturer and which is compatible with materials in contact.

### 2.3 MISCELLANEOUS MATERIALS

A. Protection Board: Pre-moulded minimum 1/8" thick asphalt protection board, W. R. Meadows "Sealtite" PC-1 or 1/4" thick PC-3 where indicated, or equivalent products of Celotex or Sonneborn. Adhesives as recommended by manufacturer. Confirm compatibility with membrane.

B. Slip Sheet: Polyethylene film clear, 4 mill thickness.

C. Sheet lead: 4# or 6# sheet lead as indicated.

## PART 3: EXECUTION

### 3.1 GENERAL WORKMANSHIP REQUIREMENTS

A. Workmanship: Conform to best practice and accomplish by using only skilled mechanics. SPILL NO MEMBRANE MATERIALS ON BUILDING OR OTHER MATERIALS. Spilled materials on exposed surface will result in applicator repairing, resurfacing or replacing the stained work. Requirements for installing membrane applies to similar operations for vapor barrier work. See Section 01010 for conditions for working on and over membranes, and Section 01500 for Temporary Heat requirements.

B. General Responsibility: Perform no work in conflict with, contrary to, or below the standards established by membrane materials manufacturer. After starting work, applicator is responsible for complete water integrity of the membrane, and for providing properly applied membranes which will insure a satisfactory life of not less than 20 years. Therefore, applicator shall:

1. Not apply membranes or other work under any conditions which are not proper and in best recommended practices, including surfaces or weather.

2. Examine decks and other surfaces with prime contractor for suitability of surfaces and not proceed until corrections have been made where necessary. Start of work means acceptance of the deck and conditions by this Subcontractor.

3. Review all drawing and specification requirements and establish control and test procedures to insure compliance.

4. Exercise care to insure adequate quantities of materials are used.

5. Maintain competent foremen continuously supervising the work, with authority to discard unsuitable materials or remove unsatisfactory workmen.

6. Supervise installation of, and be responsible for seeing that drains, curbs, and other work is properly set and membrane is not damaged, make membrane and flashing repairs as necessary; advise Supervising Engineer and Prime Contractor of any potential leaks due to work of others.

7. Resolve questionable installation work prior to proceeding.

8. Inspect deck with Owner representative prior to starting work.

### 3.2 PREPARATION IN GENERAL

A. Surfaces: Properly prepare all surfaces to provide and insure best installation. Decks and other surfaces must be clean and dry. Sweep and clean areas thoroughly before starting work. Do not start work during threatening weather. Notify General Contractor of any areas unsuitable for applying membrane. Do not proceed over frosty or damp surface nor until deck is proper. Remove snow from decks and dry thoroughly before starting.

### 3.3 INSTALLATING COLD APPLIED WATERPROOFING MEMBRANE

A. General: Install cold applied membrane water proofing and flashing (including base flashing of membrane) in accordance with manufacturer's instructions and requirements of this section. Coordinate all work. Provide extra plies of membrane as called for by the manufacturer or as otherwise indicated in the Contract Documents, whichever is the greater requirement.

B. Preparation of Substrate:

1. Concrete Finish: Horizontal concrete surfaces will have a troweled finish as a minimum, or as otherwise called for under Section 03300.

2. Wearing surfaces will be regular weight concrete block with joints cut flush.

3. Surface Condition: Concrete and masonry surfaces shall be surface-dry and must be cured for seven days before application of membrane or primer. Surface shall be broom-cleaned and free of voids, loose stones, and sharp protrusions prior to priming or applying membrane.

4. Priming: Membrane is generally applied directly to concrete or masonry; all surfaces must be primed with specified or approved primer. Apply by brush, roller or spray at the rate of 200 to 400 square feet per gallon until the surface is black, using more than one pass if necessary. Membrane must be applied only after the primer solvents have flashed off and the primer has become tack-free (at least 60 minutes after priming, but not over 36 hours). After 36 hours, surface must be reprimed. Metal, plastics and other dense surfaces need not be primed, but must be clean, dry and free of grease, oil and dust.

5. Temperature: Ambient surface and materials temperatures shall be over 40°F. and under 100°F. during application of membrane primer and mastic to insure a good bond. At temperatures below 40°F, special techniques may be used for certain applications on recommendation of membrane manufacturer.

## G. Application:

1. Drainage and Joints: Proper slope for drainage is to be provided by the concrete fill at exterior locations. Advise contractor where slope is not proper. Lay membrane from the low point to the high point across the fall line so that the laps shed water. Apply membrane in double thickness over control and construction joints. Over expansion joints a minimum 8" wide strip of membrane shall be laid on the joint before applying the standard double thickness for joints. Provide a loop of excess material across expansion joints (and other joints where required) as shown and as necessary to relieve the strain.

2. Sealing Edges: Membrane shall be finished off by sealing it into a reglet joint, or by drawing the membrane down over the edge of a slab or over the top of a foundation or parapet wall, setting and pressing or rolling it down firmly and completely in two parallel  $\frac{1}{4}$ " beads of mastic, then trowelling a liberal bead over edge of membrane. Where these installations are not possible, the top edge of the membrane on the vertical surface must be set and pressed or rolled down firmly and completely in two parallel  $\frac{1}{4}$ " beads of mastic and finished with a trowelled bead of mastic. If nails are used, use large head nails and cover with a 6" strip of membrane. Where the membrane is carried over the edge of the slab, carry down wall face a minimum of 18", but in all cases, cover the joint in concrete between the wall and the slab.

3. Foundation Walls and Other Vertical Surfaces: Install membrane a minimum of 3' high above the footing or 2'-6" above the floor line, whichever is highest. Carry out and over edge of footing, or 12" out onto footing where footing projection is more than 12". At vertical surfaces, apply membrane vertically in strips of 12' or less. For higher walls apply in two or more section with the upper section overlapping the lower by at least 6". Smooth membrane down over the entire area with heavy hand pressure, with the seams and top and bottom edges pressed or rolled down firmly and completely.

4. Sealing Seams: All seams shall be overlapped at least 2 $\frac{1}{2}$ ", and pressed or rolled firmly in place. The succeeding strip shall be laid with a minimum 2 $\frac{1}{2}$ " overlapping and rolled down firmly and completely. Misaligned or inadequately lapped seams shall be covered with a minimum 6" wide strip of membrane.

5. Corner Details: All inside and outside corners (vertical or horizontal) including where a cant strip occurs, shall be double-covered with membrane by applying an initial strip of 11" minimum width, centered along the axis of the corner. This strip shall be completely covered by the regular application of membrane. Outside corners shall be rounded and inside corners filled with an inorganic cant strip or mortar fillet prior to application. Seams must be carefully sealed in corners. Where details indicate, the base flashing shall be the additional ply of membrane. Any exposed edge of membrane shall have troweled bead of mastic over these edges.

6. Drains and Protrusions: Areas around drains, posts or other protrusions shall have two plies of membrane, set in full beds of mastic, set in clamping ring and edges and ring covered with trowelled bead of mastic. (Drains, connected to sewer, are provided and set under Division 15, built-in under this section). Build-in drains, plumbing vents and similar items as recommended by the manufacturer.

7. Membrane Protection, Vertical Surfaces: Within 5 days, cover the membrane and protection board. Temporarily hold in place, if necessary until backfilling or other cover is placed. Protection board shall completely cover the membrane to prevent damage and shield from sunlight.

8. Membrane Protection, Interior and Exterior Horizontal Areas: Immediately after testing the membrane, it shall be covered and protected. Place the polyethylene slip sheet and place the protection board cover over it. Also cover areas at can strips of flashing to protect the membrane. Protection board (and other covering) shall be laid tightly butted to prevent exposure to sunlight. Promptly advise others of the readiness for cover materials provided under other sections (including sheet metal) so the membrane areas are promptly covered and protected by the final finishes.

#### D. Precautions:

1. Punctures and Tears: Care shall be taken not to puncture or tear the membrane prior to covering it. Topping, backfill, insulation or protection board shall be placed immediately to protect membrane. Careful inspection shall be made prior to covering membrane, and any ruptures shall be patched with membrane and mastic.

2. Placing Steel: In placing steel on a membrane without protection board the use of wood blocks or chairs with plastic tips or rolled feet is required to prevent sharp edges of steel from puncturing the membrane. Particular care shall be taken with wire mesh to avoid punctures. Advise the Contractor and others of these requirements.

3. Exposed Edges: If the work must be left partially complete, the exposed edges of the outside strips shall be set and pressed or rolled down in two parallel  $\frac{1}{4}$ " beads of mastic and the edge sealed with a trowelled bead of mastic.

### 3.5 INSTALLING PLASTIC SHEET MEMBRANES

A. General: Accomplish all work in accordance with manufacturer's directions and recommendations. Use maximum sized rolls to minimize joints. Factory fabricated wide rolls are preferred. Place membrane just prior to subsequent topping, tile, sheet metal or other finish work. Provide complete and waterproof membrane and be responsible for accomplishing all work to meet this intent. Protect against abrasion, holes, cuts or other damage at all times. At corners where 2 vertical surfaces meet, provide formed folded corner, watertight. Install so water flows in the direction of joints.

B. Surfaces: Apply to clean, dry surfaces, free of loose particles, projections and similar. Remove all such obstructions. Apply only to cured concrete, minimum 30 days old. Prime concrete surfaces prior to installing membrane, using primer recommended by the membrane manufacturer.

C. Adhesive: Use adhesive supplied by or recommended by the manufacturer of the selected membrane, for both placing the membrane and making joints.

D. Joints: Generally avoid the use of lapped joints for side and end joints. Instead, butt the side and end edges and cover with a strip of the same sheeting. Provide cover strip as recommended by membrane manufacturer, but not less than 6". Provide full bed of adhesive at entire surface of contact. Where lapped joints are necessary lap 4" minimum. As joints are made, thoroughly roll, or otherwise compress, to insure tightly bonded permanent joint that is water-tight. Make lapped joints in direction of flow.



E. Installation: Coat entire back-up surface with manufacturer's recommended adhesive to full uniform coating. Verify compatibility of adhesive with back-up surface. Clean all residue, tac or soil from surfaces in contact with adhesive or at edges where joints are to be made. Install membrane that is warm, pliable, and free from wrinkles. At lower temperature (i.e., below 50°) or as recommended by manufacturer, warm the roll prior to installation. Place membrane smoothly, at time that adhesive will achieve maximum bond, without wrinkles, buckles, fishmouths, or other defects. Roll membrane to provide intimate contact with adhesive and smooth the installation using 50-100 lb. roller at horizontal surfaces. Install membrane with sealed laps at corners and minimum number of joints.

F. Abutting Masonry Walls: As masonry walls are laid install "flashing" sheet in masonry with at least 8" excess material out into slab area for building in to membrane later. Wherever possible, install to form a large "pan" with flashing extending up center of wall (behind inner wythe of masonry) to a height of at least 8" above highest point of floor or above highest point of curb.

G. Reglets: Where shown at membranes on exterior, turn membrane into reglet and install metal counterflashing insert (furnish under Section 07600) with wedges or lead wool, then sealant as recommended by manufacturer to seal the assembly into reglet. If more practical, use flashing ply into reglet, with flashing bonded to horizontal membrane as specified for joints.

H. Cover: Where cover (other than protection board) is to be installed over membrane, advise prime Contractor as work progresses to provide the cover. Installation shall be made as soon as possible.

### 3.6 INSTALLING FLASHING

A. General: Examine all drawings, including mechanical and electrical work for general indication of curbs, openings, sleeves, vents, drains, joints and similar work as well as types of flashing work. Drawings are not represented as indicating all obstructions or features that may occur nor do details indicate all requirements or methods of flashing work.

B. Vertical Surfaces: Where membrane is applied to vertical or steeply sloping surfaces, provide necessary support, such as nailing through washers. If nailed, apply strip over line of nails, set in full bed of adhesive. Flash up all vertical abutting surfaces. At locations where horizontal surface ends, carry down over edge a minimum of 18" below top of structural slab or cover joint between slab and wall. Where earth or fill is to be placed against membrane, provide protective cover over membrane to prevent damage and to prevent slippage of membrane from backfill.

C. Expansion Joints: Generally flash as for other vertical surfaces, both sides of joint. In addition, over top install plastic flashing cap. Also install plastic flashing at bottom of joint cavity. Plastic flashing shall have loop of surplus material to permit building movement.

D. Miscellaneous: Cooperate with sheet metal subcontractor to allow sufficient time for setting metal work.

E. Plastic Flashing Installation: Accomplish plastic flashing work by following manufacturer's directions to maintain watertight integrity of flashing material and installation. Lengths shall be as long as possible by rolls of material. Ends shall be lapped minimum 2", sealed entire lap with adhesive (not pitch or plastic cement). Wipe talc off material and clean free of other residue. Where plastic flashing is sealed to plastic flashing (as end laps), rub surfaces with cotton soaked with MEK. When flashing becomes tacky, press together and roll (or otherwise compress) the joint

to form firm bond. No pitch or plastic cement permitted. If temperature is below 60°F, warm the sealed joints.

### 3.7 PLASTIC VAPOR STOP

A. Vapor Stop: Provide the plastic vapor stops as indicated (typically at bottoms of expansion or other open joints). Apply full bead of adhesive to the surface and firmly imbed the plastic sheet to form a vapor-tight seal and secure in place. Lap ends of plastic vapor stop and seal the lap with adhesive.

### 3.8 PROTECTIVE COVER

A. Over all membranes, except under sheet metal roofing, install protection board cover as previously specified under Article 3.3 above.

### 3.9 TESTS

A. Flood Tests: Perform flood tests upon completion of the horizontal membrane areas, prior to placing protection board or any subsequent fill or finishes. Construct watertight dams, using membrane materials, and temporarily close drains. Flood area to depth of 1" minimum, maintaining flooded condition for at least 24 hours. Thoroughly test intersections and flashings by flooding or hose testing. Notify the University in advance of testing and inspect the work with the Owner's representative. Repair any leaks and repeat flood test until there is no evidence of leaks.

### 3.10 FOLLOW-UP INSPECTIONS AND SERVICE

A. Project Completion: Just prior to acceptance of entire Project, or covering with finish surfaces, membrane applicator shall inspect entire membrane, remove all nails, wire, cut metal and other debris. Remove any drips of bitumen. Any "ridging", blisters and similar defects shall be cut open and repaired.

B. Annual Inspection: Provide the inspection and services for three years, in connection with specified guarantee.

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## Part 1: General

1.1 SCOPE

A. Conditions of Contract and Division 1, General Requirements, apply to all work of this section. Refer to Article 12 of the Instructions to Bidders, Article 7 of the General Conditions and Section 01600 - Materials and Equipment for requirements on pre-bid and post-bid evaluation of proposed substitute products, methods, and other conditions.

B. Work under this section includes all dampproofing of exterior foundation walls.

C. Related work specified elsewhere:

1. Earthwork: Section 02200.
2. Membrane Waterproofing: Section 07110.
3. Insulated Membrane Roofing: Section 07511.
4. Gaskets, caulking and sealant: Section 07900.

1.2 DELIVERY, STORAGE, HANDLING

A. Package, handle, deliver and store at the jobsite in a manner that will avoid damage.

B. Deliver all materials in their original, unopened containers, seals intact.

## PART 2: PRODUCTS

2.1 MATERIALS

A. Mastic Coating: Trowelled on pitch base material. Celotex Pitch Base Plastic Cement or similar product of Koppers, or approved equal.

## PART 3: EXECUTION

3.1 APPLICATION, WALLS

A. Extent: Provide dampproofing on outside (earth side) face of all below-grade building foundation walls from top of waterproof membrane (or top of footing if no membrane) to 6" below finished grade. Dampproofing is not required where membrane waterproofing is indicated.

B. Trowel on as recommended by manufacturer to a coat 1/16" to 1/8" thick.

C. Apply to clean, dry surfaces, free of loose particles, projections and similar defects. Remove all such obstructions.

D. Accurately establish finish grade lines, or levels of paving or concrete, prior to coating walls to prevent dampproofing above grade. Where concrete, brick pavers, or bituminous surfacing occurs, carry up to underside of the top paving slab.

E. Carry coatings from 6" below grade to footings and carry 6" out on footings to completely seal wall to footing joints. Accurately establish finish grade lines, or levels of paving or concrete, prior to coating walls, to prevent dampproofing above grade. At Plaza area, carry up to underside of the top concrete slab. Apply coating prior to installation of foundation wall insulation and coat walls where insulation will also be placed. Where coated walls intersect non-coated walls, run bead in corner and carry coating minimum 3 feet onto non-coated walls or 3 feet onto walls of non-excavated spaces.

F. Where dampproofing is contiguous with asphaltic waterproofing, provide mask of minimum 6 mil aluminum foil. Cement foil to asphaltic membrane with asphaltic plastic cement for top 6" of aluminum foil then apply pitch-base dampproofing to entire outside face of foil, then fold foil back (up) on itself to produce pocket to retain pitch base material. If the detail calls for asphaltic material above the dampproofing, reverse this foil procedure, folding foil back over asphaltic material.

G. Provide workmanship in best practice, accomplished by skilled mechanics trained in their trade and instructed accordance with manufacturer's instructions. Provide finished work free of damage, blisters, cracks, open joints, pin holes, skips holidays, thin spots, etc.

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## PART 1: GENERAL

1.1 SCOPE

- A. Conditions of contract and Division 1 - General Requirements apply to all work in this section. Refer to Article 12 of the Instructions to Bidders, Article 7 of the General Conditions and Section 01600 - Materials and Equipment for requirements on pre-bid and post-bid evaluation of proposed substitute products, methods, and other conditions.
- B. Work under this section includes all thermal insulation of the exterior of the building except roof insulation and sprayed or plaster fireproofing and including all acoustical insulation of air chambers.
- C. Related Work specified elsewhere:
1. Roof Deck Insulation (insulating gradient fill): Section 07210.
  2. Rigid Insulation under built-up roofing and sheet metal roofing: Section 07511.
  3. Plaster Fireproofing: Section 09100.
  4. Sprayed Fireproofing: Section 09841.
  5. Thermal and Acoustical Insulation in metal soffits and ceilings: Section 09541.
- D. Furnished by Owner:
1. Retain and pay testing agency.

1.2 SUBMITTALS

- A. thermal Insulation Systems: Submit description of all materials, locations for use, and installation methods and drawings of application details for Architect's approval. Submit in accord with Section 01300.

1.3 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver packaged materials in original unopened containers with labels or seals intact.
- B. Deliver, store and handle all materials at the jobsite in a manner that will avoid damage. Crushed or broken rigid insulation, shredded batt insulation, or cut or torn vapor barrier membranes shall not be used.

1.4 QUALIFICATION

- A. Qualification of Product Manufacturer: Refer to Article 1.1 herein.
- B. Qualification of Insulation subcontractor. The subcontractors named below are acceptable to perform the work of this section. Subcontract bidders not so named are required to apply in writing for acceptance in accordance with similar procedures to those required for pre-bid product evaluation (see Article 1.1, herein). Prospective subcontractors shall submit such information and references.

as the University may require to demonstrate their ability to perform the work not later than two weeks (14 calendar days) prior to the bid date and time.

Acceptable insulation subcontractors are:

1. Industrial Coatings, Inc.  
County Road 36 at Highway 101  
Rogers, Minnesota 55374
2. Western Waterproofing Co., Inc.  
2838 Stevens Avenue  
Minneapolis, Minnesota 55408

## PART 2: PRODUCTS

### 2.1 THERMAL INSULATION SYSTEM

A. Provide and install a system of thermal insulation for all exterior precast concrete and concrete walls above grade. Thermal insulation system shall provide the following thermal and physical properties:

1. Thermal Resistance (R) (of insulation system): No less than 8.83.
2. Permeance (for vapor barrier): No greater than .15 perm.

B. Thermal insulation system shall be designed utilizing the below specified products in combination with one another and in such thicknesses as the details of construction will allow and as required to produce the specified thermal properties.

C. As a general rule, the thermal insulation system will be applied at the inside surface of the precast concrete panels.

1. Insulation on surfaces which will be inaccessible after erection of the precast concrete panels or on surfaces which are protected by flanges, ribs or edges of panels shall be applied to panels prior to erection, either in the field or the precaster's shop at the Contractor's option.

2. Insulation on surfaces which will be accessible after erection of the precast concrete panels or on surfaces which would be exposed to damage during erection shall be applied after erection, after sprayed fireproofing has been applied to adjacent structural steel and after exterior joints of building have been sealed.

3. Coordination of options: Refer to Article 1.3 paragraph C of Section 09841 Sprayed Fireproofing. Contractor bidders for this Section 07220 must provide quotation for the vapor barrier work related to the option to fireproof before or after erection of precast concrete. General Contractor is responsible for coordination of these two Sections (07220 and 09841) and selection of option.

4. If sprayed fireproofing is applied to outside steel before precast concrete is erected, the vapor barrier must be bridged from insulation to beam. Insulation Subcontractor shall not be allowed to remove fireproofing to fasten bridge material for vapor barrier. All such fastening must be installed prior to fireproofing.

5. Except where insulation is applied to panels before erection, no thermal insulation shall be applied until the secondary sealant has been installed in precast concrete joints.

D. The of combinations of materials used in the thermal insulation system shall be subject to the certification by their manufacturers of the compatibility of different products used adjacent and in contact with one another in both the cured state or the inclusion of suitable masking or separation of incompatible products in the design of the systems.

E. Insulating Materials:

1. Cellulose fiber insulation: Mono-Therm Sprayed On Insulation as manufactured by Mono-Therm Insulation Systems, Inc., K-13 type 'T' (thermal), Category III as manufactured by National Cellulose Corp., or approved equal. Material shall be listed by Underwriters' Laboratories, Inc. Classified Building Materials Index: Flame spread 20 maximum; fuel contributed 10 maximum; smoke developed 0.

2. Foam plastic insulations, general: Qualification testing shall be acceptable diversified tests such as, but not limited to, tunnel tests (UBC std. 42-1), full scale corner tests or ignition temperature tests.

a. Flame spread: Foam plastic materials shall have a fire hazard classification of less than 75 when tested in accordance with UBC Standard No. 42-1 in the way intended for use.

b. Smoke density: Foam plastic materials shall have a smoke density rating no greater than 450 when tested in accordance with UBC Standard No. 42-1 in the way intended for use or a smoke density rating no greater than 15 when tested in the thickness intended for use in the chamber method test under UBC Standard No. 52-2.

c. Toxicity: The products of combustion shall be no more toxic than those of untreated wood when burned under similar conditions.

d. Any foam plastic insulation, in addition to the above requirements, shall be fully protected by a thermal barrier of  $\frac{1}{2}$  inch gypsum wallboard, or other approved material having a finish rating of not less than 15 minutes as determined by UBC Standard No. 43-1. Thermal barriers shall be installed in contact with foam plastic insulation and in a manner that will assure they will remain in place for the entire 15 minutes.

3. Polystyrene foam board, extruded: Amspec Inc. Styrofoam, SM, TG or IB, or approved equal.

4. Polystyrene foam board, molded: Snow-Larson, Inc. bd Foam, Holland Plastics, Inc., Thermco White FR, Zonolite Styrene Foam, or approved equal, 1 lb. per cubic foot minimum density.

5. Polyurethane Foam, Sprayed: Upjohn Isonate CPR 425, or the qualifying products of an approved manufacturer based on chemicals of Witco Chemical Co., Inc., Owens-Corning Fiberglas Corp., Reichold Chemicals, Inc., or approved equal.

F. Adhesives:

1. Use only adhesives which are recommended by the insulation manufacturer for use with the specific substrates to insure permanent bond.

G. Accessories: Provide all miscellaneous accessory items such as lath, screeds, sheet metal angles, etc.

## 2.2 RIGID INSULATION

A. Dow Styrofoam SM, or approved equal, shall be installed in the indicated thickness where rigid insulation is scheduled for the following application:

1. Perimeter and foundation insulation in direct contact with the ground.
2. Thermal insulation under fans in air chambers in basement.

B. Adhesives:

1. Use only adhesives which are recommended by the insulation manufacturer for use with the specific substrate to insure permanent bond.

2. Rigid insulation exposed at the interior of the building shall be protected as required by Article 2.1.c herein.

## 2.3 GLASS FIBER INSULATION

A. Batt Insulation: Owens-Corning, Zonolite, or US Gypsum glass fiber insulation, unfaced batts or blankets, thickness as noted on the drawings.

B. Semi-Rigid Insulation: Equivalent to Owens-Corning type 703, unfaced.

## 2.4 VAPOR BARRIER SYSTEMS

A. Sprayed vapor barrier: Lion Nokorode Seal Kote, Fire Retardant (regular) medium, spray-type applied to thickness required to provide 0.15 perm.

1. In general, application will be made at the warm (inside) surface of the outside course of thermal insulation system or the rigid wall or overhead insulation after all such insulation has been installed.

2. Use Nokorode SP Asphalt sprayed at a coverage of 150 square feet per gallon wherever vapor barrier is to be applied to porous or fibrous insulation or to sprayed fireproofing.

3. Where such insulation is not accessible (as in Article 2.1.c above) for application of sprayed vapor barrier, bridge and reinforce joint between field applied insulation and sprayed fireproofing and carry vapor barrier application out and over sprayed fireproofing.

4. where noted in the room finish schedules, apply vapor barrier to the concrete block surface before application of acoustic insulation.

B. Membrane Vapor Barrier: Lexsuco, or approved equal, non-combustible vapor barrier shall be installed on warm side of all batt insulation. Use Lexsuco R-907-T adhesive at all joints and edges.



## 2.5 AIR CHAMBER ACOUSTICAL INSULATION

- A. Insulation: Owens-Corning Fiberglas Airoflex Duct Liner Type 150, 2" thick, or the equivalent product of PPG Industries, or approved equal.
- B. Adhesive: Fire resistand adhesive recommended by the insulation manufacturer. Verify compatibility of adhesive with sprayed vapor barrier.

## PART 3: EXECUTION

### 3.1 INSTALLING THERMAL INSULATION SYSTEM

- A. Install insulation materials in accord with the approved insulation system details, the instructions of the insulation materials manufacturers and the below specifications for rigid insulation.
- B. Coordinate work with precast concrete fabricator and erector where pre-erection application of insulation is required or desired.

### 3.2 APPLICATION OF RIGID AND SEMI-RIGID INSULATIONS

- A. On walls or overheads: Apply adhesives to substrate surface in sufficient quantity to secure insulation boards. Ties, anchors, pipes and other items penetrating insulation shall be sealed with additional spot of adhesive. Edges of insulation boards shall be butted tight with no voids.
- B. Perimter and foundation insulation: Secure in place to prevent displacement during backfilling or concreting.

### 3.3 INSTALLING BATT INSULATION

- A. Install with tight joints, compressing batts slightly.
- B. Use batt insulation wherever low density insulation is indicated.
- C. Use tape, adhesive or staples to hold batts in place except where they are required to be removable.

### 3.4 APPLYING VAPOR BARRIERS

- A. sprayed Vapor Barrier: Apply specified, or approved sprayed, vapor barrier material at warm side of thermal insulation system or rigid insulation by spray in accord with manufacturer-s instructions at the application rate necessary to provide a dry mill thickness producing a maximum perm rating of 0.15. Double coat all insulation joints and inter-sections and penetrations to reinforce and bridge and produce vapor barrier integrity.
- B. Membrane Vapor Barrier: apply specified, or approved, membrane vapor barrier at warm side of all batt insulation. Lap all joints and edges a minimum of 2 inches and seal for vapor barrier integrity with specified adhesive. Seal and reinforce around items penetrating vapor barrier with additional layer of membrane and cement.

### 3.5 APPLYING ACOUSTICAL INSULATION

- A. Install with 100% coverate of adhesive with tight butt joints.
- B. Carefully cut and fit at corners to assure snug fit.
- C. Apply insulation with the neoprene surface facing the air stream.

D. The installation of the air chamber acoustic insulation shall include stik-clips, or such other mechanical method recommended by the manufacturer to prevent bond failure or insulation delamination due to anticipated air velocities in chambers.

### 3.6 FIELD QUALITY CONTROL

A. Sprayed thermal insulation system and sprayed vapor barrier will be tested by an independent testing agency retained and paid by the Owner. Contractor shall cut samples from completed work and patch areas where samples are removed.

B. Test samples shall be removed from applied areas by cutting through insulation to substrate, then scraping and lifting material out. Samples shall be cut only.

C. Provide six samples, each 12" x 12", for each 10,000 square feet of insulation. Cut samples at random locations designated by the University.

D. Place samples in polyethylene bags, identify with date, location taken and required thickness and density and deliver to the University.

E. Testing agency retained and paid by Owner will measure and test samples to determine dry density and thickness as follows:

1. Insulation and vapor barrier shall be separated.

2. Insulation samples will be fully cured and dried to constant weight.

3. Dried samples will be accurately weighed and measured, their density will be calculated and thickness and dry density reported.

4. Vapor barrier samples shall be measured for average mil thickness.

5. Vapor barrier samples shall be tested for vapor permeance in accordance with ASTM E96.

F. Where a sample fails to meet permeance, density or thickness requirements, further sampling and testing will be required in the area of the deficient sample and shall be paid for by the Contractor. If such further testing indicates an area deficient in permeance thickness or density, correction shall be made by application of additional material or removal of deficient material and replacement with satisfactory material.

G. Patching: All areas from which samples have been removed shall be patched by applicator to provide the specified requirements.

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## PART 1: GENERAL

1.1 SCOPE

- A. Conditions of Contract and Division 1, General Requirements, apply to all work of this section. Refer to Article 12 of the Instructions to Bidders, Article 7 of the General Conditions and Section 01600 - Materials and Equipment, for requirements on pre-bid and post-bid evaluation of proposed substitute products, methods, and other conditions.
- B. Work under this section includes all preformed metal siding, and wall panels, insulated and uninsulated and associated metal trim (not flashing).
- C. Related work specified elsewhere:
1. Unit Masonry: Section 04200.
  2. Structural Steel Erection and Miscellaneous Metals: Sections 05122, 05500.
  3. Special Formed Metal: Section 05750.
  4. Sheet Metal Flashing: Section 07600.
  5. Curtainwall Systems: Section 08900.
  6. Grilles and Louvers: Section 10200.
  7. Insulated Hollow Metal Panels: Section 08110.

1.2 SUBMITTALS

- A. Shop Drawings: Submit fabrication and erection drawings in accordance with Section 01300.

1.3 HANDLING, DELIVERY, STORAGE

- A. Handle, transport, and store at the job site in a manner that will avoid damage or deformation. Only minor surface scratches or abrasions as determined by the Architect will be allowed to be corrected in the erected panels. Damaged panels shall be discarded.

## PART 2: PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. The products specified herein are those of HH Robertson Company to establish standards of quality, design profile and workmanship. The equivalent products of Inland-Ryerson Construction Products Company, Walcon Corporation, Inc., or approved equal will be acceptable.

2.2 COMPONENTS

## A. Interior Liner

1. Metal for the liner panel shall be formed from steel sheets conforming to ASTM A245-64. The steel shall have received before being formed, a metal protective coating of zinc suitable for field painting conforming to ASTM A525-65T wiped coating and to Federal Specification QQ-S-777c Type I, Class e.
2. Design of the liner panel shall have 1-3/8" deep lap flanged interlocking side joints with shop caulked vapor seal. The interior joint of these liner panels shall have a tight metal to metal joint.
3. The width and gauge of the liner shall be as required to contribute to the combined action of the panel to resist the designated load and deflection criteria.

4. The finish of the interior surface of the liner panel shall be as fabricated.

B. Subgirts shall be roll-formed from metal coated steel into the required shape to properly receive all panel fasteners and produce the combined action between the face sheet and the liner to meet the designated design loads and deflections.

C. Insulation shall be of a glass fiber type, 1½" thick (or as required to produce specified "U" factor) conforming to Federal Specification HH-1-521-C, Type I, Class A.

D. Hidden Clips for fastening exterior face to subgirt shall be coated steel. Clip design shall effectively function to meet all design requirements of the total panel assembly.

E. Exterior Face.

1. Design shall be nominal 1½" deep having a module of 12" width and be profile F-1. Side joints shall have concealed male and female lips so as to provide a continuous protected interlocking factory sealed joint, allowing for expansion without opening to the weather. Neither exposed fasteners nor button-punching shall be required nor permitted. End joints shall be either counter-sunk or butted with lap strips.

2. Exterior metal shall be fabricated from steel. The gauge shall be as required to meet the load and deflection criteria, in conjunction with the minimum metal thicknesses that might be required for the specific finishing process.

3. Exterior color shall be premium two-coat custom color as selected by the Architect.

4. Exterior finish shall be baked enamel. A minimum three coat field paint finish will be acceptable in lieu of factory baked enamel finish. Field painting shall be accomplished under this Section 07411.

### 2.3 ASSEMBLY OF COMPONENTS

A. Assembly of interior and exterior elements shall be preformed by the manufacturer in the shop or field at the option of the manufacturer.

### 2.4 PANEL DESIGN CRITERIA

A. Wind Load - 30 psf single span.

B. Deflection - L/180 maximum.

C. Fasteners - concealed at exterior; special at interior.

D. U. Factor - .15.

### 3.1 FIELD ERECTION

A. Field erection of the shop-assembled panel or field erection and assembly of the field-assembled components shall be performed by the manufacturer's erection division or by its sub-contractor or by a licensed service dealer in accord with approved assembly and erection drawings.

B. Inspection and Correction of support: The alignment of all structural steel girts or other steel supports to receive wall panels shall be examined by the erecting contractor before commencing installation. Any misalignment of such steel or arrangements not within the usual AISC tolerance shall be reported to the Contractor and erection shall begin only after such necessary corrections have been made to properly receive the wall panels.

C. Flashing, Accessories and Trim: Installation of flashing, accessories and trim required around windows, doors, etc. shall be performed in a neat, workmanlike manner and such components shall be fastened with screws of a material type and nominal size consistent with the metal wall construction.

D. Touch up painting: Touch up exterior facing panels that have been scratched or abraded in erection. Only touch-up allowed will be that of minor finish nature as determined by the Architect.

E. Apply neoprene compression seals relating to insulated metal siding using adhesive at neoprene to metal joint. Clean adjacent surfaces of adhesive and masking. Foam shall be compressed 25% minimum at completion.

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## PART 1: GENERAL

1.1 SCOPE

A. Conditions of Contract and Division 1 - General Requirements apply to all work of this section. Refer to Article 12 of the Instructions to Bidders, Article 7 of the General Conditions and Section 01600 - Materials and Equipment for requirements on pre-bid and post-bid evaluation of proposed substitute products, methods, and other conditions.

## B. Work Included:

1. Twenty-year type, built-up pitch and gravel and coal tar saturated felt membrane roof. Installation by licensed roofer.
2. Built-in composition, plastic and lead flashing at roof edges, curbs, roof drains, vents and similar roofing around openings and obstructions. Clean soiled work, including check-up after completion to remove any drips on other work.
3. Rigid insulation: Styrofoam RM
4. Protection of work of others. Supervision of installation of roof membranes. Ten-year roofing and flashing warranty. Inspections, reports and repairs during and at end of warranty period. Built-up roofing tests.

## C. Work Not in This Section:

1. Wood curbs and blocking: Section 06100.
2. Bituminous dampproofing: Section 07150.
3. Membrane waterproofing: Section 07110.
4. Building Insulation: Section 07220.
5. Metal flashing: Section 07600.
6. Roof accessories: Section 07800.

1.2 GENERAL REQUIREMENTS

- A. General: Following information is intended to complement and clarify the intent of the drawings; but do not construe as outlining all work required. Provide all materials and installation to complete the work.
- B. Flashing: Provide all composition and plastic flashing including: up all walls, curbs, and similar abutting surfaces; plastic sheet under metal roof edge and flashing. Provide temporary, removable, water proof covering over all wood members built into roof until covered by membrane roofing and flashing.
- C. Compatibility: Where any "plastic" flashing is in contact with built-up membranes and bitumens, verify the compatibility of the proposed "plastic" flashing with the built-up membrane and bitumen materials. Do not use any "plastic" flashing that is

Incompatible, will soften or cause deterioration to plastic or built-up membrane.

D. Bonded Construction and Guarantee, Inspection and Maintenance Service: Construct built-up membrane as for 20-year bonded roof. Bond is not required. Instead of bond, provide a 10-year warranty, as herein specified.

E. Insulated membrane roofing system: Dow/Amspec IRMA system.

### 1.3 SUBMITTALS

A. Roofing Guarantee: Submit two copies of "Roofing Guarantee" in the form of the Down Chemical Company Insulated Roof Membrane Assembly (IRMA) Warranty Agreement. Provide 10 year warranty period, starting on the date of Owner's acceptance of the completed construction work.

## PART 2: PRODUCTS

### 2.1 BUILT-UP ROOFING AND FLASHING MATERIALS

A. Provide materials conforming to ASTM Standards where they apply as minimum requirements as well as equal to Carey or Koppers materials.

B. Tarred Felt: ASTM D227-56, with U.L. label, 15 lbs./100 sq.ft.

C. Asphalt Saturated Organic Felt: ASTM D226-75, 15 lbs./100 sq.ft.

D. Coal Tar Pitch: ASTM D450-71, Type A straight run, high bitumen coat for pitch.

E. Steep Asphalt: ASTM D312-71, type III (180°F minimum to 200°F maximum softening point).

F. Primer: Concrete priming oil.

G. Cap or Base Flashing: 90# granular surfaced roofing, ASTM D249-73 or D371-58.

H. Reinforced Asbestos Base Flashing: Asphalt saturated and coated asbestos felt reinforced with woven cotton fabric.

I. Flashing Cement: As recommended by roofing manufacturer.

J. Plastic Cement: As recommended by roofing manufacturer, minimum standards Federal Specification SS-C-153, Type 1 or Type 2 as required.

K. Plastic Flashing: Minimum 30 mil; B.F. Goodrich vinyl water barrier, Wasco vinyl flashing, Lexsuco F40 flexible flashing, Nervastral 300 or Saraloy #640R (with joint adhesive recommended by manufacturer, flashing must be compatible with bitumens).

L. Roof Drain Flashing: Minimum 6 lb. lead, 36" diameter or minimum 6" beyond drain body.

### 2.2 ROOF INSULATION

A. Insulation: Styrofoam Rm as manufactured by Dow Chemical Company.

B. Insulation Cants: Mineral fiber board, Permalite Cants by Grefco or approved equal.

### 2.3 CRUSHED STONE

A. Crushed Stone: Washed crushed stone, well graded with an average size of 3/4" with no fines or stones smaller than 1/2". Coverage rate of 1,200 lbs. per square.

## PART 3: EXECUTION

### 3.1 GENERAL

A. All materials and installation shall be in accordance with the latest Amspec, Inc. specifications, with Amspec approval of modification to coal tar pitch bitumen as specified herein, installation shall be by an Amspec Approved Roofing Contractor, and the roofing system shall be warranted for 10 years by Amspec, Inc.

B. Storage: Store all materials off the ground and keep under waterproof covering. Do not allow covering to be torn, displaced or otherwise damaged. Store rolls by stacking one end, with adequate platform and clearance to prevent penetration of moisture from grade. Do not pile roof materials to such weight as will damage deck. Keep felts covered and dry prior to and during installation in roof.

C. Workmanship and Requirements: Conform to best practice and accomplish by using only skilled mechanics. Exercise special care at openings through roof and at roof edge. SPILL NO ROOFING MATERIALS ON OTHER BUILDING MATERIALS. Spilled materials on exposed surface will result in roofer repairing, resurfacing or replacing the stained work. Requirements for installing roofing apply to similar operations for vapor barrier and insulation work. See Section 01010 for conditions for working on roof and over membranes, as well as for Temporary Heat Requirements. No part of the roofing system and materials shall be left exposed to inclement weather during application or at the end of the working day.

D. In cold weather (below 35°F) store felts in warmed enclosure prior to installation. Heat shall be sufficient to drive moisture from material.

E. General Responsibility: Perform no work in conflict with, contrary to, or below the standards established by roofing or membrane materials manufacturer. After starting work, roofer is responsible for complete water integrity of the membranes, checking all work installed on the roof and other membranes, and for properly applied membrane which will insure a satisfactory roof life of not less than 20 years. Therefore, the roofer shall:

1. Not apply membranes or other work under any conditions which are not proper and in best recommended practices, including surfaces or weather.
2. Examine roof deck and other surfaces with prime contractor for suitability of surfaces and do not proceed until corrections have been made where necessary.
3. Not overheat bitumens and in event of accidental high temperatures, discard entire batch.
4. Not install any felts or other materials that have been exposed to any moisture, felts shall be stored off the ground and covered with a waterproof membrane. Felts that have been exposed to moisture shall be discarded.
5. Review all drawings and specification requirements and establish control and test procedures to insure compliance.
6. Exercise care to insure adequate quantities of materials are used.
7. Maintain competent foreman continuously supervising the work, with authority to discard unsuitable materials or remove unsatisfactory workmen.
8. Supervise installation of and be responsible for seeing that drains, curbs and other work are properly set and roof is not damaged; make roof and flashing repairs as necessary, advise General Contractor of any potential leaks in work of others.



9. Resolve questionable installation work prior to proceeding.

### 3.2 PREPARATION

A. Surfaces: Properly prepare all surfaces to provide and insure best installation. Decks and other surfaces must be clean and dry. Sweep and clear areas thoroughly before starting work. Do not start work during threatening weather. Do not proceed over frosty or damp surfaces and until deck is proper. Remove snow from decks and clean thoroughly before starting.

B. Deck Smoothness: Check deck for smoothness and for suitability to receive materials. Install no membrane over deck with ridges and/or depressions which exceed 1/4". Have all corrections made to provide deck that meets project requirements and roofer's approval.

### 3.3 BUILT-UP COAL TAR PITCH ROOFING

A. Prime the deck surface with concrete priming oil at the rate of one gallon per square and allow to dry thoroughly before proceeding.

B. General: Use only dry, undamaged and properly heated bitumen. Complete roofing in one operation without phases, Lay all plies "shingle fashion" at one time (no combination laying). Spread bitumen by mopping prior to roofing area. Imbed felts by "brooming" in with a squeegee. "Glaze" over felts if work is temporarily interrupted and operations cannot be completed. Apply glaze coat at the rate of 25 lbs. of pitch per square.

C. Protection: Keep all felts covered, clean and dry. Perform work on roof, including use of equipment to transport materials to prevent damage to insulation or deck. Roofer shall do all preparation work, take all precautions and be responsible for preventing any bitumen dripping onto or into building.

D. Heating: DO NOT OVERHEAT BITUMEN. Discard any overheated materials. Do not use on project. Do not heat pitch over 400° and apply to roof above 350°. Do not heat asphalt over 450° and apply to roof over 400°. (If manufacturer recommends lower heat temperature, follow manufacturer's recommendations). Temperatures apply to roofing, vapor barrier and insulation work. Roofer shall keep accurate thermometers at site for use of workmen and Owner's representative. Thermometers shall not be built-in kettle thermometers.

E. Roofing Plies: Install at least three (3) plies of saturated tarred felt, lapping each 23-2/3" over preceding felt and mopping each felt uniformly and fully so in no place does felt touch felt. Use minimum 25 lbs. of pitch per ply per 100 sq. ft. Lay all felts without buckles and wrinkles and squeegee in each ply to form intimate contact over entire surface so plies are completely bonded together with bitumen.

F. Contraction Joints: Construct joints as indicated, watertight.

G. Temporary Cutoffs: At day's end, turn roofing felt down over exposed edges of insulation and mop solidly so that water cannot penetrate below insulation. Remove the next day when roofing proceeds.

H. Drains: At drains, built in sheet lead flashing pan. Keep drains free of pitch and gravel so strainer can be removed. Set flashing piles, flashing clamp, and the drain in plastic cement for at least 2 feet around drain. Use plastic cement around drain in lieu of flood coat.

I. Obstructions and Roof Penetrations: Perform and install all work around openings with plastic cement, including drains, vents and similar items. Double felt strip flanges into roofing! At pipes, conduits and similar round items (without flanges) which penetrate roof, install plastic flashing sealed to obstruction and carried out onto roof at least 8", built into roofing.

### 3.4 FLASHING

#### A. Vertical Junctures:

1. A cant strip shall be provided between the roof deck and vertical wall or parapet surface, extending 4" horizontally and vertically.

2. The roof membrane shall be carried to the top of the cant and cut off cleanly.

3. The base flashing shall consist of three layers of 15 lb. asphalt saturated felt laminated with flashing cement and one 55# asbestos base sheet laminated with plastic cement. The three layers of 15 lb. felts shall extend down from just below the top of the metal flashing and out onto the roof 2", 4" and 6", respectively.

4. Nail base flashing assembly every 8" at a point about 1-1'4" from top of flashing felts. Use case hardened concrete nails drive through flat tin discs for concrete walls and 1-1/2" barbed nails driven through tin discs into mortar joints for masonry walls.

5. Immediately after nailing along top of base flashing, apply a generous troweling of plastic cement on the top edge of the felt strip and extend it down far enough to cover the nail heads.

B. Metal Coping Cover (edge flashing): Install waterproof plastic flashing as liner directly under metal for full dimension of metal as shown on details. Set all plastic fishing in flashing cement between roofing felts and flashing felts.

C. Contraction Joints: Install waterproof plastic flashing as liner directly under metal and over roofing. Flash to top of cant.

D. Plastic Flashing Installation: Extend plastic flashing over roof edge as detailed. Accomplish plastic flashing work by following manufacturer's directions to maintain watertight integrity of flashing materials and installation. Lengths to be as long as possible by rolls of material. Ends shall be lapped minimum 2", and entire lap sealed with adhesive (not pitch or plastic cement). Wipe talc off material and clean free of other residue. Where plastic flashing is sealed to plastic flashing, rub surfaces with cotton soaked with MEK. When flashing becomes tacky, press together and roll (or otherwise compress) the joint to form firm bond. If temperature is below 60°F, warm the sealed joints.

#### E. Miscellaneous Flashing Specifications:

1. The asphalt used to adhere the felts to the vertical wall surface and the interply asphalt shall be flashing cement.

2. All base flashing strips are to be applied in lengths not to exceed 12' and shall be end-lapped 3".

### 3.5 TESTS

- A. Cut Tests: In locations directed by Testing Agency, before mopping, for installing insulation, roofer shall cut a minimum of one 4" x 36" sample per each 3,000 square feet or fraction thereof, of built-up membrane construction. Make cuts as work starts in any area of 10 squares or more. Make cuts in presence of Architect. Weight samples on accurate scale and keep records. Underweight samples will result in rejection and replacement of area to extent determined by Architect. (NOTE: Adding a ply to correct deficiencies will not be permitted.)
- B. Patching Cuts: If cut sample indicates compliance, reset the sample in the area cut out. If it does not comply, turn over to Architect and cut felts to match the membrane construction, lay in cut out with plastic cement between each ply. Over top of cut out, install four plies of felt and five moppings applied over patch, extending 4", 8", 12" and 16" beyond patch.
- C. Material Tests: In addition to above cut samples for weight and visual inspection, roofing subcontractor shall provide for two tests each on bitumen and felts by independent testing laboratory, for material conformance. Take test samples when directed.
- D. Owner's Independent Testing Agency: Owner will employ, and pay for, a qualified independent testing and inspection agency to analyze materials and test cuts and evaluate the quality of work. Notify the inspection agency whenever work is to be done, in sufficient time to arrange inspections. Furnish the roof inspection agency with all pertinent job information and copies of all technical and material submittals required by the specifications, prior to beginning any work.

### 3.6 INSULATION INSTALLATION

- A. The membrane shall be covered with Styrofoam RM brand plastic foam as soon as possible. If necessary, the membrane may be left exposed for up to three weeks.
- B. flood coat the previously completed membrane with 45 lbs. per square coal tar pitch (total top coverage - 70 lbs./square) and lay the Styrofoam RM brand plastic foam into it while the pitch is still fluid. Butt all joints tightly and take care to ensure the foam is as nearly 100% bonded as possible.
- C. The top covering should be applied soon after foam placement. Do not leave the foam exposed longer than one week.
- D. Miscellaneous Installation Specifications:

1. Styrofoam RM brand plastic foam shall be solidly adhered to the membrane. Accomplished by making sure that the fullpitch top covering is applied and by embedding the foam in the pitch while the pitch is at the right temperature. As the boards are applied, they shall be walked in to assure good embedment.

### 3.7 TOP COVERING INSTALLATION

- A. Cover plastic foam with washed crushed stone. Crushed stone shall be well graded and shall have an average size of 3/4" with no fins or stones smaller than 1/2" Coverage rate shall be 1,200 lbs./square.

### 3.8 INSPECTIONS AND SERVICE

- A. Project Completion: Just prior to acceptance of entire project, roofing subcontractor shall inspect entire roof, remove all debris, nails, wire, cut metal and respread

crushed stone over thin or bare spots. Provide additional stone as required. Remove any drips of bitumen. Send written confirmation to Owner and Architect when such services have been performed.

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UM HEALTH SCIENCES  
P/N 07511-7

## PART 1: GENERAL

1.1 SCOPE

- A. Conditions of Contract and Division 1-General Requirements, apply to all work of this section. Refer to Article 12 of the Instructions to Bidders, Article 7 of the General Conditions and Section 01600 - Materials and Equipment for requirements on pre-bid and post-bid evaluation of proposed substitute products, methods and other conditions.
- B. Provide labor, materials, equipment and supervision necessary to complete the fluid applied deck waterproofing.
- C. Extent of work is shown on Drawings.
- D. Related work specified elsewhere:
1. Concrete Work: 0310,0320 and 0330.

1.2 QUALITY ASSURANCE

- A. Qualifications: Manufacturer of the waterproofing system shall have a minimum of 5 years experience in the manufacture of fluid applied deck waterprooings. The system applicator shall be licensed by the manufacturer and shall have a minimum of 5 years experience in application of fluid applied deck waterproofing.

1.3 SUBMITTALS

- A. Samples: Submit sample of coating system applied to 1/4" plywood or similar rigid base. Submit one sample of each color coating to be used on project.
- B. Manufacturer's Literature: Submit complete manufacturer's literature and technical data for deck coating systems proposed.
- C. Maintenance Manual: Upon completion of the work required by this Section, submit one Maintenance Manual, identified with project name, location and date; type of coating system applied; and surface to which system was applied, including sketches where necessary. Include recommendations for periodic inspections, care and maintenance. Identify common causes of damage with instructions for temporary patching until permanent repair can be made.
- D. Guarantee: Upon completion and acceptance of the work required by this Section, submit an executed copy of the attached guarantee.

1.4 PRODUCT DELIVERY & STORAGE

- A. Deliver materials to job site in sealed, undamaged containers. Each container shall be identified with material name, date of manufacture and lot number.

1.5 JOB CONDITIONS

- A. Install coating materials under conditions where all of the following criteria can be met:

1. Substrate surface temperatures are above 40 degrees F. (5 degrees C.) and lower than 110 degrees F. (44 degrees C.).

2. Positive ventilation for interior applications can be continuously supplied throughout application period and 8 hours after.

3. Open fires and spark producing equipment are not, and will not be, in application area until vapors have dissipated.

B. Post "No Smoking" signs in area during and for at least 8 hours following application period.

C. Strictly adhere to special requirements of manufacturer as modified by applicable rules and regulations of local, State and Federal authorities having jurisdiction.

#### 1.6 GUARANTEE

A. Complete installation shall be guaranteed against defects of materials and workmanship as defined on the guarantee attached, for a period of 3 years, beginning with date of acceptance of the deck coating system.

### PART 2: PRODUCTS

#### 2.1 GENERAL

A. Components shall be products of a single approved manufacturer, or shall be certified by the approved manufacturer as compatible with components produced by him.

#### 2.2 DECK COATING

A. Coating material shall be polyurethane elastomer based, meeting or exceeding minimum physical properties listed in Table 1, and capable of producing a seamless, waterproof, traffic bearing deck coating. Color of top coating shall be selected from manufacturer's standard range by Architect.

B. If in compliance with this Specification, the following systems will be acceptable:

1. "Scotch-Clad Deck Coating, System P" by 3M Company.
2. Tremproof 850 by Tremco.
3. Ped-A-Gard by Neogard.

TABLE 1 PROPERTIES OF CURED MEMBRANE

<u>PROPERTY</u>	<u>MEASURING STANDARDS &amp; CONDITIONS</u>	<u>RESULTS, BASE COAT</u>	<u>RESULTS, TOP COAT</u>
Tensile Strength (see Note 1)	ASTM D412 Die "C" pulled at 20 ipm	500 psi min (.351 kgf/sq mm)	1500 psi min (1.054 Kgf/sq mm)
Elongation (See Note 1)	ASTM D412, Die "C" pulled at 20 ipm	400% min	150% min
Moisture Vapor Transmission 15 dry mil	ASTM E96, Procedure "B" See Note 2	4.0 perms + or - 0.4	1.9 perms + or - 0.2
Moisture Vapor Transmission 30 dry mil	ASTM E96, Procedure "B" See Note 2	1.8 perms + or - 0.2	NA
Abrasion	ASTM C501 30 mil dry film on 4"x4" metal CS-17 whl 1000 revs with 100 gram wgt.	4 mg 41 mg max wt. loss	Max wt. loss
Fire Resistance	ASTM E108 UL 790	System rated Class "A" on non-combustible substrate	
Silicon Carbide Aggregate	MOHS Scale See Note 3	9.0 or harder	

Note 1 Base coat tests conducted on deaerated 40 mil (1 mm) dry film top coat tests conducted on deaerated 10 mil (0.2 mm) dry film, cured for 7 days at 77 degrees F. at 50% relative humidity.

Note 2: Cured for 7 days at 77 degrees F at 50% relative humidity.

Note 3: Silicon Carbide is not required for light traffic areas.

### 2.3 RELATED MATERIALS

- A. Primer: As recommended by the approved deck coating manufacturer for the type of substrate involved.
- B. Backer Rod: Expanded polyethylene rod equal to "Ethafoam" by Dow Chemical.
- C. Sealant: Polyurethane or polysulfide based as recommended by deck coating manufacturer.
- D. Sheet Flashing: .050" thick, precured, commercial grade neoprene.
- E. Aggregate: 20-24 mesh silicon carbide.

### PART 3: EXECUTION

#### 3.1 CONDITION OF SURFACES

- A. Before membrane work is commenced, surface shall be reinspected and treated as necessary to remove laitance, loose material on the surface, grease, oil and other contaminants which will affect bond of the membrane. Surfaces shall be left broom-clean. Before membrane installation is commenced, surface shall be broom and/or vacuum cleaned.
- B. Horizontal concrete surfaces shall be visibly dry and pass a 4 hour rubber mat test (no condensation) prior to application of coating system. Mat shall be taped to deck on all edges.
- C. Verify that curing methods used for concrete are compatible with coating system.
- D. Metal surfaces shall be dry, clean, free of grease, oil, dirt, rust and corrosion and other coatings and contaminants which could affect bond of coating system, and without sharp edges or offsets at joints.
- E. Commencement of membrane installation implies acceptance of that substrate area, as it regards suitability of the surface to accept the membrane system.

#### 3.2 PREPARATION

- A. Thoroughly clean all surfaces to receive coating materials in strict accordance with manufacturer's instructions and recommendations. Remove oil and grease with a commercial grade alkaline cleaner; thoroughly rinse and dry. Prepare all concrete surfaces by sandblasting followed by vacuum cleaning or by etching with a 10-15% solution of muriatic acid. Flush all acid with clean water and allow to dry.
- B. Rout or sawcut all cracks exceeding 1/16" in width and fill with sealant.
- C. Fill all expansion, control and construction joints to be overcoated by deck coating with sealant.
- D. Protect adjacent surfaces with drop cloths or masking as required.



### 3.3 FLASHINGS FLUID APPLIED

- A. Provide fluid applied flashings at all locations where a horizontal surface abuts a vertical surface and at all deck penetrations as specified.
- B. At locations of potential high movement such as wall/slab intersections which are not structurally and rigidly connected, provide 10" min. width of precured sheet flashing or reinforce coating with one layer of uncoated, woven fiberglass cloth. Where sheet flashings are used, they shall be free or unbonded to the substrate within 2" vertically and horizontally from meeting angle but shall be fully bonded for not less than 2" on vertical surface and 4" on horizontal surface. Do not use precured sheet flashings over expansion joints in horizontal surfaces.
- C. At projections through deck coatings such as posts, vents, pipes, stanchions, railings and similar locations of potential slight movement, provide a 1/4" bead of sealant. Tool sealant to form a cove and allow to cure before overcoating.

### 3.4 PRIMER & DETAIL WORK

- A. Primer: Prime all concrete, masonry and metal surfaces. Apply primer at coating manufacturer's recommended rate. Concrete prime coat shall be allowed to completely dry but shall not be applied more than 8 hours preceding application of deck coating.
- B. Apply 20 mil dry film thickness of non-flowing type coating over all flashings (sheet flashings, sealants coves and rigid corners). Extend coating 2" beyond flashing out onto adjacent deck surface. Unless otherwise indicated on Drawings or where limited by height of base, extend coating a minimum of 1" above the top of the flashing and terminate in a neat straight line. Use masking tape for such purposes.
- C. Apply 20 mil dry film thickness of nonflowing type coating for a distance of 1-1/2" on each side of all cracks.

### 3.5 BASE COAT

- A. Apply coating material at a dry film thickness of 25 mils. Extend coating over all fluid applied flashings and detail coatings.
- B. Allow to cure for 16 hours min. At temperatures less than 75 degrees F. (24 degrees C.) and relative humidities less than 50%, extend curing time.

### 3.6 TOP COAT

- A. Apply top coating material at a dry film thickness of 15 mils to all areas which have been previously coated.
- B. While coating is still fluid, uniformly broadcast silicon carbide over the surface at the rate of 5 lbs. per 100 square feet. Immediately roll to evenly distribute and completely coat the aggregate.
- C. Allow top coat to cure for 24 hours min. before permitting traffic on surfaces. At temperatures less than 75°F, (24°C) and relative humidities less than 50%, extend curing time.

### 3.7 CLEANING

- A. Clean stains from adjacent surfaces with toluene, 1,1,1, Trichloroethane, xylene, commercial tar remover, or as recommended by coating manufacturer.
- B. Remove foreign matter from finished coating surfaces.

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## PART 1: GENERAL

1.1 SCOPE

A. Conditions of Contract and Division 1 - General Requirements, apply to all work of this section. Refer to Article 12 of the Instructions to Bidders, Article 7 of the General Conditions and Section 01600 - Materials and Equipment - for requirements on pre-bid and post-bid evaluation of proposed substitute products, methods and other conditions.

B. Work under this section includes all sheet metal work except sheet metal roofing.

C. Related work specified elsewhere:

1. Unit Masonry: Section 04200
2. Miscellaneous and Ornamental Metal: Section 05500
3. Special Formed Metal: Section 05750
4. Membrane Waterproofing: Section 07110
5. Insulated Metal Siding: Section 07411
6. Insulated Membrane Roofing: Section 07511
7. Roof Accessories: Section 07800
8. Insulated aluminum panels, etc: Section 08900
9. Preformed Metal Soffits and Ceilings: Section 09541.
10. Field Painting: Section 09900.

D. Furnished under this Section, built-in under other Sections:

1. Sheet metal built-in masonry and similar locations by other trades: Build-in under appropriate sections.

2. Sheet metal for membrane waterproofing: Built-in under Section 07110.

3. Sheet metal for roof flashing and trim: Built-in under Section 07511.

1.2 GENERAL LOCATION OF TYPES OF SHEET METAL WORK

A. Provide all required sheet metal work, of the general types and character outlined herein. Provide soft stainless steel (S. Stl.), color finished metal (C.F.) protected metal and copper where noted or specified and galvanized iron (G.I.) for all other metal work. It is intended that non-replaceable metal work (i.e.: cannot be removed from construction or extends down into "concealed" areas, such as below plaza) be soft stainless steel. Metal work in contact with, or draining over exposed faces of precast concrete except reglet shall be color finished metal. Consult Architect in event of question of location.

1. 0.012" stainless steel joint cover and counterflashing at below plaza slab, curbs and joints.

2. 0.015" stainless steel built-in flashing - counter flashing receiver at non-replaceable locations.

3. 22 gauge protected metal covers and flashings at exhaust duct housings.

4. 16 oz. copper for bellows (if any) in exterior walls.
5. 20 ga. G.I. cover - counter flashing at curbs and membrane joints, such as: cooling tower curbs, roof control joints, and similar replaceable curb work.
6. 24 ga. G.I. reglets, flashing receivers and counterflashing where roof flashing abut parapets, walls and similar vertical surfaces, other than exposed precast concrete.
7. 20 ga. G.I. counterflashing at areaways and plaza where flashing extends above top slab. Note that all details of this condition may not note metal counterflashing but provide protective counter flashing at all similar locations. Extend counterflashing down past the top slab, to a line even with or below bottom of slab.
8. 20 ga. G.I. metal coping cover at equipment curbs, sills, etc. at sill over wood.
9. 20 ga. G.I. metal flashing pans (i.e. similar to "pitch-pockets") at cooling tower screen posts, as well as at all conduit, cable, pipe or similar penetrations through roof and plaza membranes.
10. 12 ga. G.I. gravel stop ring around roof drains at roofs where slopes occur.
11. 25 ga. color finished metal flashing panels laminated to plywood and other items where indicated on drawings.
12. 18 ga. G.I. metal enclosure for trash chute, including metal stud framing. Metal stud framing shall conform to Section 09100.
13. P.V.C. reglets for grouting into existing concrete or masonry. Fry Reglet Co. 1858 or approved equal. Note: Reglets cast in new concrete are furnished under Section 03100.
14. 25 ga. color finished metal flashing where shown on drawings.
15. 22 ga. G.I. expansion joint covers.

B. Provide all other sheet metal work and related materials of similar nature, for flashing, counterflashing, inserts or reglets at masonry (but not at concrete), curbs, enclosures, caps and all other sheet metal except as may be provided under other sections.

C. Install .032" anodized aluminum flashings furnished under Section 08900.

### 1.3 SUBMITTALS

A. Samples: Submit full size samples of each type of roof edge, coping and typical counter flashing, prior to fabricating metal for the Project. Show joints for each type.

B. Shop Drawings: Submit fabrication and erection drawings of all sheet metal work including full size details, prior to fabrication. Show locations of proposed joints at exposed metal work. Submit in accord with Section 01300.

#### 1.4 DELIVERY, STORAGE, HANDLING

A. Deliver, handle and store at the jobsite in a manner that will avoid damage. Scratched, dented, or deformed metal items will be rejected.

#### PART 2: PRODUCTS

##### 2.1 MATERIALS

A. Galvanized Sheet Metal: ASTM A525 and ASTM A361, 1.25 oz. class (G90) by Armco, US Steel, Wheeling or Toncan Metal, or approved equal. Prime on both sides. Gauges of metal as specified shown on drawings and required to provide highest quality installation.

B. Color Finished Metal: Plastic Coated Steel, 26 ga. 4 x 1 PVS as manufactured by a PVS Licensee or Vincent Colorklad.

C. Stainless Steel: "Soft" chrome-nickel stainless steel, "Micro Flex", of Washington Steel Corporation, or approved equal, dull matte finish, thickness as specified. Prime exposed metal prior to furnishing to the job, for final field painting.

D. Protected Metal: Galvanized steel sheets with asphaltic impregnated asbestos layer, coated with chemical and fume resistant waterproof outer coating, HH Robertson's Galvestos, or approved equal, flat sheets, free from dents or other damage, with coating intact and free of scratches, scraped areas or other coating damage.

E. Copper: ASTM B370, cold rolled sheet copper, cornice temper, free of such imperfections as holes, dents, creases, crinkles, pinch marks and similar defects.

#### F. Paint:

1. Asphaltic coating: Coat metal (G.I., S.Stl. or Copper) built into roof type membranes, or under insulation, with bituminous paint on parts to be built in. Prime back side of copper with heavy coat (or two coats) of asphaltic paint wherever it laps over or comes in contact with other metal or where it is built into masonry.

2. Galvanized metal: For all other G.I. flashing (not built into roofing) thoroughly clean metal of all dirt, grease, oil, or other residue, properly treat surface to insure adhesion, then apply one full coat of zinc dust primer on both sides of metal before installation. Primer to be Type I, in accordance with Federal Specification TT-P-641-D with 80% metallic zinc dust. No substitutions. See Article 2.2 below.

3. Stainless Steel: Paint all exposed parts of S.Stl. with primer recommended by manufacturer, after thoroughly cleaning metal. Apply in shop prior to delivery to job. See Article 2.2 below.

#### F. Fastenings:

1. General: Provide appropriate and recommended type and size of non-rusting fastenings for all metal to insure: proper and permanent alignment; metal remaining permanently in place; restricted movement; permanently tight

joints. Provide screws or rivets at all soldered joints to take the stresses. No nails to be used where exposed. Where exposed fastenings are required, provide screws. Fastenings shall penetrate wood a minimum of 3/4".

2. Color-finished metal: Stainless steel or monel.

3. Protected metal: Stainless steel screws with neoprene and stainless steel washers, paint to match Galbestos.

4. Stainless steel: Stainless steel screws and nails.

5. Copper work: Copper or hardware bronze nails of Stronghold type, large flat heads, needle point, not less than No. 12 stub gauge. Copper, brass or bronze screws.

6. Galvanized metal: Hot dip zinc coated steel nails and screws, except screws holding removable counter flashing shall be stainless steel.

7. Watertight washers: For screws at coping caps, roof edges, tops of curbs and similar locations. Provide neoprene washers under the head to insure watertight hole.

G. Solder:

1. Stainless steel work: 50-50 tin and lead alloy for general work, except use 60-40 or 80-20 at exposed unpainted work. Use strong acid type flux as recommended by metal manufacturer.

2. Other metal work: 50-50 tin-lead alloy.

H. Joint Sealer, Mastic and Miscellaneous:

1. Roofer's Mastic: Plastic cement as specified for roofing, Section 07511.

2. Protected metal mastic: As recommended by manufacturer.

3. Concealed sealant (bedding sealant): Tremco Curtainwall Sealant, Polyisobutylene-butyl type, or approved equal.

4. Caulking compound-sealant: As specified for sealant under Section 07900.

5. Plasting flashing sheets: 30 mil thickness, as specified under Section 07511.

## 2.2 FABRICATION WORKMANSHIP

A. General: Provide metal free from holes, waves, buckles, pinch marks and other defects. Imperfect metal will be rejected and shall be replaced. Coping covers and roof edge covers will be rejected if not straight and level.

B. Peeling Paint: Thoroughly cleaned metal is a requirement prior to priming to insure proper adhesion. Paint that peels or blisters from metal work (primed under this section) at the line of primer and metal,

within two years after acceptance by Owner, shall be basis for rejection of painting and this subcontractor shall brush, reclean and repaint such work as directed at the expense of this subcontract. If repainting is required, two coats of paint shall be provided and entire metal will be cleaned and repainted.

### PART 3: EXECUTION

#### 3.1 WORKMANSHIP

- A. General: Conform to best practice, accomplish by using skilled mechanics, in accordance with Sheet Metal Constructor's Association Handbook and Recommendations and to details shown. Provide metal work that is substantial, securely fastened, neatly installed, with clean sharp breaks, water and weatherproof at exterior and below plaza locations. At roof and below plaza locations, provide metal work to meet roofer's requirements and approval for twenty year bonded type roof. Insulate between dissimilar material with asphalt paint or other approved insulator, such as plastic sheet.
- B. Verify conditions: Prior to starting work, verify that all nailers, etc., are true to size and line and securely anchored. Notify General Contractor of unsatisfactory work and do not proceed until corrections are made so straight, level, plumb and properly sized work results. Verify dimensions in field to provide proper and accurate fit.
- C. Dimensions: Carefully form and install metal work, including at masonry, to conform to dimensions indicated and to field confirmed dimensions.
- D. Movement: Install all work with proper allowance for expansion and contraction from thermal changes.
- E. Joints: Construct all joints with laps in firection of flow. At butt and locked joints, construct joints watertight.
- F. Hemmed edges: Turn back metal to form hemmed edged wherever the edge creates a hazard or where it may cut into membranes. Provide hemmed edges at lower edges of flashing, counter flashing, coping covers, roof edge covers and the straight metal counter flashing extending below plaza slabs.
- G. Soldering: Screw, spot weld or rivet all soldered joints to take stress, with solder acting only as sealant between metal. Keep solder work neat, smooth, with no greater spread than required to seal the joint. For stainless steel solder work, carefully follow manufacturer's directions. Thoroughly clean all flux from surfaces and for acid type flux residue, neutralize with ammonia or washing soda and rinse with clean water.
- H. Keepers and wedges: Where shown, or required to firmly hold metal in place, provide continuous keepers, screeds or cleats of same metal as metal work. Provide lead wedges where noted or where required to hold metal work firmly in place.
- I. Shop corners: Provide shop built, soldered, inside and outside corners for coping covers, roof edge covers and similar work.
- J. Built-in work: Furnish reglets or flashing receivers to mason for building in masonry. Furnish other metal to proper trades for installation

when other work is in progress. Sheet metal fabricator is responsible to be aware of job progress and to provide built-in metal at proper time to prevent delays at jobsite.

K. Existing construction: Where necessary at existing construction, cut out groove for receiving flashing or flashing inserts.

L. Plastic sheet: Except as specified under Sections 07110 or 07510, provide plastic sheet liner or protective flashing under metal as noted. Follow specifications for installation as included under applicable section.

### 3.2 LOCATION OF JOINTS IN METAL

A. Exposed work: At coping covers, roof edges and other metal exposed to view, provide joints so as to be symmetrical on facade and locate to center on other features as shown or approved, with 8 foot maximum length metal.

B. Counterflashing and concealed work: Joints may be placed where convenient to metal lengths, not over 10 foot lengths.

### 3.3 TYPES OF JOINTS

A. Coping covers, roof edge covers (built-in or entirely cover type), and similar exposed metal: Provide flush, butt type, with concealed back plate.

B. Curb Covering, expansion joints and membrane or control joints: Provide cover strip over joint with single lock seam between cover strip and each metal length (or use butt joints with back plate).

C. Counterflashing: Lapped joint.

D. Other joints: Similar to above outline for comparable joints. Where appearance is a factor (i.e.: Metal seen from ground or through windows) provide butt joints with concealed back plates.

### 3.4 END JOINT CONSTRUCTION

A. Butt joints with back plate:

1. Provide back plates of same gauge and metal as flashing metal, 5" wide (2-1/2" each side of joint), conforming to exact shape of metal and full dimension of metal after forming.

2. At both ends of each length of flashing metal, provide bent clips spot welded near end, to receive back plate. Provide at least 3 clips at shapes such as typical coping cover or roof edges. Construct so backplates slip under bent clips, forming tight contact with flashing or cover metal.

3. To install, butter a bed of concealed sealant on backplate and slide section of roof metal onto backplate, such that backplate fits into clips to hold metal tight and in perfect alignment. Coat entire contact surfaces between back of metal and face of backplates with sealant. Repeat until all metal has been set. At joints, allow about 3/8" clearance between edges of metal.

4. At locations with wood nailers, as at roof edges, at joint between lengths of metal, install screw with neoprene washers through backplate without



fastening to metal flashing length, at top edge. (Notch out ends of flashing metal to accommodate screw heads and to eliminate obstructions for metal expansion.) Also provide screw with neoprene washers at center of roof metal flashing, or provide keepers or cleats to keep metal in place. No screws at front faces, where face is exposed.

B. Locked Cover Strips: Provide cover strips with same profile as flashing and be formed with single lock seam to metal each side of joint. Provide about 3/4" seam lock, with flashing spaced about 3/8". Permit movement at each joint.

C. Lapped Joint: Lap 2" in direction of water flow. At counter flashings and similar work, lock bottom edges together.

D. General: At all corners, inside or outside type, provide sections built up in shop, with soldered joints. Corners unit to be neat and follow profile of adjacent metal. No nails permitted at exposed surfaces of exposed roof metal, use only screws. Set roof edges in cooperation with roofer. At typical roof edges roofer shall install all roofing and flashing plies as specified under roofing. Form metal as indicated to field verified dimensions.

### 3.5 REGLETS AND METAL RECEIVERS

A. Conform to general details indicated. Form and construct reglets and receivers, including at plaza, so counterflashing may be easily inserted after composition flashing has been installed and so metal counter flashing can be easily removed in future by removing screws. See typical details.

### 3.6 CONTROL JOINT

A. General: Construct to details shown; with end joints to permit movement; watertight. Provide securely fastened and solder sealed joints at intersection with metal roof edges. Install after installation of composition plies of flashing to top of curb and continuous cover sheet of plastic flashing (set by roofer).

### 3.7 COUNTER AND CURB FLASHING

A. General: Install metal counterflashing after composition flashing and cap sheets are installed. Where inserts (reglets) occur, slip into receiver at bottom of insert and secure with stainless steel (or non-ferrous) screws about 18" o.c. Coordinate with other contractors. Lap joints and lock lower edges together. Counterflashing to provide watertight closure over top of composition flashing. At corners, burbs and similar intersections, solder watertight. Carry counterflashing down 45° cant strip to about 1" above roofing membrane.

B. Combined curbs: Note that where curbs or ventilators are less than 20" apart, they shall be combined into a single unit so roofing will not be installed between them. Provide a sheet metal saddle between individual vents (at top of curb, form to drain, reinforce to support units and to prevent being deformed).

### 3.8 METAL WORK BUILT INTO MEMBRANES

A. Set metal built into membranes in cooperation with roofer. Install on

full bed of plastic cement and after first plies of roofing are installed and turned back, apply mastic to roofing to receive metal. Install cleats about 24" o.c. at flange in roofing and keeper at bottom of exposed vertical face. Roofer to install flashing plies over metal, set in plastic cement.

### 3.9 SCUPPERS

A. Construct to sizes and to general details indicated. Provide scuppers for openings through precast panels, built into flashing or not. Construct watertight and to resist temperature changes. Set in full bed of plastic cement, all sides. At back side of scuppers, form a flange for building into roofing and flashing, about 6" wide flange, riveted and soldered to form watertight connection to scupper.

B. Typical scuppers: Provide entire scupper, including sleeve of soft stainless steel. Verify angles to provide proper fit to construction.

### 3.10 PROTECTED METAL COVERS

A. General: It is intended that the Galbestos cover over each housing will be furnished and installed as a solid cover (no holes for ducts). Provide standing seam down center with the cap channel as indicated, filled with mastic recommended by metal fabricator. Mechanical Contractor will cut his own holes for ducts, as required, and install the Galbestos collar over which the duct will be turned back. After ducts and duct collars are installed, caulk under collar as indicated, using sealant recommended by manufacturer, to insure watertight housing cover.

### 3.11 METAL FLASHING PANS ("PITCH POCKETS") AND ROOF DRAIN RINGS

A. Provide at locations previously specified. Construct with 4" flange for building into roofing, with 2" high collar extending above roofing and with 1/2" clearance between inside of collar and the penetration through roofing (i.e.: collar 1" larger inside than the post or conduit). If constructed of 2 pieces, solder collar to flange. Provide double thickness collar, or with hemmed edge at top.

B. At all roof drains in sloped roofs, provide a 12 gauge 1" high ring, with 4" flashing flange, for building in as a gravel stop.

### 3.12 MISCELLANEOUS FLASHING AND METAL WORK REQUIREMENTS

A. Provide all miscellaneous metal flashing and other metal work shown.

B. Provide only stainless steel for metal work which will be in contact with precast concrete or which will allow water to wash onto same.

C. Bellows (if any): Construct of copper, with anchor, to a vee shape with round apex. Form to divide wide joints into 2 equal spaces, and to flex with building movement.

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## PART 1: GENERAL

1.1 SCOPE

A. Conditions of Contract and Division 1, General Requirements, apply to all work of this section. Refer to Article 12 of the Instructions to Bidders, Article 7 of the General Conditions and Section 01600 - Materials and Equipment - for requirements on pre-bid and post-bid evaluation of proposed substitute products, methods and other conditions.

B. Work under this section includes furnishing and installation of roof hatch units.

C. Related work specified elsewhere:

1. Concrete: Section 03300.
2. Metal Deck: Section 05302
3. Insulated Membrane Roofing: Section 07511
4. Sheet Metal: Section 07600.

1.2 QUALITY ASSURANCE

A. Units as manufactured by Fisher Skylights, Inc., are specified to establish a standard of quality. Approved equal will be acceptable subject to meeting the performance and construction criteria of the base product.

1.3 SUBMITTALS

A. Shop Drawings: Submit fabrication and installation drawings in accordance with Section 01300.

1.4 DELIVERY, STORAGE AND HANDLING

A. Package, deliver, handle and store at jobsite to avoid damage. Repair or replace damaged material.

1.5 JOB CONDITIONS

A. Coordinate installation with roofer.

## PART 2: PRODUCTS

2.1 ROOF VENTS

A. Fisher "Double Pitch Fire and Explosion Vents" designed and constructed to provide automatic fire release, automatic explosion release, manual interior release and manual exterior release.

B. Provide vents with emergency release cable, galvanized steel covering, doors lined with rigid insulation set in wood frames and reinforced with metal corner angles, continuous piano hinges, curb frames and anchorage.

PART 3: EXECUTION

3.1 INSTALLATION

- A. Installation shall be made by manufacturer or authorized installer.
- B. Coordinate placement, roofing, and flashing installation with other trades.
- C. Set in place level and plumb and true to line and anchor unit to roof by approved anchoring methods.
- D. Adjust all units for smooth operation after installation.

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## PART 1: GENERAL

1.1 SCOPE

A. Conditions of Contract and Division 1, General Requirements, apply to all work of this section. Refer to Article 12 of the Instructions to Bidders, Article 7 of the General Conditions and Section 01600 - Materials and Equipment, for requirements on pre-bid and post-bid evaluation of proposed substitute products, methods, and other conditions.

B. Work under this section includes all caulking, sealing, and gasket work except that specifically required under other sections.

C. Related work specified elsewhere:

1. Caulking and sealants related to membrane waterproofing: Section 07110.

2. Caulking and sealants related to roofing: Section 07511.

3. Caulking and sealants related to sheet metal flashing:  
Section 07600.

4. Caulking, sealants and gaskets related to glazing: Sections 08800.

5. Caulking, sealants and gaskets related to curtainwall: Section 08900.

6. Caulking, sealants and gaskets related to acoustical sealing of partitions: Section 09100.

7. Caulking and sealants related to tile work: Section 09300.

1.2 GENERAL INFORMATION

A. Following outline is intended to indicate the locations and general types of work under this Section as well as to complement and clarify drawing requirements. Do not construe as indicating all work required by this Section, describing all operations or mentioning each type of sealing requirement. Refer to drawings and other Sections for additional requirements.

1. Non-staining compressible filler: This is the secondary sealant system for use at all exterior precast concrete joints, at certain joints at grade, at window perimeters, and at all other locations shown on the drawings where there is danger of staining finish materials.

2. Asphalt impregnated compressible filler: This is the secondary sealant system for use at all locations shown on drawings where danger of staining does not exist.

3. Joint Sealant: This is the primary sealant for use at all exterior precast concrete joints, at joints between precast concrete and other materials

and at all other caulked joints in vertical surfaces of the exterior of the building.

4. Exterior Slab Sealant: This is the primary sealant for use at all caulked joints at Plaza areas, including expansion joints, slab control joints, feature joints to maintain pattern, joints where slabs abut buildings, areaways, columns, shafts, and similar feature and expansion joints in areaways, including at perimeters where slabs abut buildings or walls installed under this contract, and all similar locations. Refer to drawings for general indications as well as to Section 03300 for joint locations which may not be indicated.

5. Interior Slab Sealant: Provide at joints around perimeters of all equipment bases and pads at locations on earth, as at basement equipment rooms, floor expansion and cut control joints, as indicated on drawings and specified under Section 03300, isolation joint at perimeter of laboratory (and similar) spaces at basement floor, interior slab control joints where joint is not covered with finish floor material, other interior joints of the same type where joint filler or cut slab joint is provided or indicated.

6. Interior vertical surface joint sealer (caulking): This is the primary interior sealant for all uses in joints in vertical surfaces except acoustical sealant.

7. Acoustical Sealant: This is sealant for use at perimeter of all partitions where they abut floors and other partitions as shown on drawings.

8. Compressible Gasket: This is a gasket material for use at joining of materials in interior applications including partition ceiling runner to finished ceiling, hollow metal to precast concrete, precast to concrete, and other locations indicated where movement is expected but a water and weathertight seal (caulking) is not required.

9. Neoprene Filler: This is a molded neoprene foam gasket for use in joining partitions to metal deck where partition runs perpendicular to the deck flutes.

10. Sound isolated slabs and masonry walls: Provide exterior slab sealant or primary vertical surface joint sealant at surface edge of all sound isolation board, sound isolation panels and around all piping, conduit and ductwork penetrating sound isolation slabs or walls. See Section 13770.

11. Compression Seals: Provide compression seals at all surfaces of expansion joints.

### 1.3 SUBMITTALS

A. Color Samples: Submit actual samples of full color palette of each material for Architect's selection.

B. Manufacturer's Recommendation: Submit technical data including performance requirements, recommendations and application instructions to the Architect for approval of materials used.

## PART 2: PRODUCTS

### 2.1 COMPRESSIBLE FILLERS

A. Non-staining Compressible Filler: Preformed resilient polyurethane foam gasket impregnated with waterproofing polybutylene, Sandell Manufacturing Co's "Polytite", or approved equal. Provide sizes as specified below, but in no case less size (width and depth) than the minimum recommendation of manufacturer. Provide full length gasket for any joint where the joint length is less than the manufacturer's standard length.

B. Asphalt Impregnated Compressible Filler: Preformed resilient polyurethane foam gasket, impregnated with asphalt, Secoa, Inc's "Compriband". Provide sizes as specified below but in no case less size (width and depth) than the minimum recommendation of manufacturer. Provide full length gaskets for any joint 6 foot or shorter.

### 2.2 SEALANTS

A. Primary Vertical Surface Joint Sealant: Sealant shall be a gun-grade class B, non-sag two-part polysulfide sealant licensed by Thiokol Chemical Corp. as conforming to Thiokol Building Trade Performance Specification, such as Tremco "Lasto-Meric", W.R. Grade Hornflex, Pecora Synthacalk GC-5, Sonneborn Sonolastic (two-part), or approved equal. Special sealant color may be required, to blend with precast and to be similar or match Health Sciences Unit A sealant, as selected by Architect. Provide in-place samples, after preliminary selection, for final approval.

B. Exterior Slab Sealant: Heel resistant, self-leveling, high strength, one part polyurethane rubber sealant, Dupont Imron, Vulkem 45, or approved equal.

C. Interior Slab Sealant: Polysulphide-base sealant conforming to ASA A-116.1 Class A, self-leveling, guaranteed non-staining without the use of primer. Acceptable products and manufacturers, subject to suitable colors, are those listed by Thiokol Chemical Corp under "Approved Sealant Products" and conforming to Thiokol's Building Trade Performance Specification, current at the date of this specification. Submit name of proposed product, with approved independent testing laboratory evidence that material (formula) conforms to ASA and Thiokol's specifications. Provide manufacturer's certificate that material (formula) conforms to specifications. Thiokol's "Tested and Approved" seal shall appear on all containers of the product in addition to the supplier's name.

D. Interior Vertical Surface Joint Sealant: Same as 2.2.A, above.

E. Primer: Provide primer type as supplied or as recommended by manufacturer of sealant or gasket material, including "conditioner" for exterior slab sealant.

### 2.3 GASKETS AND COMPRESSION SEALS

A. Compressible Gasket: Electrovert Rodofam Soft, or approved equal, except where semi-rigid is indicated Rodofam Semi-Rigid, or approved equal.

B. Neoprene Filler: Premolded neoprene gasket manufactured specifically to

fit the metal deck flutes. See Section 05300.

C. Gasket Adhesive: Provide adhesive as supplied or as recommended by manufacturer. Use epoxy type of asphalt impregnated gaskets.

D. Compression Seals: Compression seals shall be Acmasel as manufactured by Acme Highway Products Corporation or approved equal.

1. Type 1: Acmasel B-1052.
2. Type 2: Acmasel B-1241.
3. Type 3: Acmasel B-1306
4. Type 4: Acmasel S-545.

E. Compression Seal Adhesive: Acma lubricant adhesive recommended by the manufacturer for the specific application and installation method.

#### 2.4 BACKING AND BOND BREAKERS

A. Backing and Rod Stock Backstops: Refer to other Sections (including Sections 03300, 04200) for backstop provided under other sections. Where appropriate backing for proper joint configuration is not supplied by others, or where backing is too deep in joint, provide "Ethafoam" rod stock (or other similar recommended rod type backing) oversize for joint. At all locations, provide approved backstop that will prevent sealant adhesion at backside and use as separator between non-compatible sealant materials.

B. Bond Breaker: Aluminum foil or other sheet goods, compatible with sealants.

### PART 3: EXECUTION

#### 3.1 GENERAL INSTALLATION REQUIREMENTS

A. DILUTION: DO NOT DILUTE, CUT, GAS, ADULTERATE OR OTHERWISE CHANGE ANY SEALANT. SUCH PRACTICE WILL RESULT IN AUTOMATIC REJECTION OF CAULKING SUBCONTRACTOR. IN ADDITION, ALL CAULKING DONE WILL BE REJECTED, REMOVED AND REPLACED BY OTHERS AT EXPENSE OF OFFENDING SUBCONTRACTOR, TO EXTENT DIRECTED BY ARCHITECT OR UNIVERSITY.

B. Joint Condition: Do no work until joints are in proper condition for best results. Caulking subcontractor shall perform all work to insure joints that are clean, dry, and free from frost, dust, oil (including form oil) or other residue that will prevent or reduce adhesion. Joint defects, including lack of adequate depth or size shall be corrected by prime contractor.

C. Primer: At porous surfaces and elsewhere recommended by sealant manufacturer, prime joints with clear primer made for that purpose, as recommended by manufacturer. Surface to show gloss. Primer is required at stone, porous masonry and porous concrete. Provide primer (conditioner) at all joints to receive exterior slab sealant.

D. Clean Sealant: Keep surface of all sealant clean until "skinning" has taken place. Do not caulk under conditions which will permit dust to adhere to surface.



E. Joint Design and Configurations: Details provide only general indications as to where sealants occur. Provide proper depth of material in relation to width, with proper configuration to insure proper adhesion, without exceeding adhesion abilities of the sealant. Obtain manufacturer's recommendations and keep copy at jobsite to permit reference. Joint size and configuration shall be as recommended by manufacturer for location, proportion, type of stress and shape, including joints in shear. In all cases, provide backstop or bond backer at backup to prevent sealant from adhering to backup.

F. Instructing Mechanics: Prior to commencing work, thoroughly instruct all mechanics in the proper methods and techniques required to insure best possible end result. In addition to reviewing instruction of each of the manufacturers involved, review requirements of temperature, surface of sealant with relation to surrounding materials, cleaning joints, priming joints, backstops and joint configurations.

### 3.2 IMPREGNATED GASKETS

A. General: Gasket sizes shall be selected to provide gaskets which are highly compressed in the joints after installation, a minimum  $2\frac{1}{2}$  times the width of the open (maximum position) joint by 3 times the width of the open joint. Gaskets are to be held back from face of surrounding materials as indicated on drawings. Follow manufacturer's recommendations for installation.

B. Adhesive Application: At all Compriband joints, apply adhesive (epoxy type) to surface of concrete prior to inserting gasket. Note: All joints to be glued both sides.

C. Installation: Install by precompressing gaskets to less than joint width by using two flat surfaces, maintaining compression for length of time recommended by manufacturer. Compress in width only. Insert in joint to exact location, with face a uniform depth back from surrounding surface. Use gauge or screed device to insure uniform depth from surrounding surface. Prevent any pressure against face of gasket until gasket has expanded and bonded to adjacent surfaces.

D. Splicing: Minimize splices by using longest lengths available. Follow manufacturer's recommendations and to insure tight splice. Do not splice at corners. For Compriband, cut at angle and press together to form completely adhered joint. For Polytite, cut square, leaving 2-3 inches of overlap, compress each end back along its axis, position the ends and allow gasket to expand to provide constant butting pressure.

### 3.3 CAULKING

A. General: Do not caulk during period of precipitation nor immediately thereafter. Provide proper backing at all joints. Provide rod stock typically at all joints, including raked back mortar, except where gaskets are provided. Use oversize rod stock to insure proper shape and to hold rod stock backing firmly in place. Follow manufacturer's recommendations on joint proportions. Caulking depth generally shall be two-thirds of joint width, but not less than  $\frac{1}{4}$ " depth. Fill joints over  $\frac{3}{8}$ " in width by at least 3 passes, running a bead in each corner and finish by a bead down center.

B. Preparation: Before caulking, take only measures to insure clean, dry joints. Brush, degrease, dry and clean all grooves. Use solvents recommended by manufacturer.

C. Temperatures: Caulk under ideal temperatures, above 40°. If necessary, provide heated enclosures to accomplish work under ideal temperatures.

D. Caulking: Use proper and approved guns, with proper size nozzles, including offset nozzles at limited clearance spaces. Mask adjacent surfaces as required to prevent surplus or misplaced sealant. If caulking operations indicate careless workmanship, misplaced sealant or sealant smeared (or overlapping) adjacent surfaces, masking will be required (and provided without extra cost) at all locations. Finish joints by neatly pointing with beading tool. Apply surface coating to surface of sealant before tooling only if recommended by manufacturer and if coating will not discolor caulking.

E. Cleanup: Immediately clean adjacent materials which have been soiled; leave work in a neat, clean condition; finish work to be smooth, clean, even surfaces, neat, free from holes, pits and absolutely watertight.

F. Rope Wicks: When wicks for weeping masonry or in-wall flashing occur, cut wick flush with caulking face and do not seal wick ends.

G. Recessed Caulking: Where shown, caulk so surface of caulking is uniformly back from adjacent surface. Where not otherwise indicated at recessed caulking, hold surface back about  $\frac{1}{4}$ ".

H. Seal joints of precast concrete prior to application of thermal insulation at interior side.

### 3.4 SLAB SEALANT

A. General: Conform to applicable provisions of caulking requirements above, such as cleaning, preparation, temperatures, caulking, primer and cleanup. Expansion joint filler is typically provided under Section 03300, but provide bond breaker on top of any joint filler material which is not of the Ethafoam type. Prime (or "condition") all exterior joints.

B. Level of Sealant: At all interior joints, install sealant so top face is flush and level with surrounding surfaces. At exterior joints of Plaza where edges of joint are slightly rounded, keep top face of sealant down a uniform  $\frac{1}{4}$ " from surrounding surfaces. At joints located in areaways, where slabs abut building or other features, install so sealant face is flush and level with surrounding surfaces.

C. Sealant Depth: Also refer to Section 03300. Provide uniform depth sealant for each type of joint and verify uniform backing depth prior to starting. Depth of sealant noted herein is from face of sealant to high (rounded) point of backing. At interior joints, provide  $\frac{3}{8}$ " deep sealant. At exterior expansion joints and slab control joints (as at Plaza) and all joints subject to heel traffic, provide sealant depth equal to width of joint, but not less than  $\frac{3}{8}$ " nor more than  $\frac{5}{8}$ ". At other exterior joints, as at areaways and where slabs abut building, walls or similar features, provide depth  $\frac{1}{8}$ " less than joint

width, but not less than 3/8".

D. Application: Install backing or bond breaker as required and to regulate joint depth. Apply primer or conditioner of type recommended by manufacturer. Apply sealant by gun, using proper nozzle size, filling all voids and to insure proper level and thickness. Tool sealant to smooth, even finish, free from ridges, wrinkles or similar surface marks.

### 3.5 INSTALLING COMPRESSION SEALS

#### A. Joint Preparation and Seal Installation.

1. Where indicated and noted on drawings, install the proper seals in a neat, workmanlike manner. All surfaces to receive Acmasseal shall be free from dirt, water, oil, rust, frost and any other loose foreign debris which may be detrimental to effective joint sealing.

2. All joints to receive Acmasseal shall be free from defects such as spalls, cracks or loose materials.

3. For ease of installation, the air temperature should be below 85°F. At higher temperatures, the joint opening closes to such a degree that the seal becomes difficult to insert.

4. Apply a continuous coat of Acma Prima-Lube Adhesive to both joint interfaces immediately prior to seal installation. Prima-Lube Adhesive shall not be applied below 40°F.

5. Unless otherwise specified, Acmasseal to be installed shall be recessed 1/8" to 3/8" depending on seal size and application.

6. All joints on drawings required to be sealed shall be the responsibility of the contractor to install the proper size seal for the constructed joint at the time of installation.

7. For turns and junctions, Acmasseal shall be spliced using Aron Alpha Adhesive to provide a permanent, watertight joint. T-joints, X-joints and L-joints are made just as easily using a closed cell Neoprene sponge (Grade SC41-ASTM Spec. C-509) bonded to Acmasseal at each intersection in accordance with manufacturer's recommendations.

#### B. Protection of Personnel.

1. Health: Warn all personnel against breathing in adhesive and solvent vapors and to avoid contact with skin and eyes. Application of adhesive and solvent should take place in a well ventilated area.

2. Fire: Keep all adhesives and solvents away from heat, sparks and open flame.

3. Observe all manufacturer's safety precautions as shown on can labels.

C. Final Clean-Up: Misapplied adhesive shall be immediately removed. Solvent such as methylethylketone (MEK) or toluene may be used.

### 3.6 WORKMANSHIP

A. Conform to best practice and accomplish by using mechanics skilled in their trade. Caulking shall accomplish its purpose to prevent admittance of air and water. Remove and replace defective caulking. Requirements herein specified are minimum requirements as to materials and methods and perform work and use all means as necessary to insure best results. Assume responsibility for defective work. Following types of failure will be adjudged defective work: Leakage of air or water; hardening, cracking, pulling away from adjacent surfaces; loss of bond; crumbling; sagging; shrinking; running of compound; staining of adjacent work by compound; improper levels; surfaces which are not smooth.

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## PART 1: GENERAL

1.1 SCOPE

- A. Conditions of Contract and Division 1 - General Requirements - apply to all work of this section. Refer to Article 12 of the Instructions to Bidders, Article 7 of the General Conditions and Section 01600 - Materials and Equipment - for requirements on pre-bid and post-bid evaluation of proposed substitute products, methods and other conditions.
- B. Work under this section includes all hollow metal shown on drawings and specified herein including but not necessarily limited to the following: Interior and exterior hollow metal doors, and frames including UL labeled and non-labeled openings; frames including door openings, sidelights, transoms, view and borrowed light frames and similar frames and louver and panel frames. Provide all mullions at door openings, fixed or removable, as called for on Opening Schedule, and rough bucks and frame reinforcing shown, specified or required. Standard and special anchors, clip angles, etc, required for installation. Jamb, head and floor anchorage. Extensions of frames (channels or similar) to secure frames and mullions to structure above, as shown or required.
- C. Related work specified elsewhere:
1. Grouting of frames: Sections 04200, 09100.
  2. Special formed metal: Section 05750.
  3. Structural steel framing: Section 05122.
  4. Metal Fabrication: Section 05500.
  5. Carpentry: Section 06100.
  6. Wood doors: Section 08200.
  7. Finish Hardware: Section 08700.
  8. Weatherstripping and Soundstripping: Section 08730.
  9. Glass and glazing: Section 08800.
  10. Field painting: Section 09900.
  11. Louvers: Section 10200.
- D. Furnished under other contracts:
1. Elevator doors and frames:
- E. Installed but not furnished under this section:
1. Door louvers, Section 10200.

1.2 SUBMITTALS

- A. Shop Drawings: Submit shop drawings of hollow metal items in accordance with Section 01300. Show all features of construction, dimensions, gauges, reinforcements, cutouts anchorage to adjacent construction and other pertinent data.
- B. If requested by Architect, prior to fabrication submit samples to job site of 1/4 of a door and a frame showing reinforcing, construction and workmanship. If approved, samples will be retained as a comparison with delivered hollow metal.

### 1.3 PRODUCT HANDLING

A. Handle, transport and store hollow metal work in a manner that will prevent damage and deterioration. Provide proper packaging to protect all items. Store at the project site in an upright position under cover and on wood sills.

## PART 2: PRODUCTS

### 2.1 MATERIALS AND MANUFACTURERS

A. This specification is based on Trussbilt Custom Hollow Metal Door and Frames. All hollow metal shall be custom quality.

B. Comparable products manufactured by Overly Mfg. Co., or Curries Manufacturing, Inc., Pioneer Industries, Steelcraft, Michels (Superior/Precision), or approved equal which conforms to these specifications will be acceptable. Doors and frames shall be responsibility of same manufacturer or vendor.

### 2.2 FABRICATION

A. Construct all work in a first class manner in accordance with details and approved shop drawings. All joints and mortises shall be to hairline accuracy, with all welds continuous and ground smooth and with all items square and true.

B. Factory assemble frames in the largest size units permitted by shipping restrictions for minimum assembly of related parts at the job site.

C. Frames:

1. Provide one piece welded unit type construction formed to the profiles shown on details. Construct frames of hot-rolled pickled and annealed steel. Use 14-gauge for exterior frames and 16-gauge for all other frames. Label frames, 16 gauge or heavier if required by label.

2. Miter all corners, including stops, to hairline accuracy continuously arc welded on the back side. Grind frame faces smooth for invisible joint. At mullion intersections of special frames, arc weld faces of frames and stops. Welding and grinding to flush, smooth surfaces shall be done to preserve the original profile of the frame and to maintain crisp square corners. Spot welding of reinforcement shall be invisible on exposed surfaces. The welding at mitred corners, including stops, shall not be visible on the exposed side of frame. The exposed corners shall be crisp, clean and true.

3. Provide removable stops for glass, louvers and panels as required formed of 16-gauge steel, hand fitted to each opening with corners square and true and tightly fitted. Fasten stops with #6 Jackson-head screws spaced 16" o.c. Fit and install at factory.

4. Provide at least three anchors at each jamb for anchoring frame to adjacent construction. Type of anchor shall be determined by the type of construction and as recommended by the frame manufacturer. Provide 2" x 3-1/2" x 12 gauge floor clip angles. Where no separate structural lintel is indicated for frames in 4" walls, provide a 12-gauge channel head reinforcement, welded to frame head.

5. Provide a minimum of 12 gauge channel reinforcement in mullions where a door hinges on the mullion and at any mullion 7'-6" or more in height where a door closes against the mullion. Provide all other special reinforcing called for on

the drawings and as required to provide rigid, straight and adequately strengthened frames for the conditions, including wind conditions at exterior doors.

6. Provide cutouts for electrical outlets and switches located in hollow metal. Verify location and size with electrical contractor.

D. Doors:

1. Provide hollow metal doors of size and type shown. Construct of coldrolled, furniture, stretcher-leveled steel. Use 16 gauge face sheets for exterior doors and 18 gauge face sheets for interior doors, or heavier as required by Underwriter's label. No seams on face sheets. Provide an 18 gauge steel channel on top and bottom of doors. Provide watertight flush plate at top to prevent water pockets. Door edges shall be flush and smooth, without visible seam or joint. Provide doors with undamaged edges, including top and bottom. Provide doors with faces and edges which are smooth, free from waves and dimples and with no visible weld spots.

2. Provide continuous true truss inner core, full height and width, spot welded to face sheets 3" on center both vertically and horizontally

or

3. Provide an inner core consisting of vertical stiffeners of 16 gauge channel or zee members spaced 6" on center and spot welded to face sheet 3" on center.

4. Insulate doors and panels with 6-pound density mineral rock wool.

5. Provide glass light and louver openings as required complete with removable molding hand fitted to each opening with joints true and tightly fitted. Fasten with #6 Jackson-head screws. Moldings shall not overlap door face sheets. Install door louvers at the factory. Moldings shall be hand-fitted as for stops in frames.

6. Construct stile and rail doors with equivalent reinforcing to flush doors. Reinforce intersections of stiles and rails to form rigid unit, capable of severe abuse without racking or sagging. Weld intersections of stiles and rails and grind smooth to form smooth face without visible evidence of joint. Reinforce stiles so they remain straight and rigid.

7. Close all holes in tops and bottoms of doors (except holes to receive hardware fastenings) to prevent vermin from entering door. Weep holes permitted at bottom of exterior doors.

E. Panels:

1. Construct hollow metal panels as specified above for doors.

F. Hardware Preparation:

1. Mortise, reinforce, drill and tap doors and frames for hardware using templates furnished by the hardware supplier. Provide the following minimum reinforcements and components:

a. Frames:

Hinge reinforcements - 3-1/16" x 1-1/2" x 9"

Strike clips - 3/16" x 1-1/2" x 9".

Closer and holder - 12 gauge.

Spreader - 16 gauge channel arc-welded.

Cover boxes - full enclosed steel boxes over mortises.

At jambs that receive lead lined doors: Provide in both jambs, 2-1/2" x 3" x 3/16" steel angle, frame floor to structure above. Weld to frame. Provide vertical clip connection to absorb floor deflection.

All exterior frames and where doors 3'-4" or wider - on hinge side, 3/16" thick x 5" wide or full width of frame, continuous channel or angle. Provide cover boxes (caps) on back sides of frames at holes for door silencer for frames to be installed in masonry or concrete walls.

b. Doors:

Hinge reinforcements - 3/16" x 1-1/2" x 9".

Lock front reinforcement - 3/16" x 1-1/2" x 4".

Cylindrical lock reinforcement - 16 gauge.

Closer reinforcement - 12-gauge channel 14" long.

All exterior doors - inside door on hinge side with continuous 3/16" x 1-1/2" bar.

2. Provide three Glynn-Johnson GJ64 moulded, non-staining rubber mutes for all interior door frames.

G. Underwriters Construction:

1. Provide Underwriter's construction and labels of the classifications required by the drawings. Label requirements shall take precedence over any conflicting portions of the drawings and specifications. Hollow metal shall be capable of the required label with the specified hardware, including single point locks.

2. The hollow metal manufacturer shall submit a certificate that doors and frames called for as labeled constructed only have actually been constructed in accordance with U.L. construction requirements.

2.3 PAINTING

A. After fabrication, thoroughly clean all items of rust, oil, grease or other impurities, spot glaze where necessary to correct defects and apply the following coats of red oxide primer, each coat baked-on.

1. Frames - 1 coat.
2. Doors - 2 coats.
3. Interior of all doors - 1 coat.
4. Paint under and inside of removable stops.

PART 3: ERECTION

3.1 ERECTION

A. Erect frames in position plumb, rigid and in true alignment. Provide the necessary bracing and spreaders to prevent displacement or distortion until adjacent construction is completed. Securely attach frames to floor and adjacent construction. Frames in masonry walls shall be grouted full of mortar at jambs and anchors built into joints by the mason as the walls as laid up. Frames in metal stud walls shall be grouted full under Section 09100.



B. Drill and tap for field splices and connections after erection. Caulk splices and connections and leave finished work smooth and free from warps and buckles.

C. Install doors with uniform margin at jambs and head.

D. After erection, touch up field splices, connections, welds and abrasions with specified primer.

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## PART 1: GENERAL

1.1 SCOPE

A. Conditions of Contract and Division 1 - General Requirements, apply to all work of this section. Refer to Article 12 of the Instructions to Bidders, Article 7 of the General Conditions and Section 01600 - Materials and Equipment for requirements on pre-bid and post-bid evaluation of proposed substitute products, methods and other conditions.

B. Work under this section includes all acoustical hollow metal door units shown on drawings and specified herein which includes the following but not necessarily limited to: interior acoustical hollow metal doors and frames. Rough bucks and frame reinforcing shown, specified or required. Standard and special anchors, clip angles, etc., required for installation. Jamb, head and floor anchorage. Extensions of frames (channels or similar) to secure frames and mullions to structure above, as shown or required.

C. Relate work specified elsewhere:

1. Grouting of frames: Section 04200, 09150.
2. Special formed metal: Section 05750.
3. Metal Fabrication: Section 05500.
4. Hollow Metal: Section 08110.
5. Wood doors: Section 08200.
6. Finish hardware: Section 08700.
7. Weatherstripping and Soundstripping: Section 08730.
8. Glass and glazing: Section 08800.
9. Field painting: Section 09900.
10. Louvers: Section 10200.

D. Furnished under other contracts:

1. Elevator doors and frames:

E. Installed but not furnished under this section: Finish Hardware, Section 08700.

1.2 SUBMITTALS

A. Shop Drawings: Submit shop drawings of acoustical hollow metal items in accordance with Section 01300. Show all features of construction, dimensions, gauges, reinforcements, cutouts anchorage to adjacent construction and other pertinent data.

B. If requested by Architect, prior to fabrication submit samples to job site of  $\frac{1}{4}$  of a door and a frame showing reinforcing, construction and workmanship. If approved, samples will be retained as a comparison with delivered hollow metal.

1.3 PRODUCT HANDLING

A. Handle, transport and store hollow metal work in a manner that will prevent damage and deterioration. Provide proper packaging to protect all items. Store at the project site in an upright position under cover and on wood sills.

B. Comparable products manufactured by Trussbilt, or Curries Manufacturing, Inc., or approved equal which conforms to these specifications will be acceptable.

C. General: All acoustical door and frame units indicated in door schedule shall be furnished by Overly Manufacturing Company. Rating of each opening shall be 51 db STC (E90-61T). Provide test certification if requested by Architect. Furnish complete units; including doors, frames and seals. Units shall be designed for use with standard builder's hardware.

D. Doors: 1-3/4" thick doors; flush fabricated from prime quality, cold-rolled, stretcher-leveled steel plates and shapes, appearance to match conventional hollow metal doors.

E. Frames to be fabricated from prime quality, cold-rolled, stretcher - leveled steel to meet the wall conditions indicated.

F. Seals: Furnish adjustable composite sound seals, astragals and automatic door bottoms, as required to meet specified rating.

G. Hardware: To be furnished to door manufacturer by Section 08700. Door manufacturer to install all hardware on doors and frames in shop.

## 2.2 FABRICATION

A. Construct all work in a first class manner in accordance with details and approved shop drawings. All joints and mortises shall be to hairline accuracy, with all welds continuous and ground smooth and with all items square and true.

B. Factory assemble frames in the largest size units permitted by shipping restrictions for minimum assembly of related parts at the job site.

C. Frames:

1. Provide welded unit type construction formed to the profiles shown on details.

2. Miter all corners, including stops, to hairline accuracy continuously arc welded on the back side. Grind frame faces smooth for invisible joint. At mullion intersections of special frames, arc weld faces of frames and stops. Welding and grinding to flush, smooth surfaces shall be done to preserve the original profile of the frame and to maintain crisp square corners. Spot welding of reinforcement shall be invisible on exposed surfaces.

3. Provide at least three anchors at each jamb for anchoring frame to adjacent construction. Type of anchor shall be determined by the type of construction and as recommended by the frame manufacturer. Provide minimum 2" x 3 1/2" x 12-gauge floor clip angles. Where no separate structural lintel is indicated for frames in 4" walls, provide a 12-gauge channel head reinforcement, welded to frame head.

4. Reinforce frames for acoustical doors as required to adequately support the door.

### 2.3 PAINTING

A. After fabrication, thoroughly clean all items of rust, oil, grease or other impurities, spot glaze where necessary to correct defects and apply the following coats of red oxide primer, each coat baked-on.

1. Frames - 1 coat.
2. Doors - 2 coats.

### PART 3: ERECTION

#### 3.1 ERECTION

A. Erect frames in position plumb, rigid and in true alignment. Provide the necessary bracing and spreaders to prevent displacement or distortion until adjacent construction is completed. Securely attach frames to floor and adjacent construction and in strict accordance with manufacturer's specifications. Frames in masonry walls shall be grouted full of mortar at jambs and anchors built into joints by the mason as the walls are laid up.

B. Drill and tap for field splices and connections after erection. Caulk splices and connections and leave finished work smooth and free from warps and buckles.

C. Install doors with uniform margin at jambs and head.

D. After erection, touch up field splices, connections, welds and abrasions with specified primer.

#### 3.2 TEST

A. After installation, manufacturer or his authorized representative, shall check installation and test to illustrate conformance with specification requirements.

B. The Owner reserves the right to make tests of the complete installation. Contractor shall correct any deficiencies.

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## PART 1: GENERAL

1.1 SCOPE

A. Conditions of Contract and Division 1 - General Requirements, apply to all work of this section. Refer to Article 12 of the Instructions to Bidders, Article 7 of the General Conditions and Section 01600 - Materials and Equipment, for requirements on pre-bid and post-bid evaluation of proposed substitute products, methods and other conditions.

B. Work under this section includes furnishing all wood doors, 1-3/8" thick and thicker, shown on the drawings (except as noted in Door Schedule), prefabricating and pre-machining. Label and non-label doors. Prefit and machine all doors.

C. Related work specified elsewhere:

1. Installation of doors: Section 06100.
2. Millwork: Section 06400.
3. Hollow Metal: Section 08100.
4. Finish Hardware: Section 08700.
5. Weatherstripping and sound stripping: Section 08730.
6. Field Finishing: Section 09900.
7. Glass and Glazing: Section 08800.

D. Installed but not furnished under this section.

1. Door Louvers: Section 10200.

1.2 GENERAL INFORMATION

A. Coordination: Coordinate work directly with appropriate subcontractors (i.e. Hardware, Hollow Metal) as necessary to insure proper fitting, opening sizes and clearances to other work. Door manufacturer shall be responsible for coordination of information to insure proper fit of doors.

B. field Dimensions: Field measure building features as required to insure proper fitting of work.

C. Samples: Provide Painting Subcontractor with four unfinished samples (two of each) of Project veneers. Samples shall be uniform in size, approximately one square foot. Identify Project in ink directly on one surface of sample. Provide sample pieces which will be representative for each species.

1.3 JOB CONDITIONS

A. General Contractor shall not permit delivery until job conditions, including humidity, are suitable. Do not deliver until building is sufficiently dry to insure no damage to doors will result; as a minimum, plastering and similar

moisture shall have been out of entire building for at least ten days, relative humidity shall be less than 50% and in cold weather, heat shall have been provided for at least ten days prior to delivery, frames and construction condition ready to finish and hang doors.

#### 1.4 DELIVERY, HANDLING AND STORAGE

- A. Package, handle, deliver and store at the jobsite in a manner that will avoid damage. Damaged doors will be cause for rejection.
- B. Store doors flat and support in such a way as to prevent marring or crushing.
- C. Store doors in unopened containers until ready to hang.

#### 1.5 SUBMITTALS

- A. Shop Drawings: Submit shop drawings of all wood door items in accordance with Section 01300. Show all features of construction, dimensions; and all other pertinent data.

#### 1.6 GUARANTEE

Guarantee interior doors for five years. Guaranty shall cover faulty workmanship, materials, delamination or splitting of veneer or warp in excess of 1/4" for doors up to 7'-0" and warp in excess of 3/8" for doors over 8'-0". Replace doors complete including fitting, hanging and finishing. Installation of wood battens by Section 06400 shall not alter guarantee.

### PART 2: PRODUCTS

#### 2.1 MANUFACTURERS

- A. Acceptable Wood Door Manufacturers: Doors by Eggers Hardwood Products Corporation, Algoma Hardwoods, Inc., Weyerhaeuser, Aaron Carlson Company, or approved equal, conforming to the below specifications will be acceptable.

#### 2.2 WOOD DOORS AND TRANSOM PANELS

- A. Quality Grade: Except as otherwise specified herein, provide Premium Grade, as defined in AWI Quality Standards, Section 1300.
- B. Transom panels to be same construction as doors, see details for support, and stops.
- C. Flush Door Construction: Solid core, wood flake board core, 28 to 32 lb. per cubic foot density; or single thickness slab of 3-ply particle board; conforming to Commercial Standards CS236-66, Type 1, Density C, Class 1. Stile edges 1-3/8" to 1-1/2", top and bottom edges 1-1/4" thick, overlays as specified under 2.3 herein. Provide dutch door shelf as indicated on detail 17/11-5.
- D. Fire Door Construction: Solid, mineral core, joined together in accordance with Underwriters' Laboratories procedure manual, for Class "B" (1-1/2 hour) and Class "C" (3/4 hour) openings, Doors shall bear UL labels designating the rating. Overlay as specified under 2.3 herein.

## 2.3 FACE VENEER OR OVERLAY

A. Refer to Door Schedule for doors and transom panels that receive transparent finish or paint finish.

B. Veneers for Transparent (Natural) Finish: Plain sliced Red Oak, book matched. Run grain of all face veneers vertically unless otherwise shown or approved. Where more than one transparent finish door, dutch door or door and transom is used in one opening, architecturally match, sequence and number. Smoothley belt sand face veneers. Face veneers with open joints, face depressions, glue or other stains, or telegraphing core variances will be cause for rejection and replacement of doors.

C. Overlay for Paint Finish: Medium-density overlay sheet of phenolic resins and cellulose fibers laminated over a sound grade hardwood face veneer.

## 2.4 PREFITTING AND PACKAGING

A. Prefitting: Factory prefit and bevel, to net opening size less approximately 1/4" in width and 3/8" in height for doors occurring over hard surface floors and 3/4" height for doors occurring over carpet (unless otherwise required by drawings or specification). Slightly ease vertical edges.

B. Machine for Hardware: Machine for all hardware and weatherstripping requiring cutting of door, except hardware and weatherstripping applied by surface application. General Contractor shall provide door manufacturer with hollow metal shop drawings, hardware and weatherstripping templates, floor plans, opening schedules, hardware schedule and physical samples, if required, not less than 120 days prior to desired delivery date of doors. Mortising of lead lined doors must allow for additional width for lead thickness at locksets and other mortised hardware.

C. Openings: Manufacturer shall cut for glass or louvers where required if any, as shown. Openings shall have mouldings tacked in place for field glazing. Seal all cutout openings at mill prior to setting louvers or tacking in mouldings. Prevent any stains on face of door. Install door louvers furnished to the factory under Section 10200.

D. Numbering: Provide door opening number on either top or bottom edge of door. Location of numbers shall be consistent.

E. Packaging: Pack doors individually in heavy cardboard cartons; paper bag packaging not acceptable. Provide door opening number on shipping carton.

## PART 3: EXECUTION

### 3.1 INSTALLING AND FINISHING

A. All doors are hung and installed under Section 06100 and finished under Section 09900.

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## PART 1: GENERAL

1.1 SCOPE

A. Conditions of Contract and Division 1-General Requirements, apply to all work of this section. Refer to Article 12 of the Instructions to Bidders, Article 7 of the General Conditions and Section 01600-Materials and Equipment, for requirements on pre-bid and post-bid evaluation of proposed substitute products, methods and other conditions.

B. Work under this section includes furnishing and installing the following types of rolling shutters:

1. Rolling shutters, fire doors.
2. Rolling shutters, counter door.

C. Related work specified elsewhere:

1. Wood Doors: Section 08200.
2. Folding Partitions: Section 10620.
3. Operable Walls: Section 10630.
4. Field Painting: Section 09900.

1.2 SUBMITTALS

A. Shop Drawings: Submit shop drawings of all rolling shutters, housing, track and support structures in accordance with Section 01300. Show all features of construction, dimensions, material type and gauges, and all other pertinent data.

1.3 GENERAL INFORMATION

A. Coordination: Coordinate work directly with appropriate subcontractors as necessary to insure proper fitting, opening sizes and clearances to other work. Manufacturer shall be responsible for coordination of information to insure proper fit of doors.

B. Field Dimensions: Field measure building features as required to insure proper fitting of work.

C. Pretreat and shop prime galvanized metal to receive finish paint.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Handle, transport and store at the jobsite in a manner which will avoid damage.



PART 2: PRODUCTS

2.1 ROLLING SHUTTERS, FIRE DOOR

- A. Manufacturers: Rolling Shutter, Fire Door, manual push-up, steel fire door UFI as manufactured by North American Door or equivalent as manufactured by Cookson, J.G. Wilson or Crawford, or approved equal. Shutters shall bear a Class "B" label, 1-1/2 hour rating.
- B. Doors shall have an automatic closing device and governor; which shall become operative upon the fusing of a 160° fusible link.
- C. Curtain: formed of galvanized steel slats and endlocks as required by UL Specifications. Reinforce top slat, bottom bar to be two steel angles back to back.
- D. Counterbalance: Counterbalancing mechanism shall be helical torsion springs enclosed in a barrel.
- E. Operation: Manual, push-up operation with finger lift mounts on bottom bar.
- F. Guides: Fabricated from 3/16" thick angles, bolted at 12" on centers.
- G. Brackets: To be of minimum 5/16" thick steel plate and provided with ball bearings.
- H. Hood and Flame Baffle: To be furnished as required by UL Specification.
- I. Finish: Curtain shall have a baked grey acrylic primer. All other exposed surfaces shall be given a factory prime coat.
- J. Accessories: Furnish all necessary accessories required.

2.2 ROLLING SHUTTER, COUNTER SHUTTER

- A. Manufacturers: Rolling Shutter, Counter Door, type manual push-up, rolling shutter, hot dipped galvanized with baked grey acrylic primer as manufactured by North American Door or equivalent by Cookson, J.G. Wilson or Crawford, or approved equal. Rolling shutters shall bear UL B label, 1 hour.
- B. Shutter formed of galvanized steel, flat faced slats, 1-1/4" wide, crown 1/2" deep. Footpiece, tubular and with double vinyl astragal, provide endlocks as required for UL rating.
- C. Shutter, coiled around steel tubing 4" in diameter. Counterbalancing unit encased and rotate on grease sealed ball bearings.
- D. Counterbalance, oil tempered torsion spring capable of counterbalancing weight of shutter.
- E. Push-up operation with finger lift mounts on bottom bar.
- F. Guides, box type section fabricated from galvanized steel.

G. Locking devices:

1. At Room 3-106, shutter to have lock on room side only. Provide "Best" Universal Lock Co., six-pin cylinder, rim cabinet cylinder cam lock #1E6D4, with reversible cam to prevent key from being removed in unlocked position.

2. Key as directed by Owner.

H. Hood, 24-gauge, to encase shutter roll.

I. Furnish all necessary accessories required.

PART 3: EXECUTION

3.1 INSTALLING AND FINISHING

A. Door manufacturers shall completely install all materials as specified and shall verify all dimensions at job. Erect so that doors operate easily and fit properly. Provide proper information to others regarding holes, dimensions, etc. Completely coordinate entire work.

B. Verify location of power units with Owners and Architect.

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## PART 1: GENERAL

1.1 SCOPE

A. Conditions of Contract and Division 1-General Requirements, apply to all work of this section. Refer to Article 12 of the Instructions to Bidders, Article 7 of the General Conditions and Section 01600 - Materials and Equipment for requirements on pre-bid and post-bid evaluation of proposed substitute products, methods and other conditions.

B. Work under this section includes flexible doors.

C. Related work under other sections:

1. Hollow Metal: Section 08110.
2. Wood Doors: Section 08200.
3. Rolling Shutters: Section 08331.
4. Lath and Plaster: Section 09100.

1.2 SUBMITTALS

A. Submit fabrication and installation showing methods of anchorage and fastenings.

## PART 2: PRODUCTS

2.1 MANUFACTURERS

A. The products of Rubbair Doors Division of Eckel Industries, Inc., are specified to establish standards of quality and intent of design. The equivalent products of the below listed manufacturers are acceptable subject to the approval of the Architect and the University of minor deviations in detail and performance:

1. Rubbair Doors
2. Clark Door Company
3. Eliason Corporation
4. W.B. McGuire Co., Inc.

2.2 CONSTRUCTION

A. Rubbair Door shall be full thickness, namely 1-13/16" minimum for the entire door. It shall be double-action type, flexible and of shock absorbing construction. Style shall be Vu-Thru.

B. The door facing shall be made using a heavy duty rubber, 60 durometer, rotocured processed, and of high tensile strength (2,200 psi).

C. Rubber "H" extrusion, 70 durometer, shall be used at uniformly spaced intervals and bonded to rubber facings for dimensional stability and memory.

D. The spacings between the extrusions shall be filled with a flexible, firm material of good insulation quality.

E. The "unitized" assembly shall be attached to a wooden stile, and with steel mounts shall be secured to a steel shaft (62,000 psi) with rivets and screws.

F. The vision panels shall be at least 96% optically clear. Flexible polycarbonate shall be used for the panel.

G. DuPont Hypalon rubber shall be attached to the door at the factory for a flexible air-tight seal at the jambs.

H. The door shall be provided with a hollow cushioned nosing, made of reinforced rubber (2,200 psi tensile) for safety protection of personnel (OSHA) and fragile merchandise.

I. The upper cam bearing and cam follower shall be made of cast iron of 150,000 psi compression.

J. Cam follower shall be factory aligned and prepinned to the door at the factory.

K. DuPont Hypalon rubber attached to a metal anchor strip shall be used for the seal at the header for field installation.

L. The door shall be made to a tolerance of +0, -1/8".

M. Provide jamb guards to protect operating hardware.

### PART 3: EXECUTION

#### 3.1 INSTALLATION

A. Inspect frames installed under Section 05500. Report any deficiencies which would prevent proper installation and/or operation of the flexible doors to the contractor and University. Do not proceed until openings are correct.

B. Install flexible doors level and plumb and tightly fitting in accordance with manufacturers instructions and the approved installation.

C. At completion of installation adjust doors to operate freely and smoothly.

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## PART 1: GENERAL

1.1 SCOPE

- A. Conditions of Contract and Division 1-General Requirements apply to all work of this section. Refer to Article 12 of the Instructions to Bidders, Article 7 of the General Conditions and Section 01600-Materials and Equipment, for requirements on pre-bid and post-bid evaluation of proposed substitute products, methods and other conditions.
- B. Work under this section includes furnishing of all finish hardware shown on drawings and specified herein except for that specified under other sections.
- C. Related work specified elsewhere:
1. Hardware Built-in to Millwork: Section 06400.
  2. Hollow Metal: Section 08110.
  3. Wood Doors: Section 08200.
  4. Hardware for Metal Laboratory Casework: Section 11611.
  5. Other Finishing Hardware Specifically included with manufactured items or under specific fabrication or erection specifications: Applicable Sections.
  6. Rough Hardware: Applicable Sections.
- D. Furnished but not installed under this section:
1. Finish hardware is installed under Section 06100.
- E. Outline and schedules contained herein have been listed to indicate scope of work. Under this Section provide all work reasonably required by the general scope as outlined herein, and all work shown on drawings. Provide items, articles, materials, operations and methods listed, mentioned or scheduled herein or on drawings, in quantities as required to complete the project. Provide hardware which functions properly and advise Architect of any items that will not operate properly and are improper for conditions or will not remain permanently anchored before hardware is furnished.

1.2 SUBMITTALS

- A. Schedule: Submit in accordance with Section 01300 and the following:
1. After award of contract, prior to preparation of schedule, successful bidder is required to deliver an outline of products of all proposed items to the Architect for acceptance. For proposed substitutions provide samples in specified finishes, identified as to manufacturer and catalog number. Accompany samples of substitute items with samples of specified item for comparison.
  2. Submit three copies of a complete vertical type detailed hardware schedule with doors listed in numerical order and sequentially identified by specification hardware group.
  3. Resubmit six correct copies.

4. Submit a brochure of all approved items to facilitate Architect's checking of catalog items.

5. Include schedule of mounting heights of hardware. Verify that no conflicts exist in mounting heights specified. If discrepancies are uncovered call to architects attention for direction about how to proceed.

B. Templates: Furnish a final hardware schedule and accurate templates to the door and frame supplier. If required, furnish physical hardware to the door and frame manufacturer for application. All reinforcements required to adapt hardware to metal doors or frames are specified in door and/or frame specifications.

C. Operating and maintenance manuals, three ring loose leaf, hard cover binders in five copies.

D. Letter certifying to final hardware adjustments.

### 1.3 DELIVERY, STORAGE, HANDLING

A. Properly and carefully pack items to guard against damage in transit. Pack each group separately and mark clearly to show its contents and place in building for which it is intended. Do not deliver hardware until General Contractor has suitable locked storage space.

### 1.4 GUARANTEE AND ADJUSTMENTS

A. The hardware distributor shall guarantee all workmanship and material against defective manufacture, and he shall replace and make good all defective workmanship and material appearing within a period of one year. Hardware distributor shall not be responsible for faulty application.

B. Where hardware indicates improper operation, hardware supplier or manufacturer shall visit job and make necessary adjustments and corrections. Where hardware is inadequate for required function, exposure or use, replace with suitable hardware as directed.

C. Shortages and/or incorrect items (based on the plans and specifications and approved schedules) shall be furnished and/or replaced with correct material by the hardware distributor, at no additional cost to the Owner.

D. Prior to completion of the project, ascertain that all closers are in proper adjustment. No closer shall complete its full closing cycle in less than four to six seconds and there shall be no abrupt change in speed between the "sweep" and "latch" speeds. Also, the backcheck shall be adjusted properly. All knobs and lever handles shall be free from binding. Latchbolts and deadbolts shall be properly engaged into strikes. All wrenches and adjusting tools, as provided with hardware, shall be turned over to the Owner.

## PART 2: PRODUCTS

### 2.1 GENERAL QUALITY

A. Furnish new hardware, free from defects, scratches, mars, etc. Furnish hardware complete with necessary screws, shields, grommets, etc., for correct installation onto door, frame or other supporting surface for which each item is intended.

B. Unless specifically called for herein, furnish no hardware with aluminum components.

C. All like items of hardware shall be of the same manufacturer.

2.2 FINISH AND MATERIALS

A. Unless otherwise indicated in the specification groups, all finishes shall be as follows:

- Hinges . . . . . US26D
- Locksets . . . . . US32D
- Closers. . . . . Sprayed Alum.
- Push, Pulls, Kickplates & Armorplates. . . . . US2D
- Overhead Stops and Holders . . . . . US26D
- Door Stops and Holders . . . . . US26D
- Miscellaneous Items. . . . . US26D

2.3 LOCKS AND KEYING

A. Provide locks and latch sets of "heavy duty" mortise locks, Sargent 12-8200 series with lever handles and escutcheons. Locks shall have adjustable armored fronts and anti-friction latch bolts with minimum 3/4" throw. Provide wrought boxes and curved lip strikes with proper lip length to protect trim but not to project more than 1/8" behind trim, frame or inactive leaf. For labeled fire doors all locks and latchsets shall be UL listed.

B. Provide Sargent lever handle trim, 1446F special (all edges eased), stainless steel. Escutcheons to be 7-5/8" x 1-5/8" cast stainless steel, through bolted top and bottom (concealed outside), Sargent LEI. Both handles shall be removable from spindle by set screw in inner handle and concealed handle pin in outer handle.

C. Lock functions shall be as listed in hardware groups.

D. The following table indicates products for public spaces:

	BASE BID <u>SARGENT</u>	ALTERNATE A <u>CORBIN</u>	ALTERNATE B <u>RUSSWIN</u>
Series:	8200	9500	5000
Design:	LEIF	76857 x 76430	LE DarMo II

E. The following table indicates acceptable products for non-public spaces:

	BASE BID <u>SARGENT</u>	ALTERNATE A <u>CORBIN</u>	ALTERNATE B <u>RUSSWIN</u>
Series:	8-7700	9500	5000
Design:	KWIC	75222 x 76430	RonMo II x F3376

F. For all key operated locksets provide Best Universal Lock Company 7 pin cylinder with Best's interchangeable cores, typically 1E74, US26D.

G. Keying will be determined by Owner in conjunction with representative of Best Universal Lock Company. Ship permanent cores directly to University of Minnesota, for installation by Owner. If contractor desires temporary construction cores for certain locksets during construction, Owner will, upon application, furnish and install a reasonable number of such cores without charge.

## 2.4 HINGES

A. Each door leaf shall be supplied with hinges fabricated of planished and plated contract grade materials and shall have:

1. Flat button tips.
2. Non-rising loose pins.
3. Steel pints.
4. Inner edge of hinge need not be beveled.

B. Hinges shall be fabricated to template for use with metal doors or frames.

C. Non-removable loose pins are required on all locked outswinging doors.

D. Hinge material shall be as follows:

1. All hinges shall be steel.

E. Weight and bearing of hinges shall be determined by door width and type as follows:

1. Interior doors less than 44 inches wide - standard weight ball-bearing hinges.

2. Interior doors wider than 44 inches - extra heavy hinges with four ball-bearing races.

F. Size of hinges shall be determined by door thickness as follows:

1. Doors 1-3/4" thick - 4-1/2" x 4-1/2"

G. Number of hinges per door, shall be determined by door opening height, width and location as follows:

- |                                     |          |
|-------------------------------------|----------|
| 1. 60 inches and under              | 2 hinges |
| 2. 61 through 90 inches             | 3 hinges |
| 3. 91 through 120 inches            | 4 hinges |
| 4. Doors 40 inches or more in width | 4 hinges |

H. Acceptable Hinges:

<u>Type</u>	<u>Lawrence</u>	<u>Stanley</u>	<u>McKinney</u>	<u>Hager</u>
Plain Bearing-steel	4181	F179	T2714	1279
Standard Weight BB Steel	BB4101	FBB179	TB2714	BB1279
Extra Heavy 4-BB Steel	BB5151	FBB168	T4B3786	BB1168

## 2.5 MAGNETIC HOLDERS

A. Magnetic holders shall be U.L. listed capable of wall mounting on standard electrical box at 6 ft., 6 in. height. Backset and projection shall be as required to protect all hardware from damage. Verify voltage with electrical contractor.

B. Acceptable Manufacturers - Firemark FM998, Norton 6900, Russwin S13949, Yale 100 Series.



## 2.6 CLOSERS

A. Door closers shall be cast of iron and arms shall be forged. Closers shall be complete with all accessories to correctly mount closer.

B. Closers shall be of a surface type with full cover and narrow projection. Closers shall have full rack and pinion mechanism with backcheck, 50% adjustable spring power where indicated and separately adjustable controls on "sweep", "latch" and "backcheck" speeds.

C. Locate closers as follows unless details or special conditions require otherwise.

1. Room side of corridor doors.
2. Do not mount closers to limit door swing.

D. Typical Closers:

1. Interior doors swinging into corridors from rooms opening 180°: 4020 or 4110 Series.

2. Typical Interior Doors:

a. 2/08" or less in width any degree opening or 3'-0" or less in width 90° opening: 4030 Series.

b. Wider doors, all stairs and corridors or greater degree opening than "a": 4010 Series.

3. Acceptable Closers: LCN 4010, 4020, 4030.

E. Furnish closers for all doors as noted in groups and in addition, furnish closers for all labeled and/or labeled construction doors whether or not specifically noted in group.

F. Hardware schedule shall show the manufacturer, type, size, finish, accessories and degree of opening for each closer. Final closer mounting position may be determined during review of the hardware schedule.

G. Size of door closer shall be as recommended by manufacturer. Schedule closer of larger size if required by special conditions such as door seal, latching resistance, internal building pressure and wind conditions.

H. Guarantee successful operation of each door supplied with door closer and provide, if necessary, and at no additional cost to the Owner, a larger size closer for any door which will not operate properly.

## 2.7 EXIT DEVICES

A. All exit devices shall be "U.L." listed for safety requirements as well as listed for labeled doors.

B. Provide crossbars with metal reinforcements for all doors over 40" wide.

C. The following table indicates acceptable products:

### VON DUPRIN

Series: 33  
Design: 333

UM HEALTH SCIENCES  
P/N 08700-5

## 2.8 KICK PLATES AND ARMOR PLATES

A. Kick Plates: 14" high generally, stainless steel, .050 thickness with countersunk screw holes. Width shall be 1-1/2" less than door width on stop side of doors and 1/2" less than door width on hinge side of doors. Where one kick plate is specified per door, install on stop side of door. Packaging, workmanship and quality equal to Hiawatha hardware. Height 1/2" less than bottom rail where limiting mounting conditions occur.

B. Armor plates to be 36" high, otherwise as kick plates.

## 2.9 PULL PLATES

A. Unless otherwise specified furnish Hiawatha 1458B on 4" x 18" 300G plate. Cut for cylinder or turnpiece with pull to plate positioning to match existing.

B. Acceptable manufacturers - Hiawatha, Brookline, Cipco, or equal.

## 2.10 PUSH PLATES

A. Where specified, furnish push plates of .050 material, beveled all sides, size 8" x 16", equal to Hiawatha. Furnish 4" x 16" on doors with 5" stiles.

## 2.11 PUSH-PULL PLATES

A. Where specified furnish Push-Pull plates size 8" x 18" equal to Hiawatha 1457. Furnish 4" x 18" on doors with 5" stiles.

B. Acceptable Manufacturers - Hiawatha, Brookline, Cipco or equal.

## 2.12 STOPS AND HOLDERS

A. Furnish a stop or holder for each door whether equipped with a closer or not.

1. Interior doors with hardware groups calling for a "stop" shall have one of the following, as required by surrounding conditions:

- a. G-J WB50, WB60, WB11A, WB11, RB3, RB4, RB6 or 510 A Series.  
Note: Use G-J 560 series when an over-head stop is required on labeled doors. Use G-J 300 series, when required, on lead lined doors. Interior doors calling for "holder" shall have one of the following, as required by surrounding conditions: G-J W20,, W20A or 501A series.

2. Exterior and vestibule doors with hardware groups calling for "stop and holder" shall have one of the following, as required by surrounding conditions: G-J W20, W20A or 120 series. Exterior doors opening against 1-1/2 or 2" pipe railings shall be furnished with a G-J W20 X pipe adapter block, where conditions allow.

a. Floor or base stops shall be used only where definitely specified or where absolutely unavoidable.

b. Where two doors swing open against each other, furnish G-J RB3, RB4, or RB6, as required.

c. Furnish each stop with proper fastenings for the supporting surface, including any shims, etc., required to make the stop or holder function properly.

d. Doors that are capable of swinging more than 145 degrees before striking a wall and are equipped with a regular arm surface mounted closer, shall have an overhead type stop (G-J 510A series).

### 2.13 SILENCERS

A. Provide four silencers to align transom panel with door; three at strike jamb of single doors, two at heads of pairs without transom panel. At wood frames use GJ65 silencers; at metal frames use GJ64 silencers.

B. Acceptable Manufacturers: Glynn Johnson, Sargent or equal.

### 2.14 DOOR SEAL

A. Unless otherwise indicated, head and jambs shall have co-polymer plastic, Schlegel PF114T black.

B. Unless otherwise indicated, automatic door bottoms shall be surface type Reese 320N at metal doors and Mortise type 370N at wood doors.

C. Acceptable manufacturers Reese, Zero, Pemko or Schlegel.

### 2.15 PAIRS OF DOORS

A. Unless otherwise specified, furnish two bolts Corbin 2846 - or equal, Ives, Russwin, or Sargent for all pairs of non-labeled doors with locks or latch sets. Furnish dustproof strike plates for bottom bolt. Unless otherwise specified, trim each leaf of a pair of doors identically. Bottom bolt 12" size, top bolt size required to mount approximately 6' up from floor.

### 2.16 MOUNTING HEIGHTS

A. All dimensions up from finished floor:

Lever	40" to C/L
Push Plate	56" to Top
Pull Plate	38" to bottom of plate
Pull Plate x SLLI	Match existing
Push-Pull Plate	Match existing
Deadlock	60" to C/L of cylinder
Kickplate/Armorplate	Bottom within 1/8" of door bottom

## PART 3: HARDWARE GROUPS

### Group 1

Each door shall have

- A. Butts as required
- B. 1 Latchset 8215
- C. 1 Stop G-J WB50
  - 1. Use G-J 511A series or G-J WB11 where G-J WB50 is not applicable.

### Group 2

Each door shall have

- A. Butts as required
- B. 1 Lockset 8237
- C. 1 Stop G-J WB50
  - 1. Use G-J 511A series or G-J WB11 where G-J WB50 is not applicable.

Group 3

Each door shall have

- A. Butts as required
- B. 1 Lockset 8204
- C. 1 Stop G-J WB50
  - 1. Use G-J 511A series where G-J WB50 is not applicable.

Group 5

Each door shall have

- A. Butts as required
- B. 1 Privacy Set 8265
- C. 1 Clothes Hook 572B
- D. 1 Stop G-J WB60
  - 1. Use G-J 511A series where G-J WB50 is not applicable.

Group 7

Each door shall have

- A. 1 Set Pivots 127-3/4 x M19
- B. 2 Pushes
- C. 2 Kick plates
- D. 1 Holder G-J 200

Group 9

Each door shall have

- A. Butts as required
- B. 1 Lockset 8237
- C. 1 Closer
- D. 1 Kick Plate
- E. 1 Stop G-J WB50
  - 1. Use G-J 560 series where G-J WB50 is not applicable.

Group 11

Each door shall have

- A. Butts as required
- B. 1 Lockset 8205
- C. 1 Closer
- D. 1 Kick plate
- E. 1 Stop G-J WB50
  - 1. Use G-J 560 series where G-J WB50 is not applicable.

Group 4

Each door shall have

- A. Butts as required
- B. 1 Lockset 8205
- C. 1 Stop G-J WB60
  - 1. Use G-J 511A series where G-J WB60 is not applicable.

Group 6

Each door shall have

- A. Butts as required
- B. 1 Push
- C. 1 Pull
- D. 1 Closer
- E. 1 Kick Plate
- F. 1 Stop G-J WB50
  - 1. Use G-J 511A series where G-J WB50 is not applicable.

Group 8

Each door shall have

- A. Butts as required
- B. 1 Latchset 8215
- C. 1 Closer
- D. 1 Kick plate
- E. 1 Stop G-J WB50
  - 1. Use G-J WB11 or G-J 560 series where G-J WB50 is not applicable.

Group 10

Each door shall have

- A. Butts as required
- B. 1 Lockset 8204
- C. 1 Closer
- D. 1 Kick plate
- E. 1 Stop G-J WB50
  - 1. Use G-J 560 series where G-J WB50 is not applicable.

Group 12

Each door shall have

- A. Butts as required
- B. 1 Privacy set 8265
- C. 1 Closer
- D. 1 Kick plate
- E. 1 Clothes Hook 572B (single use rooms only)
- F. 1 Stop G-J WB50
  - 1. Use G-J 560 series where G-J WB60 is not applicable.

Group 13

Each door shall have

- A. 1 Cylinder (verify type)

Group 15

Each pair shall have

- A. Butts as required
- B. 1 Passage Set 8215
- C. 2 Closers
- D. 2 Kick plates
- E. 2 Automatic flush bolts 801 or 901 as applicable
- F. 1 Dust Proof Strike 80
- G. 1 Coordinator 600 series
- H. 2 Stops G-J WB50
  - 1. Use G-J 560 series where G-J WB50 is not applicable.

Group 17

Each door shall have

- A. Butts as required
- B. 1 Lockset 8-7705 x abrasive coating
- C. 1 Stop G-J WB50
  - 1. Use G-J 511A series where G-J WB50 is not applicable.

Group 19

Each pair shall have

- A. Butts as required
- B. 1 Lockset 8-7704 x abrasive coating
- C. 1 Closer (active leaf)
- D. 1 Kick plate (active leaf)
- E. 2 Flush bolts 3450-12"
- F. 1 Dustproof Strike 3475
- G. 2 stops G-J WB50
  - 1. Use G-J 511A series where G-J WB50 is not applicable.
  - 2. Use G-J 80M for Dr. 95 (Roof)

Group 14

Each door shall have

- A. 1-1/2 pair butts CP881279 4 1/2" x 4 1/2"
- B. 2 Cam Levers 260 x outside handles (Ventlock Co.)

Group 16

Each door shall have

- A. Butts as required
- B. 1 Lockset 8-7704 x abrasive coating
- C. 1 Closer
- D. 1 Kick plate
- E. 1 Stop G-J WB50
  - 1. Use G-J 560 series where G-J WB50 is not applicable.

Group 18

Each door shall have

- A. Butts as required
- B. 1 Lockset 8-7737 x abrasive coating
- C. 1 Stop G-J WB50
  - 1. Use G-J 511A series where G-J WB50 is not applicable.

Group 20

Each pair shall have

- A. Butts as required
- B. 1 Passage set 8-7715 x abrasive coating
- C. 1 Closer (active leaf)
- D. 1 Kick plate (active leaf)
- E. 2 Flush bolts 3450-12"
- F. 1 Dustproof Strike 3475
- G. 2 Stops G-J WB50
  - 1. Use G-J 511A series where G-J WB50 is not applicable.

Group 21

Each door shall have

- A. Butts as required
- B. 1 lockset 8-7704 x less o.s. trim
- C. 1 Flush Pull 1459 x US26D x abrasive coating
- D. 1 Closer
- E. Omit kick plate and stop

Group 23

Each pair shall have

- A. Butts as required
- B. 1 Passage Set 8-7715
- C. 2 Closers
- D. 2 Kickplates
- E. 2 Automatic Flush Bolts 801 or 901 as applicable.
- F. 1 Dust proof strike 80
- G. 1 Coordinator 600
- H. 2 Stops G-J WB50
  - I. Use G-J 560 series where G-J WBto is not applicable.

Group 25

Each door shall have

- A. Butts as required
- B. 1 Lockset 8-7705 x abrasive coating
- C. 1 Closer
- D. 1 Kick plate
- E. 1 Stop G-J WB50
  - I. Use G-J 560 series where G-J WB50 is not applicable.

Group 27

Each door shall have

- A. Butts as required
- B. 1 Lockset 8-7737 x abrasive coating
- C. 1 Closer
- D. 1 Kick plate
- E. 1 Stop G-J WB50
  - I. Use G-J 560 series where G-J WB50 is not applicable.

Group 22

Each pair shall have

- A. Butts as required
- B. 1 Passage Set 8215
- C. 2 Closers
- D. 2 Kick plates
- E. 2 Automatic Flush Bolts 801 or 901 as applicable.
- F. 1 Dust proof strike 80
- G. 1 Coordinator 600
- H. 2 Magnetic Holders

Group 24

Each pair shall have

- A. Butts as required
- B. 1 Lockset 8237
- C. 2 Closers
- D. Kick plate (active leaf)
- E. 2 Automatic Flush Bolts 801 or 901 as applicable.
- F. 1 Dust proof strike 80
- G. 1 Coordinator 600
- H. 2 Stops G-J WB50
  - I. Use G-J 560 series where G-J WB50 is not applicable.

Group 26

Each door shall have

- A. Butts as required
- B. 1 Passage Set 8-7715 x abrasive coating
- C. 1 Stop G-J WB50
  - I. Use G-J 511A series where -J WB50 is not applicable.

Group 28

Each door shall have

- A. Butts as required
- B. 1 Special lock as selected
- C. 1 Closer
- D. 1 Kick plate
- E. 1 Stop G-J WB50
  - I. Use G-J 560 series where G-J WB50 is not applicable.

Group 29

- Each pair shall have
- A. Butts as required
  - B. 1 Exit Device LR-3327NL (active leaf)
  - C. 1 Exit Device LR 3327DT
  - D. 2 Closers
  - E. 2 Overhead Stops G-J 120 series

Group 31

- Each pair shall have
- A. Butts as required
  - B. 2 Push Bars 330
  - C. 2 Pulls 333 DTV
  - D. 2 Closers
  - E. 2 Overhead Stops G-J 120 series

Group 33

- Each pair shall have
- A. Butts as required
  - B. 1 Lockset 8237
  - C. 2 Closers
  - D. 2 Kick plates
  - E. 2 Automatic Flush Bolts 801 or 901 as applicable
  - F. 1 Dust proof Strike 80
  - G. 1 Coordinator 600
  - H. 2 Magnetic holders

Group 34

- Each pair shall have
- A. Butts as required
  - B. 1 Lockset 8237
  - C. 1 Closer (active leaf)
  - D. 1 Kick plate (active leaf)
  - E. 2 Flush Bolts 3450-12"
  - F. 1 Dust proof Strike 3475
  - G. 2 Stops G-J WB50
    - 1. Use G-J 511A series where G-J WB50 is not applicable.

Group 36

- Each door shall have
- A. Butts as required
  - B. 1 Exit device 33NL
  - C. 1 Closer
  - D. 1 Overhead Stop G-J 120 series

Group 30

- Each pair shall have
- A. Butts as required
  - B. 2 Exit Devices 3327DT
  - C. 2 Closers
  - D. 2 Overhead Stops G-J 120 series

Group 32

- Each pair shall have
- A. Butts as required
  - B. 1 Passage Set 8215
  - C. 2 Closers (FM5630 w/magnetic hold open
  - D. 2 Automatic Flush Bolts 801 or 901 as applicable.
  - E. 1 Dust proof Strike 80
  - F. 1 Coordinator 600

Group 33A

- Each pair shall have
- A. Butts as required
  - B. 1 Lockset 8237
  - C. 2 Closers FM 5630 w/magnetic hold open
  - D. 2 Automatic Flush Bolts 801 or 901 as applicable
  - E. 1 Dust proof Strike 80
  - F. 1 Coordinator 600

Group 35

- Each pair shall have
- A. Butts as required
  - B. 2 Pulls
  - C. 2 Roller latches G-J 32

Group 37

- Each pair shall have
- A. 2 pair butts as required
  - B. 2 Locksets 8237
  - C. 1 Closer (top half)
  - D. 1 Dustproof Strike 3475
  - E. 2 Stops G-J WB50
    - 1. Use G-J 511A series where G-J WB50 is not applicable.

Group 38

Each pair shall have

- A. Butts as required
- B. 1 Lockset 8237
- C. 2 Flush Bolts 3450-12"
- D. 1 Dust proof Strike 3475
- E. 2 Stops G-J WB50
  - I. Use G-J 511A series where G-J WB50 is not applicable.

Group 40

Each door shall have

- A. Butts as required
- B. 1 Passage set 8215
- C. 2 Flush Bolts 3450-12"
- D. 1 Dust proof Strike 3475
- E. 2 Stops G-J WB50
  - I. Use G-J 511A series where G-J WB50 is not applicable.

Group 42

Each door shall have

- A. Butts as required
- B. 1 Lockset 8205
- C. 1 Armor plate
- D. 1 Stop G-J WB50
  - I. Use G-J 511A series where G-J WB50 is not applicable.

Group 44

Each door shall have

- A. Butts as required
- B. 1 Lockset 8-7704 x cyl. inside x abrasive coating
- C. 1 Closer x PSH

Group 46

Each Door shall have

- A. Butts as required
- B. Deadlock 4876
- C. 1 Flush Pull 1459

Group 48

Each door shall have

- A. Recessed cup pulls
- B. Sliding door (Grant 1200 Hdwe)
- C. Silencers

Group 39

Each door shall have

- A. 1 Electric Strike (verify type for existing lockset)

Group 41

Each door shall have

- A. Butts as required
- B. 1 Passage set 8215
- C. 1 Armor Plate
- D. 1 Stop G-J WB50
  - I. Use G-J 511A series where G-J WB50 is not applicable.

Group 43

Each door shall have

- A. Butts as required
- B. 1 Exit Alarm 230H x ECL-1565K
- C. 1 Stop G-J WB11
  - I. Use G-J 120 series where G-J WB11 is not applicable.

Group 45

Each door shall have

- A. Butts as required
- B. 1 Lockset 8-7704 x cyl. inside x abrasive coating
- C. 1 Closer x PSH
- D. 2 Flush Bolts 3450-12"
- E. 1 Dust proof Strike 3475

Group 47

Each door shall have

- A. Cylinder

Group 49

Each door shall have

- A. Butts as required
- B. 1 Latchset (equiv. of Corbin 7510)
- C. 1 Holder for ext. doors only.

- - -



## PART 1: GENERAL

1.1 SCOPE

A. Conditions of Contract and Division 1 - General Requirements - apply to all work of this section. Refer to Article 12 of the Instructions to Bidders, Article 7 of the General Conditions and Section 01600 - Materials and Equipment - for requirements on pre-bid and post-bid evaluation of proposed substitute products, methods and other conditions.

B. Work under this section includes: thermal weatherstripping at head, jamb and door bottom of all exterior doors, except aluminum doors; thermal weatherseal at all air chamber doors; soundstripping at head, jamb and door bottom, at interior doors; lightstripping (light-tight) at head, jamb and door bottom, at interior doors. All as indicated on "Door Schedules".

C. Related work specified elsewhere:

1. Carpentry: Section 06100.
2. Hollow Metal: Section 08110.
3. Acoustical Hollow Metal: Section 08113.
4. Wood Doors: Section 08200.
5. Thresholds: Section 08700.
6. Weatherstripping at Aluminum Doors: Section 08900.

1.2 GENERAL INFORMATION

A. Coordination: Coordinate work directly with Contractor and necessary sub-contractors. Provide and obtain necessary clearances, templates and similar data for coordination with work of others.

B. Shop prime aluminum to receive finish paint.

1.3 SUBMITTALS

A. Shop Drawings: Submit shop drawings and/or manufacturers literature on all head, jamb and door bottom weatherstripping and soundstripping in accordance with Section 01300. Show all features, material types, and all other pertinent data.

B. Samples: Submit samples of each type of weatherstripping and soundstripping 12" long.

## PART 2: PRODUCTS

2.1 MANUFACTURERS

A. Acceptable manufacturers: Products of Schlegel Manufacturing Co., Reese Metal Weather Strip Co., Zero Weatherstripping Co., Inc., Brookdale Engineering Corp, or approved equal, conforming to the below specifications will be acceptable.

2.2 SOUNDSTRIPPING AT INTERIOR DOORS (NOTE 3)

A. Head and Jamb: Closed cell, elastomer configuration, Thermosonic dB TU, as manufactured by JBN Company, Rahway, N.J. 07065.

B. Door Bottoms:

1. Type #1: Mortised at wood doors, Zero #360, solid neoprene plunger.
2. Type #2: Surface mounted at hollow metal and label doors, Zero #361, solid neoprene plunger.

Provide with galvanized steel cases, brass end plate.

2.3 THERMAL WEATHERSTRIPPING (NOTE 2)

- A. Frame and Door Meeting: Schlegel No. MB5025-500 gray pile.
- B. Door Bottoms: Reese 323N with solid neoprene sweepstrip, aluminum with anodic hard coating (313S).

2.4 THERMAL WEATHERSEALING

- A. Head, jamb and sills: Adjustable stops, #399, aluminum casing with prime coat of zinc chromate, solid neoprene as manufactured by Reese Metal Weather Strip Co.

2.5 LIGHTSTRIPPING AT INTERIOR DOORS (NOTE 5)

- A. Head and Jamb: Zero #570, self-adjusting seal, extruded aluminum casing with anodic hard coating (313S), closed cell sponge neoprene plunger.
- B. Door Bottoms: Zero #362, semi-mortised, extruded aluminum casing with anodic hard coating (313S) and closed cell sponge neoprene plunger.

2.6 SILL SEALS (NOTE 6)

- A. At core access doors and panels and where noted "sill seal", provide door bottom - Zero #361 in bottom recess of door.

PART 3: EXECUTION

3.1 GENERAL

- A. Lightstrip, soundstrip and weatherstrip in field after finish paint is complete. Verify clearance and pile heights.

3.2 INTERIOR SOUNDSTRIPPING

- A. Adhesive of epoxy type, equal to H.B. Fuller Manufacturing, for jambs. Coat surfaces with adhesive to full even coat and press stripping into adhesive. Run full length, miter corners.
- B. Doors: Install automatic bottoms in secure manner with properly operating bottom bar. Adjust to strike floor evenly across entire width of bottom bar.
- C. Adjust to contact and slightly compress to form effective seal.

3.3 THERMAL WEATHERSTRIPPING

- A. At frames (head and jambs): At hinge side, apply to frame so door edge will close against pile. At lock jamb and at head apply to stop face the door closes

against. Allow approximately 1/8" clearance for depressed pile. Door clearance and setting of stripping shall insure door contact at least 3/4 of strip width. Unroll and "flatten" stripping to form straight sections. Secure to frame with adhesive and wafer head drive screws. Adhesives shall be epoxy type, equal to H.B. Fuller manufacture. Coat surfaces with adhesive to full coat and press stripping into adhesive. Nail immediately about 4" o.c. drilling fine hole through metal for nails. Then apply straight board and clamps to frame and stripping to keep stripping firmly pressed into adhesive until set. Installation shall provide well secured stripping that lies flat against frame for full length.

B. At sill where threshold does not occur: Apply to sill using procedure specified above, uniformly contacting inside face of door near bottom.

C. At Doors (Sill): At all exterior hollow metal doors, provide sweepstrip at bottoms, single length per door. Set with screws to make strip adjustable.

### 3.4 THERMAL WEATHERSEAL

A. At head, jams and sill apply to frame, so that the door closes against neoprene seal. Miter corners, continuous lengths, adjust to provide tight seal.

### 3.5 INTERIOR LIGHTSTRIPPING

A. At head and lock-side jamb, apply to frame stop, so that the door closes against neoprene seal.

B. At hinge-side jamb, apply to door so that as door closes the neoprene seals against the frame stop.

C. At door bottom, install automatic bottoms in secure manner with properly operating bottom bar. Adjust to strike floor evenly across the entire width of door opening.

D. Continuous lengths, miter corners, and adjust to provide tight seal.

### 3.6 SILL SEAL

A. At door bottom, install automatic bottoms in secure manner with properly operating bottom bar. adjust to strike floor evenly across the entire width of the door opening.

- - -

## PART 1: GENERAL

1.1 SCOPE

A. Conditions of Contract and Division 1-General Requirements, apply to all work of this section. Refer to Article 12 of the Instructions to Bidders, Article 7 of the General Conditions and Section 01600-Materials and Equipment for requirements on pre-bid and post-bid evaluation of proposed substitute products, methods and other conditions.

B. Work under this section includes all interior glass and mirrors unless specifically called for other sections and related glazing and setting materials and accessories.

C. Related work specified elsewhere:

1. Glass & glazing at exterior walls, windows, doors: Section 08900.

1.2 SUBMITTALS

A. Shop Drawings: Submit shop drawings on mirrors and mirror frames, showing all features of construction, dimensions and all other pertinent data.

B. Submit any proposed variations from specification requirements in writing at least three months before starting glazing. Incorporate such variations only upon written approval of Architect.

C. Submit, at least three months prior to starting glazing, complete outline of materials and methods, showing all products in full size detail of each glazing conditions and listing step-by-step, all operations. Provide after review by Architect, prints to Architect, job office and each workman on job.

1.3 GUARANTEE

A. General: Guarantee all materials, installation and other work of this Section for minimum of two years after project acceptance, covering: faulty materials and workmanship; compatibility of materials; flowing, sagging or other displacement of sealant; other deficiencies. In event of necessary corrective work, promptly replace or remedy the installation in approved manner to equal a new installation.

## PART 2: PRODUCTS

2.1 GLASS

A. Provide glass of type and thickness indicated on drawings and of manufacture and quality specified. Provide 1/4" plate glass if type and thickness are not otherwise indicated.

1. Polished Plate Glass: Glazing quality polished plate or float glass, 1/4" thick unless otherwise indicated. By PPG Industries, L.O.F., or approved equal which conforms to these specifications will be acceptable.

2. Wire Glass: Polished wire, plate glass, 1/4" thick; set so wires run vertical and horizontal. Mississippi Glass, Polished Baroque; L.O.F. equivalent or approved equal, which conforms to these specifications will be acceptable. All wire glass shall be UL approved.

3. Acoustical Glass: Sound retardant glass, 1/2" thick plate, STC 40 conforming to ASTM E90-66T. By Amerada Glass Co., Dearborn Glass Co., or approved equal which conforms to these specifications will be acceptable.

4. Mirror Glass: Transparent mirror, 1/4" thick plate or float glass. Mirropane as manufactured by L.O.F., or approved equal.

5. Tempered Glass: (Only where indicated) Herculite K Tempered Safety Glass, 1/4" thick, ease all edges at both faces. Tempered glass as manufactured by Pittsburgh, LOF or approved equal which conforms to these specifications.

6. One-Way Glass: Mirropane Transparent Mirror Glass or approved equal.

B. All safety glazing (i.e., tempered glass, laminated glass, wire glass and plastic glazing) must meet test requirements of ANSI Z-97.1-1972.

C. Provide permanent label on all safety glazing in compliance with code and/or law.

1. Label must be legible and visible after installation of material.

2. Label to include: Identification of seller, manufacturer, fabricator or installer; nominal thickness; type of safety glazing material; fact that material meets test requirements of ANSI Z-97.1-1972.

## 2.2 MIRRORS

A. Provide to sizes indicated on drawings, with frames and shelves, including mirror mounted on doors in dressing room.

1. 1/4" mirror quality plate with electrolytic copper back. "Copper Back Type" By PPG; Parallel-O-Flat by L.O.F., or approved equal, which conforms to these specifications will be acceptable.

2. Frames Stylemark 620007, or frame with shelf, Stylemark 620009, complete assembly SACR-SS finish. Equivalent products of J.G. Braun Co., Engineered Products Co., or approved equal, are acceptable.

3. At examination room toilets, and where noted, provide tilted mirrors with 5" wide shelf, Parker No. 54020, or equal, in 16" wide x 30" high size, unless otherwise noted.

## 2.3 SHIMS AND BLOCKS, ACCESSORIES

A. Pure vinyl or neoprene, minimum 1" long. Setting block portion under glass about 70-80 durometer hardness, shims between glass and stops 40-50 durometer hardness. Sizes as recommended by a glass manufacturer.

## 2.4 GLAZING COMPOUNDS AND SEALANTS

A. Sealant: (For use at interior sound retardant glass) Tremco's Mono-Lasto-Meric with sealant heated and applied at material temperature of 110°F to 120°F using power gun.

B. Glazing Compound: (For use at interior glass) Tremco's Tremglas or equivalent mastic compound of DAP (#231), PPG, PRC or Presstite.

C. Glazing Tape: Tremco 440 Tape or equivalent by Protective Treatments, Inc. or approved equal, size as required to provide minimum 1/8" tape after depression, width as required.

## 2.5 SLIDING WINDOW TRACK AND ACCESSORIES

A. Provide to size indicated on drawings.

B. Complete hardware for pair of 1/4 inch thick tempered glass doors; #P-1092 assembly, anodized aluminum; plunger lock, No. 981, zinc finish; knob No. 1088 anodized aluminum; as manufactured by Knappe & Vogt Manufacturing Company, or approved equal.

C. In auditorium; complete hardware for pair of 1/4" thick tempered sliding glass doors: track - K&V 2416G - 7/8" x 5/16" plastic track and guides - at head, jambs and sills; with ratchet lock KV-963; with 1/8" thick self adhesive urethane weather-stripping cushion in jambs as indicated.

## 2.6 SECURITY WINDOW AND FRAME

A. Diebold, Inc. No. 115-20B.R., security window.

B. Size 30" x 32" x 9" wide, unless noted otherwise.

C. Prime finish frame throughout.

D. Stainless steel pass tray.

E. Include glove-rail, sized according to window.

## PART 3: EXECUTION

### 3.1 GENERAL

A. Accomplish work in accordance with project specifications. In absence of project specification requirements, follow recommendations of glass manufacturer, glazing material manufacturer and Glazing Manual of Flat Glass Jobbers Association. Obtain Architect's written direction, before proceeding with work, in the event project specifications are at variance with manufacturer's recommendations. In no case shall installation be below standard recommended by manufacturer.

B. Obtain shop drawings directly from frame, door or window unit fabricator, determine conditions and dimensions. Architect will not furnish such data.

C. Check stop lengths and locations and advise fabricator, in writing, of any missing stops, improper or ill-fitting stops, improper clearance - prior to starting work. Do not set glass until corrections are made. Replace stops lost, damaged, misplaced or misapplied subsequent to check.

D. Glaze into wood openings only after all surfaces of rabbet and glass side of stops are sealed by paint or varnish by painter.

- E. Glaze only into rabbets providing proper clearance between glass and stops, i.e. 1/8" (unless otherwise detailed) at interior openings.
- F. Glaze sound retardant glass, as recommended by Glass Manufacturer.
- G. Glaze only when temperature is 40°F or higher.
- H. Clean, just prior to glazing, rabbets, stops and glass free of dirt, rust, oil, grease, moisture, frost, temporary protective films or other foreign matter. Notify Contractor of any unsuitable conditions. Glaze when all surfaces are clean, dry.
- I. If recommended by glazing material manufacturer, prime surfaces prior to glazing using materials and procedures in accordance with manufacturer's instructions.
- J. Follow manufacturer's recommendations for protection of edges. Examine each piece of glass for nicked or otherwise damaged edges and install only glass free of such damage.
- K. Set glass with factory attached labels in place.
- L. Set glass with reams (waves) running horizontally.
- M. Glaze only with proper sized glass i.e.: with edge clearance as recommended by manufacturer and with glass lapping stops not less than 2/3 of stop depth.
- N. Off set shims and setting blocks so no "through-joint" occurs in glazing material.
- O. Place setting blocks at locations recommended by glass manufacturer, generally between 1/4 points and 6" from corner except at glazed doors. At glazed doors, provide one block at sill located 3" from edge of glass at hinge side, one block at hinge side jamb located 3" up from lower edge of glass, one block at head located 3" from edge of glass at latch side of door and one block at jamb at lock side of door located 3" down from edge of glass at top corner. Use blocks of length required to properly support glass. Offset approximately 1" from shims.

### 3.2 INTERIOR GLAZING

- A. Use glazing compound, sealant or tape both sides of glass for entire perimeter of interior openings.
- B. Center glass in openings and in rabbet, using shims both sides.
- C. Use sealant at sound retardent glass, fill all spaces around glass solid with sealant.
- D. Apply full bed of compound to rabbet and apply loose stop in compound so that rabbet is completely filled, without voids. Remove surplus compound so flush with daylight edge of stops. Strip to straight, unpitted smooth surface meeting at corners with sharp intersection.

### 3.3 MIRROR INSTALLATION

- A. Consult Architect and Owner for heights and locations of mirrors if not shown on drawings.

B. Mount mirrors securely, level, plumb, free of defects both sides. Install frames with flush hairline joints and with frame-shelf solidly anchored.

C. Use theft-proof concealed hangers where possible.

#### 3.4 SLIDING GLASS WINDOW INSTALLATION

A. Install track, guides and accessories complete as per manufacturer's recommendations. Install glass securely in track.

#### 3.5 SECURITY WINDOW ASSEMBLY INSTALLATION

A. Install security window assembly complete as per manufacturer's instructions, and as detailed.

#### 3.6 CLEANING

A. Remove all surplus materials. Final cleaning of glass shall be done by General Contractor.

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## PART 1: GENERAL

1.1 SCOPE

A. Conditions of Contract and Division 1-General Requirements, apply to all work of this section. Refer to Article 12 of the Instructions to Bidders, Article 7 of the General Conditions and Section 01600-Materials and Equipment for requirements on pre-bid and post-bid evaluation of proposed substitute products, methods and other conditions.

B. Work under this section includes fabrication and erection of complete curtain walls; entrances and vestibules; aluminum stile and rail glazed doors; fabrication and installation of fixed and operating window units; all glass and glazing with curtainwall, window and door units; aluminum closures, blind stops, and insulation.

1. Fabrication and erection of complete bridge (link) envelopes; anodized aluminum sheet skin over top and bottom of bridges; fixed curtainwall window units; all glass and glazing within curtainwall; neoprene glazing gaskets, and designing and providing the structural reinforcing for support of curtainwall and skin, except for bridge floor, with the loading requirements as indicated.

2. Aluminum (anodized) insulated panels at spandrels in conjunction with and part of curtainwall. Aluminum (anodized) counterflashing and parapet covering in conjunction with insulated panels.

3. Aluminum (anodized) formed fascia and gutter with flange, drain built-into gutter.

4. Caulking and sealants at perimeters of all openings, to surrounding construction (as to precast).

5. Provide aluminum cover over the steel handrail support brackets. Steel plate post, bracket and steel tube handrail is specified under Section 05750 and finish field paint under Section 09900. Note: Steel bar bents (in lieu of steel plate posts) at bridge links for curtainwall and skin support are by curtainwall subcontractor.

6. Curtainwall Subcontractor may, at his option, reuse existing windows removed from Unit "A" to accommodate the new construction - see Article 3.14 herein for specific requirements. Glass units from existing windows that are not reused shall be salvaged and turned over to the Owner for future maintenance work.

C. Related work specified elsewhere:

1. Cast-in-place concrete: Section 03300.
2. Architectural precast concrete: Section 03450.
3. Miscellaneous and ornamental metal: Section 05500.
4. Convactor covers, radiation covers, mullion simulators, mullin closures: Section 05750.
5. Grilles and louvers: Section 10200.
6. Hollow metal: Section 08110.

7. Caulking and sealants (other than curtainwall): Section 07900. Refer to and comply with Section 07900 for caulking, sealant and backup materials, methods and workmanship for caulking and sealant materials to be furnished and installed under this Section 08900.
8. Other glass and glazing (other than curtainwall): Section 08800.
9. Building Insulation - Section 07200.

D. Installed but not furnished under this section:

1. Finish hardware (other than specified herein): Furnished under Section 08700.

1.2 REFERENCE STANDARDS

A. The following specifications, codes and standards are incorporated by reference. If the provisions of any of the referenced documents are at variance with these project specifications, the requirements of these specifications shall govern:

1. National Association of Architectural Metal Manufacturers:
  - a. Metal Curtain Wall Specification Manual, February 1968.
  - b. Methods of Test for Metal Curtain Walls, TM-1-68T.
  - c. Specifications for Metal Windows, SW-1-71.
  - d. Field Check for Water Leakage of Metal Curtain Walls, FC-1-69.

1.3 QUALIFICATIONS OF CURTAINWALL FABRICATOR

A. Curtainwall fabricators will be considered for approval in accordance with Article 12 of the Instructions to Bidders and the following:

1. Prospective Bidder shall have been regularly engaged in the production of custom curtainwall systems for not less than ten years.
2. Prospective Bidder shall submit a listing of projects (building, location, Owner and Architect) of a similar type and size which have been completed during the last ten years.
3. Prospective Bidder shall submit preliminary design drawings indicating his proposed method of satisfying the performance and appearance criteria detailed and specified.
4. Prospective Bidder shall submit a written statement of all proposed variances from, or exceptions to, the requirements of the drawings and these specifications, along with large scale drawings fully explaining such variations. Unless exceptions and/or variances are so presented, the proposal shall be understood to represent full compliance with all requirements.
5. Approval for submission of a bid will be granted by the Architect by written addenda. All bidders will at the same time be advised of this approval and any variances allowed.
6. All such requests for consideration shall be submitted a minimum of 21 days in advance of the date set for receipt of bids.

B. The following manufacturers are acceptable as curtain wall fabricators for this project as complying with the design requirements of curtain wall, window and door members and conforming to the specifications herein, provided they furnish units as furnished by them on Unit "A" or Unit "K-E".

1. Alpana Aluminum Products, Inc.
2. Flour City Architectural Metals, Division of Seagrave Corporation.

#### 1.4 QUALIFICATIONS OF CURTAINWALL ERECTOR

A. All items under this section shall be erected or installed by the Curtainwall Fabricator or under his direct supervision and responsibility.

#### 1.5 PERFORMANCE DESIGN CRITERIA AND QUALITY ASSURANCE

A. Laboratory Tests: All testing and inspection shall be performed by an independent testing laboratory acceptable to the Owner and paid by the curtainwall subcontractor.

B. Test reports indicating compliance with the following are required:

##### 1. Curtainwall

a. Provision for thermal movements: The wall units shall be so constructed as to provide for such expansion and/or contraction or component materials as will be caused by an ambient temperature ranging from  $-40^{\circ}\text{F}$  to  $+110^{\circ}\text{F}$  without causing harmful buckling, failure of joint seals, undue stress on fasteners or other detrimental effects.

##### b. Structural Properties:

1) The wall shall be designed to withstand the following wind loads acting normal to the plane of the wall:

a) On all stories: 30 psf acting inward, and the same load acting outward.

2) The deflection of any metal framing member in a direction normal to the plane of the wall, (when tested in accordance with NAAMM "Specifications for Performance Testing of Metal Curtain Walls, Test A") shall not exceed  $1/175$  of its clear span or  $3/4"$ , whichever is less.

3) The deflection of any member in a direction parallel to the plane of the wall, when carrying its full design load, shall not exceed 75% of the design clearance dimension between that member and the top of the panel, sash, glass or any other part immediately below it.

##### c. Water Penetration.

1) Water penetration, in this specification, is defined as the appearance of uncontrolled water other than condensation on the indoor face of any part of the wall.

2) Provision shall be made to drain to the exterior face of the wall any water entering at joints and/or any condensation occurring within the wall construction.

3) No water penetration shall occur when the wall is tested in accordance with NAAMM "Specifications for the Performance Testing of Walls."

d. Air Infiltration: Air Infiltration through the wall, when tested in accordance with NAAMM "Specifications for the Performance Testing of Walls, Test B", shall not exceed 0.06 cubic feet per minute per square foot of fixed wall area plus the permissible allowance specified for operable windows within the test area.

3. Required Tests: One series of the above tests shall be conducted on the largest possible wall assembly and in each case evidence of satisfactory performance as specified shall be provided, before any fabrication is commenced.

## 2. Window Units.

a. Required Tests: Window units shall be tested as Class 40 units in accordance with NAAMM Standard SW-1-71. One series of tests shall be performed and reported prior to commencing fabrication to provide design and two series of tests shall be performed during production on samples selected at random by the University.

b. Closed Window Performance: Windows shall meet following performance levels when tested in accordance with NAAMM SW-1-71.

- 1) Air infiltration: Grade H50.
- 2) Water penetration: Grade H.
- 3) Structural capacity: 40 psf test pressure.

c. Test of Bending Stiffness: Windows shall meet the following performance levels when tested in accordance with NAAMM SW-1-71.

- 1) Maximum deflection 1/8".

d. Other Structural Tests: Windows shall meet the following performance levels when tested in accordance with AAMA 302.7-1971 (ANSI 134.1-1970) Specification VP-A2.

1) Uniform Load Test: No failure of any part when subjected to 40 psf uniform load.

2) Torsion Load Test on Ventilator: Maximum allowable corner deflection - 2.00".

3) Horizontal Concentration Load Test: Maximum deflection at point of loading - .062".

4) Vertical Concentrated Load Test: Maximum deflection at free corners - .031".

C. Steel structural supporting members at bridge and steel reinforcing members.

1. Curtainwall subcontractor shall design and provide all structural steel reinforcing for support of curtainwall and skin, except for bridge floor.

1. Design requirements = 40 psf snow live load on roof in addition to dead loads. Wind loads, acting normal to plane of wall, 20 psf acting inward, and the same load acting outward.

b. Size of members indicated are approximate. Final size and shape to be determined by curtainwall subcontractor. Do not alter the aluminum frame profile and dimensions without Architect's specific approval.

## 1.6 SUBMITTALS

### A. Samples:

1. Finish colors: Provide 3 range samples for each type of extruded or sheet alloy. Samples to indicate maximum permissible color variation. Minimum size of range sample 6" x 6" for sheet, 12" long for extrusion. In event range is deemed excessive, provide additional samples. Sample examination by visual determination. In case of dispute, provide photo volt meter rating to verify compliance. Samples to be used for comparisons purposes during production finishing and installation.

2. Glass, minimum 12" x 12" panel each type.

3. Glazing gasket, 12" long.

4. Sealants, one cartridge each type.

5. Hardware, one sample each item.

B. Shop Drawings: Submit fabrication and erection drawings in accordance with Section 01300. Details shall be at full scale as far as practical, showing construction of all parts of the work, including metal and glass thicknesses, methods of joining, details of all field connections and anchorage, fastening and sealing methods, metal finishes and all pertinent information.

### C. Calculations:

1. Furnish to the Architect for review copies of structural calculations and design for reinforcing and support of bridge (link) curtainwall and skin. (Note: Architect's review does not relieve subcontractor of complete design responsibility.)

2. Copies of any structural calculations made by or for the wall subcontractor in connection with supplementary design and/or detailing of the work herein specified shall be furnished to the Architect, if requested.

## 1.7 MAINTENANCE MATERIALS

A. Upon completion of glazing, provide to Owner replacement glass units as follows:

1. Obscure tinted insulation glass: two units for each size less than 24" wide.

2. Obscure tinted insulation glass: four units for each size 24" wide or more.

3. Typical window glass unit: two units of insulating glass for each size opening in the typical window units.

B. Replacement glass shall be properly packaged for safe storage and package shall be clearly marked with size and description of glass.

## 1.8 DELIVERY, STORAGE, HANDLING

- A. Package, deliver, handle and store at the jobsite in a manner that will avoid damage. Damaged units, scratched glass or materials delivered in broken containers or packages will be rejected.
- B. All materials delivered to the site shall be stored on each floor of the building. These spaces shall be located where the stored materials will not be exposed to wetting, or damage, and shall permit easy access to and handling of the materials. Materials shall be stored neatly, properly stacked on dunnage.
- C. Provide removable, factory applied, protective coating or wrapping to all finished items.

## 1.9 JOB CONDITIONS

- A. Minimum allowable temperature for glazing and caulking 40°F. Temporary enclosures may be used to provide such temperature.
- B. Glazing or caulking on damp or frosty surfaces is prohibited.

## 1.10 GUARANTEE

- A. Guarantee all work of this Section against defects in materials or workmanship of fabrication or erection for a period of two years after completion of the Project.
- B. In addition to the above, guarantee the weather-and-water-tightness of the curtainwall and windows for a period of five years after completion of the Project.
- C. Should any work under this contract be found defective in materials or workmanship, it shall be corrected at no cost to Owner. If exploratory work is required to determine the cause of defects, the cost of this exploratory work shall be borne by the wall subcontractor only in case, and in proportion to the extent that, his work is found to be at fault.

## PART 2: PRODUCTS

### 2.1 MATERIALS

- A. Aluminum: Aluminum of commercial quality and of proper alloy for door and window construction, free from defects impairing strength and/or durability, as follows:

1. Exposed members: The proper proprietary alloys and system required to produce the "hardcoat" integral colors of the Architectural Class 1, AA-C22A42 designation, Alcoa Duranodic, Kaiser Kalcolor, Reynolds Reynocolor, or approved equal. Color, Alcoa Duranodic 313E or 313S applicable to specific part. Texture, finish and color to match in all respects the curtain wall on Unit A, Health Sciences at the University of Minnesota.

2. Concealed members: Standards and designation of the Aluminum Association and the following ASTM Standards:

- a. Sheet and plate. . . . . .B209-73
- b. Extruded bars, rods, shapes and tubes. . . . .B221-74
- c. Bars, rods and wire. . . . .B221-74
- d. Standard structural shapes . . . . .B308-73
- e. Drawn seamless tube. . . . .B210-74a
- f. Extruded structural pipe and tubes . . . . .B429-73

B. Carbon Steel: ASTM A36, with SSPC Paint System No. 1.

C. Fasteners:

1. Screws, nuts, washers, bolts, rivets and other miscellaneous fastening devices incorporated in the windows shall be of aluminum, non-magnetic 302 stainless steel or other non-corrosive materials compatible with aluminum and shall be of sufficient strength to perform the functions for which they are used.

2. Fasteners which are concealed when the window is installed and closed shall be of stainless steel having a chromium content of not less than 16%.

3. Fasteners which remain concealed when window is installed and open may be of cadmium or zinc-plated steel in accordance with ASTM A165-71 and A164-71, or stainless steel.

4. No fasteners shall be exposed when windows or other operating units are installed and closed.

D. Weatherstripping:

1. Provide three parallel rows of extruded polyvinyl chloride Weatherstrip materials interlocked within integral grooves provided for the entire perimeter of the operating sash. Sponge or neoprene weatherstripping not acceptable.

2. The weatherstrip shall have sealed corners and be continuous and uninterrupted.

3. The double row of weatherstripping shall seal against the inside frame and the single row against the outside frame as shown on drawings. Weeps shall drain space between double and single rows.

4. All weatherstripping shall seal against frame metal.

E. Thermal Break:

1. Extruded polyvinyl chloride as indicated on drawings to provide complete thermal separation of interior and exterior metal components.

2. All sash, frame and closure members shall be assembled to form separate interior and exterior frames, jointed together by continuous rigid vinyl insulating strips in such a manner that the insulating members are not subject to sheer or tensile stresses, and allow independent thermal movement of exterior and interior frames. Bolts, screws, or other metal fasteners which prohibit independent movement and bridge the thermo-barrier will not be acceptable.

3. Thermal break without voids is required. The thermal break shall be constructed to provide proper structural characteristics, to preclude collection and freezing of condensation, and to prevent thermal air movement within members under all weather conditions.

#### F. Ventilator Hardware.

1. Sash shall pivot in one direction only.

2. White bronze and stainless steel throughout. Provide two white bronze sash locks and keepers in each vent jamb. Finish on exposed hardware shall be US10B.

3. Locks shall be custodial type operated by means of a custodial key and shall be located in sill section of frame. No locks or other hardware will be allowed in jambs or mullions.

4. Provide a positive limit stop on bottom pivot assembly. Limit stop shall lock at 25, 90, 180 and 360 degrees. Release of limit stop for rotation of ventilator for window cleaning by means of removable custodial key.

#### G. Glazing Gaskets:

1. H profile lock strip type (except H profile with "tongue and groove" leg at muntin sections at bridge windows). Extruded neoprene with durometer of  $75 \pm 5$ , conforming to ASTM C-542-71a.

2. Units shall be one piece per glazing light. No field joints.

3. Zipper (lock strip) shall be placed on inside on fixed sash except at third and fourth floors and on outside on operating sash and fixed sash at third and fourth floors and at bridges.

4. Weep holes: Provide in sill of each gasket unit; provide condensation channels into sill members and to outside.

#### H. Glass:

1. Provide glass to type and thickness indicated on drawings and of manufacturer and quality specified. Provide 1/4" plate or float glass if type and thickness are not otherwise indicated.

b. Tinted Insulated Glass Units: Consisting of exterior sheet of 1/4" bronze colored (Solarbronze) plate or float glass and interior sheet of 1/4" clear plate or float glass, units shall be nominal 3/4" thick, except nominal 1" thick at windows at floors 3 and 4.

c. Tinted tempered Insulating Glass Units: consisting of exterior sheet of 1/4" tempered (Herculite) bronze colored (Solarbronze) glass and interior sheet of 1/4" clear tempered (Herculite) glass; units shall be nominal 1" thick.



d. Tinted sloping tempered insulation glass units at entrances: consisting of exterior sheets of 5/16" tempered (Herculite) bronze colored (Solarbronze) glass and interior sheet of 5/16" clear tempered (Herculite) glass; units shall be nominal 1" thick.

e. Insulating glass units shall be hermetically sealed, with desiccant for moisture control, as manufacturer by PPG Industries or Libby-Owens-Ford. All insulating units to be from the same manufacturer.

f. Clear Glass: 1/2" thick clear float or plate glass as manufactured by PPG Industries of Libby-Owens-Ford.

g. Tempered glass (for all glazed doors): 1/4" thick tempered (Herculite). Clear at interior doors of curtainwall, bronze colored (Solarbronze) at exterior doors of curtainwall. Herculite clear or Herculite Solarbronze as manufactured by PPG Industries or Libby-Owens-Ford. Verify with drawings, for location of clear or bronze colored glass if noted differently than above mentioned.

h. Bronze colored glass, for insulating or single units shall be of same manufacturer.

i. Insulated Spandrel Panels shall consist of 1/4" solar bronze glass on exterior and core material of rigid urethane (black finish) in thickness shown. All components shall be permanently joined by an adhesive which is sprayed on continuously to all components being joined.

k. All safety glazing (i.e. tempered glass, laminated glass, wire glass and plastic glazing) must meet test requirements of ANSI-Z-97.1-1972). Provide permanent label on all safety glazing in compliance with code and/or law.

1) Label must be legible and visible after installation of material.

2) Label to include: identification of seller, manufacturer, fabricator or installer; nominal thickness; type of safety glazing material; fact that material meets test requirements of ANSI Z-97.1-1972.

#### I. Sealants:

1. Metal to metal joints shall be sealed with a two part polysulfide, Class B, non-sag sealant licensed by Thiokol Chemical Corporation as conforming to Thiokol Building Trade Performance Specification, such as Trem-co "Lasto-Meric", to Sonno-born's "Sonolastic", Deway & Almy "Hornflex", Pecora Synthacalk GC-5, or approved equal.

2. Metal to masonry and precast concrete joints shall be sealed under this section 08900, in accordance with requirements specified under Section 07900. Materials (sealant, non-staining compressible gaskets and backup material), methods and workmanship comply with requirements as specified under Section 07900.

3. At Sloping Windows: All exterior horizontal gasket edges (and 6" up each vertical edge) shall be sealed with compatible sealant similar to translucent G.E. Silicone Sealant 1200.

#### J. Neoprene Compression Seal:

1. Furnished and installed by Section 07900.

K. Aluminum Stile and Rail Doors:

1. Refer to Article 2.2, paragraph C-7 herein. Finish to be color matched within window wall range samples.

L. Hardware:

1. Furnish all hardware shown and required to complete installation.

a. At Hinged Doors:

1) All hardware and templates furnished under Section 08700, and installed by Section 08900.

2) Coordinate templates, reinforcing and cutouts with hardware supplier, and if necessary, hardware supplier will ship actual hardware to door manufacturer for installation in shop.

b. Provide locks to receive masterkey cylinder (masterkeyed cylinders by Section 08700).

M. Aluminum Panels: (Flat and Curved)

1. Conform to Article 2.1, paragraph A-1 and A-2 herein. Provide sufficient plate or sheet thickness to maintain profile indicated on drawings (dead flat plane at flat panels) without warping, bowing or oil-canning.

2. Secure with blind fastenings.

N. Insulated anodized Aluminum Panels

1. Provide insulated panels of size and thickness indicated; conform to article 2.1, paragraphs A-1 and A-2 herein.

2. Face panels with edge returns; provide sufficient sheet thickness to maintain dead flat plane without warping, bowing or oil canning. Back panel with edge returns, fabricated to fit within face panel.

3. Core material shall be rigid urethane insulation in sufficient thickness to produce a panel with a total thickness as indicated on drawings.

4. All components shall be permanently joined by an adhesive, as recommended by adhesive manufacturer.

O. Insulation:

1. Glass fiber insulation, unfaced batts or blankets. Thickness as noted on drawings or of thickness required to fill voids full at mullions, sill, head and where indicated; US Gypsum, Owens-Corning or Zonolite.

P. Aluminum Grilles:

1. Finish shall be same as other exposed aluminum. See Article 2.1, paragraph A, this section.

2. Aluminum grilles at vestibule face of spandrels in entrance curtainwalls: Similar to Model C-1500 bar type Fineline by Titus Manufacturing Corp, Waterloo, Iowa, Tuttle and Bailey, or approved equal. Provide without border. Extruded fixed bar louvers 1/8" x 1/2" 1° deflection, spaced 1/2" o.c.

3. Provide plywood backup (painted Matte Black) at grilles, except at mechanical duct connections.

Q. Aluminum Gutter with Flange, Fascia, Scuppers and other Aluminum Flashings:

1. Aluminum: Aluminum of commercial quality and of proper alloy for roof edge and flashing, free from defects impairing strength and/or durability, finish to be same as curtainwall, as specified under Article 2.1, paragraph A-1 herein. All members shall be formed, fabricated, welded and riveted to project dimensions before receiving "hardcoat" integral color.

2. Paint--Asphalt Coating: Coat metal built into roof type membranes, or under dissimilar materials with bituminous paint on parts to be built in. Prime back side with heavy coat (or two coats) of asphaltic paint wherever it laps over or comes in contact with other metal or where it is built into masonry.

3. Fastenings:

a. General: Provide appropriate and recommended type and size of non-rusting fastenings for all metals to insure: Proper and permanent alignment; metal remaining permanently in place; restricted movement; permanently tight joints. Provide rivets at all welded joints to take the stresses. Where exposed fastenings are required, provide stainless steel screws with watertight washers. Fastenings to penetrate wood a minimum of 3/4".

b. Stainless steel screws to color match "hardcoat".

c. Watertight washers for screws at exposed fastening and similar locations, provide neoprene washers under the head to insure watertight hole.

4. Welding:

a. Aluminum Work: Weld all joints as required as per American Welding Society Standards.

5. Joint Sealer, Mastic and Miscellaneous:

a. Roofer's Mastic: Plastic cement as specified for roofing, Section 07510.

b. Protected metal mastic: As recommended by Manufacturer.

c. Concealed Sealant (bedding sealant): Tremco Sealant, Polyisobutylenebutyl type, or approved equal.

d. Caulking Compound-Sealant: As specified for sealant under Section 07900.

3. Plastic Flashing Sheets: 30 mil thickness, as specified under Section 07510.

## 2.2 FABRICATION

A. Design: See Article 1.5 for performance design criteria.

B. Dissimilar Metal and Protection:

1. Provide protection against galvanic action whenever dissimilar metals are in contact. Provide protection by painting contact surfaces with heavy coat of zinc chromate primer or by application of an appropriate sealant or tape.

2. Protect aluminum which is to be in contact with cured concrete, mortar or plaster wherever crevices between contact surfaces may entrap moisture and corrosive elements. Where appearance is a factor, protect contact surfaces of all metals, except galvanized or stainless steel, which are to be in contact with fresh concrete, mortar or plaster, with zinc chromate primer, butiminous paint, aluminum metal-and-masonry paint, or clear protective coating. Verify compatibility of protection materials with sealants so that bond or adhesion of sealant is not destroyed. Do not coat surfaces to receive sealant.

C. Aluminum Curtainwalls, Doors and Entrances:

1. All parts of the doors and window wall assemblies shall be of the materials, design, sizes and thicknesses as may be required to meet the requirements of these specifications and to the profiles shown on the architectural drawings. Minor deviations in details and profile will be considered, provided the final appearance is uniform with existing items in Unit "A", Health Sciences Expansion. All proposed deviations shall be subject to the approval of the Architect, whose decision shall be binding.

2. All work shall be performed by competent workmen thoroughly skilled in the trade. All exposed work shall be carefully matched to produce continuity of line and design, with all joints being accurately fitted, rigidly secured and sealed weathertight on the unexposed surfaces.

3. In general, no exposed fastenings are permitted. The attachment of stiffeners, anchor clips or other required appurtenances may be accomplished by various welding techniques (stud weld, tack weld, plug weld, etc.) or by mechanical means as long as the connection is covered by a finishing member, and weld marks do not show through on the finished work.

4. Vertical mullions shall be of split design to allow for horizontal thermal movement and shall be designed as shown on the drawings.

5. All splice plates shall be of the internal variety, external cover plates between two adjacent members are not acceptable.

6. All door frames and fixed window wall units shall be factory fabricated into the largest units practicable for shipping, handling and installation. Cutting, fitting and assembly work shall be done at the factory.

7. Door, stiles and rails shall be one piece extruded aluminum sections with not less than .125 inch wall thickness. Corners shall be reinforced with machined aluminum corner shoes welded internally to the adjoining section. Stiles and rails shall be carefully fitted to produce neat hairline joints.

D. Vertically Pivoted and Fixed Windows:

1. Window frames and mullions shall be size and profile as required by architectural drawings. The metal thickness shall be as required to meet the structural requirements herein specified and to assure proper functioning of the sash, in no case less than 0.125". Minor deviations in details and profile will be considered, provided the final appearance is uniform with existing windows in Unit "A", Health Sciences. All proposed deviations are subject to the Architect's approval whose decision shall be binding.

2. Minimum typical wall thickness of the ventilator member shall be 0.125". Profiles of ventilator and frame members shall conform to those shown on the architectural drawings.

3. Multiple window openings shall be factory fabricated in single units having continuous and uninterrupted head and sill members. Frame shall have reinforced mechanically joined corners. Vertical mullions shall be accurately coped into horizontal members and mechanically fastened with stainless steel screws. All joints and intersections shall be sealed internally to provide permanent, rigid and weathertight connections.

4. All four corners of the ventilator unit shall be mitre cut and reinforced with heavy corner shoes. The corner shoes shall be thoroughly coated with sealant before insertion into tubular portion of ventilator section. Secure in place with stainless steel fasteners on the unexposed surface to form permanent weather tight joints and develop the full strength of section.

E. Assembly:

1. Windows shall be assembled in a secure and workmanlike manner to perform as herein specified and to assure neat and weathertight construction. A permanent watertight joint shall be made at the junction of the sill and side frame members. When welding flux is used, it shall be completely removed immediately upon completion of the welding operation.

2. Windows may be shipped completely assembled or knocked down. A K.D. window is a window that is complete in its entirety with the exception of glass, glazing materials which is shipped in a disassembled condition and later assembled according to the instructions of the manufacturer and utilizing all of the components supplied or specified by the manufacturer.

F. Hardware:

1. Hardware shall be designed to perform the functions for which it is intended and shall be securely attached to the window.

G. Mullions or Other Structural Members:

1. When mullion units occur, whether they are jointed by integral mullions, independent mullions, or by a combination of frame members, the resulting members must be capable of withstanding the loads specified.

## H. Tolerances:

1. All references herein to dimensions for wall thickness of window members are minimum dimension, to which the standard wall thickness tolerances published by the Aluminum Association shall apply.

2. The absolute minimum wall thickness for a solid shape is 0.125" and for a hollow shape, 0.125".

3. The over-all size tolerance shall be within plus or minus 1/16" for all dimensions 6'-0" and under, and plus or minus 1/8" for all dimensions in excess of 6'-0". This tolerance does not apply to diagonal measurements.

## I. Sub-Frames; Reinforcing and Supports:

1. Where steel sub-frames, reinforcing and supports are required or used, all surfaces of the steel shall be insulated from direct contact with aluminum surfaces by a heavy coat of an alkali-resistant bituminous paint or a zinc-chromate primer coat or other coating suitable for this purpose. No part of the steel sub-frame shall be left exposed.

2. Provide thermal break between exterior frame and any sub-frame member.

J. Blind Stops: Provide blind stops at entire perimeter of all windows, jambs and heads at entrance frames.

## K. Anchorage:

1. Anchorage system shall allow for a minimum differential vertical movement (deflection) between head and sill of 1/4".

2. Anchors shall be at head and sill only. No anchors will be allowed at jambs except at curtain wall and entrance wall over six feet in height.

## PART 3: EXECUTION

### 3.1 PRIOR INSPECTION OF THE STRUCTURE

A. After lines and grades have been established, and before beginning installation in any area, the erector shall examine all parts of the structure on which the curtainwall, entrances or windows are to be placed in that area. Should any conditions be found which, in his opinion, will prevent the proper execution of his work, he shall report such conditions in writing to the University and the General Contractor. Installation work shall not proceed in that area until such conditions are corrected or adjusted to the satisfaction of the University and the Erector.

### 3.2 WORKMANSHIP

A. All work shall be performed by skilled workmen, especially trained and experienced in this type of work. If the fabricator chooses to subcontract the erection, the proposed subcontractor's qualifications shall first be filed with and approved by the University.

B. All parts of the curtainwall, windows and entrances shall be erected plumb and true, in proper alignment and relation to established lines and grades, as shown on approved shop and/or erection drawings.

### 3.3 TOLERANCES

A. Permissible dimensional tolerances in the building structure and precast concrete envelope are specified in Section 05122 and 03410 of these specifications. Unless irregularities in adjoining construction exceed these tolerances, all parts of the curtainwall entrances and windows, when completed, shall be within the following tolerances:

1. Maximum deviation from true vertical, horizontal or designated position shall be 1/8" per 12 feet of length in any member, of 1/4" in any total run in any line.

2. Maximum offset from true alignment at joints between abutting members in line end-to-end shall be 1/16".

3. Maximum differential in dimension of two diagonals of any glass openings shall be 1/8".

### 3.4 ANCHORAGE

A. Anchorage of components to the structure shall be by approved methods, in strict accordance with approved shop and/or erection drawings. Supporting brackets shall be so designed as to provide three-dimensional adjustment and accurate location of wall components. After the wall is properly positioned, all connections so designated on approved shop drawings shall be rigidly fixed by welding or other positive means.

B. Unless otherwise agreed or specified, all necessary inserts to be built into masonry and/or concrete work shall be provided by the window contractor for installation by others.

C. No provision is made in Section 03410 for casting in window curtainwall or entrance anchorages. Such work shall be the sole responsibility of the curtainwall manufacturer. If his anchorage system requires cast-in components, he shall provide and install (or pay for installation) at his own expense.

D. Before final installation of blind stops, stuff all voids at jambs, sills and mullions with low density fiberglass insulation.

### 3.5 SEALING OF JOINTS

A. All metal-to-metal joints between window and/or framing members which are included in this contract shall be sealed weathertight with specified sealants. Joints around openings, between work of this section and surrounding construction shall be sealed (caulked) as a part of work under this Section 08900. Sealant and caulking products and execution, furnished and installed by Section 08900, shall be in accordance with Section 07900.

B. All sealants shall be applied in strict accordance with the sealant manufacturer's printed instructions.

C. Sealing materials shall be used in strict accordance with the manufacturer's printed instructions, and shall be applied only by mechanics specially trained or experienced in their use. Before applying sealant, all mortar, dirt, dust, moisture and other foreign matter shall be completely removed from surfaces it will contact. Adjoining surfaces shall be masked when required, to maintain a clean and neat appearance.

D. Sealing compounds shall be tooled to fill the joint and provide a smooth finished surface.

E. Where a suitable backstop is not provided, a compatible joint backing material approved by the sealant manufacturer shall be used. This backing shall be so recessed that the depth of sealant does not exceed the joint width or 1/4", whichever is greater, and in no case shall it exceed 1/2".

F. All excess sealant and caulking material shall be completely removed, leaving all joints and surfaces neat, smooth and clean.

### 3.6 INSTALLATION OF NEOPRENE COMPRESSION SEALS

A. Furnished and installed by Section 07900.

### 3.7 WELDING

A. All welding shall be done by skilled mechanics qualified or licensed in accordance with local building regulations, and shall conform to the recommended practices of the American Welding Society. Welds and adjoining burned areas shall be thoroughly cleaned and painted with paint system specified. Special care shall be taken to protect glass and other finished surfaces from damage and to prevent causing fires.

### 3.8 GLAZING

A. Before glazing, openings shall be checked to see that they are square, plumb and in true plane. If found otherwise, glazing shall not proceed until proper corrections are made.

B. No tempered, heat-strengthened or insulating glass shall be cut after leaving the factory.

C. Perimeter clearance must be sufficient to avoid all point loading.

D. Insulating glass containing tinted glass shall be installed with the tinted glass on the outdoor side.

E. Install structural gaskets and glass in strict accordance with manufacturer's recommendations and instructions, use only lubricants and methods approved by him.

### 3.9 ADJUSTMENTS

A. At the time components are installed, all ventilators and/or sash, doors and other operating parts shall be adjusted to operate smoothly and be weathertight



when closed and locked, and hardware shall be properly adjusted and lubricated. Any adjustment necessary after field glazing shall be the responsibility of the General Contractor.

### 3.10 GUTTER, SCUPPER, FASCIA AND FLASHING

A. General: Conform to best practice, accomplish by using skilled mechanics, in accordance with Aluminum Association Manufacturer's and Sheet Metal Contractor's Association Handbook and Recommendations and to details shown. Provide metal work that is substantial, securely fastened, neatly installed, with clean sharp breaks, water and weatherproof. At membrane roof locations, provide metal work to meet roofer's requirements and approval for twenty year bonded type roof. Insulated between dissimilar material with asphalt paint or other approved insulator.

1. Verify Conditions: Prior to starting work, verify that all nailers, blocking, etc., are true to size and line and securely anchored. Notify General Contractor of unsatisfactory work and do not proceed until corrections are made so straight, level, plumb and properly sized work results. Verify dimensions in field to provide proper and accurate fit.

2. Dimensions: Carefully form and install metal work, to conform to dimensions and indicated and to field confirmed dimensions.

3. Movement: Install all work with proper allowance for expansion and contraction from thermal changes.

4. Joints: Construct all joints with laps in direction of flow. At butt and locked joints, construct joints watertight.

5. Hemmed Edges: Turn back metal to form hemmed edges wherever the edge creates a hazard or where it may cut into membranes. Provide hemmed edges at lower edges of flashing, counterflashing, coping covers.

6. Welding: Rivet all welded joints to take stress. Keep welding work neat and smooth.

7. Keepers and Wedges: Where shown, or required to firmly hold metal in place, provide continuous keepers, screeds or cleats of same metal as metalwork. Provide lead wedges where noted or where required to hold metal work firmly in place.

8. Plastic Sheet: Provide plastic flashing under metal as noted. Follow specifications for installation as included under applicable section.

B. Gutter and Scupper: Form to profile as indicated; fascia, gutter and flange fabricated and one piece. Close ends of gutter water tight, by welding and riveting. Build in scupper, to size indicated on drawings, weld and rivet all joints water-tight, provide with positive drainage with slight drip at end. Provide continuous keeper at bottom edge of fascia.

C. Flashing, cap, fascia and counterflashing: Form to profile as indicated; fabricate in one piece, provide expansion joints at ends as detailed on drawings. Provide all accessories required.

### 3.11 REMOVAL OF DEBRIS

A. All debris caused by or incidental to the installation work shall be promptly removed from the jobsite as the work progresses.

### 3.12 PROTECTION AND CLEANING

A. The wall contractor shall remove from the installed work all mastic smears or other unsightly marks caused by his workmen, and shall be responsible for any damage to or disfigurement of the work caused at any time by his own men. Protection of the work against damage by other trades, as well as any cleaning other than this shall be the responsibility of the General Contractor.

### 3.13 INSULATING GLASS GUARANTEE

A. Guarantee sealed double insulating glass units for minimum period of 15 years, with manufacturer's replacement guarantee, covering as a minimum: Defective or failure of seal; material vision obstruction as result of dust collection or film formation between panes; other similar failure. In addition to replacement units, provide removal and reinstallation of new units without cost to Owner during first five years of guarantee.

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## PART 1: GENERAL

1.1 SCOPE

A. Conditions of Contract and Division 1, General Requirements, apply to all work of this section. Refer to Article 12 of the Instructions to Bidder, Article 7 of the General Conditions and Section 01600 - Materials and Equipment for requirements on pre-bid and post-bid evaluation of proposed substitute products, methods and other conditions.

B. Work under this section includes furnishing and installing all metal stud partition systems, metal furring, metal lath, lath and plaster accessories, veneer plaster and stucco work, and all gypsum drywall work indicated, or specified.

1. Veneer plaster may, at installer's option, be substituted for gypsum board but gypsum board shall not be substituted for veneer plaster.

2. The removal of existing plaster ceiling, the disconnection and removal and protection for reuse of lighting fixtures, mechanical diffusers and other electrical and mechanical equipment, and the providing of new ceiling (veneer plaster) and the reinstallation of lighting fixtures, diffusers and other equipment in Unit A auditorium is the work of this section 09100. Refer to sheet A4-3.

C. Related work specified elsewhere:

1. Lip type hanger tabs to metal decking: Section 05302 (&ECS Contracts).
2. Sprayed fireproofing: Section 09841.
3. Metal suspension and furring for other than plaster and gypsum drywall ceilings: Section 06100, 09541 and 13500.

D. Installed but not furnished under this section:

1. Sound gasket at ends of partitions abutting exterior walls; furnished under Section 05750.

1.2 REFERENCE STANDARDS

A. Lathing and furring work shall conform to the Specifications for Interior Lathing and Furring, ANSI A42.4-1967, unless otherwise specified herein.

B. Gypsum plastering work shall conform to the Specifications for Gypsum Plastering, ANSI A42.1-1964, unless otherwise specified herein.

C. Gypsum drywall work shall conform to the Specifications for the application and finishing of wallboard, ANSI A97.1-1965, unless otherwise specified herein.

D. Gypsum drywall partition and ceiling systems shall be constructed strictly according to the gypsum manufacturer's current printed specifications.

E. Portland cement plaster and stucco work shall conform to ANSI 42.2-1971.

F. Lathing and furring for Portland cement plaster and stucco work shall conform to ANSI 42.3-1971.

G. Where a fire resistance rating is required, the partitions or ceilings shall be constructed strictly according to the rated design so that the completed installation will achieve the required fire resistance rating.

### 1.3 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver packaged materials in their original, unopened packages, containers or bundles with labels intact. Deliver, store and handle materials to prevent damage. Protect from water and the elements. Store gypsum lath and gypsum indoors in dry locations, neatly stacked flat on wooden pallets. Protect metal items from rusting and damage to painted finishes. Do not unwrap gypsum board until ready for actual use.

B. Protect plaster, lime and cement from water, the elements and other damage during delivery, storage and handling. Store cementitious materials in water-tight sheds with elevated floors or indoors in dry location on wooden pallets.

### 1.4 JOB CONDITIONS

A. No gypsum lath, plaster, stucco, nor gypsum drywall shall be applied when the temperature is below 55°F and a minimum temperature of 55°F shall be maintained throughout the curing period.

B. Protect wood, glass, metal and other finished surfaces by placing adequate coverings over such surfaces before starting work. Damaged, stained or soiled surfaces shall be replaced or restored.

C. Provide adequate ventilation during and after installation throughout curing period avoid uneven drying.

## PART 2: PRODUCTS

### 2.1 LATHING AND FURRING MATERIALS

A. Metal studs shall be screw type, channel studs (not drywall studs) formed from 20 gauge galvanized steel with knockouts for pipe and conduit. Runners shall be channel shaped with 1" minimum legs formed from 20-gauge galvanized steel. Studs and accessories shall be manufactured by National Gypsum, U.S. Gypsum, Milcor Inland Ryerson, Wheeling, Penn Metal, or approved equal. Furnish studs in widths indicated on the drawings.

B. Drywall furring channels shall be 7/8" deep, hat-shaped sections with a 2-3/4" wide back and a 1-3/8" face formed from 25 gauge galvanized steel or resilient channels (furring). Provide appropriate channels or clips for condition.

C. Furring channels and runners shall be 3/4", 1 1/2" or 2" cold rolled steel channels. Minimum weight per lineal foot shall be 0.300 pounds for 3/4" channels, 0.475 pounds for 1 1/2" channels and 0.590 pounds for 2" channels. Channels shall be coated with rust inhibitive paint after forming.

D. Metal lath shall be flat or self-furring lath manufactured from copper bearing steel and conforming to Federal Specification QQ-L-101a. Lath for stucco work and Portland cement plaster shall be galvanized; other lath shall be coated with rust inhibitive paint after fabrication. Minimum weight of lath (painted) shall be 3.4 pounds per square yard.

E. Cornerite and strip lath shall be 2.5 pound flat expanded metal lath. Cornerite shall be bent at right angles with 3" wide legs each side. Strip lath shall be 6" wide.

F. Accessories for stucco work shall be formed from zinc sheets; other accessories shall be formed from galvanized sheet. Accessories shall be manufactured by Inland-Ryerson (Milcor), National Gypsum, U.S. Gypsum, or approved equal, and shall be as follows:

1. Corner bead - Milcor No. 1, 26 gauge.
2. Casing bead - Milcor No. 66 Expansion, 24 gauge.
3. Control joint - USG No. 50, 75 or 100.
4. Corner control joint - Milcor No. 30, 26 gauge.
5. Custom shapes, plates as detailed, 24 gauge.

G. Tie wire and clips shall be galvanized, soft annealed steel. Hanger wire shall be galvanized steel wire, #9 gauge except in fire rated ceilings where #8 gauge shall be used. Provide spring connectors in suspension system conforming to Section 13500.

H. Gypsum lath and accessories shall be manufactured by National Gypsu, U.S. Gypsum, or approved equal.

1. Gypsum lath shall conform to ASTM C37, Plain Gypsum Lath, 3/8" and 1/2" thick, 16" wide. Fire retardant gypsum lath shall be type 'X'.

2. Clips for attachment of gypsum lath to furred and suspended ceilings shall be National Gypsum Wire-Tite Clips, U.S. Gypsum Brace-Tite Clips, or approved equal. Other clips, screws and accessories for the attachment of gypsum lath shall be manufacturer's standard type for intended use.

3. Gypsum lath for veneer plaster shall comply with ASTM C588 of thickness noted on the drawings. Use as large panels as is practicable to minimize joints. Fire retardant gypsum lath for veneer plaster shall be Type 'X'.

4. Adhesive for application of gypsum lath to core walls shall be as recommended by the manufacturer of the lath for application to the particular substrate.

5. Accessories for gypsum lath for veneer plaster shall be formed from galvanized sheet and shall be manufactured by Inland-Ryerson (Milcor), National Gypsum, U.S. Gypsum, or approved equal as follows:

- a. Joint reinforcement: Perf-a-Tape and Durabond 90.
- b. Corner bead: USG 900.
- c. Casing bead: USG 701-A or 701-B.
- d. Control joint: USG 093.

1. Compressible gasket for steel stud partitions shall be 3/8" thick, Norton Norseal V770 series closed cell PVC foam with pressure sensitive adhesive; one side or approved equal.

J. Sound insulation for steel stud partitions shall be a semi-rigid spun mineral or glass fiber mat conforming to Federal Specification HH-1-521c, Type 1, Class A or B; Fiberglas Noise Barrier Batts, U.S. Gypsum Thermafiber Sound Attenuating Blankets. Unless otherwise indicated, sound insulation shall be 2" thickness.

K. Screws for attachment to acoustical ceiling main runners and cross runners shall be stainless steel or cadmium plated steel screws, 5/16" diameter by 18 threads per inch, 5/8" maximum length.

L. Vapor barrier shall be 6 mil thick, polyethylene sheet. Furnish 2" wide polyethylene tape with pressure sensitive adhesive one side.

M. Acoustical Sealant shall be Pecora BA-98, Tremco Acoustical Sealant, Prestite 579.64, USG Acoustical Sealant, or approved equal.

N. Acoustical tape shall be a 2" wide, pressure sensitive, permanently resilient, non-drying, non-shrinking plastic tape; Tremco Acoustical Tape or approved equal.

O. Cell closures for tops of partitions abutting steel deck: preformed neoprene closures minimum 1" thick of proper profile to match deck profile.

P. Clips, screws and other accessories for the attachment of metal studs, runners and drywall furring channels shall be manufacturer's standard type for intended use.

Q. Ceiling Inserts: Brock-White 3308 drive-in type or shell type inserts or powder driven eye pins at the subcontractor's option capable of supporting 150 pounds without pulling out.

R. Use spring suspension as detailed in area bonded by grids S2, E13, S6 and #29. Use standard suspension elsewhere.

S. Plenum Sound Barrier: Plenum sound barriers shall be Asarco Acoustic lead sheet or approved equal, 1/64" thick, one pound per square foot. Where plenum sound barrier is indicated either horizontal or vertical above plaster or gypsum drywall ceiling or above interface of plaster or gypsum drywall ceiling and ceiling of Acoustic tile #1, or preformed metal ceiling, the plenum sound barrier shall be provided under this Section 09100.

## 2.2 PLASTER AND STUCCO MATERIALS

### A. Veneer plaster

1. One coat finish: USG Diamond Finish Plaster or comparable product of National Gypsum Company, Georgia-Pacific or approved equal.

### B. Stucco and Portland cement plaster materials shall conform to ASTM standard specifications as follows:

1. Portland Cement: ASTM C150. Cement for job mixed finish coat shall be non-staining, white Portland cement.

2. Hydrated Lime: ASTM C206, Type S.

3. Factory Prepared Finish Coat: US Gypsum Oriental Exterior Finish Coat or approved equal. Color shall be white.

4. Sand: ASTM C144, graded as follows:

Passing #4 sieve	100%
Passing #8 sieve	100%
Passing #16 sieve	60-90%
Passing #30 sieve	35-70%
Passing #50 sieve	10-30%
Passing #100 sieve	5% maximum

Not more than 50% shall be retained between any two consecutive sieves nor more than 25% between the #50 and #100 sieves.

a. Sand for job mixed finished coats shall be a white silica sand as specified in paragraph 5.a above.

C. Water shall be clean, potable and free of deleterious amounts of acids, alkalies or organic materials.

### 2.3 GYPSUM PLASTER MIXES

#### A. Finish Coat Proportions.

1. Veneer finish plaster is mill proportioned.

a. Sand float finish veneer plaster shall be mixed in proportions of 100 lb. Keenes cement to 50 lb. lime to 400 lb. sand by dry weight.

#### B. Mixing.

1. Accurately measure materials.

2. If mixing by hand, mix plaster and aggregate to a uniform color at one end of the box before adding water, hoe into water at the other end a thoroughly mix to the proper consistency. Clean tools and mixing box after each batch.

3. If using a power mixer, add approximate amount of water, approximately half the sand, all the plaster and the remainder of the sand, in that order, while the mixer is in continuous operation, and mix to proper consistency adding additional water as necessary. Clean mixer after discharging each batch.

4. Plaster shall be accelerated, if necessary to provide a setting time of not more than 4 hours after addition of mixing water.

5. Discard material which has partially set. No retempering will be permitted.

### 2.4 STUCCO AND PORTLAND CEMENT PLASTER MIXES

A. Stucco and Portland Cement Plaster Proportions. Scratch coat and brown coat shall be one part Portland cement to not less than 3 nor more than 5 parts damp, loose sand by volume. Hydrated lime may be added as a plasticizer, but the amount used shall not exceed 10% by weight or 25% by volume of the Portland cement. Use the smallest amount of lime necessary to obtain the desired plasticity.

B. Finish Coat Proportions. Finish coat shall either be a factory prepared finish coat mixed strictly according to manufacturer's instructions or a job mixed finish coat mixed in the proportions of one part white Portland cement to 3 parts silica sand by volume.

#### C. Mixing.

1. Accurately measure materials by volume. Use a power mixer. Mix cement, lime and sand to a uniform color before adding water. Mix for at least 5 minutes after adding water. Thoroughly clean mixer after discharging each batch.

2. Apply stucco within one hour after mixing. No retempering will be permitted.

## 2.6 GYPSUM WALLBOARD

A. Gypsum wallboard, accessories and related materials shall be manufactured by National Gypsum, U.S. Gypsum, or approved equal. Materials shall be as follows:

1. Gypsum wallboard shall be  $\frac{1}{2}$ ", 48" wide wallboard with tapered edges conforming to ASTM C36.
2. Fire-retardant gypsum wallboard shall be  $\frac{1}{2}$ ", 48" wide wallboard with tapered edges conforming to ASTM C36, Type X. Fire-retardant gypsum wallboard shall be listed by the Underwriters Laboratories, Inc. (Guide No. 40 U18.23).
3. Gypsum backing board shall be  $\frac{1}{2}$ ", 48" wide backing board with square edges conforming to ASTM C442. Fireretardant gypsum backing board shall conform to ASTM C442, Type X and shall be UL listed.
4. Accessories shall be as follows:
  - a. Corner Bead - US Gypsum DUR-A-BEAD, No. 101 or No. 103.
  - b. Casing Bead - US Gypsum No. 200-A or 200-B Metal Trim.
  - c. Control Joint - US Gypsum No. 093.
5. Screws, nails, clips, ties and other accessories shall be as recommended by the gypsum board manufacturer. Use WR (water-resistant type) where indicated.
6. Adhesives shall be Durabond of type recommended by the gypsum board manufacturer for application required.
7. Joint treatment system shall be a perforated tape and cement system, Durabond or equivalent recommended by the gypsum board manufacturer for the intended use.

## 2.7 CORE WALL SYSTEM

A. Core Wall system, Metaledge Corewall system by National Gypsum is specified to establish standards of quality, performance and construction. Comparable system of U.S. Gypsum (Caviety Shaft Wall), or approved equal, are acceptable subject to approval of the Architect of minor deviations in detail and wall thickness dimension.

1. The core wall system shall have a fire resistance rating of 2 hours. The core wall system shall be capable of resisting the live loads specified in Article 3.18 herein.
2. Metal edged coreboard panels shall consist of two layers of 1" thick, homogeneous gypsum coreboard, 24" wide with 1" by 1" by 1" by 24-gauge hot dipped galvanized steel channel factory laminated to the vertical edges of each 1" thick layer. Vertical edges of the two layers shall be offset  $2\frac{1}{2}$ " from each other. Panels shall have water repellent paper both sides.
3. Metal components shall be as follows:
  - a. Ceiling Runners - 2" by 2" by 1" by 20-gauge hot dipped galvanized steel J-channels or two 2" by 2" by 20-gauge hot dipped galvanized steel angles.
  - b. Floor Runners - 2" by 2" by 20-gauge hot dipped galvanized angles.



- c. Edge Channels - 1" by 2" by 1" by 24-gauge hot dipped galvanized channels.
- d. Steel Strapping - 3/4" by 24-gauge rust resistant steel strapping with 3/16" diameter holes spaced not over 6" on center.
- e. Metal Studs - 2½" by 20-gauge metal studs as specified in Paragraph A, Article 2.1 above.
- f. Metal Lath: 3.4 lb. diamond mesh expanded metal lath.

## 2.8 MISCELLANEOUS RELATED MATERIALS

A. Service Chase Access Panel: Custom fabricated of 22 gauge steel (prime paint) on ½" fir plywood. See details.

## PART 3: EXECUTION

### 3.1 INSPECTION

A. Examine supporting materials and surfaces to receive work of this section before commencing work. Do not proceed until conditions which would result in a less than first class installation are satisfactorily corrected. Commencing work shall be construed as acceptance of the surface by this Contractor as satisfactory to receive furring, lath, plaster or gypsum wallboard.

### 3.2 INSTALLATION OF METAL STUDS

A. Install metal studs, runners and accessories strictly according to manufacturer's recommendations. Align partitions accurately. Coordinate with work of other trades.

B. Secure floor runners to concrete floor with concrete stub nails or powder driven anchors spaces not over 24" on center, except no powder driven anchors within 3" of any slab edge.

C. Anchor ceiling runners at approximately 24" on center. Where partitions terminate at the finish ceiling, install compressible gaskets between runners and ceiling grillage, and screw ceiling runner to acoustical ceiling main runners or cross runners. Where partitions extend through finished ceilings, securely attach ceiling runners to structure above. Do not screw into metal deck cells. For runners which may be attached to fireproofed beams, columns and metal deck, the runners shall be installed prior to fireproofing operations, as specified under Article 3.17 herein. Removal of fireproofing from runners shall be done only to the extent required to place the studs (not complete removal in channel). Where runners attach to non-fireproofed surfaces such as metal deck, they may be installed prior to fireproofing, cleaned of fireproofing overspray as above specified, or may be installed after fireproofing with any overspray of fireproofing on the surface cleaned off prior to runner installation under this Section.

D. Locating studs: Space studs 16" o.c. unless otherwise indicated. Install additional studs or adjust location of basic studs to accommodate the following:

1. Plumbing chases in laboratories.
2. Wall hung casework or cabinets. Locate studs within 4" inside each end of all wall hung casework and cabinets. Critical stud locations for casework or cabinets to be located by casework supplier.

3. At all intersections of walls and partitions.
4. At all changes in partition and wall types.
5. Where any other equipment or shelf standard is to be mounted on the wall or partition.

E. Studs shall be full height without splices. Securely attach all studs to floor and ceiling runners. Where lath and plaster or gypsum board occur on one side only, brace with 1'-0" wide strip of gypsum board horizontally at midheight with 2 screws per stud.

F. Place studs directly against jambs of hollow metal door frames, abutting partitions, internal partition corners, partition terminals and similar locations, and anchor such studs to runner channels with screws or other positive fasteners.

G. Securely anchor studs to jamb and head anchor clips at hollow metal door frames with screws or bolts. Install a runner track with web and flanges bent down at each end across head of hollow metal frames, and screw each flange to vertical studs. Install jack studs above frame.

H. Locate extra studs not more than 2" from jambs of hollow metal door frames, abutting partitions, internal partition corners, partition terminals and similar locations and anchor such studs to runner channels with screws or other positive fasteners.

I. Install sound insulation in partitions where indicated on the drawings.

J. Construct partitions thicker than standard stud width using studs back to back and screwed together not over 24" on center or use double stud walls. Brace double stud walls with 12" high, ½" thick gypsum lath gussets spaced not over 24" on center and screwed to studs with not less than 3 screws on each side of wall, or brace with 2½" studs spaced not over 48" on center.

K. Reinforce partitions as necessary to receive and support casework and other equipment mounted on the walls.

L. Where ceiling runner abuts non-cellular steel deck, install neoprene or metal profile closures as shown on drawings.

M. In no case shall ceiling runner be fastened into electrical cells of steel deck.

### 3.3 INSTALLATION OF WALL FURRING

A. Install drywall furring channels vertically. Attach to masonry and concrete surfaces with concrete stub nails or powder driven anchors spaced not over 24" on center and staggered on opposite flanges. Make splices by nesting at least 8", and securely anchor with 2 anchors in each flange.

### 3.4 SUSPENDED CEILING GRILLAGE

A. Securely attach hanger wires to structure above. Space hangers along direction of main runners not over 48" on center, and locate hangers not more than 6" from ends of runners. Use #8 gauge hanger wires where ceilings require fire rating. Provide resilient suspension system to same criteria as Section 13500, using spring connectors.

- B. Main runners shall be 1½" furring channels spaced not over 36" on center. Locate main runners within 6" of parallel walls. Keep ends of main runners at least 1" away from walls. Install main runners level, true to plane, at the required elevation with hangers saddle tied.
- C. Where hanger spacing must exceed 48" on center, use #8 gauge hangers spaced not over 60" on center and 2" furring channels spaced not over 36" on center.
- D. Where main runners are spliced, lap ends with channel flanges interlocked not less than 12", and tie each end of the lap with double loops of #16 gauge wire.
- E. Cross runners shall be ¾" furring channels or metal furring channels spaced 16" on center maximum and saddle tied to main runners with 16-gauge wire or a double strand of #18 gauge wire at each crossing. Locate cross runners about 1" from parallel walls, and keep ends at least 1" away from walls.
- F. Where main runners or cross runners are interrupted by light fixtures, grilles and registers and other openings, install additional runners to frame openings. Reinforce grillage as necessary to support light fixtures, grilles and registers and other items mounted in the ceiling with a maximum allowable deflection of 1/360 of the span.
- G. Grillage shall not be suspended from ductwork or piping. Where hanger spacing and spans exceed the specified spans, use hangers with a larger capacity, larger main runners or additional reinforcing members, hangers, stiffening or bracing as necessary to support the loads without exceeding the specified deflection.
- H. Where suspended ceilings are to receive Portland cement plaster, install cross runners not over 13½" on center, and lath with 3.4 pound metal lath.
- I. Where plenum sound barrier occurs above plaster ceiling, provide under this section 09100.

### 3.5 MISCELLANEOUS METAL FRAMING

- A. Construct miscellaneous metal framing and furring as indicated on the drawings. Use metal studs, or use drywall furring channels screwed to 1½" furring channels. Space members not over 24" on center. Brace vertical members with diagonal bracing spaced not over 48" on center.
- B. Where masonry walls are to be furred, install drywall furring channels vertically and spaced 24" on center. Shim as necessary. Securely anchor channels to masonry with anchors spaced not over 24" on center and staggered on opposite flanges. Make splices by nesting at least 8", and securely anchor with 2 anchors in each flange.

### 3.6 INSTALLATION OF GYPSUM BASE FOR VENEER PLASTER

- A. Starting at the bottom, install gypsum base at right angles to the supports with face out. Fit joints tightly but not forced. Locate end joints with joints staggered in successive courses and on opposite sides of partitions. Screw lath to studs and supports. Cut base to fit neatly around electrical boxes, pipe, grilles and registers and similar items. Attach lath to each support with 2 screws, each located 2" from edge.

B. Where required by the details apply bead of acoustical sealant at entire perimeter of gypsum lath at both faces of partition studs.

C. In ceilings, install gypsum lath at right angles to the 3/4" furring channel cross runners. Butt joints together. Locate end joints between runner channels with joints staggered in alternate courses. Attach lath to furring channels with clips installed strictly according to manufacturer's instructions. Support end joints with clips. Cut lath neatly around light fixtures, grilles and registers and other openings.

### 3.7 LATHING OF GYPSUM COREWALL

A. Apply gypsum base for veneer plaster to gypsum board corewalls where scheduled. Use as large panels as possible to minimize joints.

B. Apply lath by adhesive method using positive mechanical fastening to hold in place until adhesives cure. Apply in accord with manufacturer's recommendations.

### 3.8 INSTALLATION OF METAL LATH

A. Install metal lath with long dimension of sheets perpendicular to supports. Attach lath to supports not over 6" on center. Tie lath to metal furring and other metal supports with 18 gauge wire.

B. Lap ends of 3.4 pound metal lath not less than 1" and sides not less than 1/2". Stagger end laps where possible. Lace or tie end laps occurring between supports not over 9" on center with 18-gauge wire. Tie side laps to supports, and tie side laps not over 9" on center between supports.

C. Reinforce corners of openings in metal lath with a 12" by 24" piece of 3.4 pound self-furring metal lath installed diagonally across corners.

D. Where partitions are to receive Portland Cement plaster, lath with 3.4 lb. self-furring metal lath screwed to studs 6" on center. Where partitions are to receive Portland cement plaster on one side only, cover studs with polyethylene vapor barrier before installing lath. Seal joints and edges of vapor barrier with polyethylene tape.

### 3.9 INSTALLATION OF PLASTER ACCESSORIES

A. Install corner beads at all external corners. Securely anchor in place 8" on center.

B. Install casing beads where plaster surfaces abut dissimilar finish materials and elsewhere as indicated on the drawings. Accurately cut and miter ends. Position and securely attach to provide full plaster grounds.

C. Install control joints where indicated on the drawings. Where not indicated, install control joints in ceilings so that plaster panels are less than 2400 square feet and control joints are spaced not over 60 feet on center in either direction. Where not indicated, space control joints in walls and partitions not over 30' on center. Where length of wall or partition is unbroken for distances greater than 30', provide control joints dividing wall into approximately equal panels not longer than 30'. Provide corner control joint at inside corners or all abutting walls and partitions.

#### D. Veneer Accessory Application:

1. Joint reinforcement shall be applied over the full length of all lath joints but shall not overlap at intersections.

a. Embed Perf-A-Tape with Durabond 90.

2. Corner Bead - All vertical and horizontal exterior corners shall be reinforced with corner bead fastened with staples not over 12" o.c. on both flanges along the entire length of the bead.

3. Casing Bead - When a plaster veneer wall or partition terminates against masonry or other dissimilar material, USG Metal Trim shall be applied over the Plaster Base and fastened on the perforated side with staples spaced 12" o.c.

4. Screws shall be power-driven with an electric screwdriver and set so that the screwhead is flush with the surface of the Plaster Base without tearing through the face paper.

5. Control joints shall be provided in the non-resilient face layer as required above and shall be fastened with staples not over 12" o.c. on both flanges along entire joint length.

#### 3.10 MISCELLANEOUS LATHING AND FURRING

A. Install miscellaneous lathing and furring according to ANSI A42.4.

#### 3.12 APPLICATION OF VENEER PLASTERS

A. Base and finish coat: Embed tape fill beads and allow to set. Apply a thin tight scratch coat over entire working area. Immediately double back with material from same batch to nominal 1/16" thickness.

#### 3.13 CLOSURE AT DECKS

A. Where ceiling runners abut non-cellular steel deck, completely fill voids at deck flutes with a stiff mortar of 100: 2 sanded gypsum. THIS PROCEDURE IS REQUIRED AT BOTH PLASTER AND DRYWALL PARTITIONS.

#### 3.14 APPLICATION OF STUCCO AND PORTLAND CEMENT PLASTER

A. Thickness and Number of Coats. Stucco and Portland cement plaster shall be applied in 3 coats, except omit finish coat where Portland cement plaster is backing for ceramic tile. Total thickness of stucco shall be not less than 1" measured from face of lath, and total thickness of Portland cement plaster shall be not less than 7/8".

B. Scratch Coat. Hair or fiber (not over one pound per sack of cement) may be added to the scratch coat mixture for application on horizontal surfaces only. Apply coat to approximately 1/2" thickness using sufficient pressure to form full keys and completely embed the lath. Before coating hardens, rough darby and scratch the surface with horizontal scratches to provide a good mechanical bond with the brown coat.

C. Brown Coat. After the scratch coat has set sufficiently to support an additional 3/8" of material (about 3 to 4 hours), apply the brown coat approximately 3/8" thick. Bring surface to a true even plane depressed about 1/8" below surface of grounds. Leave surface rough to receive finish coat. Moist cure for not less than 48 hours and then allow to dry at least 5 days before proceeding with finish coat.

D. Finish Coat. Dampen surface of brown coat sufficiently to produce uniform suction, and apply finish coat not less than 1/8" thick. Bring to true surface, flush with grounds, and wood float to a fine sand float finish, then steel trowel to dense, smooth surface to receive paint or special coating. Protect finish coat from rapid drying but do not moist cure until the day after application. Then moist cure using a light fog spray for at least 24 hours.

### 3.15 PATCHING

A. After plaster, stucco and Portland cement plaster is cured, rake out expansion joints and clean beads adjacent to other materials. Patch defects as required to produce a true unblemished surface.

### 3.16 INSTALLATION OF GYPSUM BOARD

A. Install gypsum strictly according to ANSI A97.1 and manufacturer's recommendations.

B. Cut gypsum board by scoring and breaking neatly or by sawing, working from the face side. Cut or break back paper. Smooth cuts as necessary to form neat joints. Kerf where required for form curved surfaces.

C. Install gypsum board with true, even surfaces and straight, sharp corners. In general, install gypsum board on ceilings before installing on walls. Use full length boards where possible. End joints on the same side of wall shall be staggered, and end joints on opposite sides of wall shall not occur over the same support. Do not locate normal end joints at edge of openings. Form joints neatly. Butt boards together, but do not force into place. Do not place butt ends against tapered edges. No joint shall have a gap greater than 1/4".

D. Use gypsum backing board for first layer of double layer construction. Stagger joints between layers.

E. Fasten gypsum board beginning at the center and work toward the outer edges. Hold the board firmly against the supports while fastening. Locate fasteners opposite each other on adjacent ends and edges. Fasteners at edges of boards shall be located from 3/8" to 1/2" from the edge.

F. Openings for electrical devices, piping and grilles and registers shall be accurately located and neatly made to closely fit the devices and be completely covered by plates and escutcheons.

G. Install corner reinforcing at external corners, and install casing beads at exposed perimeter joints to be sealed and where gypsum board abuts other materials. Install corner joints where indicated on the drawings. Where not indicated, locate control joints not over 30' on center.

H. Seal partition perimeter joints where indicated on the drawings, and seal all perimeter joints (top, bottom and both ends) in partitions indicated to be round rated. Seal around pipes, ducts, conduit and other items extending through gypsum board partitions. Use acoustical sealant.

I. In sound rated partitions, completely cover the back and sides of electrical boxes and other cutouts with acoustical tape. Extend tape onto back of gypsum board to seal the joint. After box is taped, solidly fill the joint with joint compound.

### 3.17 INSTALLATION OF GYPSUM BOARD ON METAL FRAMING

A. Install gypsum board with long dimension on board parallel to metal studs or furring channels. Center joints over flanges of studs and furring channels, and stagger joints on opposite sides of stud partitions.

B. Screw gypsum board to studs and furring channels with manufacturer's standard screw of type recommended for this installation. For single layer construction, space screws 8" on center along edges and 12" on center in the field. For double layer construction, space screws 16" on center for both layers.

C. Where metal stud partitions have gypsum board one side only, brace the exposed stud side with 12" high,  $\frac{1}{2}$ " thick gypsum board gussets, spaced not over 24" on centers, and screwed to each stud with minimum of two screws.

### 3.18 INSTALLATION OF COREWALL SYSTEM

A. Install corewall system strictly according to manufacturer's recommendations.

B. The completed installation shall have a fire resistance rating of not less than 2 hours, before application of gypsum board face panels or gypsum lath and plaster face.

C. The corewall system at shafts (i.e. elevator shafts) shall be designed and installed to resist a live load (air pressure load) of 7.5 lbs. per square foot with a maximum deflection of 1/240 of the unsupported height for installations with gypsum board panels and 1/360 of the unsupported height for installations with gypsum lath and plaster facing. The corewall system at utility cores, stairwells and all other locations shall be designed and installed to resist a live load (air pressure load) of 5.0 pounds per square foot with a maximum deflection of 1/240 of the unsupported height for installations with gypsum board face panels and 1/360 of the unsupported height for installations with gypsum lath and plaster facing.

D. Install ceiling runner channels and vertical edge channels to be attached to structural steel beams, columns and metal deck to be fireproofed before fire-proofing is applied. After sprayed fireproofing is applied, carefully rake out channels. Do not damage fireproofing.

E. Accurately locate floor and ceiling runners and edge channels. Install 2" by 2" by 1" J-channel ceiling runners, 2" by 2" angle floor runners and 1" by 2" by 1" edge channels with 1/8" minimum diameter power-driven fasteners or equivalent anchors spaced not over 24" on center. Locate vertical edge channels at columns and abutting walls.

F. Install metal stud stiffeners, where required, on shaft side of wall, and screw to floor and ceiling runners.

G. Install coreboard panels starting at vertical intersection. Cut one edge of first panel to form a square edge, and insert into vertical edge channel. Accurately plumb panel, and screw to top and bottom runners. Install following panels with ship-lap edges overlapping. Butt edges together, but do not force. Screw each panel to ceiling runner with one screw located at panel center, and screw through panel face to metal edge of preceding panel not over 24" on center. Where panels are installed over metal stud stiffeners, screw to stiffeners not over 12" on center. Cut last panel  $\frac{1}{4}$ " less than opening width, and insert into edge panel. Install steel strapping at top and bottom, and screw each strap to each panel with 3 screws.

H. At corners, intersection partitions and partition ends, cut panel edges square and cover with 1" by 2" by 1" edge channels. Screw through channel flanges with screws spaced not over 24" on center and staggered between flanges. At corners and intersections, screw through panel into web of abutting channel not over 24" on center.

I. Install 1" by 2" by 1" edge channels at jambs of hollow metal frames, and screw to panel not over 12" on center. Install floor runner angle across head of frame and screw to each vertical channel. Securely anchor channels to hollow metal frame anchor clips.

J. Cut openings neatly for ducts, conduit and other items extending through core-wall, and frame openings with 1" by 2" by 1" channels or 2" by 2" angles screwed to panels not over 24" on center.

K. Reinforce panels with 6" by 26" by 20-gauge galvanized steel plates to receive handrail brackets. Reinforce as necessary to receive other items to be mounted on corewalls.

L. Where corewalls are to be faced with gypsum board, use  $\frac{1}{2}$ " thick, Type X gypsum board applied vertically. Install gypsum board with edges centered over coreboard metal channels, and screw to metal channels at center and vertical edges of board with screws spaced not over 12" on center. Stagger joints between layers of gypsum board. Cut and fit board neatly. Do not locate joints at edges of openings.

M. Install corner beads at external corners of gypsum board face panels. Install casing beads at exposed perimeter joints to be sealed and where gypsum board face panels abut dissimilar materials. Install control joints where indicated on the drawings. Where not indicated, locate control joints not over 30' on center.

N. Seal all corewall perimeter joints (top, bottom and both ends) and seal around pipes, ducts, conduit and other items extending through the corewalls with acoustical sealant.

O. Where intricate shapes of members penetrating corewall make it impossible to close shaft wall, provide rectangular opening in corewall, install metal lath at rear or front face of corewall and completely fill opening with fireproofing plaster to a minimum thickness of 1".

### 3.19 JOINT TREATMENT

A. Tape and finish gypsum board surfaces including partitions above suspended ceiling. Apply materials strictly according to manufacturer's recommendations. Fill joints



with joint compound, embed perforated tape, and apply a skim coat of joint compound over tape. Apply two additional coats of joint compound allowing at least 24 hours between each coat. Fill dimples and imperfections with three coats. Sand each coat. Finished surfaces shall be uniformly smooth, true and in satisfactory condition to receive paint.

### 3.20 CAULKING

A. Seal perimeter joints and other joints in gypsum board as indicated on the drawings or specified above.

B. Joints shall be clean and dry. Prime joints as recommended by the sealant manufacturer. Mask face of gypsum board and adjoining materials at exposed joints as necessary to keep exposed faces free of sealant. Apply sealant strictly according to manufacturer's instruction. Completely fill the joint with sealant. Clean sealant from adjacent surfaces, and remove masking.

### 3.21 GROUTING OF FRAMES

A. Partitions with plaster finish: At hollow metal frames, grout heads and jambs full.

B. Partitions with gypsumboard finish: Spot grout hollow metal frames at each anchor and at floor. At corewall, grout hollow metal frames at each anchor and at floor. At corewall, grout hollow metal frames and elevator frames in accordance with published requirements of manufacturer. Grout is not indicated on details but shall be provided as specified.

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## PART 1: GENERAL

1.1 SCOPE

A. Conditions of Contract and Division 1 - General Requirements, apply to all work of this section. Refer to Article 12 of the Instructions to Bidders, Article 7 of the General Conditions and Section 01600 - Materials and Equipment - for requirements on pre-bid and post-bid evaluation of proposed substitute products, methods and other conditions.

B. Work under this section includes all ceramic tile, paver tile, and grouting and pointing of brick pavers.

C. Related work specified elsewhere:

1. Cast-in-Place Concrete: Section 03300
2. Setting of Brick Pavers: Section 04200.
3. Cleaning of Brick Pavers: Section 04200.
4. Brick Pavers and Paver Tile: Section 04260
5. Membrane Waterproofing: Section 07110.
6. Drains: Division 15.

D. Samples: Submit sample colors and panels in duplicate for Architect's selection and approval. Each panel shall have at least 8 tile representing the normal range of color, including the color of grout and be a minimum of 144 square inches.

E. Submit Master Grade Certificate.

1.3 REFERENCE SPECIFICATIONS

A. The following specifications and standards are incorporated by reference:

1. Specification for Ceramic Mosaic Tile installed with Dry-Set Portland Cement Mortar ANSI A108.5-1976.

2. Specifications for Quarry Tile and Paver Tile installed with Portland Cement Mortar, ANSI A108.3-1967(R1972).

3. Tile Council of America, Inc. Handbook for Ceramic Tile Installation, 1975 edition.

1.4 HANDLING, DELIVERY, STORAGE

A. Tile and other materials shall be properly packaged and brought to the site in original, unopened containers with grade, type, and quality indicated on the labels.

B. Containers shall be stored and protected, raised above floor level and kept dry until ready for use.

## PART 2: PRODUCTS

### 2.1 MATERIALS

A. Tile: TCA A137.1-1976 and conforming to National Bureau of Standards SPR-R61-61 and Federal Specifications SS-T-308c; Master Grade Certificate; United States Ceramic Tile Co., American Olean Tile Co., Inc., Florida Tile, or approved equal.

1. Floor and Wall Tile: 2" x 2" x 1/4" ceramic mosaics, unglazed, of color and pattern as selected by the Architect from any color group, except as follows:

a. Where Indicated to patch: match existing size, type and color.

b. Non-slip floor tile to be 1" x 1" x 1/4" unglazed ceramic mosaics with 7-1/2% abrasive surface: in all shower rooms, rooms that enter into shower rooms, and rooms with shower areas.

2. Ceramic Tile Base: Type similar to American-Olean C-833 cove with S-882 cap, unglazed of color as selected by the Architect.

3. Paver Tile: Conform to Section 04260.

4. Provide special shapes as required by the details.

5. Extra tile: Provide one carton of each pattern and color of tile to Owner for future patching.

#### B. Mortar Materials:

1. Portland Cement: Cement shall conform to ASTM C150-74, Type I.

2. Aggregate: Sand shall be clean and graded in accordance with ASTM C144-70 for mortar or for grout as required. Fine sand shall pass a 16-mesh screen.

3. Hydrated Lime: Lime shall conform to ASTM C206-49 or ASTM C207-74, Type S.

4. Water: Water for mixing shall be clean and potable.

C. Wall Tile Grout: One part Portland Cement to one part clean, fine sand by volume. Grout color as selected by Architect (gray or white as selected).

D. Grout for floors and bases of ceramic tile, paver tile, and brick pavers: Hydroment Joint Filler as manufactured by Upco Company, or approved equal. Color as selected by the Architect. Any standard color or mixture of colors may be selected.

E. Sealant: Two-component, Federal Specification TT-S-227b, Type II for joints in vertical surfaces, Type I for joints in horizontal surfaces, colored to match grout; DAP Flexiseal, W. R. Grace Hornflex, Sonneborn Sonolastic, Tremco Tremco Lasto-Meric, or approved equal.

1. Backup: Flexible and compressible as recommended by the sealant manufacturer.

2. Bond Breaker: Polyethylene tape, wax paper, or aluminum foil same width as joint.

3. Preformed Filler (use for backup in paver tile expansion and control joints): W. R. Grace semi-rigid Rodofam, or approved equal.

F. Reinforcing Wire Fabric: ASTM A82-72, 2" x 2" - 16/16 welded wire fabric.

G. Cleavage Planes: (Not to be confused with waterproofing membranes). Use waterproof building paper (ASTM D226 or D227) or .004" polyethylene sheet (ASTM C156).

H. Metal divider strips at all junctions between ceramic tile or paver tile, and dissimilar floor finish materials shall be solid zinc or aluminum terrazzo strips with 3/16" thick top as approved by the Architect. Strip shall have mortar anchors 8" o.c. Overall depth shall suit conditions of the job.

### PART 3: EXECUTION

#### 3.1 EXAMINATION OF SURFACES

A. Inspect surfaces to which tile is to be applied with the Contractor and the Architect to determine the suitability of surfaces. Commencement of work implies acceptance of surface and assumption of responsibility.

B. Work shall commence only after grounds, anchors, plus, hangers, bucks, and electrical and mechanical work to be in or behind tile have been installed. All surfaces shall be dry and clean before setting bed is applied.

#### 3.2 SETTING

A. Set all tile work in accordance with the requirements of the Tile Council of America, Inc. Handbook for Installation, 1978 edition and as specified herein.

1. Set floor tile and quarry tile according to Method F-113, dry-set-mortar except as follows:

a. Set floor tile in shower rooms according to Method F-121, cement mortar with waterproofing membrane.

2. Set paver tile and brick paver stair treads according to Method F-111, cement mortar with cleavage membrane at structural slabs or Method F-112, cement mortar bonded at slabs on grade.

3. Set all paver tile in pattern shown.

4. Provide expansion joints according to Method EJ-411, as applicable:

a. At perimeter of all rooms over 12 feet in largest dimension.

b. Not over 12'-4" in both directions in large rooms.

c. Not over 12'-4" across narrow corridors (less than 12' wide).

d. Where elsewhere shown on the drawings.

B. So all necessary cutting, fitting and drilling to accommodate the work of other trades.

C. Room temperatures at areas in which ceramic materials are being installed shall be maintained at not less than 40°F for a period of 24 hours prior to commencement of tile work, during tile work, and afterwards until completion of construction. Areas in which tile work is being done shall be closed to traffic until the installation has set.

D. As far as possible, lay out work so that no tile less than half size occurs. Align joints in wall tile vertically and horizontally except where other patterns are shown or specified. Align joints in floor tile at right angles to each other and straight with walls to conform to patterns selected. Verify locations of accessories before installing tile. Coordinate with plumbing and other trades. Fully tile surfaces behind all surface-mounted items.

E. Install cleavage planes over all structural floor slabs above grade where waterproofing membranes have not been provided by another trade. Use single layer lapped 2" at joints. Omit cleavage plane at non-structural slabs-on-grade.

F. Install all tile using lighting conditions that will closely approximate the proposed lighting required in the areas involved in order to achieve uniformity in finished work.

### 3.3 GROUTING

A. Tile Grouting: Grout ceramic tile in accordance with the applicable portions of ANSI A108.5-1976 and the following:

1. Allow a minimum of 24 hours after setting of tile before commencing of grouting.
2. Grout full depth of ceramic tile joints.
3. Compress joints to dense, smooth surface.

B. Paver Tile Grouting: Grout paver tile and brick pavers (interior) with Portland Cement and sand mix (1:1-1/2) and rake back to depth of 1/2". Point grout joints with specified paver tile grout in accordance with the applicable portions of ANSI 108.3-1976 and the grout manufacturer's instructions.

C. Grouting Brick pavers: Brick pavers (exterior) are to be set, grouted and raked to a depth of 1/2" under Section 04200. Grout joints shall be pointed up to the surface of brick pavers as part of the work of this section. Grouting and pointing shall be in accordance with the applicable portions of ANSI 108.3-1976 and the grout manufacturer's instructions.

### 3.4 FLOOR TILE AND PAVER TILE INSTALLATION (PORTLAND CEMENT BED)

A. Set in Portland Cement setting beds in accordance with listed standards. Clean concrete and waterproofing membrane surfaces, and thoroughly wet surface of concrete prior to placing setting bed mortar.

B. Setting bed mortar mix shall consist of one (1) part Portland Cement and six (6) parts dry sand, by volume, to which not more than 1/10 parts of hydrated

lime may be added. Mix in approved waterproofing compound in accordance with manufacturer's instructions.

C. When mixed with water, the mortar mix shall be of such consistency and workability as to produce maximum density. Determine consistency by stroking the mortar surface with a trowel. When of correct consistency, the troweled surface readily assumes a smoothed, slickened appearance.

D. Spread setting bed mortar and screed to provide smooth, dense beds with true planes properly pitched to drains. Install reinforcing mesh in all setting beds over waterproof membranes. The thickness of bed shall be such that the floor tile will finish flush with top of division strips and adjacent finish flooring, but in any case, not less than 3/4" nor more than 1-1/4" thick. Where additional build-up is required, apply as separate layers.

E. Install metal dividing strips where tile floors abut other finish floor materials. Separate dividing strips a reasonable distance from control joints to assure firm anchorage of the strips. Where divider strips are located across door openings, locate strip on the door side, in line with the edge of door stop, terminating at the rabbet; set strip in place while under-bed is still semi-plastic.

F. After bed has set sufficiently to be worked over, trowel or brush a thin layer, 1/32" to 1/16" in thickness, of neat Portland Cement paste over the bed or the back of tile or apply a thin layer of dry Portland Cement over the setting bed worked in lightly with a trowel. Do not prepare larger setting bed than can be covered with tile before the mortar sets.

G. Press tile firmly into the bed tamping with wood blocks to obtain smooth surface. All tile shall be properly aligned, with straight joints in even widths. Joints width shall be determined by spacers on ceramic tile. Quarry tile shall have 1/8" joints. Tamping shall be completed within one (1) hour after placing tile. Adjust work out of line within this period. See drawings for locations of expansion joints. All expansion joints shall be clear of grout to receive filler and sealant.

H. Fit tile closely around pipes running through walls and floors. Pitch floors to drain.

### 3.5 FLOOR TILE INSTALLATION (Dry-Set Mortar)

A. Set in dry-set mortar, 1/8" to 1/4" setting thickness, in accordance with ANSI A108.5.

B. Press tile firmly into the bed tamping with wood blocks to obtain smooth surface. All tile shall be properly aligned, with straight joints in even widths. Tamping shall be completed within one (1) hour after placing tile. Adjust work out of line within this period. See drawings for locations of expansion joints. All expansion joints shall be clear of grout to receive filler and sealant. Set quarry tile flatwork in half-lap running bond pattern.

### 3.6 CONTROL JOINTS

A. Cut through setting beds at perimeter joints and at projections through the floor. Install neoprene or butyl rubber strip (Shore A hardness 70) full depth of setting bed. Provide specified joint sealant.

B. Provide control joints where floor tiles meet restraining surfaces such as perimeter walls, cove bases, curbs, columns, pipes, etc., and directly over control or expansion joints in sub-surfaces. Control joints shall be placed as specified in Article 3.2. Form control joints in neat, straight lines. Cut tile cleanly and to accurate radius at exposed junctions with pipes, etc. Tile control joints shall be full width of control joint in sub-surfaces and same width as grouted joints (but not less than 1/4") at quarry tile.

C. Fill control joints that will be exposed in the finished work to full depth of setting beds from sub-surface to rear face of tile, with control joint backing. Keep remaining void clear of grout and debris. After completion of grouting operations, control joints sealant of color to match adjoining grout shall be applied.

### 3.7 CLEANING, PATCHING, PROTECTION

A. After completion, clean all work, point open joints and replace defective work. After cleaning, protect work with a suitable covering of paper before other trades have access to area.

B. Cleaning of prick pavers is specified under Section 04200.

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## PART 1: GENERAL

1.1 SCOPE

A. Conditions of Contract and Division 1-General Requirements, apply to all work of this section. Refer to Article 12 of the Instructions to Bidders, Article 7 of the General Conditions and Section 01600-Materials and Equipment for requirements on pre-bid and post-bid evaluation of proposed substitute products, methods and other conditions.

B. Work under this section includes the furnishing and installing of all metal soffits (exterior) as indicated, all metal ceilings indicated "Metal Ceilings" A and B as shown on drawings. All accessories required to furnish Project complete. Acoustical and thermal insulation. Access panels, size and location as indicated on drawing. Provide and install all linear air diffusers specified in this section.

C. Related work specified elsewhere:

1. Metal soffits at windows (interior): Section 05750.
2. Preformed Metal Siding: Section 07411.
3. Acoustical Treatment: Section 09500.
4. Integrated Ceilings: Section 13500.
5. Fixed and Flexible Ductwork: Division 15.

1.2 SUBMITTALS

A. Shop Drawings: Submit shop drawings of all metal soffits and metal ceilings, suspension members, hold down members and accessories, in accordance with Section 01300.

B. Samples: Submit samples in 3'-0" x 3'-0" panels, of all soffit and metal ceiling material, including suspension members, closures and accessories. Submit samples at time of final approval of shop drawings.

1.4 GENERAL INFORMATION

A. Coordination: Coordinate work directly with appropriate contractors and subcontractors as necessary to insure proper fitting, opening sizes and clearances to other work. Metal soffit and ceiling manufacturer shall be responsible for coordination of information to insure proper fit of soffits and ceilings.

B. Field Dimensions: Field measure building features as required to insure proper fitting of work.

## PART 2: PRODUCTS

2.1 MANUFACTURERS

A. The products specified herein are based on the "Luxalon Lineal Ceiling" as manufactured by Hunter Douglas, Inc. Stamford, Connecticut, to establish stan-



dards of quality, design profile and performance. The products as manufactured by others will be acceptable subject to meeting the design profile and functional requirements of these specifications and the drawings.

## 2.2 METAL CEILINGS

A. Refer to "Room Finish Schedule" for location of metal ceilings and herein for description.

1. Met A: Metal panels, 3-5/16" wide by 5/8" deep ribs at 4" o.c., no reveal closures; panel face with 15% perforations. Acoustical Insulation, 1" thick over panel surface, where indicated.

B. Properties of Interior Panels:

1. Metal: .025" aluminum. (Note increased gauge), 15% perforations where indicated.

2. Width: 3-5/16".

3. Depth: 5/8".

4. Length: Maximum length, interior sleeve at splice.

5. Finish: Concealed side - prime coated. Exposed side - two coats baked enamel, matt finish, color as selected from manufacturer's standards.

6. Diffuser connection: Provide snap-on connectors so panels cover diffuser frames.

C. Interior Panel Carriers: Formed and punched from prepainted strip and cut to maximum lengths, splice carriers. Carriers with prongs, panels clipped to prongs; prongs punched to maintain panel spacing of 4" o.c., providing reveal spacing on each side. Holes prepunched to receive hangers.

1. Metal: .040" aluminum.

2. Depth: 1-1/4".

3. Length: Maximum length.

4. Finish: 2 coats baked enamel (black).

5. Supports: No. 12-gauge wire hangers.

## 2.3 EXTERIOR METAL SOFFITS

A. At exterior soffits, called "metal soffit", refer herein for description.

1. Metal soffit: Metal panels; 3-5/16" wide x 5/8" deep, 4" o.c. with reveal closures between each panel. Thermal insulation, 3" thick over 100% of panel surface.

B. Properties of Exterior Panels:

1. Metal: .025" aluminum.
2. Width: 3-5/16".
3. Depth: 5/8"
4. Length: Maximum length, interior sleeve at splice.
5. Finish: Concealed side - prime coated. Exposed side - two coats baked enamel, matt finish, color, special Luxalon Beige PP1920 to match Unit A finish.

C. Exterior Panel Carriers: Formed and punched from pre-painted strip and cut to maximum lengths. Carriers shaped and profiled to accept panels with snap action. Holes prepunched to receive hangers and uplift support.

1. Metal: .040" aluminum.
2. Depth: 1-7/8"
3. Length: Maximum length
4. Finish: 2 coats baked enamel.

2.4 CLOSURES

A. Recessed joint profile installed in the carrier prior to installation of the panels. Provide at all joints.

1. Metal: .025" aluminum.
2. Depth: .315"
3. Width: 1-1/2"
4. Lengths: Maximum lengths.
5. Finish: As specified for interior or exterior panels in Articles 2-2 and 2-3 herein.

B. Flush Joint Profile installed between panels. Provide at all joints.

1. Metal: .012" aluminum.
2. Width: 82"
3. Depth: .551"
4. Lengths: Maximum lengths
5. Finish: Concealed side-prime coated; exposed side - 2 coats baked enamel, matt finish, color as selected from manufacturer's standards.

2.5 LINEAR AIR DIFFUSERS

A. Furnish and install all linear air diffusers in metal ceilings as detailed. See mechanical drawings for location and size of all diffusers. The diffuser plenum is furnished and installed under the Mechanical Contract. The diffuser shall be Titus Modulinear, Model ML-3909-1-J-YY-Z, or approved equal.

B. Metal panels will snap onto and conceal diffuser frame.

2.6 INSULATION; ACOUSTICAL AND THERMAL

A. Acoustical: 1" thick, 3 pounds density per cubic foot mineral wool or fiber-glass insulation with black covered exposed face (2 oz. fabric lamination) NRC .70.

B. Thermal: Owens-Corning, Zonolite or U.S. Gypsum, 3" thick, with vapor barrier, batts or blankets, at exterior soffits. Provide hold-down clips for all thermal insulation in metal soffits.

PART 3: EXECUTION

3.1 FIELD ERECTION

A. Field erection of all components, including acoustical and thermal insulation shall be performed by the manufacturer's erection division or by its Sub-contractor in accord with approved assembly and erection drawings. Wherever metal ceilings are built into or occur within plaster, gypsumboard or integrated ceiling systems, provide resilient suspension system to same criteria as Section 13500.

B. Install all carriers on 4'-0" grid, securely fasten to structure above; at exterior soffits provide steel angles anchored to structure and clipped to carriers to resist upward thrust of wind load. Carriers and intermediates to be level to within 1/8" in 10'-0" span in all directions. Provide necessary carriers at interior fascias.

C. Install insulation; thermal insulation to have tight butt joints, provide tape over joints, fill all spaces full. Acoustical insulation at ceiling indicated; install insulation to conform to Sound Absorption Test A70-142, at 100% coverage. Lay acoustical insulation with black side down. Perpendicular to panels.

D. Closures and panels, snap on panels, close space between exterior panels with both closures. Provide panels in as long a length as possible, no pieces shorter than 4'-0" unless to fill out areas. At panel splice, provide internal sleeve at joints. Lay out ceilings, soffits and covers to provide equal panel widths at all side walls.

E. Accessories and Trim: Furnish and install as required and detailed. Make necessary cut-outs for light fixtures and other features set in ceiling or soffit. Access panels where indicated, provide sleeves at end joints, securely fasten all panel members together, removable, by hinged and screw cam.

F. Touch-Up Painting: Touch up all ceilings and soffits, edges that have been field cut; all scratches and abrasions.

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## PART 1: GENERAL

1.1 SCOPE

A. Conditions of Contract and Division 1 - General Requirements, apply to all work of this section. Refer to Article 12 of the Instructions to Bidders, Article 7 of the General Conditions on pre-bid and post-bid evaluation of proposed substitute products, methods and other conditions.

B. Work under this section includes furnishing and installing the resilient tile and sheet flooring and base materials shown on the drawings and specified herein.

C. Resilient base at floor mounted casework shall be furnished and installed as follows:

1. At resilient flooring, install casework prior to installation of flooring. Resilient Flooring (V.A.T.) by Section 09650 will stop at the base of the casework and will not continue underneath. Resilient base will be applied to the casework base by Section 09650 (but not to walls concealed by casework).

2. At composition flooring, first install composition flooring and composition base at all areas and walls (including floor underneath and walls behind casework), and then install casework. The casework supplier shall apply a continuous toe bead of sealant at juncture of casework base and composition flooring. Sealant by casework supplier to be Tromco, or equal, non-hardening type, compatible with composition flooring. The casework supplier shall furnish and install the resilient base, in compliance with requirements of Section 09650. Seal and embed the toe of the resilient base in sealant during installation. At completion, clean excess sealant and adhesive.

D. Related work specified elsewhere:

1. Plastic Laminate Casework: Section 06412.
2. Ceramic Tile Flooring: Section 09300.
3. Seamless Flooring: Section 09750
4. Metal Laboratory Casework: Section 11611.

E. Alternates:

1. Under provisions of certain alternates, casework may be omitted. Where resilient floor and base are scheduled in spaces where casework is omitted, the resilient flooring shall be extended to cover area of omitted casework and base shall be omitted from casework and extended along walls behind omitted casework.

2. Under provisions of certain alternates, certain areas of resilient flooring may be omitted. Resilient base is not omitted in these spaces.

1.2 SUBMITTALS

A. Samples. Submit samples of materials to the Architect for selection and approval in accordance with Section 01300.

### 1.3 PRODUCT HANDLING

- A. Deliver materials in their original unopened containers with manufacturer's labels intact.
- B. Store and handle materials in a manner that will prevent damage and provide protection against moisture and the elements. Store materials at the job site for at least 24 hours prior to installation.
- C. Store materials containing solvents in tightly sealed containers. Assume fire and safety protection.

### 1.4 ENVIRONMENTAL CONDITIONS

- A. Maintain 70°F minimum temperature in rooms for 24 hours before, during and for 48 hours after laying flooring.

## PART 2: PRODUCTS

### 2.1 MATERIALS

A. Resilient tile and related materials: Armstrong Cork Co., American Biltrite Rubber Co., Flintkote Co., GAF Corp., Kentile Floors, Inc., Johnson Rubber Co., Vinyl Plastics and Mercer Plastics Co. are approved manufacturers of the following materials.

1. Vinyl Asbestos Tile: 12" by 12" by 1/8" thick of custom color equivalent to Armstrong Imperial Modern Series. Conform to requirements of Federal Specifications SS-T-312, Type IV; color selected by Architect.

2. Vinyl Transition Strips: Of type as detailed (for applicable conditions), of custom color selected by Architect. Furnish and install for all conditions required regardless of materials joined, including at carpet whether VAT adjoins or not:

a. Carpet transition reducer: Mercer No. 17 cut to 1-3/4" x 1/8" x 3/8" VAT to CT.

b. Carpet reducer, VAT to carpet to QT Mercer Imperial Reducer No. 7.

3. Resilient Base: Vinyl or rubber, top set cove or straight type, 4" high or 2-1/2" high as indicated of colors selected by the Architect. Provide pre-formed internal and external corners.

4. Adhesive: Waterproof type as recommended by above material manufacturers.

5. Surface Finish: Wax of type recommended by tile manufacturer.

6. Match existing adjacent flooring at remodeled existing areas with resilient flooring.

B. Resilient sheet flooring and base (vinyl): Multiflor Granit as manufactured by Tarkett AB, Mipolam 220 by Dynamit Nobel, or approved equal.

1. Composition and Materials: Thickness - .090" (2.0 mm): Width - 6'-0" (72", 184 cm): Length - 82 lin.ft. (25m). Chemical Composition: Polyvinyl

Chloride 80%; Color Pigments, stabilizers and plasticizers 20%. Pattern and color shall extend throughout total thickness of material.

2. Technical Data:

a. Chemical Resistance: (Surface immersed for 24 hours). Resists most chemicals and miscellaneous foreign materials.

b. Wear Resistance: The Taber Abrasion resistance of flooring material using an H-18 abrasive wheel with a load of 500 grams shall be at least an average of 23,000 cycles.

c. Tensile Strength: PVC surface must be at least 2,750 psi.

d. Fire Resistance: Material shall have been tested per ASTM E84-70 with a flame spread rate of 45 and fuel contribution of 0.

e. Flexibility: Material shall not crack, separate or fracture after repeated cycles of 360° bending and/or flexure.

3. Trim for base: Tarkett Standard Metal Trim, cap, outside corner and end cap as detailed.

4. Cove form: Standard wood cove form or equivalent PVC, feather edge.

5. Adhesive: As approved by manufacturer.

6. Seam material: Tarkett Welding Rod.

PART 3: EXECUTION

3.1 EXAMINATION OF SURFACES

A. Examine surfaces to receive resilient flooring and base and notify the Contractor in writing if any condition exists that will prevent satisfactory results. Do not proceed with installation until unsatisfactory conditions are corrected. Commencement of work implies acceptance of surfaces and assumption of responsibility for satisfactory results.

3.2 PREPARATION OF SUB-FLOORS

A. Thoroughly clean sub-floors and remove grease, dirt and other substances. Fill cracks and holes.

3.3 INSTALLATION

A. Install resilient tile: Apply adhesive and install resilient tile flooring and base in accordance with manufacturer's recommendations.

1. Vinyl Asbestos Tile: Lay and fit tile with joints tight and in true alignment. Layout tile starting at center of floor, as indicated by north-south, east-west lines on drawings. Continuous joints to run east-west. At individual spaces lay tile symmetrical about center lines of rooms or spaces with no border tile less than one-half size. Lay tile with alternating rows of tile breaking joint at midpoint of previous rows, grain pattern continuous. Cut tile to fit around permanent fixtures and fit accurately at joining with other materials. Install vinyl reducer strips where edge of tile is exposed.

2. Resilient Base: Install base on walls where shown and on built-in casework and other similar items in rooms scheduled to have base. Use straight type at carpet and use cove type at all other flooring. Firmly cement base to backing, straight and true with tight butt joints. Apply after floor tile is in place.

3. Electrical trench headers and/or devices are set under Division 16. Trench headers are provided with an integral floor covering stop to which the floor covering shall be neatly, tightly and squarely fitted. Trench covers shall have full tile only installed across the width.

B. Install resilient sheet flooring in strict accordance with manufacturer's installation instructions using approved adhesive by an approved, qualified installer.

1. In all areas, side and end seams shall be mechanically welded with welding rod, or cold welding adhesive, as recommended by manufacturer.

2. Set cove form and roll floor material into base. Weld inside base corners. Use metal trim at outside corners and caps.

### 3.4 CLEANING AND FINISHING

A. Just prior to final inspection, thoroughly clean surfaces of above materials in accordance with manufacturer's instructions. After cleaning apply one coat of surface finish and polish with a mechanical buffer. Upon completion, leave floors clean, smooth and free of buckles and projecting edges.

### 3.5 PROTECTION

A. Protect finished work from damage until final acceptance. Replace any damaged work.

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## PART 1: GENERAL

1.1 SCOPE

A. Conditions of Contract and Division 1-General Requirements, apply to all work of this section. Refer to Article 12 of the Instructions to Bidders, Article 7 of the General Conditions and Section 01600 - Materials and Equipment for requirements on pre-bid and post-bid evaluation of proposed substitute products, methods and other conditions.

B. Work under this section includes furnishing and installation of composition seamless flooring and base (height as indicated). Waterproof membrane under finished surface. Provide to extent indicated on the drawings and room finish schedules as "COMP".

C. Related work specified elsewhere:

1. Concrete sub-strate: Section 03300.
2. Deck Waterproofing: Section 09300.
3. Ceramic Tile: Section 09300.
4. Floor Drains: Division 15.

D. Resilient base at floor mounted casework to be furnished and installed as follows:

1. At resilient flooring, install casework prior to installation of flooring. Resilient flooring (V.A.T.) by Section 09650 will stop at the base of the casework and will not continue underneath. Resilient base will be applied to the casework base by Section 09650 (but not to walls concealed by casework.)

2. At composition flooring, first install composition flooring and composition base at all areas and walls (including floor underneath and walls behind casework), and then install casework. The casework supplier shall apply a continuous toe bead of sealant at juncture of casework base and composition flooring. Sealant by casework supplier to be Tremco or equal, non-hardening type, compatible with composition flooring. The casework supplier shall furnish and install the resilient base, in compliance with requirements of Section 09650. Seal and embed the toe of the resilient base in sealant during installation. At completion, clean excess sealant and adhesive.

1.2 SUBMITTAL

A. Samples: Provide three 12" x 12" samples to Architect for color approval.

B. Submit report certifying that number of coats and thickness specified have been approved.

1.3 PRODUCT HANDLING

A. Deliver materials to project in original containers with seals unbroken, labels intact, containing manufacturers hallmark. Containers without labels will be cause for rejection. Use materials only in accordance with container label directions.



## PART 2: PRODUCTS

### 2.1 MANUFACTURERS AND MATERIAL

A. This specification is based on Dex-O-Tex Neotex (Industrial-67 Formulation) Flooring and Dex-O-Tex Membrane Waterproofing as manufactured by Crossfield Products Corporation. Products as manufactured by Selby-Battersby & Company, Todco Division of McNaughton Brooks, H.B. Fuller Company, Ceram Trax Corporation, or approved equal which conform to these specifications will be acceptable.

### 2.2 MEMBRANE WATERPROOFING

A. Dex-O-Tex Membrane Waterproofing (see Article 2.1 above), thin-section, troweled neoprene-latex composition material reinforced with glass fabric, 1/16" thick, apply to concrete sub-floor and up onto concrete masonry base.

#### B. Physical Characteristics:

1. Waterproofness: 18" diameter sample, subject to 50 pounds per inch water pressure for 60 minutes. Amount of water forced through in grams: none.

2. Tensile Strength and Elongation: Conform to ASTM D-1117-69.

3. Strip Adhesion: Strip adhesion measured in per linear inch force required to pull up membrane, 8.75 to 10.0 lbs. per inch.

### 2.3 COMPOSITION SEAMLESS FLOOR

A. Dex-O-Tex Neotex (see Article 2.1 above); troweled, jointless floor and base, water-phase resin material applied in a series of coats to a smooth finish. Total thickness 1/4", color selected by Architect, slip-resistant final finish.

#### B. Physical Characteristics:

1. Resistance to Heavy Rolling Load: Standard #1-39T (2" wide cast iron wheel with 500 lb. load, 500 strokes; test run both on dry sample and sample immediate after immersion in water for 24 hours).

Dry - .002" indent

Wet - .006" indent

2. Surface Hardness: Conform to ASTM D-2240-68 (Scale "D" 62).

3. Indentation Characteristics: Conform to MIL-D-3134, Para 4.7.4.2.1 - (2.74%) (Steadily applied load).

4. Adhesion: Conform to MIL-D-3134, Para. 4.7.14 - (395 psi).

5. Tensile Strength: Conform to ASTM C-190 (607 psi).

6. Flammability: Conform to ASTM E-162, flame spread index - 0.0, smoke deposited - less than 0.1 mg. Conform to ASTM E84, flame spread rate - 10, fuel contributed factor - 0, smoke density factor - 0.

PART 3: EXECUTION

3.1 INSTALLATION OF MEMBRANE WATERPROOFING

- A. Prepare surfaces by removal of all laitence, grease and foreign matter.
- B. Apply initial troweled adhesive waterproofing coating to floor and wall base surfaces.
- C. Embed reinforcing fabric into adhesive-waterproofing coating.
- D. Trowel or brush apply additional waterproofing coating as necessary to fill voids or pinholes.
- E. Application shall be made by factory franchised or authorized installed only.

3.2 INSTALLATION OF COMPOSITION SEAMLESS FLOOR

- A. Prepare surfaces by removal of all foreign matter.
- B. Apply bonding coat by trowel or brush.
- C. Trowel apply 1/4" body coat.
- D. Apply two grout coats to fill in and smooth off body coat.
- E. Power sand to remove trowel marks.
- F. Roller apply two coats of saturating final finish dressing in texture as selected.
- G. Application shall be made by factory franchised or authorized installed only.

3.3 PROTECTION

- A. Keep traffic off all surfaces for a minimum of 48 hours after application is complete.
- B. General Contractor shall protect floor surface, with heavy duty paper, until building is accepted by Owner.

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## PART 1: GENERAL

1.1 SCOPE

A. Conditions of Contract and Division 1-General Requirements, apply to all work of this section. Refer to Article 12 of the Instructions to Bidders, Article 7 of the General Conditions and Section 01600-Materials and Equipment for requirements on pre-bid and post-bid evaluation of proposed substitute products, methods and other conditions.

B. Work under this section includes providing all labor, materials, services, equipment, transportation and services necessary to complete all epoxy-polyester wall coating work as indicated by "S.G.-1" on the drawings. Refer to drawings for locations.

C. Related work specified elsewhere:

1. Lath, plaster and gypsum drywall: Section 09100.
2. Ceramic Tile: Section 09300.
3. Composition Seamless Flooring: Section 09750.
4. Glazed Wall Coating (S.G.-2): Section 09830.
5. Painting: Section 09900.

1.2 SUBMITTAL

A. Submit full range of color samples to Architect for selection. After selection, but before commencement of work, prepare two (2) 8" by 16" samples of each color selected on concrete block or other approved surface for Architect's approval.

B. All colors shall be selected by Architect from manufacturer's standard range. Finishes shall be semi-gloss or satin, of solid, plain colors as required.

C. Samples shall be prepared and submitted in accordance with the requirements of Division 1, General Requirements, with all postage and transportation cost paid by this Subcontractor.

1.3 GUARANTEE

A. The Contractor shall obtain from the applicator a written guarantee to the Owner from both the applicator and the manufacturer of the glazed coating system materials covering replacement without charge of defective work caused by defects of materials or workmanship which appear within period of one (1) year from date of final completion of the Project.

1.4 PRODUCT HANDLING

A. Deliver materials to Project in original containers with seals unbroken, labels intact, containing manufacturer's hallmark. Containers without labels will be cause for rejection. Use materials only in accordance with container label directions.

B. Punctured or damaged containers shall be removed from the site before application of materials is begun.

C. All materials shall be properly stored in spaces provided. Such spaces shall be kept under lock and shall be inaccessible to all except those employed under this section.

## PART 2: PRODUCTS

### 2.1 MATERIAL

A. Glazed wall coating shall be a polyester-epoxy or polyester-polyurethane system providing a hard tile-like glazed finish, resistant to moisture, abrasion and staining. Glazed finish shall be one of the following products, or approved equal which conforms to these specifications will be acceptable.

1. "Descoglaze" by McNaughton Books, Buffalo, N.Y.
2. "Sanitile 550" by Master Mechanics Company, Cleveland, Ohio.
3. "Tru-Glaze" by Devoe Paint, Louisville, Kentucky.
4. "Pittglaze" by PPG Industries, Pittsburgh, Pennsylvania.

B. Materials installed under this Section shall have a Class A fire-rating and shall meet or exceed the following requirements when tested under ASTM E-84.

Flame Spread:	0 - 10
Fuel Contributed:	0 - 10
Smoke Developed:	0 - 15 (Smoke must be non-toxic)

C. All materials shall be freshly compounded, and supplied by coating manufacturer or his franchised representative. Except as otherwise indicated, coating shall comply with Federal Spec. TT-C-550a or TT-C-545b.

D. In addition to the above listed rating, materials shall meet the following minimum requirements:

1. Chemical Resistance: Unaffected by common industrial cleaning and maintenance compounds.

2. Stain Resistance: Following stains shall be easily removable: lipstick, fountain pen ink, ballpoint pen ink, grease pencil marks, rubber heel marks, petroleum oil, and crayon.

3. Scrubability Test: No harmful effects after 5000 cycles on a Gardner Straight Line Washability apparatus.

4. Alkali Resistance: Finish coat, not affected by seven day immersion in 5% sodium hydroxide held at  $75 \pm 2^{\circ}\text{F}$  - ASTM D-1647.

5. Acid Resistance: Finish coat not affected by seven day immersion in: 50% alcohol, 20% caustic sodium hydroxide, 50% sulphuric Acid, 15% hydrochloric acid, 10% lactic acid, 20% calcium chloride, 5% urea and mineral spirits.

6. Fungus Resistance: Conforms to TT-C-550a, paragraph 3.3.7. Material does not contain any mercurial fungicide.

## PART 3: EXECUTION

### 3.1 GENERAL

- A. All surfaces to receive glazed coating shall be thoroughly cured, dry and clean. Moisture content shall not exceed 16%, as measured with a moisture meter, in the presence of the Architect and Owner. Wall temperature shall be maintained at a minimum of 50°F during the application of glazed coating and for two (2) weeks thereafter.
- B. Carefully inspect all surfaces to which glazed coating is to be applied and report to the Architect in writing, surfaces which are not in satisfactory condition to receive work under this Section. Commencement of application of glazed coating to any surface will be construed as acceptance of that surface.
- C. Mask all surfaces that are not to be coated.

### 3.2 COORDINATION OF WORK

- A. Areas in which glazed wall coatings are to be applied shall be kept free of traffic, and no other trade shall be permitted to work in rooms during the application and curing of the coating.
- B. Plumbing fixtures, accessories, grilles, radiation, etc., shall not be installed until after glazed coating work is complete.
- C. Hard flooring (ceramic tile, concrete, etc.) shall be installed before glazed coating work is begun. Soft flooring (resilient flooring, composition flooring, etc.) shall not be installed until after glazed coating work is finished.
- D. Installation of suspended ceilings, painting of surrounding areas and caulking shall be done after coating work is finished.

### 3.3 APPLICATION AND WORKMANSHIP

- A. Application shall be by an applicator approved by the manufacturer and shall be in strict compliance with the manufacturer's written instructions.
- B. Adjacent areas not to receive glazed wall coating shall be effectively masked or protected by drop-cloths.
- C. Apply filler coat evenly to block by airless spray, building up 10 to 15 mils dry film thickness. Tint filler close to finish coat color. Allow 72 hours for base coat to cure before proceeding. Where concrete is required to be coated, use manufacturer's compatible first coat suitable for such surfaces to assure uniform finish results.
- D. Apply colored finish glaze coat by airless spray to a minimum dry film thickness of 5 mils. Back roll with roller as required to remove pinholes and unevenness.
- E. Allow 24 hours for finish coat to cure and protect from damage during curing periods.

F. Each Coat applied shall be inspected and approved by the Architect and Owner before succeeding coat is applied. A progress schedule showing date of application of each coat for each room, space or area shall be made by the Contractor for inspection and approval of the Architect and Owner.

G. Glazed wall coating shall cover full height of wall where indicated, from floor to ceiling of each area.

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## PART 1: GENERAL

1.1 SCOPE

- A. Conditions of Contract and Division 1-General Requirements, apply to all work of this section. Refer to Article 12 of the Instructions to Bidders, Article 7 of the General Conditions and Section 01600-Materials and Equipment for requirements on pre-bid and post-bid evaluation of proposed substitute products, methods and other conditions.
- B. Work under this section includes providing all labor, materials, services, equipment, transportation and services necessary to complete all glazed wall and ceiling coating work as indicated by "S.G.-2" on the drawings. Refer to drawings for locations.
- C. Related work specified elsewhere:
1. Lath, Plaster and Gypsum Drywall: Section 09100.
  2. Ceramic Tile: Section 09300.
  3. Composition Seamless Floorings: Section 09750.
  4. Epoxy-Polyester Coatings (S.G.-1): Section 09820.
  5. Painting: Section 09900.

1.2 SUBMITTAL

- A. Submit full range of color samples to Architect for selection. After selection, but before commencement of work, prepare two (2) 8" by 16" samples of each color selected on concrete block or other approved surface for Architect's approval.
- B. All colors shall be as selected by Architect from manufacturer's standard range. Finishes shall be semi-gloss or satin, of solid, plain colors as required.
- C. Samples shall be prepared and submitted in accordance with the requirements of Division 1, General Requirements, with all postage and transportation costs paid by this Subcontractor.

1.3 GUARANTEE

- A. The Contractor shall obtain from the applicator a written guarantee to the Owner from both the applicator and the manufacturer of the glazed coating system materials covering replacement without charge of defective work caused by defects of materials or workmanship which appear within a period of (1) one year from date of final completion of the Project.

1.4 PRODUCT HANDLING

- A. Deliver materials to Project in original containers with seals unbroken, labels intact, containing manufacturer's hallmark. Containers without labels will be cause for rejection. Use materials only in accordance with container label directions. Punctured or damaged containers shall be removed from the site before application of materials is begun.

B. All materials of this Section shall be properly stored in spaces provided. When in use, such spaces shall be kept under lock and shall be inaccessible to all except those employed under this Section.

PART 2: PRODUCTS

2.1 MATERIAL

A. All materials shall be first quality and freshly compounded, and supplied by coating manufacturer or his franchised representative.

1. Color coat shall be at least 90% inorganic, and of a solvent blend. Thinning when necessary, shall be with mineral spirits only. No emulsions, epoxies, polyesters, vinyls, or other organic materials will be accepted.

2. Glaze coat shall be clear, non-yellowing, acrylic-type, spray applied coating, containing no epoxies, polyesters, emulsions, vinyls, or two-component glazes.

B. The materials installed under this Section must be listed by the Underwriters' Laboratories, Inc., in accordance with their standards for incombustible coatings. The results obtained by the U.L. tests (all coats) must meet or exceed the following standards:

Flame Spread:	0 - 5
Fuel Contributed:	0 - 5
Smoke Developed:	0 - 10 (Any smoke developed must be non-toxic)

C. All materials must be shipped to the job site in containers bearing the UL labels listing the above ratings. All containers for all materials must arrive at the site unopened.

D. Glazed wall coating system shall be equal to "Glazetite Type II", specially formulated for use at wet areas, produced by Desco International, as approved by Architect. Manufacturers of other glazed coating systems must submit their request to Architect at least 10 days before bid opening, accompanied by the following listed items. Approval by Architect will be in the form of an addendum to the specifications issued to all bidders of record that the additional brand or brands are approved as equal to those specified so far as the requirements of the Project are concerned. Such approval, however, will not relieve any manufacturer, including the one named herein, from meeting all the requirements of this specification, and products failing under laboratory tests to meet said requirements, or inability or unwillingness to obtain the required UL label service, will cause rejection of the product even though prior approval has been given. Submissions for approval, as described above, are as follows.

1. A notarized affidavit on the bidder's company stationery stating that all requirements of this Specification will be met without exception and that he has successfully applied the material submitted for at least five years, naming at least three projects five years old.

2. Submission of duplicate samples on concrete block, not less than 8" by 8" on the face, each clearly indicating the three steps required by this Specification.



3. Submission of 1 container of color mastic and 1 container of clear glaze, each to bear the UL label stating Flame Spread 0-5, Fuel Contributed 0-5, Smoke Developed 0-10.

4. Submission of the full UL Report stating that any smoke developed is not toxic.

E. In addition to the above listed UL ratings, the material installed under this Section must meet the following minimum requirements:

1. Will not support fungus or bacteria.

2. Chemical Resistance: Unaffected by industrial cleaning and maintenance compounds.

3. Stain Resistance: Following stains must be easily removed by use of mineral spirits: lipstick, fountain pen ink, ballpoint pen ink, grease, pencil marks, rubber heel marks, petroleum oil, and crayon.

4. Fade-ometer: No apparent fading after 48 hours exposure. ASTM E188-70.

5. Scrubability Test: No harmful effects after 5000 cycles on a Gardner Straight Line Washability apparatus.

6. Impact Resistance: Gardner Impact Tester 80 inch-lbs; no loss of adhesion.

### PART 3: EXECUTION

#### 3.1 GENERAL

A. All surfaces to receive glazed wall coatings shall be thoroughly cured, dry and clean. Moisture content shall not exceed 16%, as measured with a moisture meter in the presence of the Architect and Owner. Wall temperature must be maintained at a minimum of 50°F during the application of glazed coatings and for at least two weeks thereafter.

B. Before commencing this work, carefully inspect the surfaces to which the glazed coating is to be applied and report to the Architect in writing any surfaces not satisfactory to receive the material. Commencement of application of glazed coating to any surface will be construed as acceptance of that surface as proper to receive the finish materials.

C. Mask all surfaces that are not to be coated.

#### 3.2 COORDINATION OF WORK

A. Areas in which glazed wall coatings are to be applied must be kept free of traffic, and no other trade will be permitted to work in rooms during the application and curing of the coating.

B. Fixtures, accessories, grilles, radiation, etc., will not be installed until after glazed coating work is complete.

C. Hard flooring (ceramic tile, concrete, etc.) shall be installed before glazed coating work is begun. Soft flooring (resilient flooring, composition flooring, etc.) shall not be installed until after glazed coating work is finished.

D. Painting of surrounding areas, and caulking, must be done after glazed coating work is finished. Oil-based or solvent-release caulking compound not permitted in contact with glazed coating material.

3.3 APPLICATION AND WORKMANSHIP

A. Application shall be by an applicator franchised by the manufacturer and shall be in strict compliance with the manufacturer's written instructions.

B. Adjacent areas not to receive glazed wall coating shall be effectively masked or protected by drop-cloths.

C. Apply color coat over all bases as called for, other than concrete, or concrete masonry. Apply 15 to 25 mils thick using airless spray head with a minimum 43 mil spray tip. At concrete and concrete masonry, apply three to four coats, with build-up of a minimum 40 mil thickness. The first two coats shall be heavily filled; the first applied by brush and the second sprayed with undercoating equipment. The final coat or coats shall be applied by airless spray with a minimum 43 mil spray tip.

D. Apply glaze coat over color coat in 5 mils minimum additional thickness, also by power spray method. The final glazed wall coating installation shall be entirely free of "pin-holes."

E. Each coat applied must be inspected and approved by the Architect or Owner before application of succeeding coat. A progress schedule showing date of application of each coat for each room, space or area shall be kept by this subcontractor for inspection and approval of the Architect.

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## PART 1: GENERAL

1.1 SCOPE

A. Conditions of Contract and Division 1-General Requirements, apply to all work of this section. Refer to Article 12 of the Instructions to Bidders, Article 7 of the General Conditions and Section 01600-Materials and Equipment for requirements and other conditions.

B. Work under this section includes all direct-to-steel sprayed fireproofing of all structural steel and steel deck where specified and/or scheduled including cleaning of surfaces to receive fireproofing and protection (including temporary enclosures as required) of sprayed fireproofing in critical cores. See Section 01200.

C. Related work specified elsewhere:

1. Cast-in-Place Concrete: Section 03300.
2. Precast Concrete: Section 03420, 03450.
3. Structural Steel: Section 05122.
4. Fireproofing of Insulation: Section 07220.
5. Lath and Plaster, Gypsum Drywall: Section 09100.

D. Furnished under other contracts:

1. Structural Steel: Early Contract Structural Steel (ECS-P/H). See Section 01010.

E. Furnished by Owner:

1. Retain and pay testing agency.

F. Special Requirements:

1. Fireproofing of entire height of core structures is critical to timely prosecution of the work of all contracts.

2. Refer to Section 01200 for Special Schedule Requirements and erection sequence.

3. Refer to Section 01010 for special protection requirements in cores. This subcontractor shall protect the top openings of cores.

4. In fireproofing the cores, fireproofing subcontractor shall provide his own construction light and power as his requirements and job safety demand.

1.2 SUBMITTALS

A. Fire-resistive materials standards: Submit certification by an independent testing laboratory acceptable to the Owner that materials, dry densities, thicknesses and application procedures satisfy the minimum protection requirements specified below when tested in accordance with Uniform Building Code Standard No. 43-1 or ASTM E119. Certification shall describe in detail the exact manner of application of fireproofing.

B. Submit documentation of satisfactory test results for air erosion and bonding strength testing.

C. Schedule of Systems: Prior to commencing any fireproofing work, submit a schedule of all fireproofing systems, including locations, sizes of members to be protected, degree of protection required and density and thickness of material necessary to provide the required protection. Do no fireproofing work until the Architect and University have approved the systems.

### 1.3 QUALIFICATION OF MATERIALS

A. Materials, procedures for application, dry densities, and thicknesses required to provide the following protections shall be qualified in accordance with UBC Standard No. 43-3 or ASTM E119:

1. All Columns - UL Design No. X701 (17-3) for columns less than 14WF228 or X704 (23-3 or 32-3) for 14WF228 and larger - 3 hours.

2. Primary steel members (trusses, girders and beams framing to columns, all spandrel beams supporting exterior precast concrete panels, all tie backs, all cross bracing members framing between columns and all connections and support assemblies for precast concrete panels - 3 hours as determined by Alternate Test Method (UBC Standard No. 43-1, Section 14.137 through 43.140, or ASTM E119 Section 37 through 40), minimum thickness 1-1/2".

3. Secondary steel members (beams supporting only floor or roof panel loads and not part of primary structural frame) - 2 hours as determined by Alternate Test Method (UBC Standard No. 43-1, Sections 43.137 through 43.140, or ASTM E119, Section 37 through 40), minimum thickness 1 inch.

4. Metal decking (required only where lightweight concrete slab thickness is less than 3-1/4" as at depression for quarry tile and RF shielded norms, and under trench duct, trench drains, and radiation) - 2 hours as determined by ASTM E119 or UBC Standard No. 43-1, minimum thickness 1-3/8 inch.

B. The above specified minimum thicknesses are based on International Conference of Building Officials Research Committee Recommendation Report No. 1578 dated September 1973. No other interpolation or extrapolation reducing the thickness of sprayed fireproofing required will be accepted.

C. Where Contractor elects to erect precast concrete wall panels before sprayed fireproofing is applied to outside steel, he shall obtain approval of Building Official for an enclosure of plaster on metal lath bridging from bottom of steel member to back of precast concrete. Such assembly shall provide a minimum rating of three hours. With approval of the Building Official, the direct applied fireproofing may then be omitted from the concealed (exterior) surface of the steel member. This procedure is solely a contractor's option and, if exercised, shall require the Contractor to coordinate the related work of all trades and Contracts at no change in contract sum or contract time.

1. It shall be noted that if the outside steel is fireproofed before erection of precast concrete (as shown in details) the sprayed vapor barrier applied under Section 07220 must be bridged between insulation and fireproofing at no change in Contract Sum or Contract Time. General Contractor is responsible for coordination of these two Sections (09841 and 07220).

D. Where sprayed fireproofing is applied prior to precast concrete erection, integrity of fireproofing shall be maintained. Erectors or subcontractors removing fireproofing shall be required to replace any removed material to satisfy this intent at their own cost.

E. Where fireproofing is applied before thermal insulation system is completed, fireproofing subcontractor shall properly mask all adjacent areas and material and/or clean up any overspray without damage to adjacent material of insulation or vapor barrier.

F. Cuts made in insulation shall be limited to those necessary to bridge fire proofing to precast panels, any insulation removed in excess shall be replaced at the expense of the fireproofing subcontractor.

G. Except where fireproofing is applied before precast panel erection, no fireproofing shall be applied in vicinity of panels until secondary sealant has been installed.

## PART 2: PRODUCTS

### 2.1 MATERIALS

A. Cementitious mixtures shall be listed in Underwriters' Laboratories, Inc. "Fire Resistance Index" Classified Cementitious Mixtures (CALV) and "Building Materials Index", Guide No. 40U8.4½ current edition, or subsequent Division of W.R. Grace Co., Robinson Insulation Co., Vermiculite-Intermountain, Inc., MK & CB or MK-5, or approved equal, are acceptable for column and beam fireproofing. MK-5, only, shall be used for required deck fireproofing.

B. Water shall be clean, fresh, suitable for domestic consumption, and free from such amounts of mineral or organic substance as would affect the set of the fire resistive material.

C. All manufactured materials shall be mill-mixed requiring only the addition of water at the jobsite.

D. All products shall be asbestos free.

E. Metal lath - self-furring, diamond mesh, 3.4 lb. per square yard.

### 2.2 DELIVERY AND STORAGE

A. Material shall be kept dry until ready for use. It shall be kept off the ground, under cover and away from sweating walls and other damp surfaces. Materials that have been exposed to water before actual use shall be discarded.

B. Fireproofing stock shall be rotated and all material shall be used before its expiration date.

C. All manufactured materials shall be mill-mixed and shall be delivered in original, unopened packages bearing the name of the product, the manufacturer's name and the Underwriter's Laboratories, Inc. label verifying compliance with UL quality control inspection program and the UL classification.

## 2.3 MIXING

A. Fireproofing shall be mixed by machine in a conventional plaster-type mixer. The mixer shall be kept clean and free of all previously mixed material. The mixer shall be adjusted to the lowest speed which gives adequate blending of the material.

B. Using a suitable metering device, all water shall first be added to the mixer as it turns. Where possible, the mixer shall then be stopped and all the fireproofing material added. The mixer shall then be restarted. If the mixer is left running, fireproofing addition should be as fast as possible. Mixing shall continue only until all material is thoroughly wet and no lumps remain. Overmixing reduces the pumping rate and therefore is to be avoided.

C. The wet mixer density shall be as close to 51 lbs. per cu. ft. as possible. Measurement of the wet mixer density may be made by filling and weighing a 10 quart (1/3 cu. ft.) bucket. Multiplying the net weight (lbs.) of the material in the bucket by 3 calculates the density in lbs. per cu. ft.

D. When at a delivery rate of  $\frac{1}{2}$  to 1 bag per minute through a standard spray nozzle equipped with  $\frac{1}{2}$ " to  $\frac{5}{8}$ " orifice (at approximately 15 psi air pressure), any difficulty in hanging  $\frac{1}{2}$ " of fireproofing material on bare flat steel means that the mix is too wet.

## 2.4 PHYSICAL PROPERTIES

A. Minimum bond strength between the fireproofing material and the structural steel or metal decking shall be 500 P.S.F.

B. Material shall not crack or delaminate when the structural element is subjected to downward deflection of 1/120 of the span.

C. The fireproofing material shall not be subject to losses from the finished application of sifting, flaking or dusting. This performance shall be measured by the results of a test for erosion resistance when subject to high velocity air flow across the surface of dried samples. The samples thus tested must be representative of machine applied material similar to that which can be expected on the project. The air velocity shall not be less than 9200 feet per minute, and the duration of the test shall be at least 87 hours.

D. Fireproofing shall have a minimum average dry in-place density of 18 lbs. per cu. ft.

E. Documentation of the above performance shall be submitted in accordance with Article 1.2 above.

## PART 3: EXECUTION

### 3.1 SURFACE PREPARATION

A. Thoroughly clean all surfaces to receive sprayed fireproofing with hand tools, power tools, and/or solvent cleaning methods so that no mill scale, dirt, grime, oil, grease, dust, loose rust or paint, or other foreign material which would prohibit satisfactory bonding of fireproofing to the steel.

- B. Cleaning shall be accomplished just prior to the application of fireproofing.
- C. Notify the General Contractor of any condition of surface which cannot be corrected by normal cleaning methods specified above and require correction of condition before applying sprayed fireproofing.
- D. Application of fireproofing shall be interpreted as acceptance by the applicator of the suitability of the surface to receive his work and acceptance of responsibility for any failure of bond between fireproofing and steel.

### 3.2 PROTECTION OF PERSONS AND PROPERTY

- A. Provide all necessary measures for protection of workmen and public, as required under the regulations of the US Occupational Safety and Health Act and the Minnesota Department of Labor and Industry and statutory requirements. Provide protection for workmen applying fireproofing and for other workmen who are in the vicinity of application or mixing operations.
- B. Provide all necessary measures for protection of the general public and for prevention of air pollution as required under the regulations of the Minnesota Pollution Control Agency and statutory requirements. Enclose exterior openings at areas where spray application will be in process.
- C. Minimize overspray or fall-out as far as practicable through careful spray control. Provide masking, drop cloths or other satisfactory covering as necessary to prevent damage or coating from overspray or fall-out at surfaces and features where such non-intended fireproofing coating will be detrimental to the other work or cause cleaning expense to other Contractors. Provide such protection at: open ends of ductwork and piping, or other uncovered openings in ductwork; all operating equipment; all operating features, such as damper controls and valves; stockpiled materials or equipment; finished surfaces which will be exposed; piping, ductwork or similar work which is to receive covering; glass piping, surfaces such as backs of precast panels which are to receive thermal insulation; threaded rods or bolts; and similar items. Clean or replace any material or feature damaged or coated to the satisfaction of the University, Architect and the other trades involved.

### 3.3 TEMPERATURE AND VENTILATION

- A. When the prevailing outdoor temperature at the building is less than 40°F, an interior temperature and temperature of the steel shall be maintained at 40°F or higher for 24 hours before, during and 24 hours after application of sprayed fireproofing.
- B. The applicator shall provide natural ventilation to properly dry the sprayed fireproofing during and subsequent to its application. This shall be accomplished by keeping windows open approximately 2" on each side to provide air circulation: and in enclosed areas or building lacking openings for natural ventilation, by circulating exterior air and exhausting it to the outside by use of temporary circulators and exhaust fans.

### 3.4 WORK OF OTHER TRADES

- A. All clips, hangers, supports, sleeves, precast concrete panel connections

and other attachments to the fireproofing bases, as covered under other sections of the specifications, are to be placed by other trades prior to the application of the fireproofing material, where these materials can be anticipated in advance.

B. Ducts, piping or conduit or other suspended equipment that could interfere with the uniform application of the fireproofing material are to be positioned after the application of the sprayed fireproofing.

C. All patching and repairing of sprayed fireproofing, due to cutting by other trades, shall be performed under this section and paid for by the trade(s) that performed the cutting. Section 01010.

D. Refer to Article 1.1.F herein for critical work timing.

### 3.5 APPLICATION

A. Sprayed fireproofing shall be applied in the exact manner described in the certificates submitted to prove compliance with specified protection requirements, the schedules of systems approved, and the following:

1. For thicknesses of approximately  $\frac{1}{2}$ " or less apply in one operation.

2. For thicknesses approximately  $\frac{5}{8}$ " or greater, make second and succeeding applications after previous coat has set.

3. If a smooth finish is indicated, trowel or darby the surface of the material immediately after application.

4. Only experienced mechanics approved by the materials manufacturer shall be allowed to place the materials. A qualified manufacturer's representative shall be present for initial application to guide and assist applicator's personnel.

5. Provide and use workable gauges to insure the required thicknesses are constantly provided.

B. Fireproofing mix containing material that has partially set shall not be used. Frozen, caked, or materials containing lumps shall not be used. Each batch shall be mixed separately.

### 3.6 FIELD QUALITY CONTROL

A. Test samples shall be removed from applied areas by cutting through fireproofing to steel then scraping and lifting material out. Samples shall be cut only.

B. Provide 6 samples, each 12" x 12", for each 10,000 square feet of fireproofing. Cut samples at random locations designated by the University.

C. Place samples in polyethylene bags, identify with date, location taken and required thickness and density and deliver to the University.

D. Testing agency retained and paid by Owner will measure and test samples to determine dry density and thickness as follows:



1. Samples will be over dried at 120°F for a period of 24 to 48 hours to constant weight.

2. Dried samples will be accurately weighed and measured, their density will be calculated and thickness and dry density reported.

E. Where a sample fails to meet density or thickness requirements, further sampling and testing will be required in the area of the deficient sample and shall be paid for by the Contractor. If such further testing indicates an area deficient in either thickness or density, correction shall be made by application of additional material or removal of deficient material and replacement with satisfactory material.

F. Patching: All areas from which samples have been removed shall be patched by applicator to provide the specified fire ratings.

### 3.7 CLEAN-UP

A. After completion of fireproofing work in any area, remove equipment and clean the area. Clean surplus materials or deposits from floors. Clean wall and other surfaces which will be exposed. Clean fireproofing, including overspray, fall-out of other residue from surfaces outlined under Article 3.2 above. Fireproofing material need not be cleaned from the drywall channels installed prior to fireproofing operations; refer to Section 09100.

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## PART 1: GENERAL

1.1 SCOPE

A. Conditions of Contract and Division 1, General Requirements, apply to all work of this section. Refer to Article 12 of the Instructions to Bidders, Article 7 of the General Conditions and Section 01600, Materials and Equipment, for requirements on pre-bid and post-bid evaluation of proposed substitute products, methods and other conditions.

B. Work under this Section includes field finishing of all materials scheduled and/or specified for paint, enamel, transparent finish and similar field painting not specified under other sections.

C. Related work specified elsewhere:

1. Metal Fabrications: Section 05500.
2. Special Formed Metal: Section 05750.
3. Carpentry: Section 06100.
4. Custom Woodwork: Section 06400.
5. Preformed Metal Siding: Section 07411.
6. Sheet Metal Work: Section 07600.
7. Hollow Metal: Section 08110.
8. Wood Doors: Section 08200.
9. Rolling Shutters: Section 08330.
10. Lath, Plaster and Gypsum Drywall: Section 09100.
11. Preformed Metal Ceilings and Soffits: Section 09541.
12. Elastomeric Coatings (SG-1): Section 09820.
13. Glazed Wall Coating (SG-2): Section 09830.
14. Louvers and Vents: Section 10200.

D. General Outline of Work: Following outline is intended to complement and clarify the drawings. Do not construe as listing all surfaces, materials or finishes.

1. Exterior:

- a. Hollow metal exterior doors, panels and frames (typical entrance doors and frames are aluminum).
- b. Railings, guardrails, handrails, or ferrous metal, plain or galvanized.
- c. All exposed steel at air chambers and cooling towers, including columns, beams, girders, girts, drain piping, covers at beam ends.
- d. Steel stairs.
- e. Gratings.
- f. Wall louvers (metal), including at penthouse.

g. Exposed sheet metal, including: coping; roof edges, counterflashing; exposed metal flashing at areaways; roof vents; fan units, curb flashing; and similar sheet metal (not sheet metal roofing).

h. Prime coated hardware.

i. All other exposed metal or wood (unless excluded) of this Project, including exposed parts of lintels.

## 2. Interior:

a. All walls and ceilings at rooms and surfaces, where indicated. Where plaster, gypsumboard or concrete ceilings occur in spaces with painted, enameled, spray glaze or other finish on walls, such ceilings shall be painted unless otherwise noted.

b. Exposed soffits and edges of stringers or slabs at concrete stairs.

c. Metal stairs, railings, guard bars, handrails, including undersides, brackets and other parts including the painting of steel tube handrail at curtain-wall, except where factory finished. (See Section 05750.)

d. Metal ladders and ships ladders, including treads and ladder rungs.

e. Hollow metal, including doors, frames and other hollow metal. Paint on all sides including at rooms or spaces not otherwise painted or finished.

f. Steel and aluminum entrance units, including grilles, brackets, fascias and similar steel.

g. Covers and access panels.

h. Steel lintels, beams, columns and similar steel that is exposed.

i. Beams and steel plates (not fireproofed) in utility cores, with plates painted after field holes are cut and piping installed.

j. Floor gratings throughout.

k. Wood paneling.

l. Wood trim and other millwork (custom woodwork) throughout

m. Steel grilles, louvers, registers, diffusers throughout, where furnished prime coated.

n. Exposed ducts, hoods, reheat coil boxes, and similar items (bare or insulated) in painted rooms.

o. Exposed conduit and wire mould at finished or painted spaces.

p. Bare or insulated piping, hangers, saddles, brackets, stands, supports, panel boards and similar metal throughout, including at: finished rooms, equipment rooms, vaults, utility cores, switch gear room and similar accessible spaces.

q. Insulated or bare equipment at mechanical rooms, service rooms, pent-houses, vaults and switchgear rooms (except factory painted equipment) such as: air handling units and ducts; convectors; expansion, storage, and similar tanks; other equipment without paint or prime coated only.

r. Interiors of panelboard closets adjacent to cores, interior of telephone cabinet panelboards.

s. Electrical panelboards at finished spaces, such as labs, classrooms and in panelboard closets adjacent to cores; painted to match walls.

t. Identification of bare or insulated piping at all finished spaces and at accessible non-finished spaces including above accessible ceilings.

u. Interiors (walls and ceilings) of prefab audio metric rooms.

v. All light fixture trim occurring in metal ceilings.

w. Rooms or spaces in existing building where general contractor does remodeling, demolition and cutting, walls and/or ceilings shall be entirely repainted under Section 09900.

E. Work excluded from this section (areas or materials):

1. Exterior:

a. Face brick, paving brick, precast concrete, concrete slabs (except floors where scheduled), bituminous paving.

b. Metal soffits (Section 09541).

c. Aluminum windows and entrances.

d. Preformed metal sliding (Section 07411).

e. Construction sheds (under Section 01010).

f. Factory finished surfaces. Prime coat does not constitute factory finish.

2. Interior:

a. The walls and ceilings of any room or space not scheduled for paint or clear finish in Room Finish Schedules.

b. The walls of room or space scheduled for elastomeric coating (S.G. - 1) or glazed wall coatings (S.G.-2) in Room Finish Schedules.

c. Walls and ceiling of utility cores, except paint steel support beams for steel plate floors and the steel plate floors.

d. Elevator shafts and pits, air shafts, duct shafts, air tunnels.

- e. Fume hood ducts at utility cores.
- f. All special formed metal specialties with factory finish.
- g. Metal shelving and cabinets (factory finish).
- h. Plastic laminate casework (Section 06412).
- i. Laboratory casework, shelving and equipment shown on drawings (Metal prefinished).
- j. Plastic laminate surfaces.
- k. Elevator cars and entrances.
- l. Folding partitions (Section 10620).
- m. Operable walls (Section 10630).
- n. Concrete floors or stairtreads (except where scheduled).
- o. Piping, ducts and conduit concealed in shafts and above ceilings accessible and non-accessible and their supports and hangers.
- p. Paver, brick pavers, ceramic tile, vinyl-asbestos tile.
- q. Brick and architectural precast concrete.
- r. Acoustical tile, exposed grids for ceilings and other prefinished ceiling components.
- s. Brass, bronze, stainless steel.
- t. Anodized aluminum windows and entrance assemblies.
- u. Prefinished, non-insulated equipment, such as: absorption units; fan-motor units at penthouse and equipment rooms; mechanical pumps; and similar factory painted equipment.
- v. Prefinished electrical work in non-finished areas noted above as non-painted walls and ceilings (except high voltage conduit and wiring ducts), such as: transformers; motor control centers (MCC): bus ducts; panelboards; switchboards; emergency generator.
- w. Painting of door numbers, names and directional signs (by Owner), including identification of fire extinguishers cabinets.
- x. Tiolet partitions and doors (plastic laminate).

## 1.2 INTENT OF DOCUMENTS

A. The Subcontractor providing the work of this Section shall examine the specifications for the various other trades and other contractors and shall familiarize himself with all their provisions regarding their painting and it shall be clearly

understood that all surfaces that are left unfinished or have prime coat only by the requirements of other specifications shall be field painted or finished as a part of this Section.

B. Painting under this Section includes and means all specified or required preparatory work and application of paint systems including sealers, stains, fillers, varnishes, paints, clear silicone treatments, and other similar finishes not specified under other Sections.

C. It is the intent to paint the interior new building, as well as spaces and surfaces in existing adjacent buildings affected by work of this Project, except for specifically omitted areas and items.

D. In painting new work of this Project, paint all paintable surfaces except those explicitly omitted herein under Article 1.1.E. Paintable surfaces are: concrete; concrete masonry (brick & block); plaster and stucco; hardboard; gypsum board; cement-asbestos board; wood and plywood; metal, insulated or bare, (including piping, hangers, supports, ducts, brackets and other miscellaneous metal): ducts, insulated or bare, piping and equipment insulation and insulation covering; other surfaces listed under Painting Outline above.

E. Except for factory finish coats and prime coats on certain mechanical and electrical work, no painting is required of Mechanical and Electrical Contractors; field painting of all such surfaces shall be done by Painting Subcontractor under this section. Refer to Mechanical and Electrical drawings and specifications for extent of piping, conduit, duct work and equipment.

F. The number of coats specified are field painted coats, in addition to prime or shop coats, after all touch up work has been done to restore shop coats to full coverage. Use only first line products of manufacturers specified, of types of paints specified.

### 1.3 SUBMITTALS

A. Painting Systems: Submit for Architect's approval descriptive data in duplicate for paint materials and systems to be furnished. In this submittal, indicate each specified system, locations of use and the substitute system proposed.

B. Colors: The Architect will select all colors. If color selections are made which are not in the color line of the paint to be furnished, submit in duplicate for approval, 8" x 10" color cards showing the selected color in the paint to be furnished.

### 1.4 JOB CONDITIONS

A. Paint under conditions best suited for first quality work, including dry surfaces, dust free spaces, minimum temperature of 40° or higher as recommended by manufacturer. Paint exterior surfaces only when not subject to damage from present or subsequent rain, frost or other inclement weather, or when base surface is thoroughly dry. Test materials such as plaster to insure the base surface is dry. Paint in spaces not subject to entrance of dust or moisture from adjacent areas. Work with adequate illumination. Avoid painting of surfaces while they are exposed to hot sun.

B. It is the intent to generally paint all but the last coat on walls and ceilings at rooms with laboratory equipment and casework (See Q drawings) prior to their delivery and installation, to minimize working over and around the equipment, casework and finished tops. Walls covered by equipment and casework shall be fully painted (except for final coat).

C. Protection:

1. Protect all surfaces subject to damage and misplaced paint by covering with drop cloths, by masking, by other suitable covering or by removing from area.

2. Take particular care in working over and around laboratory equipment and casework, as well as other pre-finished work. Provide hardboard covering at tops to prevent accidental damage and adequately cover or mask equipment.

3. Make good any damage caused by painting operations.

4. General Contractor shall isolate, cover or protect as necessary to insure no damage, stains, abrasions, other disfigurement of finish painted surfaces immediately upon completion by painter of final application to such surfaces.

5. Maintain 10# CO<sub>2</sub> extinguisher in paint storage, mixing rooms. Remove oily rags and other fire hazards at end of day's work. Keep cans tightly covered. Take every precaution to avoid danger of fire.

D. Cleanup:

1. Remove oily rags, waste, etc. from building every night.

2. Upon completion of work, remove all misplaced paint, stains, etc. and remove all debris, rubbish, materials and equipment, and excess materials from the premises.

1.5 PRODUCT HANDLING

A. Delivery: Deliver all materials in the original containers, with seals unbroken and labels intact.

B. Storage:

1. Store and mix materials in designated places only. Protect walls and floors of storage room.

2. Post storage and mixing areas "NO SMOKING" and strictly enforce.

1.6 GUARANTEE

A. Guarantee all work for one year against blistering, peeling, or other loss of adhesion, yellowing, excessive chalking, other defects in material or workmanship. Remove defective work, prepare and repaint surface without cost to Owner. Repaint all of surface (i.e. wall, ceiling, door, etc.) on which work is defective to exact match of other adjacent similar surface; if exact match cannot be provided, then repaint adjacent surfaces to extent required to insure exact match.

## PART 2: PRODUCTS

### 2.1 MATERIALS

- A. Use only materials of brand and quality specified, if brand and quality are not specified, use material approved by Architect and Owner.
- B. At laboratories, provide paint manufactured with lead-free pigments and colors. Verify with manufacturer.
- C. Provide turpentine, alcohol, mineral spirits, bonding solution, sundries, etc., of highest quality, pure and with identifying label on container and in accordance with paint manufacturer's recommendations.
- D. Use no material over paint product of another manufacturer except as otherwise specified or permitted by Architect, and only if recommended by manufacturers.
- E. Before applying paint over any shop coat or other pre-primed surfaces, verify compatibility of coatings.

### 2.2 COLORS

- A. General: Architect will select colors, which may be from University of Minnesota Standard Color Palette. Mix paint to match color chips where necessary. Prepare actual samples, including natural finish as directed.
- B. Insulated Piping and Equipment: At unfinished spaces, paint piping, ducts, and similar work ("Insco" or "Insulcap") with first coat white, second coat gray; paint tanks, equipment and similar items the colors as directed. At painted rooms, paint insulation to blend out, as directed, each coat a different color.
- C. Non-Insulated Piping and Equipment: At unfinished spaces, paint piping and ducts "Silver Gray", with first coat a different color; paint tanks, equipment and other equipment colors as directed. At painted rooms, paint the items to blend out, as directed, each coat a different color.
- D. Oxygen Piping: At unfinished spaces, paint finish coat "Apple Green", with different color for the first coat.
- E. Gas Piping: At unfinished spaces, paint finish coat "Orange", with different color for each coat.
- F. Electrical Conduit: At finished spaces, paint all conduit to blend out, as directed, different color each coat.

### 2.3 PAINTING SYSTEMS

- A. Painting systems are specified using the products of Pratt and Lambert Company to establish standards of quality. Comparable systems of O'Brien Paint Company, Benjamin Moore & Company, Sherwin Williams, Martin Senour Company, Pittsburgh Plate Glass, The Glidden Company and Devoe & Reynolds, or approved equal, will be acceptable subject to approval by the Architect of the systems and specific products.



B. Use the materials of the same manufacturer for each system insofar as possible.

C. Exterior Systems:

1. Ferrous Metal:

- 1 - Coat P & L Effecto Enamel Primer. (Spot prime if existing)
- 2 - Coats P & L Effecto Enamel.

2. Galvanized Metal: Chemically treat bare (unprimed) surface with #46 Metal Pre-Treatment before painting to provide good bond followed within 8 hours by:

- 1 - Coat 80% Zinc Dust-Zinc Oxide Primer, Federal Specification TT-P-641b (omit if surface is shop primed).
- 2 - Coats P & L Vapex House Paint

3. Aluminum Metal:

- 1 - Coat P & L No. 25 Zinc Chromate Primer
- 2 - Coats P & L Effecto Enamel

4. Wood:

- 1 - Coat P & L House Paint 305 Ext. Primer (spot prime if existing).
- 2 - Coats P & L Verdura Trim and Shutter Paint.

D. Interior Systems:

1. Concrete Walls - where paint is scheduled or indicated:

- 2 - Coats P & L Pro-Hide Latex Satin Enamel

2. Concrete Masonry:

- 1 - Coat P & L Pro-Hide Block Filler (Omit if there is an existing finish).
- 2 - Coats P & L Pro-Hide Latex Satin Enamel

3. Plaster of Gypsum Board Walls:

- 2 - Coats P & L Pro-Hide Latex Satin Enamel

4. Plaster, Gypsum Board or Concrete Ceilings:

- 1 - Coat P & L Vapex Wall Primer
- 1 - Coat P & L Lyt-All Stippling Flat, stippled

5. Wood Doors, Trim, Millwork and other Wood for Clear Finish (S & V) (except paneling):

- 1 - Coat P & L Paste Filler
- 1 - Coat P & L Tonetic Wood Stain
- 2 - Coats P & L "38" Pale trim Varnish gloss
- 1 - Coat P & L "38" Pale Trim Varnish Satin

6. Paneling and Related Wood Trim and Millwork for Clear Finish:

1 - Coat P & L Tonic Wood Stain - apply at least 24 hours in advance of:

2 - Coats Iowa Paint Manufacturing Co. (LPM) 5460 Fire Retardant Clear Finish Base Coat at the rate of 175 square feet per gallon each coat.

1 - Coat IPM 5440 Satin Fire Retardant Clear Finish at the rate of 300 square feet per gallon.

Allow dry time between each coat of the three coats of four (4) hours to not more than twenty four (24) hours, to provide "tooth" for the succeeding coat. If recoating or topcoating is not accomplished with the twenty four (24) hour period, it will be necessary to sand, (then wipe with tack rag) before the following coat is applied.

Apply this finish system in strict accordance with manufacturer's instructions and recommendations.

7. Wood Doors, Trim, Millwork, Overlaid Plywood and Similar wood for painted finish:

1 - Coat P & L Interior Trim Primer

1 - Coat P & L Vitralite Enamel Undercoating

1 - Coat P & L Vitralite Enamel Eggshell

8. Covered Pipe, and Ducts - canvas jacketed - painted spaces:

1 - Coat Rubber base sizing

1 - Coat H.B. Fuller Insco BC-716, White

1 - Coat finish as for adjacent wall or ceiling.

9. Covered Pipe & Ducts - canvas jacketed - unpainted wall/ceiling space, where accessible, including above accessible ceilings:

Finish as above (8), except substitute second coat H.B. Fuller Insco SC-716, Gray, for finish coat.

10. Covered Pipe, unjacketed:

Finish as for 8 and 9 above, except omit sizing.

11. Special Insulation on chilled water lines, tanks, chillers, refrigerant suction lines and gas defrost lines:

2 - Coats Armstrong Armaflex Vinyl lacquer.

12. Bare Pipe - Ungalvanized - All bare ungalvanized pipe in painted areas and mechanical equipment rooms including cores passing through them.

1 - coat P & L Noxide Metal Primer, then finish same as adjoining wall or ceiling.

15. Bare Pipe - Galvanized - all galvanized pipe in painted areas and mechanical equipment rooms including cores passing through them shall be treated with #46 Premetal Treatment, then apply:

1 - Coat 80% zinc dust - zinc oxide primer, Federal Specification TT-P-641b, then finish same as adjoining wall or ceiling.

16. All Mechanical and Electrical Cabinets and Equipment not factory finished in mechanical rooms:

- 1 - Coat Primer according to base material.
- 2 - Coats of P & L Effecto Enamel

17. All Surfaces Inside Ductwork (or ceiling plenums) and equipment visible through grilles and registers.

1 - Coat P & L Effecto Enamel, Flat Black (paint minimum 2 feet back from registers).

18. Hollow Metal and Ferrous Metal:

- 1 - Coat P & L Vitralite Enamel Undercoating
- 1 - Coat P & L Vitralite Enamel Gloss
- 1 - Coat P & L Vitralite Enamel Eggshell

19. Concrete Floors - where painted.

2 - Coats P & L 61" Floor and Porch Enamel.

20. All Other Metal Work:

- 1 - Coat appropriate Primer (or Undercoating if shop primed).
- 1 - Coat P & L Vitralite Enamel, Eggshell.

### PART 3: EXECUTION

#### 3.1 EXAMINATION OF SURFACES

A. The Subcontractor shall examine the surfaces to be finished prior to commencing work. If woodwork, metal or any other surfaces to be finished cannot be put in proper condition for finishing by customary cleaning, sanding and puttying operations, notify the Contractor in writing or assume the responsibility for and rectify any unsatisfactory finish resulting. Test surfaces for dry condition to receive paint.

#### 3.2 WORKMANSHIP

A. Job Site Sample Areas: Make sample application on Project surfaces to extent directed by Architect or Owner. Obtain acceptance of sample field application before making additional applications. Accomplish all work to equal or exceed standards established by approved samples. Protect and maintain approved field samples through completion of Project.

B. The workmanship shall be of the very best, employing only skilled mechanics. Spread the materials on in even, thorough coats without runs, sags or other blemishes. Meet standards and recommendations for "Type 1 - Recommended" type work of Painting and Decorating Contractors of America, as minimum requirements, in absence of more stringent Project specification requirements.

C. Consult with Architect and/or manufacturer's technical representative if in doubt as to suitability of material to application. Verify that paint is compatible with shop coat of others.

D. Apply succeeding coats only after prior coat has been approved by Owner, otherwise no credit will be given for the coat.

E. Coordinate work with others to insure that work to be painted is given maximum possible protection by applying coatings at times as will best insure such work against deterioration of any kind. Apply back prime and prime coats to millwork as soon as practicable after delivery to job.

### 3.3 SURFACE PREPARATION

A. All surfaces to be painted shall be cleaned and free of dirt, grease, rust, and dust before painting is started. Knots, streaks and sappy spots shall be touched up with an approved primer or sealer after removing pitch.

B. All necessary puttying of nail holes, cracks, etc., shall be done after the first coat, with putty of color to match that of the finish. Fill countersunk screw heads metal anchorage (not stop screws) with paste metal "body putty". Sand smooth and flush.

C. Touch up metal where shop coats are abraded. Clean down to bare metal and touch up paint used for shop coat.

D. All metal surfaces shall first be washed with mineral spirits to remove any dirt or grease before applying materials. Where rust or scale is present, it shall be wire brushed or sandpapered clean before painting.

E. Remove and reset hardware as required to completely finish surfaces and prevent misplaced paint. Cooperate with other trades and schedule painting operations prior to final setting and adjustment of hardware.

F. All woodwork to be finished with varnish or enamel shall be sanded smooth and the surfaces cleaned before proceeding with the application of the first coat. Sand between each coat with fine sandpaper to produce an even smooth finish, except do not sand stain.

G. All coats shall be thoroughly dry before applying succeeding coats.

H. Prime, seal or stain and seal all surfaces of all millwork and paneling immediately upon arrival at the job. All interior and exterior trim shall be back primed before installation.

I. General Contractor shall repair holes, cracks, fissures and other defects in concrete and concrete masonry and remove excess mortar before prime coat is applied by Painting Subcontractor.

J. Patch small holes, abrasions and similar defects in plaster with spackle after prime coat. Patch flush and smooth with adjacent surfaces. Large imperfections shall be patched by plasterer. Seal spackle or patch before succeeding coats.

### 3.4 PREPARATION OF EXISTING SURFACES

A. General: Wash all surfaces to be repainted. Remove all grease, oil, soil or other matter which will interfere with proper bond of new material. Scrape and wire brush all loose or flaking paint to clean down to sound surfaces, sand edges to feather out. Remove all rust, scrape and brush to provide bright, clean metal. Surfaces shall be clean, smooth, free of cracks, alligating, loose material. Etch surface of paint by using chemical wash. Fill cracks, voids and similar defects. Above work shall be done in addition to any other required preparation. Do all work necessary to place in best possible condition for re-painting.

### 3.5 APPLICATION

A. Apply all materials without reduction, unless reduction is explicitly required by manufacturer's original container label or unless otherwise directed or approved by Architect. Adulterate no material.

B. Apply all coatings smoothly, evenly and free of runs, sags, crawling, impurities and skins.

C. Apply over only thoroughly dry preceding coat. Follow manufacturer's printed directions for drying time of undercoats. (Generally 24-hour minimum will be required.)

D. Prior to painting concrete or concrete block, spray or brush treat all voids (including air or water voids) thoroughly coating the voids to provide a painted finish in the voids.

E. Apply block filler at rate not to exceed 75 square feet per gallon on blocks or 100 sq ft per gallon on concrete walls.

F. Use roller or brush on plaster, concrete and masonry surfaces; thoroughly fill all pores, each coat. Brush or spray masonry joints to insure full coverage, each coat.

G. Spray first coat on concrete walls and ceilings as approved, to thickness and hiding equivalent to properly brushed or rolled coat of material. Coat voids in concrete, as specified under D. Brush or roll succeeding coats, unless spray coat (equal in hiding and thickness to sample areas of brushed coats) are applied for comparison in Owner's presence. Spray may be used at pan and joist ceilings, metal decks and joists which are exposed, subject to the "equal coat" provision specified.

H. Color each paint coat to approximate color, somewhat lighter, of succeeding coat.

I. Stain and seal wood paneling, including edges and tongue and groove, prior to erection.

J. Finish tops and bottoms of doors same as rest of door, as well as all faces and edges of shelves, with all coats of paint. Should painter fail to paint tops and bottoms of wood doors, including cabinet doors, with all specified coats, and any door warps, painter shall be held responsible for entire cost of door replacement, including new door, fitting, sanding and refinishing.

K. Lightly sand before applying each coat of stain, sealer, varnish, enamel at wood (except do not sand stain), and elsewhere that runs or uneven build-up occurs, to insure smooth coats and adhesion.

L. At existing building, repaint walls and/or ceilings surface entirely that have been disturbed by work of the General Contractor. "Patch" or "Spot" painting is not acceptable.

M. When painting around exterior glazed openings, paint exposed glazing compound or putty and slightly, uniformly lap paint onto glass.

N. Paint primed hardware, including closers, carefully, neatly and so no hardware paintshows on doors or frames. Keep other finished hardware completely free of stain, varnish and paint.

O. Apply paint adjoining other materials or other colors with full, clean cut lines without overlapping and to straight line.

P. Apply all work so free of runs, holidays, dead spots, roller or brush marks, foreign materials and impurities, etc., and uniform in color and sheen. Apply additional coats at no expense to Owner to areas showing such deficiencies or thin spots or other lack of hiding.

Q. At completion of work of other trades, touch up and restore all painted work where damaged or defaced, free of blemishes.

R. Apply coding to piping as directed and specified.

S. Discard all containers as they are emptied. Rouse will be prohibited.

### 3.6 IDENTIFICATION OF PIPING

A. General: At all finished spaces and at accessible unfinished spaces, such as above accessible ceilings, in unpainted rooms, shafts, utility cores, tunnels and similar locations where walls and ceilings or plenums are unpainted, identify all bare or insulated piping as to type of service and direction of flow. Mechanical Contractor will mark piping for guidance of painter.

B. Laboratory Water Lines: Mark all laboratory water lines "Lab. Water - Unsafe for Drinking" not over 25 feet apart at each branch or turn, and both sides of walls or ceilings. Lines extending above ceilings shall be marked to ceiling installation, on both sides of partitions and floors where piping passes through and adjacent to each shut off valve.

C. Other Services: Mark identification every 25 feet, at each change of direction and at least once per room or space.

D. Stenciling: Mark with stenciling black letters on a yellow background, letters minimum 1" high, yellow background in neat rectangular pattern. Use non-running stencil paint. Indicate flow direction by black arrow on yellow background.

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## PART 1: GENERAL

1.1 SCOPE

- A. Conditions of Contract and Division 1 - General Requirements, apply to all work of this section. Refer to Article 12 of the Instructions to Bidders, Article 7 of the General Conditions and Section 01600 - Materials and Equipment for requirements on pre-bid and post-bid evaluation of proposed substitute products, methods and other conditions.
- B. Work under this section includes miscellaneous specialty items.
- C. Refer to drawings for extent and location.

1.2 QUALITY ASSURANCE

- A. Provide each type of specialty item as a complete unit produced by one manufacturer, including hardware, accessory items, mounting brackets, and fastenings.
- B. Unless otherwise acceptable to the Architect, furnish all items of one type by one manufacturer for the entire project.

1.3 SUBMITTALS

- A. Manufacturer's Data: For information only, submit 2 copies of manufacturer's specifications and installation instructions for each type of specialty item. Indicate by transmittal that a copy of each instruction has been distributed to the Installer.

1.4 PRODUCT DELIVERY, STORAGE & HANDLING

- A. Do not deliver products until building is enclosed and ready for their installation. Protect from damage during delivery, handling, storage and installation.

## PART 2: PRODUCTS

2.1 WALL MOUNTED CURTAIN (DRAPERY) TRACK

- A. Kirsch Series 9095 Double Duty Traverse Rod or approved equal, equipped with cord and all components including 9059 Cord Tension Pulley.

2.2 COAT HOOKS, EQUIPMENT ITEM M111

- A. Coat Hooks: No. 54570 or 54572 as selected by Architect, polished acrylic rod formed into coat and hat hooks 4-3/4" W. x 6-1/2" H x 2-1/2" deep as manufactured by Architectural Supplements Incorporated, 341A East 62nd Street, New York, NY 10021 or approved equal.
- B. Provide toggle bolt anchorage.

2.3 WALL-MOUNTED CLOCK

- A. Clock: Model No. 628-022, electric movement, 14" wall mount, white case, dial graphic option 2 as manufactured by Howard Miller Clock Company, Zeeland, Mich.

PART 3: EXECUTION

3.1 INSTALLATION

- A. Install miscellaneous specialties and accessories at the locations shown in accordance with the manufacturer's instructions. Install level, plumb, secure, and at the proper height. Cooperate with other trades for securing to substrates and finished surfaces. Repair or replace damaged units as directed by the Architect.
  
- B. Provide protections for installed units so that they will be in perfect operating condition, without damage, blemishes, or indication of use at completion of the project.

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## PART 1: GENERAL

1.1 SCOPE

A. Conditions of Contract and Division 1 - General Requirements, apply to all work of this section. Refer to Article 12 of the Instructions to Bidders, Article 7 of the General Conditions and Section 01600 - Materials and Equipment for requirements on pre-bid and post-bid evaluation of proposed substitute products, methods and other conditions.

B. Work under this section includes furnishing and install all tackboard (T.B.) installation on various base materials and its trim as detailed and specified herein. Furnish all base materials for tackboards installed under this section, as shown. Provide blocking where tackboards are mounted with reveals; refer to drawings.

C. Related work specified elsewhere:

1. Custom Woodwork: Section 06400.
2. Plastic Laminate Casework: Section 06412
3. Specialty Modules: Section 10280

1.2 SUBMITTALS

A. Shop Drawings: Submit shop drawings and manufacturer's literature on all chalkboard and tackboard installations, indicating trim.

B. Samples: Furnish samples of chalkboard, tackboard and trim, for finish color approval by Architect.

## PART 2: PRODUCTS

2.1 MANUFACTURERS

A. Acceptable manufacturers are listed under Products as hereinafter specified.

2.2 TACKBOARD (T.B.)

A. Tackboard as manufactured by Congoleum Industries, Inc., (Walnut Brown BC 19), Claridge Products and Equipment, Inc. (No. 1104, Burnt Umber), Neal Slate Co., (Char Brown #13), or approved equal, conforming to these specifications, including color, will be acceptable.

B. Tackboard shall be best quality natural cork wood, finely ground and compressed into 1/4" thick sheets with a burlap back and a fully washable, soil resistant, plastic coated finish face. Colors as indicated above.

C. Tackboards as indicated on drawings are either laminated to plywood or chipboard or directly to base material. At installations where chalkboard and tackboard are adjacent, provide backing so surfaces are flush.

D. Tackboard shall be size as indicated on drawings. No joints in cork except where both dimensions exceed 72".

## 2.3 TACKBOARD TRIM

A. Furnish and install extruded trim for wall mounted tackboard as shown on drawings and specified herein. Trim as manufactured by W. E. Neal Slate Co., Claridge Products and Equipment, Inc. and Glenmar Co., or approved equal which conforms to these specifications will be acceptable. Specified numbers are taken from Glenmar series; only as a base, other mentioned manufacturers are acceptable.

B. Typical metal mouldings: groundless, extruded aluminum trim, satin finish to receive paint, single lengths up to maximum trim lengths, straight, undamaged, true, free of defects. Chalktrays shall have lip at free ends neatly and smoothly rounded off as approved. No extrusion markings shall be noticeable. Typical trim shall be:

1. Perimeter Trim: B Series (Preassembled trim).

C. Finish: All trim shall be shop painted. Provide shop applied prime coat and two finish coats (dull) of color to match tackboard color. Touch up all abrasions, filled cuts and other areas required after installation.

D. Moulding location; all tackboard shall be trimmed all four sides. Provide perimeter trim at all edges, except where otherwise indicated.

## PART 3: EXECUTION

### 3.1 TACKBOARD INSTALLATION

A. Tackboard Installation: Where required, provide approved hardboard backing, firmly anchored to wall. Install cork with adhesive recommended by manufacturer free of bulges, marks, soiled or at otherwise damaged area. Replace soiled, damaged or unsatisfactory cork. Cork installation to be guaranteed against bulging, loosening and to remain a flat, stable surface. No joints in cork except where both dimensions exceed 72".

B. Moulding and Trim Installation: All joints shall be tight. Install in single lengths, straight, true and free of defects. Moulding shall be securely mounted and anchored to masonry and guaranteed rigid and permanent. Provide shims behind boards to hold tight against trim. Set and install to manufacturer's recommendations. Corners shall be neatly mitered.

C. General Installation: All work plumb, square and level, securely fastened, properly anchored.

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## PART 1: GENERAL

1.1 SCOPE

A. Conditions of Contract and Division 1 - General Requirements - apply to all work of this section. Refer to Article 12 of the Instructions to Bidders, Article 7 of the General Conditions and Section 01600 - Materials and Equipment - for requirements on pre-bid and post-bid evaluation of proposed substitute products, methods and other conditions.

B. Work under this section includes furnishing and installing all toilet compartments, urinal screens, hardware and accessories as indicated on drawings and herein specified.

C. Related work specified elsewhere:

1. Support above finished ceiling: Section 05500.
2. Toilet and Bath Accessories: Section 10800.

1.2 GENERAL INFORMATION

A. Competence: Work under this section shall be manufactured by a well established and experienced firm, acceptable to the Architect, with satisfactory record of similar size and quality installations. Architect reserves the right to reject any subcontractor if it is Architect's opinion that (1) shop capacity, experience of workman, equipment or supply of material will not result in the required quality within time required for completion, or (2) previous performance by manufacturer has been unsatisfactory.

1.3 SUBMITTAL

A. Shop Drawings: Submit shop drawings and manufacturer's literature on all partitions and screens; showing partition sizes, door swings and screen sizes. Indicate all fastening devices, in accordance with Section 01300.

B. Samples: Prior to award of subcontract for toilet compartments, the successful proposed subcontractor shall submit samples of all hardware for approval. No subcontract shall be awarded until the samples are approved by the Architect and Owner.

## PART 2: PRODUCTS

2.1 MANUFACTURERS

A. General and Manufacturers: Materials, panel and door thickness, accessories, hardware, hardware design, partition design, finishes and color selection must be fully equal and comparable to manufacturer specified. Provide at least 40 different colors and patterns of laminated plastic for selection by Architect, if selection is more limited, non-standard colors shall be provided. Acceptable manufacturers, subject to all criteria or requirements of specifications are Mid-South Manufacturing Company, the Sanymetal Products Co., Bobrick Washroom Equipment, Inc, Knickbocker Partition Co, Global, Weis, Metpar, Roberts, Accurate, Robart and American Standard, or approved equal.

2.2 TOILET COMPARTMENTS

A. Toilet Compartment Type: Ceiling supported, flush partitions with pilasters. Provide extended pilasters, where ceiling height dictates, to maintain

12" from bottom of partition to floor. At all compartments, where indicated, inswinging doors shall be 24" wide; outswinging doors shall be 34" wide. Panels of size to fit space and layout indicated. Compartments specified are based on Type C, Ceiling Hung Style, as manufactured by Mid-South Manufacturing Co.

B. Material: Stiles, panels and doors shall have external surfaces; faces and all edges, covered with seamless high pressure laminated plastic, .062" thick, conforming to NEMA Standards LD-1-1971, as manufactured by Westinghouse Electric Corp, Formica Brand Laminates, Textolite General Electric Co, Pioneer Plastics Corp, Enjay, and Wilson-Art; cores for stiles, panels and doors shall be particle board.

C. Construction: Laminated plastic sheets shall be bonded to the cores with a plastic resin adhesive applied under continuous heat and pressure until cured to produce sections approximately 1" thick for doors and panels and 1¼" thick for stiles. Panels shall be hooked to stiles at three (3) points by means of galvanized tension cleats recessed in the panel. Stiles, panels, and doors to be predrilled for application of fittings and hardware.

D. Hardware: Doors shall be equipped with trouble proof hinge set. Each hinge set shall consist of cast-alloy, nonferrous-metal, chrome-plated hinge brackets. The top pivot shall be recessed into the edge of the door 2½" below the top. Heavy stainless steel pivot pin operating in a Zytel nylon bearing shall be anchored above and below the top hinge bracket. The operation of the door shall be controlled by the lower hinge unit which consists of a heavy stainless pintel and mating Zytel nylon cams which permit setting of door at desired position when door is not latched. Slide latch, bumper and keeper, coat hook and wall brackets shall be of cast brass alloy, nonferrous metal, chrome plated. Wall and pilaster brackets and other fittings may be minimum 14 gauge type 302 stainless steel or cast alloy, non-ferrous Zamak Metal, chrome plated. Aluminum metal in hardware, brackets, or fittings is prohibited. Working hardware shall be brass alloy, chrome plated. All hardware, except coat hooks, shall be throughbolted with one-way type theftproof screws and fasteners. Stile cover bases shall be 3" high of .031 inch stainless steel 302 alloy, hemmed top and bottom, die formed to fit stile.

### 2.3 URINAL SCREENS

A. Urinal Screen Type: Wall hung, flush panel type, 18" x 42"; 12" from bottom to floor.

B. Material: Panel and high pressure laminated plastic as specified for toilet compartment under 2.2 B & C herein.

C. Hardware: Wall brackets shall be of cast alloy, nonferrous Zamak metal, chrome plated, or type 302 stainless steel. Throughbolted with one-way type theftproof screws and fasteners.

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## PART 1: GENERAL

1.1 SCOPE

A. Conditions of Contract and Division 1, General Requirements, apply to all work of this section. Refer to Article 12 of the Instructions to Bidders, Article 7 of the General Conditions and Section 01600 - Materials and Equipment, for requirements on pre-bid and post-bid evaluation of proposed substitute products, methods, and other conditions.

B. Work under this section includes all louvers and vents not specifically furnished under other sections and all door louvers.

C. Related work specified elsewhere:

1. Foundation Vents: Section 05500.
2. Interior grilles, registers, diffusers: Section 05750, 08900, 09541, 13500, Division 15.
3. Exterior grilles in curtain wall: Section 08900.
4. Field painting: Section 09900.

1.2 QUALITY ASSURANCE

A. Products of the Airstream Products, Industrial Louvers, Inc. and Koppers Company, Inc. are specified to establish standards of quality and performance. Products of Construction Specialties; Ventilouvre Co., Inc.; Louvers and Dampers, Inc.; Aiolite Co.; American Warming and Ventilating Inc.; or approved equal which meet the following specifications, are acceptable.

1.3 SUBMITTALS

A. Shop Drawings: Submit fabrication and installation drawings in accord with Section 01300.

B. Samples: Submit finish samples in accordance with Section 01300 and the following:

1. Finishes: Submit two samples of each louver blade (12" long) and grille pattern (6" x 6") with frame and trim with specified finish applied by manufacturer's standard shop procedure.

C. Performance Data: Submit certified data from an independent testing laboratory substantiating aerodynamic performance of all louvers and, in addition, acoustical performance of acoustical louvers.

1.4 DELIVERY, STORAGE AND HANDLING

A. Deliver in sections as large as practicable for handling and installation.

B. Protect as required during handling to preclude damage. Replace any damaged units or parts.

## PART 2: PRODUCTS

### 2.1 EXTERIOR LOUVERS

- A. Airstream Products 4" deep model SA extruded aluminum stationary louvers continuous line, minimum 50% free area is required.
- B. Aluminum: Head, sills and jams of one-piece extruded structural members in 6063-T5 alloy .081" thickness. Blades with continuous reinforcing bosses on underside. All fastenings stainless steel or aluminum.
- C. Mullions: Concealed mullions (continuous line) with extruded concealed blade brace of same material as louver.
- D. Bird Screen: Aluminum expanded bird exclusion screen secured to louver with removable extruded aluminum frame on inside of louver.
- E. Finish: Color anodized finish in Dark Bronze color to match curtainwall aluminum framing as specified in Section 08900.

### 2.2 DOOR LOUVERS

- A. Industrial Louvers, Inc. Model 414, inverted vee blade louver, blades spaced 7/16" o.c., 18 gauge steel, 1" thick, "Z" metal moulding. Edge channels not over 1/2" wide, with blades welded or securely clinched to frame to prevent loose blades, prime coat finish. Ship louvers to door manufacturer for installation.

### 2.3 STEEL REINFORCING MEMBERS

- A. Rolled steel shapes. Steel conforming to ASTM A-36, sized as detailed or required for installation.

### 2.4 AIR TRANSFER GRILLES AT CANTILEVER RETURN WALLS

- A. Provide air transfer grilles at all cantilever sidewalls to provide air movement to unheated chase space between precast and steel stud partition. Refer to detail 3/A3-1.
- B. Titus Model CM 1500, border 272, Type A fastening, aluminum with zinc chromate prime coat of paint, listed width size 3", opening width size 2-13/16", total size each unit, out to out of border 3-15/16" x 16".

## PART 3: EXECUTION

### 3.1 INSTALLATION

- A. Erect in accordance with approved installation drawings.
- B. Coordinate with other trades and Mechanical Contractor for connections.
- C. Install all supporting members as indicated.
- D. Provide dissimilar metal protection where required.

## PART 1: GENERAL

1.1 SCOPE

A. Conditions of Contract and Division 1, General Requirements, apply to all work of this section. Refer to Article 12 of the Instructions to Bidders, Article 7 of the General Conditions and Section 01010, Summary of Work and Special Requirements, for requirements on pre-bid and post-bid evaluation of proposed substitute products, methods, and other conditions.

B. Work under this section includes furnishing and installing all wall bumpers and corner guards indicated on the drawings or specified herein. See drawings for type, quantity and location.

C. Related work specified elsewhere:

1. Lath and Plaster: Section 09100.

1.2 SUBMITTALS

A. Shop Drawings. Submit layout and installation drawings in accordance with Section 01300.

1.3 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver, store and handle materials in a manner that will prevent damage. Replace damaged material.

PART 2: PRODUCTS2.1 ACCEPTABLE MANUFACTURERS

A. Products manufactured by Rawlings Rubber Corporation are specified to establish standards of quality and design intent. The equivalent products of Construction Specialties, Inc., Vinyl Plastics, Inc., Pawling Rubber Corp., Afco Rubber Co., Flexco Division of Textile Rubber Co., or approved equal.

2.2 WALL GUARDS (WALL BUMPERS)

A. Pawling WGR-1 Rubber Wall Guards, include all necessary brackets, EC-1 end stops, OC-1 outside corners, joint blocks and spacers. Color selected by Architect.

PART 3: EXECUTION3.1 ERECTION

A. Erect wall guards plumb, true and square in a rigid and substantial manner in strict accordance with approved layout drawings.

B. After erection, clean surfaces with mild detergent and rinse with clear water.

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## PART 1: GENERAL

1.1 SCOPE

A. Conditions of Contract and Division 1 - General Requirements, apply to all work of this section. Refer to Article 12 of the Instructions to Bidders, Article 7 of the General Conditions and Section 01600 - Materials and Equipment for requirements on pre-bid and post-bid evaluation of proposed substitute products, methods and other conditions.

B. Work under this section includes all specialty modules, complete, including all components shown on drawings and all required accessories, fittings, anchorages, fastenings and other incidentals required for installation.

C. Related work specified elsewhere:

1. Mechanical connections: Division 15.
2. Electrical connections: Division 16.

1.2 QUALITY ASSURANCE

A. The products named herein are intended to establish the minimum acceptable quality of products and installation. The following manufacturers are acceptable subject to the approval of the Architect of minor deviations from the specified products:

1. Watrous
2. Halsey Taylor KST Co.

1.3 SUBMITTALS

A. Shop Drawings: Submit complete manufacturer's data and fabrication and installation drawings.

B. Samples: Submit two (2) 12" x 12" samples of each specified or selected color or finish. Samples shall be actual finish on actual metal.

## PART 2: PRODUCTS

2.1 MODULAR SYSTEM

A. Modular units shall be manufactured by Watrous Incorporated, 106 Gateway Road, Bensenville, Illinois 60106. Telephone number: 312-766-8000.

B. System as specified shall be manufactured by one manufacturer. Related items shall be the responsibility of the general contractor to coordinate.

2.2 MATERIALS AND FABRICATION

A. Units shall have one piece steel frame, heliarc welded, polished, backed matte



black finish with no open mitres. Frame to have factory cut mounting holes for a neat and orderly installation.

B. All doors shall have 180° swing concealed stainless steel hinge.

C. All studs, catches and related items shall be of painted or plated steel - no plastic.

D. Fabricator shall make knock outs, cut outs, and mountings as necessary for items to fit on panel or in cabinets but not supplied by Fabricator.

E. Unit framing and products as supplied by Fabricator to be fully factory assembled, encased in heavy plastic for jobsite storage and wood crated.

F. Frame to have 3/4" feature strip between units.

G. All units to have 3/4" reveal.

### 2.3 COLORS AND FINISHES

A. All flat panels and louvers shall be Durabond baked enamel, color finished in special colors as selected by Architect. More than one color may be selected for each series of modules.

B. Drinking fountains shall be stainless steel with No. 4 finish.

### 2.4 MODULES

A. Drinking Fountains:

1. Vari-Purpose Module Drinking Fountains shall be Watrous \*W-3013 as detailed on the drawings, complete with a push button forged brass stream regulator. The drinking fountain shall be installed in a mounting frame with concealed fixing devices.

2. Vari-Purpose Module Handicapped Drinking Fountains shall be Watrous W-5013 as detailed on drawings and furnished complete with concealed mounting frame. Unit to be installed with bubbler approximately 35" above finished floor. Provide lever type operating handle. Back panel shall be color finished.

B. Water Coolers: Vari-Purpose water cooler shall be Watrous W-9076, fully U.L. approved.

C. Louvers: Vari-Purpose Module Louvers shall be Watrous W-3613 or W-3612C as applicable, as detailed on the drawings and shall be complete with concealed mounting frame. All exposed surfaces shall be color finished.

D. Fire Extinguisher Cabinets: Vari-Purpose Module fire extinguisher cabinets shall be Watrous W-3113 EC or W-3113 ECT as applicable, as detailed on the drawings and shall be complete with stainless steel hinges that permit door to travel through 180°. Door is provided with heavy duty ball stud catch assembly. Heavy gauge steel interior cabinet to be matte black finish. Silk screening as selected by

architect in accordance with local code. Door shall be color finished, red.

E. Miscellaneous Panels:

1. Access Panels: Watrous W-4349 complete with stainless steel hinges allowing movement through 180°.

2. Black Panels: Watrous W-4313, fixed.

3. Fire Pull Panels: Watrous W-3902, with cut-out for fire pull furnished and installed under Division 16.

4. Telephone Panels: Watrous W-4822, designed to accommodate standard Bell System coin telephone panels.

PART 3: EXECUTION

3.1 INSTALLATION

A. Assemble and install modules in accordance with approved erection drawings.

B. Coordinate installation with tradesmaking connections.

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## PART 1: GENERAL

1.1 SCOPE

A. Conditions of Contract and Division 1, General Requirements, apply to all work of this section. Refer to Article 12 of the Instructions to Bidders, Article 7 of the General Conditions and Section 01600 - Materials and Equipment, for requirements on pre-bid and post-bid evaluation of proposed substitute products, methods, and other conditions.

B. Work under this section includes furnishing and installing all lockers indicated on the drawings or specified herein. See drawings for type, quantity and location.

C. Related work specified elsewhere:

1. Plastic laminate lockers and benches: Section 06412.
2. Wood base for floor mounted lockers: Section 06100.

1.2 QUALIFICATIONS

A. Lockers as manufactured by Sturdy Steel Products Corporation. Lockers as manufactured by Lyon Metal Products, Medart Products, Penco Products, Republic Steel, Interior Steel Equipment Company conforming to locker style specified will be acceptable.

1.3 SUBMITTALS

A. Shop Drawings. Submit shop drawings in accordance with Section 01300.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver, store and handle lockers in a manner that will prevent damage. Replace damaged material.

## PART 2: PRODUCTS

2.1 FABRICATION

A. Lockers shall be constructed from stretcher leveled, cold rolled steel. Minimum gauge of steel shall be 16 gauge for doors and frames, 24 gauge for backs, sides, tops, bottoms, non-exposed panels (adjacent to wall) and shelves.

B. Top and bottom of doors shall be flanged, and sides shall be channel shaped, miter corners and weld flush. Frames shall be channel shaped, and vertical members shall be flanged to form a continuous door stop. Reinforce doors and frames as necessary. Doors and frames shall be free of sharp edges. Hinges shall be 2" wide, 5 knuckle, tight-pin, full loop hinges welded to frame and riveted to door. Doors 42" high or less shall have 2 hinges, and doors over 42" high shall have 3 hinges.

C. Doors for all lockers shall be flush panel, with one piece molded polypropylene recessed handles.

D. Lockers shall be complete with sides, backs, tops and bottoms. Bottoms shall be reinforced pan construction. Backs, sides, tops and other parts shall be formed and reinforced as necessary. Joints shall be neatly made, and lockers shall be sturdy and rigid. Leading edges of shelves and interior dividers shall be channel shaped. Ventilating louvers for each locker located in top and bottom of locker front (not in doors).

E. Number plate with three (3) 3/4" high etched black numbers for each locker, recessed in top of door handle. Numbers shall be as directed by the Architect.

F. Furnish 16 gauge finished end panels for exposed ends. End panels shall be full width and height of locker bank. End panels shall fit to back wall, covering space between back of locker and wall.

G. Furnish filler panels where banks of lockers are set in a recess or are indicated to extend from wall to wall, one end abuts wall, inside corner intersections and elsewhere as indicated on the drawings.

## 2.2 FINISH

A. Steel parts shall be thoroughly cleaned after fabrication, bonderized and given one coat of the manufacturer's standard, baked-on enamel. Colors shall be custom color as selected by the Architect.

## 2.3 LOCKERS

A. Lockers shall be Sturdy Steel Deluxe Style and shall be as follows:

1. Type "A" lockers shall be 15" wide, 18" deep and 72" high (not including base) Sturdy Steel 2 in 1 two compartment lockers.

2. Type "B" lockers shall be 15" wide, 18" deep and 72" high (not including base) Sturdy Steel S/S Deluxe single tier lockers.

B. Lockers shall be designed for mounting on a wood base.

C. Lockers shall be flat top lockers.

D. Each locker shall have one shelf and 3 single prong side hooks.

E. Each lockers shall be equipped with a latching mechanism, rubber silencers and a locking device. Locking device shall be channel shaped operating within the door channel and shall provide 3-point locking. Locking device shall be prelocking type so mechanism can be locked in the open position and door will automatically lock when closed. Handle shall be designed to receive a padlock.

F. Each door in locker Type "A" shall have a 1/2" x 8" cut out for mail slot.

## 2.4 COMBINATION LOCKS

A. Each locker shall also be equipped with a Master Lock Company No. 1654, or approved equal, built-in key controlled, automatic combination lock.

B. Control system for combination locks shall be as directed by the Owner. Furnish control charters in duplicate.

PART 3: EXECUTION

3.1 ERECTION

A. Erect lockers plumb, true and square in a rigid and substantial manner. Erect no more than four lockers in a bank at one time. Individual lockers shall be attached to each other, and banks of island lockers shall be bolted together. As a minimum, anchor each locker to wall. Securely anchor lockers to floor and walls.

B. After erection, clean surfaces and touch up with factory furnished matching enamel. Adjust hardware and leave in good operating condition.

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## PART 1: GENERAL

1.1 SCOPE

A. Conditions of Contract and Division 1 - General Requirements, apply to all work of this section. Refer to Article 12 of the Instructions to Bidders, Article 7 of the General Conditions and Section 01600 - Materials and Equipment for requirements on pre-bid and post-bid evaluation of proposed substitute products, methods and other conditions.

B. The extend of wire mesh partitions is shown on the drawings.

C. Related Work Specified Elsewhere:

1. Lock Cylinders - Section 08700.

1.2 QUALITY ASSURANCE

A. Provide each type of wire mesh partitions as a complete unit produced by a single manufacturer, including necessary mounting accessories, fittings, and fastenings.

1. Manufacturer: Provide wire mesh partitions as manufactured by one of the following:
  - a. Acorn Wire and Iron Works, Inc.
  - b. Kentucky Metal Products Co.
  - c. Miller Wire Works, Inc.
  - d. Superior Wire and Metal Products, Inc.
  - e. Wire and Iron Works, Inc.

B. Field Measurements:

1. Take field measurements prior to preparation of shop drawings and fabrication, where possible, to ensure proper fitting of the work. However, do not delay job progress; allow for adjustments and fitting wherever the taking of field measurements before fabrication might delay the work.

C. Inserts and Anchorages:

1. Furnish inserts and anchoring devices which must be set in concrete or built into masonry for the installation of the mesh partition work. Coordinate delivery of inserts and anchorages with other work to avoid delay.

2. See concrete and masonry sections of these specifications for installation of inserts and anchorage devices.

1.3 SUBMITTALS

A. Shop Drawings: Wire Mesh Part-tions:

1. Submit shop darwings for fabrication and erection of wire mesh partitions. Include plans, elevations, and large scale details.

2. Show anchorage and accessory items. Provide location template drawings for items supported or anchored to permanent construction.

#### 1.4 PRODUCT DELIVERY, HANDLING AND STORAGE

A. Do not deliver units until construction is substantially complete and ready for their installation. Protect from damage during delivery, handling, storage and installation.

### PART 2: PRODUCTS

#### 2.1 MATERIALS AND FABRICATION

A. General: All dimensions specified for components are minimum. Do not use components less than the size indicated; use larger size components as recommended by partition component manufacturer.

B. Mesh: 10 gage (0.135") crimped steel wire woven into 1-1/2" mesh, clinched and secured to frame members.

C. Frames: Provide cutouts for pipes, ducts, beams, and other items shown or necessary for partition installation. Finish edges of cutouts with channels matching adjacent frame members.

1. Vertical Members: 1-1/4" x 5/8" x 1/8" cold-rolled steel C-Section channels with 1/4" bolt holes approximately 15" o.c. Extend about 3" below bottom horizontal frame members.

2. Horizontal Members: 1" x 1/2" x 1/8" cold-rolled steel channels, mortised and tenoned to vertical members.

3. Horizontal Reinforcing Members: 1" x 1/2" x 1/8" cold-rolled steel channel with wire woven through, or two 1" x 3/8" channels bolted or riveted to each side of mesh, and secured to vertical members. Provide number of horizontal reinforcing members to suit panel height as recommended by partition manufacturer.

D. Top Capping Bars: 2-1/4" x 1" cold-rolled steel channels, secured to top framing channel with 1/4" U-bolts spaced not more than 28" o.c.

E. Corner Posts: 1-1/4" x 1-1/4" x 1/8" angles with 1/4" bolt holes to align with bolt holes in vertical frame members, and floor plate.

1. For other than 90 degrees intersections, use manufacturer's recommended tubular corner posts and installation accessories.

F. Floor Shoes: Cast iron, sized to suit vertical framing and to provide approximately 3" clear space between finish floor and bottom horizontal frame members. Furnish units with set screw for leveling adjustment.

G. Hinged Door: Door frame of 1-1/4" x 1/2" x 1/8" channel with 1-1/4" x 1/8" flat bar cover plate on 3 sides, and matching 1/8" thick angle strike bar and cover on lock side. Provide 1-1/2" pair butt hinges riveted or welded to door and frame, and bronze mortise type cylinder lock operated by key outside with recessed knob inside. Align bottom of door to meet bottom adjacent panels.

1. Cylinders for locks are specified in the Section 08700.

H. Line Posts: Where partition runs exceed 20' without connection to overhead framing, furnish manufacturer's standard line posts and base plates located at recommended intervals to ensure partition rigidity and stability.

I. Finish: Manufacturer's standard shop-applied enamel finish.

1. Provide colors of materials for wire mesh partitions as selected by the Architect from manufacturer's standard colors.

### PART 3 EXECUTION

#### 3.1 INSPECTION

A. Installer must examine the areas and conditions under which mesh partition units are to be installed and notify the Contractor in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the Installer.

#### 3.2 INSTALLATION

A. Provide all bolts, hardware and accessories for complete installation.

B. Erect partitions plumb, rigid, properly aligned, and securely fastened in place. Adjust opening and closing units to operate freely without bind.

C. Provide additional field bracing as shown or necessary for rigid, secure installation.

D. Touch-up paint damaged finish after completion of installation using field-applied paint to match color of shop-applied finish.

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## PART 1: GENERAL

1.1 SCOPE

A. Conditions of Contract and Division 1-General Requirements, apply to all work of this section. Refer to Article 12 of the Instructions to Bidders, Article 7 of the General Conditions and Section 01600 - Materials and Equipment for requirements on pre-bid and post-bid evaluation of proposed substitute products, methods and other conditions.

B. Work under this section includes all folding accordion type partitions, identified as Folding Partitions Type "B".

C. Related work specified elsewhere:

1. Masonry: Section 04200.
2. Support Assemblies: Section 05500.
3. Carpentry: Section 06100.
4. Wood Doors: Section 08200.
5. Operable Walls (Folding Partition Type "A") Section 10630.

1.2 SUBMITTALS

A. Shop Drawings: Submit fabrication and installation drawings of each partition type and opening schedules for all folding partitions in accordance with Section 01300.

B. Samples: Submit samples of complete color line of fabrics and finishes to the Architect for selection. Any number of colors may be selected.

C. Test Data: Submit reports by approved independent testing laboratory certifying each partition proposed to be furnished for the Project has been tested as a full size working assembly (14' x 9' test opening) in accordance with ASTM E90-70 and the assembly meets or exceeds the specified STC requirements.

1.3 PRODUCT HANDLING

A. Package, handle, transport, store and erect at the jobsite in a manner that will avoid damage. Damaged, dented or torn material or panels will be cause for rejection.

1.4 QUALIFICATIONS

A. Manufacturer: The products of New Castle Products, Incorporated are specified to establish standards of quality of appearance, performance and workmanship. The products of Richards - Wilcox Manufacturing Co., Holcomb & Hoke Manufacturing Co., Inc., or approved equal, are acceptable subject to the approval by the Architect of minor deviations from these specifications and the details of installation. The sound transmission class shall be as specified, or greater.

## PART 2: PRODUCTS

### 2.1 FOLDING PARTITION TYPE "B"

A. Folding Partitions Type B shall be manual operated accordion folding acoustical partitions complete with tracks, and accessories indicated on the drawings, specified herein, or required to complete the installation. Folding partitions shall be New Castle Products, Modernfold Soundmaster #12, or approved equal, meeting the requirements specified herein.

B. Sound Transmission Class (STC): The folding partitions shall have an STC class of not less than 40.

C. Construction: True pantograph action consisting of center double-overlap 16 gauge steel hinge plates connected vertically by 3/16" steel rods welded in place. Over 12'-0" high, double truss row 12-1/4" x 8-1/4" at top, single row at bottom and intermediate rows approximately 42" on center. Trolley pins at 1/4" diameter high tensile alloy steel to be encased by structural hinge plate channel.

D. Sound Insulation: 22 gauge V-grooved steel panels 5-1/16" wide and heavy vinyl flame-resistant acoustical membrane. Each panel attached to frame with 4 steel leaf fasteners.

E. Perimeter Seal: Pairs of flexible sealing sweep strips at top and bottom. Vertical male lead post molding to seal into polyurethane foam lined female sound channel.

F. Hardware: Satin chrome grip hand pulls, with master-keyed locks. Master keyed cylinders furnished by others. Locks where specified, shall be an integral part of the pull. Hook bolts shall not protrude from lead post. Operable walls shall have pull-in latches with retracting hook bolt to effect final closure.

G. Track and Trolley System: Track to be 1 1/2" by 1-3/4" x 14 gauge roll-formed steel self-cleaning track with positive splice alignment feature, with flanged ball bearing trolleys.

H. Jamb Lock: Backpost to be secured and sound-sealed to the wall by the "jamb lock" mechanism concealed within the backpost to provide a quick means of releasing and re-attaching the partition for cleaning and decorative purposes.

I. Ceiling Contact Guard: Shall be furnished to protect finished ceiling, installation shall be flush with ceiling line, with no exposed fastenings.

J. Lead and Back Posts: 14 gauge steel.

K. Air Release System: Air trapped within the operable wall to be released during entire stacking operation through 3/8" diameter holes, which comprise a minimum of 5% of lead post face area.

L. Stacking Space: Approximately 1 1/2" per lineal feet; 1-3/4" over 17'-0" high plus posts, straight doors only. Consult factory for exact dimensions.

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M. Cover: Tedlar-Clad Glass-Mesh, 36 ounces per lineal yard 54" wide, consisting of polyvinyl chloride polymer on woven glass fabric backing, wear surface shall be a laminate of DuPont "Tedlar" for stain resistance. Tear strength shall exceed maximum capacity of test instrument when tested per Federal Standard 191 Method 5132. Tensile strength shall be no less than 311 pounds x 251 pounds (warp x fill) when tested according to Federal Standard 191 Method 5100.

N. Flame Resistance: The fabric shall have a Flame Spread Rate no greater than 15 when tested per ASTM E84. Glass-Mesh shall further comply with the provisions of, or be found acceptable by the following: New York Board of Standards and Appeals, Rules for Flameproof Materials; Fire Department, City of Boston; National Fire Protection Association; Ohio Building Code Section 1203.34.

### PART 3: EXECUTION

#### 3.1 INSPECTION OF OPENINGS

A. Inspect openings and other work prepared under other sections which affect the first class installation of folding partitions and perform no installation until all deficiencies have been corrected. Commencement of installation of folding partitions shall be construed as acceptance of all conditions and responsibility for proper operation and performance of the installed partition.

#### 3.2 INSTALLATION

A. Folding partitions shall be installed by the partition manufacturer or his authorized representative.

B. Install folding partitions strictly in accordance with manufacturer's recommendations and approved erection drawings. Erect hardware and partitions in a substantial manner complete with operators and all accessories. Upon completion, lubricate operating parts according to manufacturer's instructions, adjust partitions and controls for ease of operation and leave installation clean, in good operating condition. Make all adjustments to insure the performance, including prompt follow-up service as required during the guarantee period.

C. The partition subcontractor shall assume full responsibility for the field performance of the "in-place" partition assemblies. The entire assembly includes the entire sealing at perimeters and the tracks. At the discretion of the Owner or Architect, field tests on the completed assemblies may be performed in accordance with ASTM E336-71. The field performance shall not be greater than 4 to 6 STC below the laboratory STC value specified for the partition. Should the assembly fail the laboratory tests, corrections shall be made by this subcontractor and the cost of the test paid by the subcontractor. If the assembly passes, the Owner will pay for the tests.

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## PART 1: GENERAL

1.1 SCOPE

A. Conditions of Contract and Division 1 - General Requirements - apply to all work of this section. Refer to Article 12 of the Instructions to Bidders, Article 7 of the General Conditions and Section 01600 - Materials and Equipment - for requirements on pre-bid and post-bid evaluation of proposed substitute products, methods and other conditions.

B. Work under this section includes all operable walls (folding panel type partitions) identified as Folding Partition Type "A".

C. Related work specified elsewhere:

1. Masonry: Section 04200.
2. Support assemblies: Section 05500.
3. Carpentry: Section 06100.
4. Wood doors: Section 08200.
5. Partitions: Section 09100.
6. Folding partitions (Type "B"): Section 10620.

1.2 SUBMITTALS

A. Shop Drawings: Submit fabrication and installation drawing of each partition type and opening schedules for all operable walls in accordance with Section 01300.

B. Samples: Submit samples of complete color line of fabrics and finishes to the Architect for selection. Any number of colors may be selected.

C. Test Data: Submit reports by an approved independent testing laboratory certifying the operable wall proposed for use in this Project has been tested in a full size 14' x 9' test opening working assembly in accordance with ASTM E90-70 and the assembly meets or exceeds the specified STC requirements.

1.3 PRODUCT HANDLING

A. Package, handle, transport, store and erect at the jobsite in a manner that will avoid damage. Damaged, dented or torn material or panels will be cause for rejection.

1.4 QUALIFICATIONS

A. Manufacturer: The products of New Castle Products, Incorporated are specified to establish standards of quality of appearance, performance and workmanship. The products of Richards-Wilcox Manufacturing Co., Holcomb & Hoke Manufacturing Co., Inc., or approved equal, are acceptable subject to the approval by the Architect of minor deviations from these specifications and the details of installation. The sound transmission class shall be as specified or greater.

## PART 2: PRODUCTS

### 2.1 FOLDING PARTITION TYPE "A"

A. Folding partition type "A" shall be manual operated folding panel operable walls complete with tracks and accessories indicated on the drawings, specified herein or required to complete the installation. Operable wall shall be New Castle Products, Inc., Modernfold Acousti-Seal Model #906 (odd number of full size panels) or Model #908 (even number of full size panels), or approved equal meeting the requirements herein.

B. Sound Transmission Class (STC): An STC of no less than 50.

C. Operation: Operable wall shall consist of a series of paired top-supported manually operated panels. Each panel shall be equipped with a 1" automatic drop seal. Each pair of panels shall be pushed into position, automatically setting the drop seal mechanism. An operable panel with 3" travel shall make the final closure. Final positive compression of the panels for sound seal may be accomplished by a lever-operated operable panel (not operable jamb).

D. Suspension System: The suspension system shall consist of a continuous cold rolled steel track, supported by adjustable steel hanger brackets connected to the structural support by threaded rods. Each panel shall be supported by the trolley assembly consisting of four flangeless steel wheels with steel ball bearings. Wheel diameter shall be a minimum 1-5/8" with 3/8" tread.

E. Panels: Panels shall be type "A" factory assembled units 3" thick, heights and widths as shown on the plans and/or determined by Modernfold Engineering. Panels construction shall consist of 20 gauge steel panel skins specially laminated to Gyp-Core sound retarding liner. Panel frames shall be 16 gauge cold rolled steel. Panel skins shall be welded to frame with continuous seams, no clips, screws or other mechanical fasteners shall be permitted. Factory installed fabric covering shall wrap around edges of the panel and be concealed beneath the astragal. Bright trim or exposed fasteners will not be acceptable.

F. Sound Seals: Vertical seals between panels shall consist of a tongue and groove steel astragal with built-in extruded vinyl sound seal. Horizontal top seals shall be continuous contact multi-finger vinyl. Operable floor seals shall provide 1" operating clearance and be activated by the final closing action of the partition. Floor seals shall compensate for live load deflection and be self-adjusting.

G. Ceiling Contact Guard: Provide guard and mounting brackets as required to protect finished ceilings, prefinished, vinyl-alkyd white. Installation shall be flush with ceiling line, with no exposed fastenings.

H. Panel Finish: All panels shall be factory finished with "Illustra-Cote", as manufactured by Moderncote, Inc., New Castle, Indiana or approved equal, meeting the following requirements:

1. Writing surface shall be of composition that readily lends to application of colored felt markers, both water soluble and permanent types. Markings shall adhere with uniformity and clarity, but remove easily and completely with erasure procedures.

2. The surface shall be resistant to staining by even the most tenacious substances like tar, lipstick and grease and withstand the harshest cleaning agents like paint remover, lacquer thinner and MEK.

3. It shall resist corrosive acids, alkalies, caustics - in effect be so inert there is no commercial solvent for it.

4. It shall not crack, check, or chip; shall stand up to prolonged rubbing and cleaning and remain impervious to moisture.

5. Color retention of the white matte surface shall be such as to present excellent projection screening for movies, slides and superimposings.

### PART 3: EXECUTION

#### 3.1 INSPECTION OF OPENINGS

A. Inspect openings and other work prepared under other sections which affect the first class installation of operable walls and perform no installation until all deficiencies have been corrected. Commencement of installation of operable walls shall be construed as acceptance of all conditions and responsibility for proper operation and performance of the installed partition.

#### 3.2 INSTALLATION

A. Operable walls shall be installed by the wall manufacturer or his authorized representative.

B. Install operable walls strictly in accordance with manufacturer's recommendations and approved erection drawings. Erect hardware and partitions in a substantial manner complete with operators and all accessories. Upon completion, lubricate operating parts according to manufacturer's instructions, adjust partitions and controls for ease of operation and leave installation clean, in good operating condition. Guarantee proper, smooth and easy operable installations. Make all adjustments to insure the performance, including prompt follow-up service during the guarantee period.

C. The operable wall subcontractor shall assume full responsibility for the field performance of the "in-place" partition assemblies. The entire assembly includes the entire sealing at perimeters and the tracks. At the discretion of the Owner or Architect, field tests on the completed assemblies may be performed in accordance with ASTM E336-71. The field performance shall not be greater than 4 to 6 STC below the laboratory STC value specified for the partition. Should the assembly fail the tests, corrections shall be made by this subcontractor and the cost of the test paid by the subcontractor. If the assembly passes, the Owner will pay for the tests.

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## PART 1: GENERAL

1.1 SCOPE

A. Conditions of Contract and Division 1 - General Requirements, apply to all work of this section. Refer to Article 12 of the Instructions to Bidders, Article 7 of the General Conditions and Section 01600 - Materials and Equipment - for requirements on pre-bid and post-bid evaluation of proposed substitute products, methods and other conditions.

B. Work under this section includes furnishing all accessories shown on drawings and specified herein.

C. Related work specified elsewhere:

1. Mirrors: Section 08800.

1.2 GENERAL INFORMATION

A. For recessed items of this Section; either furnish the item with attached anchors for building in as walls are laid or furnish appropriate anchors for building in as walls are laid for attachment of the items where it is to be installed in the recess later.

B. For non-recessed items; furnish appropriate hangers or other fastening devices for building in as walls are laid for later attachment of the item. Provide anchorage devices which will insure secure, permanent attachment.

C. Verify mounting, locations and heights.

1.3 SUBMITTALS

A. Shop Drawings: Submit shop drawings and/or manufacturer's literature on all accessories, showing all anchorage devices. In accordance with Section 01300.

## PART 2: PRODUCTS

2.1 MANUFACTURERS

A. Acceptable manufacturers are listed under each item specified herein.

2.2 TOILET PAPER HOLDER (T.P.H.)

A. Provide one holder for each water closet, whether in a toilet compartment or individual room, with proper mounting and fastening devices for the surface on which it is mounted. Furnish appropriate anchors for fastening devices to the proper trade to build in as work progresses. Provide devices to insure secure permanent attachment.

B. Provide heavy duty, cast aluminum, satin finish, theft-proof for roll type tissue, Bobrick B-274 double roll restricted delivery in all public toilet rooms, B-2730 single roll without restricted delivery in all private toilet rooms.

C. Acceptable manufacturers: Bobrick, Pocono, Parker, Watrous, Bradley.

### 2.3 SANITARY NAPKIN RECEPTOR (S.N.R.)

A. Recessed in walls behind each water closet in women's toilet. Model 473, sanitary napkin disposal as manufactured by Bradley Wash Fountain Co. Fabricated of 22 gauge, type 304, stainless steel. Self-closing push door, with piano hinge. Removable stainless steel receptacle.

B. Acceptable Manufacturers: Units by Bradley Wash Fountain Co., Bobrick Washroom Equipment, Inc. and The Charles Parker Co., conforming to these specifications will be acceptable.

### 2.4 PAPER TOWEL DISPENSER RECEPTOR (P.T.D.R.)

A. Recessed, semi-recessed or surface mounted as indicated on drawings, Model 225, towel dispenser and waste receptacle; modify units for handicapped (Model 2252), receptor compartment 22" high, dispenser recess 21" high and towel storage compartment 29" high. Units as manufactured by Bradley Wash Fountain Co. Fabricated of 22-gauge, type 304, stainless steel, exposed surfaces to have satin finish. Removable stainless steel liner for waste receptacle. Spacing collars as required for semi-recessed or surface mounted units. Doors equipped with tumbler locks, all companion units keyed alike.

B. Acceptable Manufacturers: Units by Bradley Wash Fountain Co., Bobrick Washroom Equipment, Inc. and The Charles Parker Co., or approved equal, conforming to these specifications will be acceptable.

### 2.5 GRAB BARS

A. Mounted in all toilet partitions with "outswinging" doors, on both sides; and elsewhere as indicated on drawings. Series 817 SK-005 and 817 SK-006 (both sides) 1-1/2" diameter with safety grip, 90° angle, type 304 stainless steel as manufactured by Bradley Wash Fountain Co. Fastenings as recommended by manufacturer to withstand 500 pound pull. Maximum projection of outside of grab bar from wall shall be 3 inches.

B. Acceptable Manufacturers: Units by Bradley Wash Fountain Co., Bobrick Washroom Equipment, Inc. and The Charles Parker Co., or approved equal, conforming to these specifications will be acceptable.

### 2.6 TOWEL HOOKS (AT ALL SHOWERS)

A. Provide towel bars at all showers; verify mounting with Architect. Model 908, 1" round towel bar, 24" long, 18-gauge stainless steel, C.P. brass posts, as manufactured by Bradley Wash Fountain Co.

B. Acceptable Manufacturers: Units by Bradley Wash Fountain Co., Bobrick Washroom Equipment, Inc. and The Charles Parker Co., or approved equal, conforming to the specifications will be acceptable.

### 2.7 SHOWER CURTAIN RODS

A. Furnish were indicated on drawings; Model SL175-S stainless steel, 1" diameter x 18 gauge, slotted tubing with No. 253 beaded roller hooks (hooks 6" o.c. plus one), wall flanges 170S, as manufactured by Pocono Metal Products Co., Inc.



B. Curtains - White Nylon 250N; fully reinforced wide top hem and a reversed bottom hem (to prevent water and soap from collecting); rustproof metal grommets at 6" o.c. and 3/4" down from top edge; fullness - 10% wider than opening.

C. Acceptable Manufacturers: Pocono Metal Products Co., Inc., or approved equal, conforming to these specifications will be acceptable.

#### 2.8 SHOWER SEAT

A. Provide tip-up bath seat, wood and chrome plated brass construction, Bradley No. 954 or approved equal.

#### 2.9 MEDICINE CABINET

A. Provide Bobrick B-398, Type 304 stainless steel satin finish with 1/4" mirror.

B. Acceptable manufacturers: Bobrick, Bradley, Parker, or approved equal.

#### 2.10 LAVATORY SHELF

A. Provide lavatory shelf equipment item M 615, stainless steel, 5" deep, length as shown, Bobrick B-295 or equivalent product of Bradley, Parker, or approved equal.

#### 2.11 COAT HOOKS

A. Provide on door at all toilet rooms where water closets are not enclosed by partitions. Model P-A27 coat hook, cast aluminum with silver acrylic finish or natural anodized aluminum finish, as manufactured by Vogel-Peterson Co.

B. Acceptable Manufacturers: Vogel-Peterson, Bradley Wash Fountain Co., The Charles Parker Co., or approved equal, conforming to these specifications will be acceptable.

#### 2.12 LAVATORY CONSOLE

A. Provide at locations indicated.

B. Provide Bobrick B-576 stainless steel hospital console unit combining light fixture, mirror interior shelf, towel dispenser, cup dispenser, convenience outlet, light switch, recessed shelf, soap dispenser, lavatory and waste receptacle.

C. Lavatory trim shall be gooseneck spout with foot controlled water supply.

D. Acceptable manufacturers" Bobrick, Bradley, Watrous.

### PART 3: EXECUTION

#### 3.1 INSTALLATION

A. Install in strict accordance with manufacturer's instructions and the approved shop drawings.

## PART 1: GENERAL

1.1 SCOPE

A. Conditions of Contract and Division 1, General Requirements, apply to all work of this section. Refer to Article 12 of the Instructions to Bidders, Article 7 of the General Conditions and Section 01010, Summary of Work and Special Requirements, for requirements on pre-bid and post-bid evaluation of proposed substitute products, methods and other conditions.

B. Work under this section includes furnishing and installing all laboratory equipment indicated on the drawings or specified herein.

C. Related Work Specified Elsewhere:

1. Connection of hot water, cold water, steam, distilled water and waste piping: Division 15.

2. Electrical Connection: Division 16.

D. Furnished by Owner:

1. Refer to Equipment Schedules for Group II equipment furnished and installed by Owner.

1.2 SUBMITTALS

A. Shop Drawings: Submit shop drawings in accordance with Section 01300. Shop drawings shall include rough-in dimensions for utility services.

B. Operating and Maintenance Instructions: Submit written operating and maintenance instructions and instruct the Owner's personnel in the use and maintenance of all equipment furnished under this section (Refer to Section 01700).

C. Submit certification of conformance by independent testing laboratory with all performance criteria specified in each item of equipment requiring testing.

1.3 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver, store and handle laboratory equipment in a manner that will prevent damage. Repair or replace damaged items.

1.4 POWER CHARACTERISTICS

A. Electrical power shall be 120 volt, single phase, 60 Hz and 208 volt, 3 phase, 60 Hz alternating current. Heating loads larger than 1.8 KW shall be 208 volt, single phase. Motors larger than 1/2 H.P. shall be 208 volt, 3 phase.

1.5 COORDINATION

A. The laboratory equipment subcontractor shall be responsible for coordination with the Mechanical Contractor, Electrical Contractor and other contractors and subcontractors having casework, piping, equipment, fixtures, outlet boxes or fittings connecting into or mounted on or adjacent to the laboratory equipment.

B. Contact other contractors directly and provide connection requirements, fixture and equipment sizes and locations, rough-in dimensions, holes and cutout sizes and locations, equipment weights and supports required, methods of attachment and space requirements to connect and service equipment.

## 1.6 SCHEDULE OF LABORATORY EQUIPMENT

A. Refer to drawings and equipment schedule sheet A12-1 for reference, to location and connection requirements for all laboratory equipment.

### PART 2: PRODUCTS

#### 2.1 EQUIPMENT ITEM L130 - LAMINAR FLOW HOOD

A. Equipment Item L130 shall be a horizontal laminar flow hood.

B. Horizontal laminar flow hood shall be Baker Model No. EG-3252, or approved equal.

C. Overall dimensions shall be 38 in. wide x 34 in. deep by 63 in. high.

D. Cabinet exterior shall be of not less than No. 18 gauge cold-rolled steel. Steel surfaces shall have a white polyurethane painted finish. Work surface and inner work area side walls shall be of stainless steel.

E. Hood shall have a washable Scott foam prefilter and a HEPA final filter with a minimum efficiency of 99.99% for removal of particles in the size range of 0.3 microns and larger.

F. Dampers and speed controllers shall be provided to permit regulation of the blower throughout the full range of pressure drop change encountered.

G. Work area shall be equipped with special air, special vacuum, and gas services and cocks. A duplex receptacle outlet shall be provided within the work area. A fluorescent light fixture shall provide a minimum light intensity of 200 foot candles at the work surface.

H. Unit shall conform to the requirements of Federal Standard 209b.

I. Test units for conformance with specified performance and submit certification by independent testing laboratory.

#### 2.2 EQUIPMENT ITEM L131-LAMINAR FLOW HOOD

A. Equipment Item L131 shall be a vertical laminar flow containment hood.

B. Vertical laminar flow containment hood shall be Baker Model No. VBM-400, or approved equal.

C. Overall dimensions shall be 52½" wide by 33½" deep by 99-¾" high.

D. Cabinet exterior shall be of not less than No. 18 gauge cold-rolled steel with a white polyurethane paint finish. Work surface and inner work area side-walls shall be of stainless steel.

E. Hood shall have a 1/4" thick safety plate glass sliding front view screen. An alarm shall sound to indicate when view screen is in an unsafe position while hood is in use. The screen shall be capable of being moved to a full closed position when the hood is not in use.

F. Unit shall have two front-loading HEPA filters, one for exhaust and one for supply. The filters shall have a minimum efficiency of 99.99% for removal of particles in the size range of 0.3 microns or larger. A speed control shall be provided to permit regulation of the blower throughout the full range of pressure drop change encountered. A suction gauge shall be provided to indicate if sufficient air flow is being provided to the working area for proper containment.

G. A duplex receptacle electrical outlet with drip-proof covers shall be provided within the work area. A fluorescent light fixture providing a minimum light intensity of 100 foot candles at the work surface, shall be mounted on the outside of the cabinet. Provide an ultra-violet germicidal lamp within the work area.

H. A drain valve on the lower pan shall allow for drainage of spills in work area.

I. Unit shall be capable of passing the Biological Tracer Containment tests, Section 4.1.3 of the N.I.H. Specification NIH 03-112c, dated September 17, 1974.

J. Test units for conformance with specified performance and submit certification of same by independent testing laboratory.

### 2.3 EQUIPMENT ITEM L132-LAMINAR FLOW HOOD

A. Equipment Item L-132 shall be a horizontal laminar flow hood.

B. Horizontal laminar flow hood shall be Baker Model No. EG-4252, or approved equal.

C. Overall dimensions shall be 52½" wide by 33½" deep by 99-3/4" high.

D. Cabinet exterior shall be of not less than No. 18 gauge cold-rolled steel. Steel surfaces shall have a white polyurethane painted finish. Work surface and inner work area side walls shall be of stainless steel.

E. Hood shall have a washable Scott foam prefilter and a HEPA final filter with a minimum efficiency of 99.99% for removal of particles in the size range of 0.3 microns and larger.

F. Dampers and speed controllers shall be provided to permit regulation of the blower throughout the full range of pressure drop change encountered.

G. Work area shall be equipped with special air, special vacuum, and gas services and cocks. A duplex receptacle outlet shall be provided within the work area. A fluorescent light fixture shall provide a minimum light intensity of 200 foot candles at the work surface. Unit in Room 2-115 shall have special vacuum and gas services only.

H. Unit shall conform to the requirements of Federal Standard 209b.

I. Test units for conformance with specified performance and submit certification by independent testing laboratory.

## 2.4 EQUIPMENT ITEM L133-LAMINAR FLOW STATION

- A. Equipment Item L133 shall be a biohazard laminar flow station.
- B. Horizontal laminar flow station shall be Baker Model No. B40-112 Biogard Hood, or approved equal.
- C. Overall dimensions shall be 50½" wide by 33" deep by 79" high.
- D. Cabinet exterior shall be of not less than No. 14 gauge cold-rolled steel and No. 12 gauge stainless steel. Entire work area shall be of stainless steel. Work area side walls and rear wall shall be of one-piece construction. Radius corners in work area and work surface.
- E. Station shall have a 1/4" thick safety plate glass front view screen with a full width 10" high access to work area below the screen.
- F. Station shall have two front-loading HEPA filters, one for exhaust and one for supply. The filters shall have a minimum efficiency of 99.99% for removal of particles in the size range of 0.3 microns or larger. A speed control shall be provided to permit regulation of the blower throughout the full range of pressure drop change encountered and to compensate for voltage change.
- G. Two duplex receptacle electrical outlets with drip-proof covers shall be provided in the work area and shall be switch controlled. A fluorescent light fixture providing a minimum light intensity of 100 foot candles at the work surface, shall be mounted on the outside of the cabinet. Provide an ultra-violet germicidal lamp within the work area.
- H. Work area shall be equipped with special air, special vacuum and gas services and cocks. Connection points to building services shall be on sidewall of station near floor. Electrical plugs shall be two NEMA No. 5-15 plugs.
- I. Unit shall be leak tight and shall be capable of passing all tests of Section 4 of N.I.H. Specification NIH 03-112c, dated September 17, 1974.
- J. Test units for conformance with specified performance and submit certification of same by independent testing laboratory.

## 2.5 EQUIPMENT ITEM L134-LAMINAR FLOW HOOD

- A. Equipment Item L134 shall be a horizontal laminar flow hood.
- B. Horizontal laminar flow hood shall be Baker Model No. EG-6252, or approved equal.
- C. Overall dimensions shall be 74" wide by 34" deep by 63" high.
- D. Cabinet exterior shall be of not less than No. 18 gauge cold-rolled steel. Steel surfaces shall have a white polyurethane painted finish. Work surface and inner work area side walls shall be of stainless steel.

E. Hood shall have a washable Scott foam prefilter and a HEPA final filter with a minimum efficiency of 99.99% for removal of particles in the size range of 0.3 microns and larger.

F. Dampers and speed controllers shall be provided to permit regulation of the blower throughout the full range of pressure drop change encountered.

G. Work area shall be equipped with air, vacuum, carbon dioxide and gas services and cocks. A duplex receptacle outlet shall be provided within the work area. A fluorescent light fixture shall provide a minimum light intensity of 200 foot candles at the work surface.

H. Unit shall conform to the requirements of Federal Standard 209b.

I. Test units for conformance with specified performance and submit certification by independent testing laboratory.

#### 2.6 EQUIPMENT ITEM L-211-GLASS DRYER

A. Equipment Item L-211 shall be a cabinet enclosed, electric heated, forced hot air convection type glassware dryer.

B. Glassware dryer shall be Castle Model K-7509 or approved equal. Better Bilt Machinery Corporation Turbo Dryer Series 8000, Type I will be considered an approved substitution.

C. Drying chamber shall be 26-5/8" wide x 26-9/16" deep x 55" high and shall accommodate 4 glassware racks. Glassware racks shall be the same as used with the manufacturer's glassware washers specified under Article 2.3 (Equipment Item L-326) below.

D. Drying chamber shall have 3 adjustable stainless steel wire shelves and one fixed shelf. The fixed shelf shall be equipped with tracks to mate with the transfer cart specified under Article 2.3 and receive the glassware washer's spindle header rack.

E. Drying chamber shall be insulated double wall construction with a stainless steel interior. Cabinet exterior and door shall be stainless steel, Type 304.

#### 2.7 EQUIPMENT ITEM L275 - SMALL DRYING OVEN

A. Equipment Item L275 shall be Fisher Scientific Company Model No. 176 Isotemp Oven with dual control, 1-3/4 cubic foot capacity, catalog 13-244-176, 40° to 250°C temperature range.

B. Provide special right angle thermometer 13-244-131.

#### 2.8 EQUIPMENT ITEM L286-OVEN/GLASSWARE DRYER/STERILIZER

A. Equipment Item L286 shall be an oven/glassware dryer/sterilizer.

B. Oven/glassware dryer/sterilizer shall be Hotpack Model No. 206200, or approved equal.

C. Overall dimensions shall be 39" wide by 31" deep by 92" high.

D. Cabinet exterior shall be heavy-gauge steel, treated for rust prevention, and given a baked-on chip-proof enamel finish.

E. Interior of cabinet shall be of polished stainless steel.

F. Cabinet walls shall be insulated with glass fiber insulation. Door of unit shall be gasketed with a double strip of asbestos gasket, and door latches and hinges shall be of chrome plated brass. Shelving shall be adjustable.

G. Heating elements shall be electrical resistance type of nickel-chromium. Temperature shall be thermostatically controlled, accurate to plus or minus 0.5 degrees C.

C. Automatic over-temperature protection shall be included.

H. Unit shall be equipped with a single pen, 10" recorder, and with an electrical timer, installed for automatic oven shut-off on 24 hour cycles.

#### 2.9 EQUIPMENT ITEM L291 - DRYING OVEN

A. Equipment Item L291 shall be Fisher Scientific Co. Model No. 349 Isotemp Oven with dual control, 3-3/4 cubic foot capacity, catalog 13-244-349, 40° to 250°C temperature range, + or - 0.5°C control sensitivity, uniformity + or -2.5°C, recovery less than 5 minutes.

B. Provide special right angle thermometer 13-244-131.

#### 2.10 EQUIPMENT ITEM L318 - NECROPSY TABLE

A. Equipment Item L318 shall be Animal Autopsy Table, Amsco Model CP10-200-000 with the following options:

1. Waste Disposer.
2. Table Extension
3. Instrument Tray
4. Specimen Basket
5. Tie-down Cleats
6. Perforated Sink Panel

#### 2.11 EQUIPMENT ITEM L-326 - GLASS WASHER

A. Equipment Item L-326 shall be a cabinet enclosed, front loading, steam heated, laboratory glassware washer.

B. Washers shall be Better Bilt Machinery Corporation Turbomatic Series 3000, Type I, Castle K-7504 or approved equal. Circulating pump motor shall be 7½ HP. Provide Graham 8WXF-12 Heliflow booster heater.

C. Cabinet and washing compartment shall be constructed of Type 304 stainless steel.

D. Washer shall be front loading with a double guillotine door. Door shall have adequate support when open to act as a loading platform. Door shall have tracks to receive removable headers.

E. Washing compartment shall be capable of receiving items 25" in diameter and 19" high.

F. Washer shall have upper rotating spray arm and header connection for removable headers and removable lower rotating spray arm.

G. Washer shall provide the following treatments:

1. Pre-Rinse: Reclaimed water from final fresh water rinse (or hot or cold water from house lines as selected by operator), circulated and then drained to waste.

2. Detergent Wash: 180 degrees F. detergent solution, adjustable to not less than 10 minutes, circulated and then drained to waste.

3. First Rinse: Fresh hot water from house line, circulated and then drained to waste.

4. Second Rinse: Fresh hot water from house line, circulated and then drained to waste.

5. Third Rinse: Fresh hot water from house line, circulated and then drained, retained for use as pre-rinse solution of next cycle (or drained to waste).

6. Final Rinse: Distilled water delivered direct from source under pressure.

H. Washer shall have fully automatic controls which control the sequence and duration of the treatments. Controls shall include a hold switch to extend the length of any treatment (or adjustable timers for each treatment).

I. Washer shall have a stainless steel booster tank for the distilled water final rinse. Booster tank shall be air powered (or shall have a stainless steel pump).

2.12 EQUIPMENT ITEM L329 - GLASSWASHER, UNDERCOUNTER 2-114 9-131

A. Equipment Item L329 shall be an undercounter glasswasher.

B. Undercounter glasswasher shall be BetterBuilt Turbomite Model No. UC100, or approved equal.

C. Overall dimensions shall be 24" wide by 26" deep by 34½" high.

D. Washer and reservoir tank shall be constructed of type 304 stainless steel. Tank shall be equipped with a stainless steel sheathed thermostatically controlled 5KW calrod heater.

E. Treatment cycle shall be controlled by a program timer and shall consist of the following sequence:

1. Detergent Wash: Water reclaimed from final rinse of previous cycle. Detergent is added and water circulated for minimum of four minutes then automatically drained under pump power.

2. First Rinse: Fresh water circulated for minimum of 25 seconds, then automatically drained under pump power.

3. Second Rinse: Fresh water circulated for minimum of 25 seconds, then automatically drained under pump power.

4. Third & Final Rinse: Deironized water, circulated for 25 seconds. This water remains in tank for use as detergent wash solution of next cycle.



### 2.13 EQUIPMENT ITEM M427 - WALL-MOUNTED ANEROID

- A. Equipment Item M427 shall be a wall-mounted aneroid (sphygmomanometer).
- B. Wall mounted aneroid shall be Tycos Model No. 30473-010 complete with Velcro cuff and six-foot long coiled tubing. Aneroid shall have a stainless steel swivel bracket for side angle viewing, a non-glase case with shatter-proof crystal, and 6½" diameter dial.

### 2.14 EQUIPMENT ITEM M-429 - OTOSCOPE/OPHTHALMOSCOPE

- A. Equipment Item M-429 shall be otoscope/ophthalmoscope and holder, wall mounted transformer with automatic voltage regulator.
- B. Otoscope head, without specula, Welch-Allyn Unit No. 6783-20101, or approved equal; Ophthalmoscope, head only, Welch-Allyn Unit No. 6783-11500 or approved equal; and Holder/Power Supply (transformer), Welch-Allyn Unit No. 74900, or approved equal.
- C. Instruments shall be permanently attached to handles to prevent loss or theft. Transformer to be permanently mounted on wall. Plugs into standard 110 volt, AC wall outlet to power diagnostic instruments on coiled cords. Confirm proper cord length.
- D. Built in speculum tray, pilot light, and off/on/rheostat (to regulate illumination intensity). Supplied with (2) coiled cords, 8 feet long. Painted formed aluminum housing with molded thermoplastic front. Color to be neutral beige.

### 2.15 EQUIPMENT ITEM M440 - SERVICE CONSOLE, NURSES

- A. Equipment Item M440 shall be Service Console Nurses consisting of the below listed components manufactured by Ohio Medical Products. Refer to drawings for location and quantity of the following 2 configurations.
1. Modular, recessed, flush mounted, Diamond II Outlets, Air-Vacuum-slide.
  2. Modular recessed flush mounted Diamond II Outlets, Air-Vacuum-Vacuum-Slide.

### 2.16 EQUIPMENT ITEM M683 - STORAGE CABINET, PHARMACEUTICALS

- A. Equipment Item M683 shall be a twin door storage cabinet for pharmaceuticals and medicines.
- B. Provide Model 1800 with gallon storage in lower section, white Pervaneer finish as manufactured by Blair Displays, Inc., Muskegon, Michigan, or approved equal.

### 2.17 EQUIPMENT ITEM NO. M-795 CURTAIN TRACK

- A. Equipment Item No. M-795, shall be a suspended, slotted, extruded aluminum curtain track with bright dipped aluminum finish.

B. Curtain track shall be Hill-Rom type "AE", complete with offset raceway to prevent the fastening devices from interfering with curtain movement; offset raceway to have small track opening to permit one-point contact with glides; glide and hook assemblies of one-piece molded delrin slider containing the hooks of .072 spring steel wire, cadmium plated; provide slide and hook assemblies with track every four inches on center.

C. Track shall be mounted 7'-0" above floor, complete with hanger rods, hanger rod coupling and ceiling plate as indicated on detail 24/4-17. Install track and hangers in strict conformance with manufacturer's instructions.

D. Cubicle curtains not required.

#### 2.18 EQUIPMENT ITEM M891 - ROLLING SHELVES

A. Equipment Item No. M891 shall be prefabricated, adjustable wood storage shelving, Mini-Manual I (HC-1) as manufactured by Spacesaver Corporation, or units conforming to these specifications by Lundia, Myers Industries, Inc., or approved equal.

B. Useable shelving height shall be minimum 81". Provide units with a fixed top and six (6) adjustable shelves, 12" deep. Each assembly shall consist of two (2) fixed single end units and moveable double units indicated on floor plans.

C. Materials:

1. Uprights consist of two stiles and at least three cross members.

2. Shelves shall be 45 lb. density mat-formed Type 1 particle board core stock with uniform surfaces and edges with 3/4" steel channels all edges. Tilt 1" to rear.

3. Open backs.

4. Cariage shall be one-piece construction of notched and welded aluminum extrusions or heavy gauge steel.

5. Provide steel tracks positioned in aluminum extrusions and 3/4" plywood for floor finish. Floor finish by others.

6. Exposed end panels shall be high pressure plastic laminate, opposite end panels shall be 3/16" hardboard.

7. Handles: One furnished for each moveable unit.

D. Finishes:

1. Exterior hardboard shall be painted.

2. Interior hardboard, wood stiles and rails shall be stained, sealed and lacquered.

E. Operation: System shall be designed so that a 400 lb. load can be moved with 1 lb. of effort.

2.19 ITEM X405 - FILM ILLUMINATOR, DOUBLE

A. Item No. X-405 film illuminator - S & S X-Ray Model No. 222, multiple X-ray illuminator, 1 tier, 2 bank, subdivided, with separate switch for each 14 x 17 area, wall or desk mounted, one piece uninterrupted plexiglas front with silver gray hammertone backed enamel cold rolled steel forms. Confirm proper power cord length.

PART 3: EXECUTION

3.1 INSTALLATION

A. Laboratory equipment shall be installed under the technical supervision of the manufacturer.

B. Install laboratory equipment strictly according to manufacturer's instructions. Level equipment. After utilities have been connected, lubricate operating parts, adjust controls and test for proper operation. Clean equipment, and leave ready for use by the Owner.

C. Protect laboratory equipment from damage. Repair damage.

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## PART 1: GENERAL

1.1 SCOPE

A. Conditions of Contract and Division 1, General Requirements, apply to all work of this section. Refer to Article 12 of the Instructions to Bidders, Article 7 of the General Conditions and Section 01600, Materials and Equipment, for requirements on pre-bid and post-bid evaluation of proposed substitute products, methods, and other conditions.

B. Work under this section includes furnishing and installing all metal laboratory casework indicated on the drawings or specified herein. The work includes, but is not limited to, the following:

1. Steel laboratory casework of the following types:
  - a. Base cabinets.
  - b. Wall cabinets (cases).
  - c. Storage cabinets (cases)
  - d. Tables
  - e. Benches
  - e. Benches.
  - f. Understructures for fume hoods.
  - g. Standards and brackets or supports for wall mounted shelving adjacent to steel laboratory furniture.
  - h. Steel covers for service columns.
  - i. Volatile storage cabinets.
2. Laboratory tops and accessories: Comply with Section 11613 for the following types:
  - a. Stainless steel laboratory tops, reagent racks, wall shelves and integral sinks, cup sinks, and troughs.
  - b. Redwood bench tops.
  - c. Laboratory tops, reagent racks, and wall shelves of the following materials:
    - 1) Glazed composition stone.
    - 2) Plastic laminate, when set on steel base cabinets.
3. Supports for sinks and other built-in equipment occurring in casework.
4. Fume hoods: Comply with Section 11614.
5. Stainless steel exhaust hoods or enclosures at ceiling.

6. Metal covers for service columns.

7. Support systems for all casework, shelving, sinks, counters and similar items.

8. Other related and miscellaneous work to complete the work of this section and Sections 11613 and 11614.

C. Related work specified elsewhere:

1. Fixed and adjustable wall mounted natural finished and painted wood shelving: Section 06400.

2. Resilient base against walls and base against toe space of floor mounted casework on resilient flooring: Section 09650 (see Article 1.3 herein).

3. Undercounter Refrigerators set in openings in metal casework (see Article 1.3 herein): Section 11600.

4. Laboratory Equipment: Section 11600.

5. The following work is specified under Division 15:

a. Sinks, cup sinks, drains and drain fittings including outlets, sink plugs, strainers, overflows, tailpieces, traps and plaster traps, (except integral stainless steel sink tops.

b. Installation of sink outlets, strainers, plugs, overflows and tailpieces furnished under this section (11611).

c. Plumbing service fixtures including oxygen, carbon dioxide, nitrogen, nitrous oxide, gas, air and vacuum cocks and turrets; steam cocks and mixing valves; hot, cold and distilled water faucets, cocks and stops, remote controls; steam cones and steam baths; and similar items.

d. Plumbing rough-in and piping including piping occurring within casework, fume hoods, pipe chases behind casework, box curbs, reagent racks and service columns. Pipe supports, brackets, bolts, clips and similar accessories for piping.

e. Ductwork (from fume hood outlet) and blowers for fume hoods. Absolute filters for isotope hoods.

f. Canopy hoods and exhaust hoods (except as furnished under this Section 11611).

g. Ductwork and exhaust fans for all exhaust snorkels, canopy hoods and exhaust hoods.

6. The following work is specified under Division 16.

a. Electrical outlets, switches, plug mold, pilot lights, conduit, wiring, boxes and similar electrical work (except as specified in Section 11614).

D. Furnished by Owner:

1. Refer to Equipment Schedules for Group II, Equipment Furnished and Installed by Owner.

1.2 QUALITY ASSURANCE

A. Provide metal laboratory furniture (for integration with tops, sinks, fume hoods and service fixtures, as required) manufactured or furnished by the same laboratory furniture company for single responsibility.

B. The steel laboratory furniture manufacturer shall have an established organization and production facilities, specializing in this type equipment, shall be currently engaged in the manufacture of metal laboratory casework, shall have the demonstrated ability to produce the specified metal laboratory casework of the required quality and the proven capacity to complete an installation of this size and type within the required time limits.

C. The Casework Subcontractor shall have an established resident local representative in the Minneapolis-St. Paul Metropolitan Area who is fully qualified in laboratory casework and has the authority to make decisions and act for the subcontractor.

D. Acceptable steel laboratory furniture manufacturers include the following:

1. Hamilton Industries Division of American Hospital Supply Corporation.
2. Jamestown Metal Products, Inc.
3. Kewaunee Scientific Equipment Corporation.
4. St. Charles Manufacturing Company.

E. Qualification of other Prospective Bidders: The University considers the management of the fabrication, delivery and installation of casework of prime importance to the qualifications of the casework subcontractor, to insure completion on time and within the Contractors' Construction Schedule. To assist in the evaluation of the qualifications of potential bidders, all firms interested in bidding shall submit the data listed below and shall meet with representatives of the University in a personal interview. The University will evaluate previous performances, ability to perform on this Project and other factors. The University's decision on qualified bidders shall be final and binding.

1. Interested bidders shall submit to the University, in writing: a list of representative floor mounted metal laboratory casework installations completed within the last 5 years, listing the Owner and the Owner's representative to contact, the year completed, the approximate time for the on-site installation, and the approximate value of each installation; the proposed organization for installation on this Project and its qualifications; and other data the bidder may wish to submit to demonstrate his qualification. The data shall be submitted to the person indicated under paragraph 2 following, with a copy to the Architect. The data shall be submitted prior to or at the time of the personal interview.

2. Representatives of each interested casework bidder shall meet with University representatives, at the University, to review their qualifications. Arrangements shall be made for the interview with the Health Sciences Planning Office in Powell Hall, phone (612) 373-8981, attention Paul J. Maupin.

3. The bidders representatives to meet with the University shall include a responsible officer of the bidding firm who has overall management authority relating to the production and installation of casework. The representative shall be prepared to present their management approach to insure preparation of shop drawings, production, delivery and installation on time, including monitoring of the various phases.

4. Interested bidders are encouraged to arrange and meet with the University at the earliest possible date. All meetings shall be held prior to submittal of samples, specified under paragraph F following, which are required 21 days prior to bid date.

F. Bidders' Samples: In addition to the requirements of Articles 9 and 12 of the Instructions to Bidders and Article 7 of the General Conditions, all metal laboratory casework manufacturers wishing to bid this work shall request pre-bid evaluation of their proposed products by submitting the following data and samples not later than 21 days prior to bid date, after the University interview. Samples shall be uncrated and assembled, ready for inspection.

1. Samples shall be delivered to a location on the Minneapolis Campus as designated by the University. Prior to delivery, the delivery shall be scheduled with Mr. Oliver Hughes, phone (612) 376-5294.

2. Submit a detailed, written list of proposed deviations to the Architect for acceptance. Deviations shall include any items or products which are specified by named brands or producers. Such list shall specifically identify and describe in detail each proposed deviation. Manufacturer's standard catalogs, drawings and other information may be submitted to supplement the list of proposed deviations but will not in themselves be considered as an adequate list of description.

3. Submit the following samples at no cost or obligation to the Owner or Architect. Deliver, uncrate and set up samples at a location in the Metropolitan Minneapolis-St. Paul Area, designated by the Architect. Remove samples when directed by Architect. Samples shall be of the quality and construction specified and proposed for the metal laboratory casework for the Project.

a. Two samples of each countertop material, size 12" by 12".

b. One combination drawer and cupboard unit (HB48C3), one 4-drawer unit (HB24D1), support to mount the two units together with a 36" space between and a continuous countertop.

c. One wall cabinet with glazed sliding doors (WS36A1).

d. Casework finish samples.

e. One piece of each item of hardware.

G. Pre-Bid Evaluation: The University and Architect reserve the right to make such other investigations of prospective bidders and their products as specified under "Qualification of Bidder" in the Instructions to Bidders. The decisions of the University and Architect shall be final and binding.

1. Minor variations in construction and fabrication techniques inherent between manufacturers of the metal laboratory casework will be considered, provided the specified standards of design, function, dimension, appearance, durability, strength, quality and performance are met. The burden of proof rests with the party making the request.

2. The acceptance or rejection of a proposed deviation of sample is vested in the Architect whose decision shall be final and binding. The determination may or may not express the reason for the decision. All Bidders shall be notified in addenda which deviations have been accepted by the Architect. If proposed deviations are not submitted as specified, or are not accepted, it will be held there are no deviations proposed and none will be permitted if the prospective bidder is successful.

H. Acceptance of Bidders: Acceptance of manufacturers to bid the work of this section, as listed in addenda, indicates that by interview, preliminary samples and other data submitted the manufacturers appear capable of providing metal casework to meet the design intent. The acceptance for bidding does not indicate acceptance of preliminary samples, except for casework construction, in general, nor acceptance of deviations proposed by the samples or by other data. Provide all materials, equipment and other items in strict conformance with, and to meet all performance criteria called for by the Contract Documents. Any additional permissible deviations from the basic Contract Documents will be as listed in addenda.

I. Chemical and Physical Resistance of Finish: Submit an independent testing laboratory report certifying that the exterior finish of metal laboratory furniture is capable of withstanding the following tests, with no change, or slight change of gloss, slight discoloration, or slight temporary softening of the film with no loss of adhesion and no loss of film protection.

1. Acids: Not less than 5 drops (0.25 cc) applied to finish surface, covered with watch glass (convex side down) for 60 minutes, then washed and dried.

37% Hydrochloric Acid	10% Nitric Acid
20% Hydrochloric Acid	75% Phosphoric Acid
10% Hydrochloric Acid	25% Phosphoric Acid
70% Sulphuric Acid	98% Acetic Acid
25% Sulphuric Acid	50% Acetic Acid
30% Nitric Acid	

2. Solvent: Not less than 5 drops (0.25 cc) applied to finish surface, covered with watch glass (convex side down) for 60 minutes, then washed and dried.

Ethyl Alcohol	Carbon Tetrachloride
Butyl Alcohol	Chloroform
Methyl Alcohol	37% Formaldehyde
Ethyl Acetate	Gasoline
Ethyl Ether	Naptha
Methyl Ethyl Ketone	Kerosene
Toluene	Xylene
Acetone	Glycerin
Benzene	Furfural

Test:



3. Bases and Salts: Not less than 5 drops (0.25 cc) applied to finish surface, covered with watch glass (convex side down) for 60 minutes, then washed and dried.

40% Sodium Hydroxide	Saturated Zinc Chloride
10% Sodium Hydroxide	Saturated Sodium Chloride
28% Ammonium Hydroxide	Saturated Sodium Sulphide
40% Potassium Hydroxide	Saturated Sodium Carbonate
10% Potassium Hydroxide	

4. Moisture Resistance: No visible effect when finish surface exposed to the following:

a. Hot Water at a temperature of 190 degrees F to 205 degrees F. trickled down the surface at 45 degree angle for 5 minutes.

b. Constant Moisture using a 2" x 3" x 1" cellulose sponge, soaked with water, in contact with the surface for 100 hours.

5. Cold Crack: No effect when subjected to 10 cycles of temperature change from 20 degrees F for 60 minutes to 125 degrees F for 50 minutes.

6. Adhesion and Flexibility: No peeling or cracking or exposure of metal when metal is bent 180 degrees over a 1/4" diameter mandrel.

### 1.3 SUBMITTALS

#### A. Samples: Metal Laboratory Furniture:

1. Submit 3, 6" x 6" samples of specified finish. Samples will be reviewed by Architect for color, texture, and pattern only. Compliance with other specified requirements is the exclusive responsibility of the Contractor.

2. Submit one full-size sample of finished base cabinet unit complete with hardware, doors and drawers, without finish top.

3. Submit one full-size sample of finished wall-mounted cabinet unit complete with hardware, doors, and adjustable shelves.

4. Acceptable sample units will be used for comparison inspections at the project. Unless otherwise directed, acceptable sample units may be incorporated in the work. Notify Architect of their exact locations. If not incorporated in the work, retain acceptable sample units in the building until completion and acceptance of the work. Remove sample units from the premises when directed by the Architect.

B. Shop Drawings: Submit shop drawings for metal laboratory furniture showing plans, elevations, ends, cross-sections, service run spaces, location and type of service fixtures with lines there to. Show details and location of anchorages and fitting to floors, walls, and base. Include layout of units with relation to surrounding walls, doors, windows, and other building components. Coordinate shop drawings with other work involved.

1. Shop drawings shall be prepared specifically for this project. Provide drawings for rough-in for building construction promptly to prevent construction delays and if necessary, furnish rough-in drawings prior to other shop drawings.

Provide overall plans, details, sections and connections to adjacent work. Shop drawings shall indicate: method of attaching wall mounted cases to walls; field joints, fillers and scribe strips; size and location of equipment fixtures and fittings furnished by other contractors to be built into or mounted on or adjacent to the casework; rough-in dimensions and size and location of holes and cutouts. Manufacturer's "standard" shop drawings are acceptable for individual pieces of casework provided, holes, cutouts, rough-in and similar data is indicated. Shop drawings shall include all plans, elevations, details and other information necessary to insure a complete installation.

2. Shop drawings shall locate all critical studs for mounting or anchoring casework items, including shelving and all wall mounted casework. A stud shall be located within 4" in from the end of a wall case. Locate studs by dimension from grid lines.

3. Take field measurements and verify field conditions as necessary. Indicate field measurements and other field conditions on shop drawings.

4. Submit shop drawings and erection drawings to other contractors concerned.

C. Test Reports: Promptly after award of Contract, prior to commencing shop drawings and fabrication, submit certified reports of tests of the (1) bending properties, chemical resistance and moisture resistance of the metal casework finish, (2) physical properties chemical resistance and heat resistance of the solid epoxy resin tops and (3) performance capabilities of the fume hoods. Tests shall be conducted by a nationally recognized, independent testing laboratory, and reports shall be conducted by a nationally recognized, independent testing laboratory, and reports shall indicate the testing procedures and certify the findings. Test procedures shall be as specified hereinafter.

D. Fume Hood Demonstration. As soon as practicable after award of Contract, conduct a demonstration of fume hood performance at the specified face velocity maintaining the required exhaust rate. The demonstration may take place at the casework manufacturer's plant or at another location determined by the casework manufacturer. The test demonstration shall be conducted by, or witnessed by, an independent testing laboratory, with the report results certified by the laboratory. Conduct the test in general conformance with Article 3.2. Notify Owner and Architect in advance to permit their observing the test, if they choose. Submit certified reports to Owner and Architect.

E. Maintenance and Cleaning Instructions: Submit written maintenance and cleaning instructions and instruct the Owner's personnel in the care and maintenance of all casework and equipment furnished under this section (refer to Section 01300).

#### 1.4 PRODUCT HANDLING

A. Protect finished surfaces from soiling and damage during handling and installation. Keep covered with polyethylene film or other protective covering.

#### 1.5 JOB CONDITIONS

A. Examination of Substrate and Conditions: Examine the substrate and the conditions under which the work under this section is to be performed, and notify the Contractor in writing of unsatisfactory conditions. Do not proceed

with work under this section until unsatisfactory conditions have been corrected in a manner acceptable to the installer.

## 1.6 COORDINATION

A. The metal laboratory casework subcontractor shall be responsible for coordination with the Mechanical Contractor, Electrical Contractor and other contractors and subcontractors having equipment, fixtures, outlet boxes or fittings built into or mounted on or adjacent to the metal laboratory casework.

B. Contact other contractors directly and obtain fixtures and equipment lists, fixture and equipment sizes and locations, rough-in dimensions, holes and cutout sizes and locations, equipment weights and supports required, methods of attachment and space requirements to connect and service equipment.

C. At locations indicated on drawings, provide undercounter openings for undercounter refrigerators. Refrigerators are furnished, delivered to project, and installed by laboratory equipment subcontractor, request manufacturer's literature. Provide filler panels as required.

D. Fixed shelving, including anchorage, and adjustable shelving, including related brackets and standards as follows:

1. Plastic laminate shelving, in rooms with metal laboratory casework, to be furnished and installed by Section 11611, conforming to Section 11613.

2. Plastic laminate shelving in all other rooms, including examination room shelves, to be furnished and installed by Section 06412.

3. Wood shelving, hardwood and softwood, in all rooms to be furnished by Section 06400 and installed by Section 06100.

4. Stainless steel shelving in all rooms, including animal areas, to be furnished and installed by Section 11611, conforming to Section 11613.

5. Fixed shelf brackets and anchorages as detailed or required.

E. Resilient base at floor mounted casework to be furnished and installed as follows:

1. At resilient flooring, install casework prior to installation of flooring. Resilient flooring (V.A.T.) by Section 09650 will stop at the base of the casework and will not continue underneath. Resilient base will be applied to the casework base by Section 09650 (but not to walls concealed by casework).

2. At composition flooring, first install composition flooring and composition base at all areas and walls (including floor underneath and walls behind casework), and then install casework. The casework supplier shall apply a continuous toe bead of sealant at juncture of casework base and composition flooring. Sealant by casework supplier to be Tremco, or equal, non-hardening type, compatible with composition flooring. The casework supplier shall furnish and install the resilient base, in compliance with requirements of Section 09650. Seal and embed the toe of the resilient base in sealant during installation. At completion, clean excess sealant and adhesive.

## PART 2: PRODUCTS

### 2.1 MATERIALS

A. Metal: Prime furniture steel, stretcher or roller leveled, free of scales, buckles, or other defects; ASTM A 366, E finish.

B. Minimum Metal Gauge: Provide steel laboratory furniture components of the following minimum U. S. Standard gauges:

20 Gauge: Back panels, inner door panels, drawer outer pan, inner pan and body, and shelves. Add reinforcement or use 18 gauge material for shelves over 36" long.

18 Gauge: Sides, ends, fixed backs, bottoms, tops, soffits and outer door pans. Bottoms may be 20 gauge if reinforced. Other items not otherwise noted.

16 Gauge: Intermediate horizontal rails, table frame aprons and cross rails, center posts, top gussets.

14 Gauge: Drawer runners, sink supports.

12 Gauge: Leveling and corner gussets.

C. Stainless Steel: Chromium-nickel steel sheet conforming to ASTM A 167-70, Type 316. (Type 304 may be used for wall shelving and ceiling exhaust hoods only). Finish of exposed surfaces shall be AISI No. 4 mechanical finish. Gauges shall be U. S. Standard Gauge.

D. Glass for frameless sliding doors shall be 1/4" plate or float glass. Glass used in fume hoods or other hazardous locations, shall be combination laminated safety glass. Use tempered glass where specified or required.

E. Cement-asbestos board shall be asbestos fibers and Portland cement combined under extreme pressure into homogeneous integrally colored sheets of the thickness shown, specified or otherwise required, Transite, or approved equal.

F. Sheet lead shall be 99.9% pure virgin lead free from dross, oxide inclusions, laminations, scale, blisters or cracks.

G. Structural steel, if any, shall conform to ASTM A36. Any structural steel that is exposed to view shall have the same smooth surface as the sheet steel, free from pits, scale, depressions and other defects.

### 2.2 METAL CABINETRY, GENERAL

A. Metal Cabinets shall be designed and constructed so that each case is a complete and integral, rigid, self-supporting unit that may be used by itself or in an assembly of cabinets. Metal cabinetry shall be rigidly constructed and so assembled that it can be relocated at any time. No manufacturer's label shall be applied to the exterior of cabinetry, nor on inside faces of drawers and doors. Any proposed labels shall be approved by the Owner, in inconspicuous locations.

B. Cabinets shall have a finished, flush, smooth face at all exposed sides. Where members intersect, they shall be on the same plane (not overlapped) to provide the flush, smooth surface across the joint. Exposed finished ends of

cabinets shall have no punched holes, nor fastenings which are not flush with the end panel.

C. Casework in existing Health Sciences buildings has drawers and doors inset into the cabinet, with the cabinet framing the perimeters of doors and drawers, as indicated on the drawings (stiles and rails between drawers and doors are concealed). Flush overlaid (overlap) type will be considered. If overlaid type drawers and drawers (rails, stiles, cabinet frame and partitions concealed behind doors) are proposed, the stiles, rails or partitions shall be free from unused hardware or fastening holes or slots, even though concealed when drawers and doors are closed. Adhesive applied tape or metal strip covering over unused holes will not be acceptable.

D. Metal cabinetry shall be manufactured to the dimensions indicated on the drawings. Exact widths of 18", 24", 36", 42", 48" and 52" are required; nominal dimensions differing from these exact widths will not be permitted. Vertical dimensions shown, but bottom edges of both low and high counter units shall align at the same height above the floor. Typical nominal base cabinet depth is 1'-10". The 52" cabinets at ends of islands may be made up of 2 -24" cabinets with a 4" filler section which is flush and maintains the toe space.

E. Full height cabinets may vary plus or minus 1/2" from the 7'-0" height indicated. Wall case heights may vary plus or minus 1" from dimensions indicated, but shall be mounted with the top at the same height as the full height cases.

F. Construct cabinets, frames, tops and other components to provide the full, clear pipe space dimensions called for, in a single pipe space chase.

G. All cabinets shall have bottoms. Bottoms shall be pan type with sides and backs turned up. Cabinet bottoms may have the ends turned down and the back edge turned up.

H. All cabinets shall have backs, except units with a full bank of drawers may have the back omitted provided the unit is constructed to form a rigid, non-racking unit. Backs may be welded to the cabinet framing. At units in front of piping or other services, provide removable backs. At units 30" wide or less, provide the removable rack in one piece, full height between top rail and cabinet bottom, full width between end panels or end panel and intermediate vertical back post, formed for rigidity. At cabinets over 30" wide, removable back may be two-piece, split vertically, with formed offset to insure positive snug fit. Removable backs may be pan construction or have other forming at the four edges to provide rigid panel. Removable backs and cabinets shall be constructed so the back is held snugly in place, without rattling, utilizing snap-in devices if necessary. Removable backs shall be removable without the use of tools. Provide finished backs on cabinets with backs exposed to view. The requirement for non-rattling backs includes when doors and drawers are closed.

K. Hinged doors and drawer fronts may either overlap cabinet ends, top and bottom or may be recessed (inset) within the cabinet and be flush with the cabinet ends, top and bottom. If recessed doors and drawers are used, cabinet openings shall be rabbetted on four sides to receive the doors and drawers.

L. Cabinets shall be constructed to have shelf adjustment on approximately 1" centers by means of shelf adjustment holes.

### 2.3 FABRICATION

A. General: Complete all assembly and finish work at point of manufacture. Perform unit assembly on precision jigs, to provide units which are square, fully reinforced with angles, gussets, and channels, integrally framed and welded to form a dirt and vermin retardant enclosure. Where applicable, reinforce base cabinets for heavy sink support. Maintain uniform clearance around door and drawer fronts, not exceeding 3/32".

B. Fabricate units on precision dies to provide field interchangeability of drawers, hinged doors, and similar pieces.

C. Flush Doors: Outer pan and inner pan formed and telescoped into box formation, with channel reinforcements full height on center of each pan. Fill doors solid with fire-resistant, sound-deadening material.

D. Glazed Doors: Hollow metal stiles and rails or similar construction as flush doors, with glass held in resilient channel or gasket material.

E. Hinged Doors: Mortise at flanges for hinges and reinforce with minimum 16 gauge angle, welded inside inner pan at hinge edge. Provide nylon roller catches and stainless steel strike welded to door assembly.

F. Drawers: Assemble fronts from telescoping inner and outer pans, designed to eliminate raw edge of steel at the top. Fabricate sides, back, and bottom of one piece, with rolled or formed top of sides for stiffening and comfortable grasp for drawer removal. Weld drawer front to sides, back, and bottom to form a single, integral unit. Provide drawers with rubber bumpers, runners, and positive stops to prevent metal-to-metal contact or accidental removal.

G. Adjustable Shelves: Sides and ends formed down, and returned at front and back.

H. Drawer Guides: Provide nylon rollers with metal guide channels, with integral stops to eliminate accidental removal of the drawer. Include provisions to prevent rebounding action when doors are closed.

I. Filler Strips: Provide where required for closing space between cabinets and walls and ceilings, of same material and finish as cabinets. Hem exposed edges. Job fabricated fillers not acceptable.

J. Utility Space: Provide space, cut-outs, and holes for pipes, conduits and fittings in cabinet bodies to accommodate services and their support-strut assemblies.

K. Toe Space: Approximately 4" high by 3" deep, closed metal with no open pockets, except provide vented filler where shown on drawings.

L. Table Legs: Not less than 2" square electrically welded tubing. Provide leg stretchers where required for strength and rigidity, welded or bolted to legs and cross stretchers. Securely bolt legs to table aprons. Provide leveling device welded to bottom of each leg.

### 2.4 STEEL CABINET FINISH

A. Pretreatment: After assembly, thoroughly clean all surfaces of grease, dirt, oil, flux and other foreign matter by physical and chemical means.

Treat entire unit with metallic phosphate process leaving surfaces with uniform, fine-grained, crystalline phosphate coating providing excellent bond for subsequent finish.

B. Top Coats: One coat high-bake primer followed by one or more coats of high-bake chemical-resistant enamel, to provide a hard and smooth, satin luster finish, applied to all treated surfaces. Unless otherwise indicated, color shall match existing Health Sciences cabinets (tan colored).

## 2.5 CABINET HARDWARE AND ACCESSORIES

A. Provide manufacturer's standard, satin finish hardware units, unless otherwise indicated.

1. Hinges: Shall be 2-1/2" five knuckle institutional type, heavy-duty chrome plated steel hinges. Hinges shall have hospital tips and full 180° opening. Hinged doors 36" or less in height shall have one pair of hinges per door, and hinged doors greater than 36" in height shall have 1-1/2 pairs of hinges per door. Hinges shall not be welded to the cabinet or to the door. Hinges shall be applied with four 8-32 by 3/8" flathead screws. For doors 36" or less in height, heavy duty (minimum 11 gauge) stainless steel knife type hinges will be acceptable, subject to meeting the load test. No painted hinges permitted.

2. Continuous Hinges: 0.045" thick wrought steel. Finish as specified for metal.

3. Pulls: Solid metal, for drawers and swing doors, mounted with 2 screws fastened from back. For sliding doors, provide recessed flush pulls. Provide 2 pulls for drawers over 24" wide.

4. Alternate Door and Drawer Pulls: If Owner elects alternate C, pulls shall be located as follows:

a. Base Units: On base units pulls shall be positioned horizontally with the top of the pulls, approximately 3/4" below the top of the door or drawer.

b. Overcounter Units: On overcounter units pulls shall be positioned horizontally as indicated on drawings, approximately 3/4" from the bottom of the door.

c. Full Height Units: Pulls are to be positioned vertically, 3/4" from the edge and at door centerline. Full height units may have latch handle or knobs of approved design.

5. Drawer Stops: Designed to permit easy removal, and yet prevent inadvertant drawer removal. Provide on all drawers, located on the inside.

6. Label Holders: Provide where indicated, size to receive standard label cards approximately 1" x 2" nominal size, finished to match other exposed hardware.

7. Locks: Provide locks for doors and drawers where indicated on the drawings. Locks for the purpose of coordinating keying systems, shall be Illinois "Duo", Type A, or approved equal, offering 2 sets of 5 primary tumblers

and one set of 4 secondary tumblers. Locks shall be Grand Master keyed to Owner's existing GM Key System. Controlled key blanks and registered key plan shall be used to assure a complete security system. Use and installation of locks shall assure a complete security system. Locks offering other than a non-duplicating system will not be accepted. Keying as directed by Owner. Casework contractor shall meet with Owner to establish keying schedule.

8. Sliding Door Hardware Sets: Manufacturer's standard, to suit type and size of sliding door units.

9. Leg Shoes: Extruded vinyl or rubber, black, open bottom type.

10. Adjustable Shelf Supports: BHMA B84072, wrought steel, mortise mounted.

11. Friction Catches: Shall be spring actuated, adjustable nylon-roller type friction catches. Properly sized magnetic catches will be acceptable, provided they are of sufficient power to hold the door as firmly as the specified catches. Catches determined to be undersized by the Owner shall be replaced.

12. Elbow Catches: Cadmium-plated steel elbow catches and strike plates shall be used on left-hand doors of double door cases where locks are used.

13. Up and Down Bolts: Hinged full height storage cases shall have right-hand door provided with an active knob and up-and-down bolt assembly. Left-hand door shall have an astragal strip, allowing the door to be opened only when right-hand door is open. Left-hand door shall be provided with a dummy pull. Up-and-down bolts shall be concealed between pans of solid doors.

14. Sink Supports: Sink supports and reinforcing shall be adequate to support a fully loaded sink without causing deflection, distortion or sink movement. Where necessary on large sinks, provide an additional line of supports. Coordinate dimensions with Mechanical Contractor to properly locate sink supports, with allowance for adjustment in the leveling devices. Sink supports shall be hanger type, suspended from top front and top rear horizontal rails or cabinet by four 1/4" rods, threaded at bottom end and offset at top to hang from two full length reinforcements welded to the front and rear rails. Two 3/4" by 1-1/2" by 12 gauge channels shall be hung on the threaded rods to provide an adjustable sink cradle for supporting sinks. In lieu of hanger type sink supports, the supports at base cabinets may be heavy cross channels securely fastened to cabinet framing, or reinforced back, to form a sturdy support system. All support systems shall have 4 point leveling. Submit sample of support system for final approval.

15. Shelf Supports and Shelf Adjustment Clips: Shall be provided on interior of cabinets to provide shelf adjustment on approximately 1" centers. Shelves longer than 4'-0" shall be supported at the center by an additional partition or a full width bracket.

16. Wall mounted shelving, counters and similar items: Provide the wall brackets as indicated on drawings for non-adjustable items, designed to adequately support the item under full loading. Where indicated, or otherwise required for heavy loaded items which require adjustment, provide proper sized Unistrut channels and brackets for the loads and conditions. For adjustable



wall shelving, provide extra heavy-duty slotted standards equal to Knappe and Vogt No. 87, with appropriate brackets, satin chrome finish.

17. Bumpers: All drawers and doors shall close against rubber bumpers, minimum of two with additional bumpers as specified elsewhere. Bumpers shall be type that are "locked-into" holes in casework by means of retaining collar. Stripable "tape" type rubber cushions are not acceptable.

B. Install hardware uniformly and precisely after final finishing is complete. Set hinges snug and flat in mortises unless otherwise indicated. Turn screws to flat seat. Adjust and align hardware so that moving parts operate freely and contact points meet accurately. Allow for final field adjustment after installation.

### PART 3: EXECUTION

#### 3.1 INSTALLATION

A. Install plumb, level, true and straight with no distortions. Shim as required, using concealed shims. Where metal laboratory furniture abuts other finished work, scribe and apply filler strips for accurate fit with all fasteners concealed where practicable.

B. Base Cabinets: Set cabinets straight, plumb, and level. Adjust sub-tops within 1/16" of a single plane. Fasten each individual cabinet to floor at toe space, with fasteners spaced 24" o.c. Bolt continuous cabinets together. Secure individual cabinets with not less than 2 fasteners into floor, where they do not adjoin other cabinets.

C. Where required, assemble units into one integral unit with joints flush, tight, and uniform. Align similar adjoining doors and drawers to a tolerance of 1/16".

D. Provide holes for mechanical and electrical work as shown or as directed by trades involved.

E. Wall Cabinets: Securely fasten to solid supporting material, not plaster, lath, or wallboard. Anchor, adjust, and align wall cabinets as specified for base cabinets.

I. Reinforcement of stud walls to support wall-mounted cabinets will be done during wall erection by the trade involved, but responsibility for accurate location and sizing of reinforcement is part of this work.

F. Adjust casework and hardware so that doors and drawers operate smoothly without warp or bind. Lubricate operating hardware as recommended by manufacturer.

#### 3.2 CLEANING AND PROTECTION

A. Repair or remove and replace defective work as directed upon completion of installation.

B. Clean shop-finished surfaces, touch-up as required, and remove or refinish damaged or soiled areas, as acceptable to the Architect.

C. Protection: Advise Contractor of procedures and precautions for protection and materials and installed laboratory furniture from damage by the work of other trades until acceptance of the work by the Owner.

PART 4: SCHEDULE

4.1 COMPONENT INFORMATION SCHEDULE

A. Refer to the Casework Code on drawing A12-1. The following schedule supplements the code and drawings by providing a description of the Casework Code.

B. "Component Height and Style" letter designation, first part of the Casework Code is as follows:

Component Hgt. and Style	Description
LB	Indicates low base cabinet component (2'-4-3/4" high unless noted otherwise and 1'-10" deep unless noted otherwise).
LP	Indicated low knee space component (2' 4-3/4" high unless noted otherwise).
HB	Indicates high base cabinet component (2' 11-3/4" high unless noted otherwise and 1'-10" deep unless noted otherwise.).
HP	Indicates high knee space component (2'-11-3/4" high unless noted otherwise).
WS	Indicates wall storage cabinet component (2'-6" high unless noted otherwise and 1'09" deep unless noted otherwise.)
FH	Indicates fume hood superstructure.
TS	Indicates full height (7'-0") closed storage cabinet.
OS	Indicates full height (7'-0") open storage cabinet.
PB	Indicates pegboard, epoxy resin or stainless steel.

C. "Component Width" is the number designation, width in inches, which is the second part of the Casework Code, shown on the drawings, and always follows the first part letter designations shown above.

Component Ht. and Style	Component Type	Description
LB	A	Sink base cabinet component with hinged doors and fixed panel in top 1/5.
	A1	Single door hinged left.
	A2	Single door hinged right.
	C	Base cabinet component, drawers in top 1/5, hinged door in bottom 4/5 and 1 adjustable shelf.
	CI	1 Drawer, single door, hinged left.
	D	Base cabinet component with drawer combinations as indicated below.

<u>Component Ht. and Style</u>	<u>Component Type</u>	<u>Description</u>
	D1	4 equal drawers.
LP	A	Knee space base component.
	A1	Knee space without apron or back panel.
	A2	Knee space with 2" apron with back panel.
	A3	Knee space with 2" apron without back panel.
	A4	Knee space with drawer with back panel.
	A5	Knee space with drawer without back panel.
HB	A	Sink base cabinet component with hinged doors and fixed panel in top 1/5.
	A1	Single door, hinged left.
	A2	Single door, hinged right.
	A3	Double doors.
	A4	Double doors with intermediate post.
	B	Base cabinet component with hinged doors full height of cabinet and two adjustable shelves.
	B1	Single door, hinged left.
	B2	Single door, hinged right.
	B3	Double doors.
	C	Base cabinet component with drawers in Upper 1/5, hinged doors in lower 4/5, one adjustable shelf
	C1	1 drawer, single door, hinged left.
	C2	1 drawer, single door, hinged right.
	C3	2 drawers, double doors.
	C4	1 drawer, single door hinged right.
	C5	2 drawers, double doors.
	C6	1 drawer, double doors.
	C7	2 drawers, single door hinged left.
	C8	2 drawers, single door hinged right.
	C9	4 drawers, double doors.
	D	Base cabinet component with drawer combinations, as indicated below:
	D1	5 equal drawers.
	D2	10 equal drawers.
	D3	2 equal drawers in upper 1/5 1 drawer in mid 1/5, 2 equal drawers in lower 3/5.
	D4	3 equal drawers in upper 3/5, 1 file drawer in lower 2/5.
	D5	2 equal drawers in upper 1/5, 4 equal drawers in lower 4/5.
	D6	2 equal drawers in upper 1/5, 1 drawer in mid 1/5, 1 door in lower 3/5, hinge left 1 half depth shelf - fixed
	D7	2 equal drawers in upper 1/5, 1 drawer in mid 1/5, 1 door in lower 3/5 hinged right, 1 half depth shelf - fixed.

D (Continued)	D8	2 equal drawers in upper 2/5, 2 equal drawers in lower 3/5.
	D9	4 equal drawers in upper 2/5 3 equal drawers in lower 3/5.
	E	ASB lined acid storage base cabinet component with hinged doors and adjustable expanded metal stainless steel shelf.
	E1	Single door, hinged left.
	E2	Single door, hinged right.
	E3	Druble doors.
	F	Asbestos lined volatile storage base cabinet component with hinged doors and adjustable, removable expanded metal shelf.
	F1	Single door, hinged left.
	F2	Single door, hinged right.
	F3	Double doors.
	J	Base cabinet component with no drawers or doors.
	J2	2 adjustable shelves.
	HP	A
A1		Knee space w/o apron with back panel.
A2		Knee space with 4-1/2" apron with back panel.
A3		Knee space with 4-1/2" drawer with back panel.
A4		Knee space with 4-1/2" apron with back panel.
A5		Knee space with 2 drawers in upper 1/5 w/back panel.
WS	A	Frameless sliding glass door wall cabinet component with 2 adjustable shelves, locked where indicated on drawings (lock within bottom edge)
	A1	2'-6" high x 1'-1" deep.
	A2	2'-6" high x 1'-1" deep with sloped tops.
	A3	3'-0" high x 1'-1" deep.
	C	Solid hinged door wall cabinet component w/2 adjustable shelves.
	C1	2'-6" high by 1'-1" deep single door hinged left.
	C2	2'-6" high by 1'-1" deep single door hinged right.
	C3	2'-6" high by 1'-1" deep double door.
	C7	3'-0" high x 1'-1" deep single door hinged left.
C8	3'-0" high x 1'-1" deep single door hinged right.	
C9	3'-0" high x 1'-1" deep double doors.	
OS	A	Open Storage units 7'-0" high with 5 adjustable shelves.
	A1	1'-1" deep.
	A2	1'-4" deep.
TS	A	Closed storage component 7'-0" high with solid hinged doors and 5 adjustable shelves.
	A1	1'-1" deep.
	A2	1'-4" deep.
	A3	1'-10"

<u>Component Ht. and Style</u>	<u>Component Type</u>	<u>Description</u>
	C	Closed storage component wardrobe.
	CI	7'-0" high w/one fixed shelf with hanging rod.
	D	Closed storage component 7'-0" high with sliding glass doors and 5 adjustable shelves.
	DI	1'-1" deep.
	E	Closed storage component 7'-0" high with solid sliding doors and 5 adjustable shelves.
	EI	1'-1" deep.
	F	Closed storage component 7'-0" high with solid hinged doors and 2 adjustable shelves.
	FI	1'-10" deep.
FH	A	Air Foll fume hood mounted on high base cabinet components.
	B	Radioisotope fume hood mounted on high base cabinet components.
	C	Special acid fume hood on high base cabinet components.
	D	Air Foll Distillation fume hood - walk-in.

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## PART 1: GENERAL

1.1 SCOPE

A. Conditions of Contract and Division 1-General Requirements, apply to all work of this section. Refer to Article 12 of the Instructions to Bidders, Article 7 of the General Conditions and Section 01600 - Materials and Equipment for requirements on pre-bid and post-bid evaluation of proposed substitute products, methods and other conditions.

B. Work under this section includes all laboratory tops and accessories related to steel laboratory furniture.

C. For undivided responsibility, all materials and products of this Section 11613 are specified to be furnished and installed under Section 11611.

D. Types of tops include, but are not limited to the following:

1. Laboratory tops, reagent shelves, wall shelves and integral sinks, cup sinks and troughs of stainless steel.

2. Laboratory tops, reagent shelves and wall shelves of the following materials:

a. Glazed composition stone.

b. Plastic laminate when set on steel base cabinets.

c. Laminated Hardwood.

1.2 QUALITY ASSURANCE

A. Chemical and Physical Resistance: Provide an independent testing laboratory report certifying that the finish of laboratory tops, sinks, and accessories are capable of withstanding the specified chemical and physical resistance requirements.

1.3 SUBMITTALS

A. Manufacturer's Data; Tops and Accessories: For information only, submit 2 copies of manufacturer's data and installation instructions for each type of top, sink, and accessory units. Indicate by transmittal that a copy of each instruction has been forwarded to the Installer.

Include independent laboratory certification that material complies with specified chemical and physical resistance requirements.

B. Samples; Tops, Sinks and Accessories: Submit 3, 6" x 6" samples of each type of top with specified finish. Samples will be reviewed by Architect for color, texture, and pattern only. Compliance with other specified requirements is the exclusive responsibility of the Contractor.

C. Shop Drawings; Tops, Sinks, and Accessories: Submit shop drawings for tops, sinks, and accessories, coordinated with requirements for laboratory furniture. Coordinate shop drawings with other work involved.

#### 1.4 PRODUCT HANDLING

A. Coordinate delivery of tops, sinks, and accessories with laboratory furniture items.

B. Protect finished surfaces from soiling and damage during handling and installation. Keep covered with polyethylene film or other protective covering.

#### 1.5 JOB CONDITIONS

A. Examination of Substrate and Conditions: Examine the substrate and the conditions under which the work under this section is to be performed, and notify the Contractor in writing of unsatisfactory conditions. Do not proceed with work under this section until unsatisfactory conditions have been corrected in a manner acceptable to the installer.

### PART 2: PRODUCTS

#### 2.1 GENERAL

A. Tops, Box Curbs, Splash Rim: Provide smooth, clean, exposed tops and edges, in uniform plane free of defects. Make exposed edges and corners uniformly rounded.

B. Top Sizes: Furnish tops in maximum practicable lengths, as follows, or longer if available.

Composition stone: 8 ft.

Laminated plastic: 8 ft.

Stainless steel: 10 ft.

C. Top Thickness: Maintain 1-1/4" thickness with tolerance not exceeding plus or minus 1/32". Provide front and end overhang of 1" over base cabinets, formed with continuous drip groove on under surface 1/2" from edge.

#### 2.2 GLAZED COMPOSITION STONE TOPS

A. Composition Stone: Inorganic mixture of synthetic calcium aluminum silicate binder, reinforced with finely dispersed asbestos fibers, integrally mixed with chemically-resistant inorganic pigments and fillers, formed under hydrothermal conditions into dense monolithic sheet weighing 100 pcf.

B. Glazed Finish: Factory-applied ceramic-like surface coating integrally bonded to provide smooth, durable, 100% inorganic heat and chemical resistant finish impervious to water.

Physical Properties: Brinnell hardness - 20; compressive strength - 15,000 psi; modulus of rupture - 4000 psi; screw holding with 7/8" penetration - 1600 lbs.

C. Chemical Resistance: Spot test of following reagents in standard laboratory concentrations, in contact with glaze for 24 hours, producing no effect or only slight stain which is removable with household cleanser or bleach: Hydrochloric acid, sulphuric acid, nitric acid, phosphoric acid, glacial acetic acid, chromic acid, ammonium hydroxide, sodium hydroxide, ethyl alcohol, ether, carbon tetrachloride, acetone, mineral oil, potassium permanganate, sodium hypochlorite, zinc chloride, xylol, methyl ethyl ketone, ferric chloride.

D. Workmanship: Matte finished baked-on glaze, factory applied to mill sheets. Glazed composition stone top fabricated as specified for composition stone tops. Use a special liquid glaze, having substantially the same color, physical properties and chemical resistance as factory applied baked-on glaze, for repair coating or exposed edges produced by shop fabrication or field cutting.

E. Acceptable Products: Johns-Manville Coloceran.

F. Precaution: Any machining or cutting of this product shall be done by wet-machining process or with exhaust or dust collection ventilation.

### 2.3 PLASTIC LAMINATE

A. Provide 1/16" (minimum) thick plastic laminate sheet, black color through entire thickness with satin finish, complying with NEMA LD-1. Shop-bonded with fully waterproof bond glue to 1-1/4" thick sub-top of hardwood faced plywood, medium density overlaid plywood, or phenolic resin bonded particleboard. Smooth sand surfaces to which plastic laminate is to be bonded. Apply 1/16" thick phenolic backing sheet to back of panels. Build up exposed edges of tops to 1-1/4" thickness, 3-5/8" wide. Self-edge exposed edges of top, splash, and openings with same plastic laminate used for tops. Unless otherwise indicated, top and back splash one piece with intersection coved. Intersections of end splash with top and back splash need not be coved.

B. Acceptable Products: Formica No. 840 Black (Lab Grade).

### 2.4 STAINLESS STEEL

A. Provide 16 gauge stainless steel sheet, AISI Type 302/304 with No. 4 satin finish, unless otherwise indicated. Weld all shop joints, grind smooth and polish to become practically invisible. Provide hair-line butt jointed field joints, mechanically bolted through continuous channels welded to underside at edges. Keep field jointing to a minimum. Apply steel reinforcing channels to the underside of top where necessary to insure rigidity without deflection.

B. Extend top down to provide a 1-1/4" thickness and 1/2" return flange under frame. Sound-deaden entire under-surface with heavy build mastic coating.

C. Form backsplash to be coved to and integral with top surface.

D. Provide a raised marine edge around the entire perimeter of tops and counters containing sinks. Pitch top surface two-ways to bowl and to provide adequate drainage without channeling or grooving.



## E. Sinks, Cup Sinks, Troughs:

1. Sizes: As Indicated or manufacturer's closest stock size of equal or greater volume, as acceptable to the Architect.

2. Outlets: 1-1/2" diameter, 6" minimum length, fabricated of either silicon iron, cast epoxy resin, stainless steel, glass, or lead; of same material as sink wherever possible, or as otherwise acceptable to the Architect.

3. Overflows: Furnish hereunder for sinks, except cup sinks, of standard beehive or open top type with separate strainer. Height 2" less than sink depth. Of same material as sink.

4. Stainless Steel Sinks: 18 gauge, Type 302/304, with No. 4 satin finish, unless otherwise indicated. Fabricate with horizontal and vertical corners rounded and coved to at least 5/8" radius. Slope sink bottoms to pitch to outlet. Provide double wall construction for sink partitions with top edge rounded to at least 1/2" diameter. Continuous butt weld all joints and provide factory punching for fixtures.

a. When stainless steel sinks are part of stainless steel tops, weld sink units to tops and finish to produce an integral unit with invisible joint line, without the use of solder or filler.

## 2.5 LAMINATED HARDWOOD

A. Provide equivalent to Hamilton 20L501 1-1/4" thick edge grain laminated Maple strips.

B. Finish: Provide 3 coats water and reagent resistant varnish finish on top and edge, 2 coats on bottom.

## 2.6 ACCESSORIES

A. Reagent Shelves and Turrets: Single-face or double faced units as required, fabricated of manufacturer's standard design to suit type and composition of top units.

B. Sockets for Rod Assemblies, Burette Rods, and Greenlaw Arm Assemblies: Manufacturer's Standard for 3/4" (19mm) diameter tapered rods.

C. Pegboard Panels: Shall be constructed of a combination of Portland cement and asbestos fibers impregnated with phenolic resin and pressure bonded into a solid sheet 1" thick and shall have a high bake, black chemical resistant enamel finish.

D. Pegboard Pegs: Provide polypropylene pegs, except provide stainless steel rod pegs at locations of stainless steel work. Pegs shall be held in panel by mechanical design and easily removable from board.

E. Cut holes, cutouts and other openings in countertops, working surfaces, curbs and backsplashes as necessary to receive sinks, plumbing service fixtures, piping, ductwork, electrical fixtures and defices, conduit and wiring and other equipment, fixtures or fittings to be built into or mounted on or adjacent to the metal laboratory casework.

F. Holes, cutouts and openings shall be factory cut where possible. Where size and location of holes and cutouts cannot be determined in advance or depend on future field conditions, hole and cutouts may be made in the field. field cut holes and cutouts shall be accurately located and neatly made, and surrounding surfaces shall not be damaged.

### PART 3: EXECUTION

#### 3.1 INSTALLATION OF TOPS

A. Field Jointing: Where practicable, make in same manner as factory jointing using dowels, splines, adhesives, and fasteners recommended by manufacturer. Locate field joints as shown on accepted shop drawings, factory prepared so that there is no job site processing of top and edge surfaces.

B. Fastenings: Use concealed clamping devices for field joints, except for composition stone tops, located within 6" of front, at back edges and at intervals not exceeding 24". Tighten in accordance with manufacturer's instructions to exert a constant, heavy clamping pressure at joints. Except for composition stone secure tops to cabinets with "Z"-type fasteners or equivalent, using 2 or more fasteners at each front, end, and back.

1. For composition stone, secure to cabinets with epoxy cement applied at each corner and along perimeter edges at not more than 28" o.c.

C. Workmanship: Abutt top and edge surfaces in one true plane, with internal supports placed to prevent any deflection. Provide flush hairline joints in top units using clamping devices. At stone-type material joints, use manufacturer's recommended adhesives and holding devices to provide joint widths not more than 1/16" wide at any location, completely filled and flush with abutting edges.

1. Where necessary to penetrate tops with fasteners, countersink heads approximately 1/8" and plug hole flush with material equal in chemical resistance, color, hardness, and texture to top surface.

D. After installation, carefully dress joints smooth, remove any surface scratches, clean and polish entire surface.

E. Provide all holes and cutouts as required for mechanical and electrical service fixtures specified in Divisions 15 and 16 and as otherwise required.

F. Provide scribe mouldings for closures at junctures of top, curb and splash with walls as recommended by manufacturer for materials involved. Use chemical resistant, permanently elastic sealing compound where recommended by manufacturer.

#### 3.2 INSTALLATION OF SINKS

A. Except for integral sinks, cup sinks and troughs in stainless steel counter tops, sinks, cup sinks and troughs are furnished under Division 15 and set as part of work of this section.

B. Underside Installation:

1. Use manufacturer's recommended adjustable support system for table-type and cabinet-type installation.

2. Set top edge of sink unit firmly pressed to counter top, set in manufacturer's recommended chemical resistant sealing compound to produce a tight a fully leakproof joint. Adjust sink and securely support to prevent movement.

C. Semiflush Installation: Use stainless steel sink frame, complete with clamping lugs and pads. Before setting, apply a full coat of manufacturer's recommended sealant under rim lip and along top. Omit sink frame if sink fabricated with integral rim seal.

### 3.3 INSTALLATION OF ACCESSORIES

A. Install in a precise manner in accordance with manufacturer's directions. Turn screws to a flat seat; do not drive. Adjust moving parts to operate freely without excessive bind.

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## PART 1: GENERAL

1.1 SCOPE

A. Conditions of Contract and Division 1 - General Requirements, apply to all work of this section. Refer to Article 12 of the Instructions to Bidders, Article 7 of the General Conditions and Section 01600 - Materials and Equipment for requirements on pre-bid and post-bid evaluation of proposed substitute products, methods and other conditions.

B. The extent of laboratory fume hoods is shown on the drawings and in schedules. See Section 11611, Part 4 for types required.

C. The work includes the fabrication and installation of standard laboratory fume hood components coordinated with laboratory casework system. The work of this section shall be furnished and installed under the single responsibility of Section 11611.

D. Related Work Specified Elsewhere:

1. Laboratory Equipment: Section 11600
2. Metal Laboratory Casework: Section 11611
3. Tops and Accessories: Section 11613
4. Laboratory Mechanical Service Fixtures: Division 15
5. Laboratory Electrical Service Fixtures: Division 16
6. Mechanical and Electrical Work: Divisions 15 and 16 respectively, except for hood light fixtures, electrical outlets and pilot lights.
7. Fume hood vent connections (from hood duct collar to hood exhaust system): Division 15.

1.2 QUALITY ASSURANCE

A. Provide laboratory fume hoods (for integration with laboratory tops, sinks, and service fixtures, as required) manufactured or furnished by the same laboratory furniture company for single responsibility.

Manufacturer: Provide laboratory fume hoods produced by one of the following:

Hamilton Industries  
Kewanee Scientific Equipment Corporation  
St. Charles Manufacturing Company

B. Standards: The use of the specific requirements set forth in drawings and specification, are not intended to preclude the use of any other acceptable manufacturer's product or procedures which may be equivalent, but are given

for the purpose of establishing a standard of design and quality for materials, construction and workmanship.

C. General Performance: Design hoods to operate efficiently with air velocity produced by exhaust system to which connected, when operating under normal laboratory conditions without presence of cross-drafts, high thermal loads, or other similar non-standard conditions. Dead air pockets and reverse air currents will not be permitted along the surface of hood interiors.

D. Source Quality Control: The University reserves the right to require the manufacturer to demonstrate hood performance to prove compliance with contract requirements. Test hoods, testing facility, necessary instrumentation, apparatus and equipment will be supplied by manufacturer at no cost to the University. Test hoods with smoke and air flow meters to verify performance requirements.

E. Air-Foil Type Fume Hood: Design to operate with air velocity through open face of 199 lineal fpm. Provide air by-pass to control maximum velocity of air through hood face to 300 lineal fpm at any sash position, when hood is operating at 100 lin. feet of air per minute with sash open.

1. Splay or radius sides of face opening to provide an aerodynamic section to insure smooth, even flow of air into hood.

2. Install air foil vane at bottom to match aerodynamic side sections. Mount foil with 1" open space between foil and bottom front edge of hood superstructure to prevent any back flow of air. Extend air foil under sash line, so that sash closes on top of foil without closing to 1" opening.

3. Equip hood with automatic air by-pass above sash opening to limit maximum air velocity through face of hood and to provide relatively constant volume of air through hood regardless of sash position.

### 1.3 SUBMITTALS

A. Manufacturer's Data: Laboratory Fume Hoods: For information only, submit 2 copies of manufacturer's data and installation instructions for each type of laboratory fume hood. Indicate by transmittal that a copy of each instruction has been forwarded to the installer.

B. Shop Drawings: Submit shop drawings for laboratory fume hoods showing plans, elevations, ends, cross-sections, service run spaces, location and type of service fixtures with lines there to; details and location of anchorages and fitting to floors, walls, and base; layout of units with relation to surrounding walls, doors, windows, and other building components; connection to hood exhaust system; location of access doors, cut-off valves, junction boxes.

1. Coordinate shop drawings with other work involved.

2. Provide complete roughing-in drawings for mechanical and electrical services well in advance of concrete operations so as not to delay the work.

### 1.4 PRODUCT HANDLING:

A. Coordinate delivery of fume hoods with other laboratory casework components.

B. Protect finished surfaces from soiling and damage during handling and installation. Keep covered with polyethylene film or other protective covering.

### 1.5 JOB CONDITIONS

A. Examination of Substrate and Conditions: Examine the substrate and the conditions under which the work under this section is to be performed, and notify the Contractor in writing of unsatisfactory conditions. Do not proceed with work under this section until unsatisfactory conditions have been corrected in a manner acceptable to the Installer.

## PART 2: PRODUCTS

### 2.1 MATERIALS AND CONSTRUCTION

A. Exterior Metal: Manufacturer's standard with acid and alkali resistant baked-on finish. Unless otherwise indicated, color as selected by Architect from manufacturer's standard.

B. Interior Liner: Manufacturer's standard acid and alkali resistant rigid composition board, not less than 1/4" thick.

C. Stainless Steel: AISI Type 316 with No. 4 finish.

D. Safety Glass: Two sheets of double-strength "B" quality, clear sheet glass permanently laminated with a sheet of clear plasticized polyvinyl butyral.

### 2.2 HOOD SUPERSTRUCTURE (ALL TYPES)

A. General: Design hoods to be highly fume resistant, for collection, retention and disposal of hazardous fumes with complete safety, minimum expenditure of purging air from room supply, and minimum turbulence within the chamber.

B. Framework: Heavy gauge steel members, reinforced, braced and assembled to insure strength and rigidity.

C. Body Construction: Fabricate exterior of 18 gauge cold rolled steel with component parts screwed together to allow removal of end panels, front end fascia pieces, top fascia and air foil strips, and to allow access to plumbing lines and service fixtures. Apply manufacturer's standard acid and alkali resistant baked-on finish to interior and exterior surface of all component parts prior to final assembly.

D. Ends: Double-wall end panels without projecting corner posts or other obstructions to interfere with smooth, even flow of air. Close area between double walls for housing sash counter-balance weights, utility lines, and remote control valves, as required.

E. Composition Stone Lining: Unless otherwise noted use composition stone (cement-asbestos) for exposed interior surfaces. Use stainless steel for fasteners and other exposed metal.

1. Furnish end panels, back panel, and top of not less than 1/4" thick material, screwed together with cleats or steel angles to form a completely rigid assembly to which exterior cold rolled steel panels are mounted.

2. Back-up joints with angles or cleats and coat joints with chemical resistant mastic before assembly to prevent open joints or spaces. Use stainless steel truss head screws or rivets (not countersunk) for assembly of panels and to provide maximum strength joints. Secure hood baffle to cleats at rear of hood with stainless steel screws.

F. Provide a working surface of 1-1/4" glazed composition stone with 1/2" thick raised edge across front of hood, bonded to top to make a watertight retaining ledge. Provide marine edge on stainless steel tops.

G. Punch hood fascia panels to receive remote controls and service fixtures at each side of hood. Furnish removable plug buttons for holes not used for specified fixtures.

H. Rear Baffle: Provide baffle at rear of hood with adjustable openings at top and bottom to allow adjusting flow of air through hood to compensate for type of gas, apparatus, or heat source used. Fabricate unit to be easily removable for cleaning behind baffle, or same material as hood lining.

I. Provide control adjustment strips at top and bottom with plastic or stainless steel knobs.

I. Plenum Chamber: Adequate volume for hood dimensions, extending full width of hoods to equalize incoming air flow, or same material as hood lining. Provide corrosion resistant, steel duct stub of proper dimension for connection to exhaust duct assembly.

J. By-Pass Grilles: When air is required to be taken from room other than through hood sash opening, provide suitable by-pass grilles having required free opening but concealing plenum behind. Finish to match metal casework.

K. Sash: Provide sliding sash, except where no sash is required. Fabricate sash with 18 gauge stainless steel four-sided frame with corners welded and ground smooth. Glaze with safety glass set into chemical resistant rubber glazing channels, held in place by removable stainless steel top.

I. Counterbalance vertical sliding sash with a sash weight and cable system. Provide stainless steel or monel metal cable, ball-bearing sheaves, plastic glides in stainless steel guides, and full-width stainless steel lift handles. Provide rubber bumpers at top and bottom of each sash unit.

L. Fabricate special horizontal sliding sash to slide on adjustable nylon-tired ball-bearing sheaves on stainless steel track. Sash shall bypass the primary vertical sash, and be removable. Provide flush finger pulls and rubber bumpers at both stiles of each sash.

M. Lights: Provide each hood with two (or more) rapid-start tube fluorescent light fixture of longest practicable length. Shield light from hood interior by 1/4" thick safety glass or 1/8" thick tempered glass panel, sealed air tight into hood body with chemical resistant rubber channels. Set units so that light tubes are easily replaceable from outside hood. Provide only fixtures which carry UL label.

N. Closure Strips: Metal, to match adjoining surfaces. Provide where required to close openings between fume hood base cabinet and superstructure and adjacent building wall or ceiling construction.

O. Holes: Provide holes for passage of piping and conduit and for fixtures furnished under other sections.

P. Fasteners: Provide stainless steel for fasteners wherever exposed to fumes in hood.

### 2.3 ELECTRICAL FIXTURES

A. Electrical fixtures (by fume hood fabricator) shall be as follows:

1. Light Switch: 20 amp, single pole, 277 volt, A.C.: Hubbell #1221 or approved equal.

2. Receptacle: 20 amp, 2P-3W grounded type, 125 volt, duplex, Hubbell #5362, or approved equal.

3. Pilot: Green draft-proving light, 120 volt. Provide plastic legend plate adjacent to pilot light and engrave: LIGHT ON INDICATES PROPER AIR FLOW.

4. Plates: Sierra type 302 satin stainless steel.

5. Light Fixtures: Typically fluorescent rapid start or trigger start, HPF, 120 volt. (Fume resistant incandescent in Type C hoods).

6. Lamps: Fluorescent, white (F40W typical). Lamps shall be provided and installed for all fixtures.

7. Microswitch: Provide microswitch at sash track to activate fume hood exhaust fan control when sash is at or below 10" opening. Microswitch shall be double pole - double throw.

B. The above items shall be pre-wired to a single junction box located behind the fume hood superstructure. The junction box shall be accessible. Provide a ground wire in all flexible conduit.

### 2.4 AIR FOIL FUME HOODS (TYPE A AND TYPE D)

A. Superstructure shall be as described in Article 2.2 except as modified by this Article.

B. Shall be constant volume type with a built-in automatic compensating bypass to maintain constant exhaust volume regardless of sash position. Bypass shall be positive in action controlled by the operation of the sash. A low impedance, directionally louvered panel shall be provided in the lintel bypass area. As the sash is lowered, the bypass design shall limit the increase in face velocity to a maximum of four and one-half times the average face velocity as measured with the sash full open.

C. Perimeter of access opening shall have an air foil or streamlined shape with all right angle corners radiused or angled. Bottom horizontal foil shall provide a nominal one inch bypass when the sash is in the closed position. Bottom foil shall be removable without the use of special tools.



## 2.5 RADIO ISOTOPE FUME HOODS (TYPE B)

A. Superstructure shall be as described in Article 2.2 except as modified by this Article.

B. Shall be constant volume type with a built-in automatic compensating bypass to maintain constant exhaust volume regardless of sash position. Bypass shall be positive in action controlled by the operation of the sash. A low impedance, directionally louvered panel shall be provided in the lintel bypass area. As the sash is lowered, the bypass design shall limit the increase in face velocity to a maximum of four and one-half times the average face velocity as measured with the sash full open.

C. Perimeter of access opening shall have an air foil or streamlined shape with all right angle corners radiused or angled. Bottom horizontal foil shall provide a nominal one inch bypass when the sash is in the closed position. Bottom foil shall be removable without the use of special tools.

D. All surfaces exposed in the interior of the hood, and foils at perimeter opening, except glass retaining strips, shall be 16 gauge Type 316 stainless steel with No. 4 satin finish except the work top shall be minimum 14 gauge.

E. The 16 gauge stainless steel baffle shall be held in place with stainless steel screws, and shall be removable to allow cleaning and decontamination of the area behind the baffle. Provide stainless steel adjustment strips, adjustable by means of stainless steel, at the top and bottom of the baffle.

F. The work surface shall be made in the form of a watertight pan, 1/2" deep, to contain spillage, with a 6" wide safety ledge across the front edge. It shall be reinforced with a 10 gauge steel channel at the front, and structural reinforcements at the center and rear to support a uniform maximum loading of 200 pounds per square foot.

G. The entire stainless steel hood interior shall be reinforced with angles and plug hats to provide a completely rigid assembly, and shall be welded together to form a self-supporting hood assembly to which the exterior cold-rolled steel parts can be mounted. A stainless steel duct collar shall be provided in the top of the hood plenum chamber in back of the top sloping baffle. Vendor of fume hoods to include in his price the cost of any necessary modifications to ductwork shown on drawings. Construction shall be seamless, except around removable baffle. Omit removable plumbing access panels. Access shall be from exterior and shall be gained by removing hood fascia panels or end panels. The inside end and back panels shall be made in a one-piece wrap-around, welded to the work surface, forming smooth 1/2" radius corners. All interior corners shall be 1/2" radius, except top liner, which shall be spot welded to the wrap-around.

H. Weld vent pipes from base cabinet below to the stainless steel deck.

I. All stainless steel work shall conform to the requirements specified in Section 11613 above, including welding and finishing of welds.

J. Form around cup sink so cup sink is 1/4" above deck, but 1/4" below front edge of deck. Faucet must drain into cup sink.

## 2.6 SPECIAL ACID FUME HOODS

- A. Superstructure shall be as described in Article 2.2 except as modified by this Article.
- B. Shall be variable volume type, without bypass, with the face velocity and exhaust volume adjustable by moving the sash up and down.
- C. Liner, work surface and trough shall be fabricated of stainless steel ground and blended on all exposed surfaces. Gauges shall be No. 16. All corners, vertical and horizontal, shall be coved on a 1/2" radius continuous welded ground and blended to a fine grained finish. Sides and back adjoining working surface shall have 1/2" cove and be integral with a seamless joint to working surface. Seamless joints shall be continuous welded ground and blended.
- D. A raised edge shall be provided at front of work surface, and a stainless steel trough full width across back of work surface, shall be provided for water wash down. Water wash down shall consist of stainless steel or plastic fog nozzles, internal piping and control valve.
- E. Incandescent light fixture shall be fume resistant and UL listed. Fixture shall be installed in roof with bulb replacement from interior.
- F. Provide the following additional features:
1. Wash-down inside hood.
  2. Engraved Sign: NOT FOR PERCHLORIC ACID.

## 2.7 FUME HOOD PERFORMANCE

- A. Hoods shall contain and remove fumes generated within the hoods. Hoods shall be designed to provide a face velocity of 100 cubic feet per minute across the full open face of the hood, except 150 cubic feet per minute at isotope hoods. Hood design shall be such that it will exhaust light or heavy gases efficiently, when the hood is used for ordinary laboratory work in a room free from cross drafts, and without high thermal loads or other special conditions. The air velocity shall be uniform, to a tolerance of  $\pm 10$  FPM, over the face of the hood when measured at the top, bottoms, center and sides of the hood face. No reverse currents of air shall occur along the sides, top, bottom or front of the hood. R
- B. When the sash is down, the air bypass shall control the maximum velocity of air being drawn through the hood so that it does not exceed 4-1/4 times the face velocity with the sash in the open position.

## PART 3: EXECUTION

### 3.1 INSTALLATION

- A. Laboratory Fume Hoods shall be installed under the technical supervision of the manufacturer. The manufacturer shall have a technically qualified superintendent on the site at all times during the installation of the fume hoods.

B. Coordinate installation with the Mechanical Contractor, Electrical Contractor and other contractors and subcontractors so that piping and wiring may be completed and sinks, service fixtures and equipment can be set in place and connected in the proper sequence.

C. General: Install fume hoods plumb, level, rigid, securely anchored to building in proper location, in accordance with manufacturer's instructions. Install closures neatly.

D. Coordinate sequence of work with mechanical and electrical trades.

E. Moving Parts: Carefully check to insure smooth, near-silent, and accurate operation; sash operation with one hand with uniform contact of rubber bumpers; counterbalances operate without interference; uniform contact of rubber bumpers.

F. Securely attach access panels but provide for easy removal and secure re-attachment.

G. Touch up damaged finishes.

H. Clean surfaces, including both sides of glass.

I. Damaged Work: Repair equal to new undamaged work, or replace with new units, as acceptable to the Architect.

### 3.2 FUME HOOD PERFORMANCE TESTS

A. The metal laboratory casework contractor shall test the first fume hood installed on each floor and one additional fume hood per floor as selected by the Architect and submit a written report of each test to the Architect before final acceptance. Tests shall be conducted in cooperation with the Mechanical Contractor.

B. Hoods shall be tested in an area where there is at least 5 feet of clear space in front and on each side for observation of the airflow pattern entering the hood. This area shall be without cross-drafts or other air currents exceeding 10 FPM that would affect the hood performance in the area in front and around the hood. Exhaust air volume shall be variable to show hood operation at different face velocities within the Specification range.

C. Fume hood face velocities shall be verified as follows: With exhaust blower on, the quantity of air being exhausted shall be determined by measuring the velocity of the air entering the hood face, and multiplying this velocity by the square feet of hood opening. The air velocity shall be determined by averaging at least 6 velocity readings taken at the hood face. Readings shall be taken in the center of a grid made up of 3 sections across the top half of the hood face, and 3 sections across the bottom half of the hood face. Readings shall not vary more than +10 FPM from the average face velocity. When the desired face velocity has been established, the following tests shall be made:

I. Make a complete traverse of the hood face with a cotton swab dipped in titanium tetrachloride to demonstrate that a positive flow of air is maintained into the hood over the entire hood face. No reverse air flows or dead air spaces shall be permitted.

2. Paint a strip of titanium tetrachloride along each end and across the working surface of the hood, in a line parallel with the hood face and 6" back into the hood to demonstrate that no backflows of air exist at these points. The flow of smoke shall be directly to the rear of the hood, without swirling turbulence or reverse flows.

3. A smoke bomb (one-half minute size), shall be discharged within the hood area to show the exhaust capability of the hood and its design efficiency. No reverse air flows will be permitted. Place lighted bomb in the hood area and move it to various places, checking end panels and working surface to verify that no reverse air flows exist at any point. Lower the sash to closed position to verify that a sufficient air volume is flowing through the hood working area to carry away fumes from a massive fume source. Immediately after the smoke bomb stops discharging smoke, the hood area should be purged of smoke.

4. Place a pan of dry ice in hot water in the hood and observe flow of the heavy, white vapors generated. The flow of fumes shall be carried away to the back of the hood. No reverse flows of fumes along the work surface toward the front of the hood shall occur.

D. Repeat tests 1, 2, 3 and 4 for every face velocity setting selected to be tested in the 70-100 FPM range.

E. The fume hood automatic air bypass shall maintain a relatively constant flow of air into the hood at all sash positions. When the sash is down, the air bypass shall control the maximum air velocity being drawn through the hood so that it does not exceed 4-1/4 times the face velocity when the sash is full open.

F. Check sash operation by raising and lowering sash. Sash shall glide smoothly and freely and hold at any height without creeping, assuring proper counterbalance. No metal-to-metal contact will be allowed.

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## PART I: GENERAL

1.1 SCOPE

A. Conditions of Contract and Division I, General Requirements, apply to all work of this section. Refer to Article 12 of the Instructions to Bidders, Article 7 of the General Conditions and Section 01600 - Materials and Equipment for requirements on pre-bid and post-bid evaluation of proposed substitute products, methods and other conditions.

B. Work under this section includes furnishing and installing all sterilizers and accessories indicated on the drawings or specified herein. Provide door swings as indicated on drawings.

C. Related work specified elsewhere:

1. Connection of hot water, cold water, steam, and waste piping - Division 15.

2. Electrical connection - Division 16.

D. Furnished by Owner:

1. Refer to Equipment Schedules for Group II equipment furnished and installed by Owner.

1.2 QUALIFICATIONS

A. Manufacturers: Sterilizers shall be manufactured by the American Sterilizer Company, Castle Company, or approved equal.

1. The manufacturer shall have an established organization located in the Metropolitan Minneapolis-St. Paul area which can provide technical assistance and maintenance service for the sterilizers.

1.3 SUBMITTALS

A. Shop Drawings: Submit shop drawings in accordance with Section 01300. Shop drawings shall be large scale (1/2" = 1'-0"), floor plans and room elevations; showing all rough-in dimensions, wall opening sizes and location of all services. Contractor shall submit shop drawings to the Architect, allowing time for checking by the Architect and Owner, prior to any rough-in work at sterilizing rooms.

B. Certification: The manufacturer shall provide signed certificates of Product Compliance to standards and specifications requirements.

C. Operating and Maintenance Instructions: Submit written operating and maintenance instructions and instruct the Owner's personnel in the use and maintenance of all equipment furnished under this section (Refer to Section 01300).

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver, store and handle sterilizers in a manner that will prevent damage. Repair or replace damaged items.

## 1.5 POWER CHARACTERISTICS

A. Electrical power shall be 120 volt, single phase, 60 Hz and 208 volt, 3 phase, 60 Hz alternating current. Heating loads greater than 1.8 KW shall be 208 volts, single phase. Motors larger than 1/2 HP shall be 208 volt, three phase.

## 1.6 STEAM SUPPLY

- A. Steam for all sterilizers shall be obtained from a building supply line.
- B. Sterilizers shall operate on steam delivered at 50 to 80 psig dynamic.

## PART 2: PRODUCTS

### 2.1 SCHEDULE OF STERILIZER EQUIPMENT

A. Refer to drawings and equipment schedule, sheet 13-1, for reference, location and service requirements for the following sterilizer equipment.

### 2.2 STERILIZER NO. S-218 (Room 8-139) (Pharmacognosy)

- A. Sterilizers No. S-218 shall be general purpose steam powered, air removal type sterilizer with an inside chamber dimension of 24" x 36" x 60", manual operated single door and automatic controls. Sterilizers shall be recessed through one wall and shall have a stainless steel front panel.
- B. Sterilizers No. S-218 shall be Amsco Model AP 33-060-832-5102 or Castle Model F-6030III.
- C. Sterilizers shall conform to Int. Fed. Spec. GG-S-001343, Size 3, Style B.
- D. Sterilizer exhaust system shall have a condenser assembly.
- E. Discharge line from the jacket shall have a fitting for connection to a condensed return line.
- F. Furnish one loading car and transfer carriage for each sterilizer. Loading car shall have a full-length, full-width bottom shelf, a removeable load-retaining gate to form a closure one side and either 4 half-width, full-length adjustable shelves or 2 full-length, full-width adjustable shelves.

### 2.3 STERILIZER NO. S-294 (Room 2-114-GMP) (Parenteral) (Room 10-101)(Soil)

- A. Sterilizers No. S-294 shall be general purpose, steam powered, horizontal vacuum-pressure gravity air removal type sterilizer with an inside chamber dimension of 20" x 20" x 38", manually operated single door and automatic controls with recorder
- B. Sterilizers shall be Amsco Model AN7 Series
- C. Sterilizers shall be free standing with cabinet enclosure. Enclosure shall consist of stainless steel front, side, rear and top panels and shall be removeable.
- D. Sterilizers shall conform to Int. Fed. Spec. GG-S-011340, Type 1, Size 2, Style B, but with side, rear and top enclosure panels and except as otherwise specified herein.
- E. Chamber exhaust system shall have an automatic condenser assembly.

F. Furnish one removable rack with 2 full-length, full-width extendable shelves for each sterilizer. Rack shall be a framework of welded (polished) nickel-copper alloy easily removable from the sterilizer chamber. The rack shall have angle guides to support the shelves. Shelves shall be constructed of nickel-copper alloy wire rod. When fully loaded, the shelves shall slide freely on the angle guides. Stops shall be provided to allow each shelf to be withdrawn approximately one-half of its length.

2.4 STERILIZER NO. S-296 (Room 8-140) (General Purpose Lab)

A. Sterilizers No. S-296 shall be general purpose, steam powered, horizontal vacuum-pressure gravity air removal type sterilizer with an inside chamber dimension of 20" x 20" x 38", manually operated pass-through doors and automatic controls. Sterilizers shall be cabinet enclosed with stainless steel front, side and top panels.

B. Sterilizers No. S-296 shall be Amsco Model AN-7 Series.

C. Sterilizer exhaust system shall have a condenser assembly.

D. Discharge line from the jacket shall have a fitting for connection to a condensate return line.

E. Furnish one removable rack with 2 full-length, full-width, extendable shelves for each sterilizer.

2.5 STERILIZER NO. S-297 (Room 9-129) (Injection Room)

A. Sterilizers No. S-297 shall be pass-through general purpose type with low temperature control, steam powered, horizontal vacuum-pressure gravity air removal type sterilizer with an inside chamber dimension of 20" x 20" x 38", manually operated pass-through doors and automatic controls. Sterilizers shall be cabinet enclosed with stainless steel fronts. Wall to wall pass-through dimension is 36-1/2".

B. Sterilizers No. S-297 shall be Amsco Model AN-7 Series.

C. Sterilizers shall use building steam for the jacket and the chamber. Condenser venting shall exhaust chamber steam condensate to drain, and jacket steam condensate shall be returned to a building condensate return line.

D. Automatic control system shall function in the standard manner so that no special operator attention or action is required because of the two separate steam supplies and the two separate steam exhausts.

E. Discharge line from the jacket shall have a fitting for connection to a condensate return line.

F. All parts of the sterilizer to be in contact with distilled water steam shall be free of copper, brass, bronze and uncoated ferrous metal. Chamber steam supply piping, valves and fittings including steam pressure regulator shall be constructed of Type 316 stainless steel.

G. Chamber exhaust system shall have a condenser assembly.

2. EQUIPMENT ITEM S-402 - CAGE AND RACK WASHER (Room 9-13) (Cage Wash)

A. Equipment Item S-402 shall be a pit mounted, two door pass through type, automatic animal cage and rack washer.

B. Cage and rack washer shall be Better Bilt Machinery Corporation Model 6200, or approved equal. Provide Graham 9 x 4 x F-14S booster heater.

C. Washing compartment shall be not less than required for racks 41" wide a 80" long x 84" high. Standard washing compartments of Better Bilt Model 6200 are acceptable.

D. Washer shall provide the following treatments:

1. Pre-Rinse: Reclaimed water from second fresh water rinse, adjustable from 0 to 5 minutes, circulated under pressure and then drained to waste.

a. Washer shall be equipped with an automatic acid dispensing system to inject a selected amount of commercially prepared phosphoric acid solution into the pre-rinse water at the option of the operator. Acid concentrations shall be variable from "1" to 3/4 ounce per gallon of pre-rinse water. Acid solution shall be pumped from barrels; dispensing system shall include a pump and interconnecting hoses.

2. Detergent Wash: 195° F solution, adjustable from 0 to 10 minutes, circulated under pressure and then drained to waste.

3. First Rinse: 180 to 195° F. fresh hot water, adjustable from 0 to 5 minutes, circulated under pressure and then drained to waste.

4. Second Rinse: 195° F fresh hot water, adjustable from 0 to 5 minutes, circulated under pressure and then drained, retained for use as pre-rinse solution of next cycle.

5. Or, eliminate second rinse and provide one rinse, 195°F fresh hot water, adjustable from 0 to 10 minutes, circulated under pressure and then drained to waste.

E. Washer shall have fully automatic controls which control the sequence and duration of the treatments. Individual treatment timers shall automatically reset to setting used for previous cycle unless setting is changed by operator. Controls shall include signal lights located at both ends of the washer, indicating the treatment in progress at load end, indicating unit is in operation at unload end.

F. Washing compartment basin and well shall be constructed of Type 304 stainless steel. Basin and well shall be welded construction. Well shall have one full stainless steel debris screen with 0.040" diameter perforations and 3 stainless steel debris baskets. Debris screen and baskets shall be easily removable.

G. Washing compartment well shall have a stainless steel steam coil with automatic temperature control to raise the temperature of the wash and rinse solutions from 180°F to 195°F and maintain the 195°F temperature during recirculation.



H. Washing compartment shall have a type 316 stainless steel, grating floor. Grating shall be removable to provide access to the debris screen and brackets.  
I. Washer compartment sides and top shall be constructed of sectionalized panels, gasketed and bolted together. Panels shall be insulated with not less than 2" of fiberglass insulation and faced both sides with Type 304 stainless steel.

J. Washer shall have doors at both ends. Doors shall be stainless steel, double wall insulated construction and shall provide a clear opening of not less than 41" wide x 84" high. Doors shall have an observation port, safety interlock to stop machine operation if a door is opened and emergency exit hardware. Doors shall be interlocked to prevent opening both doors at the same time.

K. Washer shall be pit mounted.

L. Circulatory piping and pumps shall be constructed of Type 304 stainless steel.

M. Washing compartment shall be illuminated with vaporproof light fixtures. Furnish light bulbs.

N. Washer shall have an exhaust vent on top of machine to vent moist air. Vent shall be equipped with an automatic damper as necessary to maintain the required treatment temperatures. Vent shall be connected to the building exhaust ductwork.

O. Provide four (4) 4-wheeled racks to accommodate drop pans, solid plastic mouse cages and similar items. Racks shall be manufacturer's standard accessory rack for use with this type washer. Exact shelf arrangement shall be as selected by the Architect. Racks and shelf shall be constructed of stainless steel.

### PART 3: EXECUTION

#### 3.1 INSTALLATION

A. Sterilizers shall be installed under the technical supervision of the manufacturer.

B. Install sterilizers strictly in accordance with manufacturer's instructions. Level sterilizers. Seal joints between front panel of recessed sterilizers and surrounding wall construction. After utilities have been connected, lubricate and adjust sterilizers. Leave installation clean, in good working order.

C. Protect sterilizers and accessories from damage. Repair damage.

#### 3.2 FIELD QUALITY CONTROL

A. After installation is complete, test sterilizers to determine that completed installation meets the performance characteristics required by the appropriate Federal Specification specified above. Submit certificate indicating tests performed and results to Architect.

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## PART 1: GENERAL

1.1 SCOPE

A. Conditions of Contract and Division 1 - General Requirements, apply to all work of this section. Refer to Article 12 of the Instructions to Bidders. Article 7 of the General Conditions and Section 01600 - Materials and Equipment, for requirements on pre-bid and post-bid evaluation of proposed substitute products, methods and other conditions.

B. Work under this section includes waste compactor.

C. Related work specified elsewhere:

1. Electrical: Division 16.

D. Refer to drawings for location and position.

1.2 QUALITY ASSURANCE

A. Quality of manufacture: The products named herein are specified to establish standards of quality, performance and design concept. The equivalent products of the named manufacturers are acceptable subject to the approval by the Architect of minor deviations from the specified standards.

1.3 SUBMITTALS

A. Shop Drawings: Submit fabrication drawings and installation layouts of compactor equipment in accord with Section 01300.

B. Operating Instruction: Submit complete operating and maintenance instructions in manual form in accord with Section 01300.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Package, handle, transport and store at the jobsite in a manner which will avoid damage.

## PART 2: PRODUCTS

2.1 WASTE COMPACTOR

A. Waste compactor shall be: Model Super T High Density Waste Compactor as manufactured by the International Dynetics Corporation, of South Norwalk, Connecticut, or approved equal. This compactor will be manufactured in accordance with the following specifications:

B. HYDRAULIC POWER PACK: 3000 psi system operating at an average pressure of 1000 psi. The power pack will generate no damaging heat, which would possibly damage the hydraulic system components. Systems which utilize a thermostatic shut-off switch because the heat build-up in the hydraulic pack shall be mounted on the body of the compactor but is moveable.

C. MECHANICAL: The hydraulically operated ram-type compactor must compact into a chamber with a round cross-section with hardened cut-off teeth on the shear plate. The ram chamber, compaction chamber and discharge tube shall be formed of 3/8" tubular steel plate. Ram face shall be of high wear resistant 3/4" steel plate. The compactor will be able to accept up to a 4" x 4" piece of structural timber and shear it without damage to the machine. In the event that a piece of material becomes cross-wedged in the machine, the unit will achieve a maximum 3000 psi shear pressure.

D. ELECTRICAL: A motor of not greater than 7-1/2 H.P. and 1735 RPM shall be used. Power to the machine shall be 208 volts, 3 phase, 4 wire, 60 cycle. The compactor shall be furnished with a motor starter and a control and logic circuit of 110 volts. Main disconnect to be furnished by others.

E. AUTOMATIC WEIGHT CONTROL: Accurate repetition of weight selected for refuse block. Selection range 30 to 300 pounds and over. The weight control shall be field adjustable.

F. COMPACTION RATIO: Factory set at 11:1. Can be field adjusted by operator.

G. REFUSE BLOCKS: The compacted refuse shall be discharged from the machine in round block form, and these blocks shall be the same size every time. The blocks must be stackable to aid in storage of the material. Machines utilizing an extrusion type (continuous extrusion type) compaction principle shall not be allowed. A built-in unloading platform which supports the block as it is discharged into the bag must be provided. The discharge door must be spring loaded for ease of opening.

H. AUTOMATIC REFUSE SENSOR: A photo electric receiver utilizing solid state components shall be used for automatic control. Sonic systems shall not be allowed.

I. COMPACTION RAM FACE PRESSURE: 145 psi of ram face pressure, 60,000 pounds force.

J. AUTOMATIC SIGNAL: A light shall indicate when sufficient refuse is compacted to form a block.

K. AUTOMATIC SAFETY CONTROL: Machine will shut itself off should an unusual size object be thrown into it.

L. AUTOMATIC INSECTICIDE AND DEODORIZER DISPENSER: Atomized spray activated by each stroke of the ram impregnates the entire refuse block.

M. DIMENSIONS: The overall height of the machine shall not be greater than 4'-1" the overall width shall not be greater than 2'-4" and the overall length shall not be greater than 11'-7".

N. FINISH: The machine must be finished with a durable, abrasion-resistant, blue vinyl.

O. SHIPPING WEIGHT: Approximately 2500 lbs. Machine will be shipped completely assembled, wired and pre-wired. Can be shipped dis-assembled in several major sections for buildings.

P. HOPPER: A manual charging hopper shall be provided with a 3'-0" x 2'-4" opening to receive refuse.

PART 3: EXECUTION

3.1 INSTALLATION

- A. Installation shall be made by the manufacturer or his authorized service agency.
- B. Install in strict accordance with approved installation drawings.
- C. Test and adjust equipment for trouble-free operation. Provide initial start-up.
- D. Instruct Owner's personnel in proper operation and maintenance.

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## PART 1: GENERAL

1.1 SCOPE

- A. Conditions of Contract and Division 1 - General Requirements, apply to all work of this section. Refer to Article 12 of the Instructions to Bidders, Article 7 of the General Conditions and Section 01600 - Materials and Equipment, for requirements on pre-bid and post-bid evaluation of proposed substitute products, methods and other conditions.
- B. Work under this section includes furnishing and installing the entire integrated ceiling system as specified herein and identified on the drawings and schedules as Acoustic Tile I (AC.T. 1) and
- C. Related work specified elsewhere:
1. Metal Decking: Sections 05301, 05302.
  2. Preformed Metal Soffits and Ceilings: Section 09541.
  3. Lathing, Plaster and Gypsum Drywall: Section 09100.
  4. Connection of Metal Ceiling Radiant Heating Panels: Division 15.
  5. Fixed and Flexible Ductwork: Division 15.
  6. Lighting Fixtures and Electrical Systems: Division 16.

1.2 GENERAL INFORMATION

- A. The following information is intended to complement and clarify the intent of the drawings in establishing the scope of the work but do not construe as listing all required work. Provide all materials and labor to complete the work.
- B. Furnish and install suspension system to lip type hanger tabs provided with metal deck under Sections 05301, 05302.
- C. Furnish and install ceiling grid as detailed on the drawings.
- D. Furnish and install modular radiant heating panels, ceiling air diffusers, linear air plenums, service panel modules, (perforated at fire speakers and paging speaker locations) acoustical board and all other acoustics and parts to the ceiling system.
- E. Furnish and place all cast-in hanger tabs or powder driven eye bolts for all locations where concrete slabs occur above integrated ceilings.

1.3 SUBMITTALS

- A. Shop Drawings:
1. Before any fabrication of members takes place, submit and obtain approval of full size design details of all ceiling members, assemblies and connections.
  2. After approval of samples (See B, below) submit and obtain approval of erection layouts, reflected ceiling plans and installation details before commencing with installation.

3. All drawing submittals shall be made in accordance with Section 01300.

B. Samples:

1. Texture and Pattern: Submit two sets of a minimum of 3 samples 24" by 60" representing the full range of texture or pattern characteristic of production of the specified or selected material. The Architect will select and approve the range of texture or pattern acceptable for the Project and will return one set to the Contractor for use in visual quality control at the factory. The other set will be delivered to the jobsite for comparison with installed material.

2. After approval of full size design details of ceiling members, assemblies and connections and before any fabrication takes place, submit a full size sample of the assembly outlined on detail 1/4-10 of the drawings. This sample shall include main runners, cross runners, main runner spacers, service panel and acoustic materials and all connections, fittings, clips and other accessories and fastenings.

3. At the same time submit a one foot long section of each other member of the ceiling grid and each joint in such grid.

4. All samples shall be submitted in accordance with Section 01300 in duplicate; after approval, one set of samples will be retained in the office of the Architect and one set in the Owner's field office as quality comparison samples for all fabricated parts.

1.4 QUALITY ASSURANCE

A. System:

1. It is intended that the ceiling furnished and installed under this Section be a complete integrated ceiling system, structurally, mechanically and electrically adequate to fulfill the requirements of the Work and of these Specifications, and to interconnect properly with work provided under other Sections.

B. The integrated ceiling system manufacturer shall have an established organization and production facilities, specializing in this type equipment, shall be currently engaged in the manufacture of integrated ceiling system, shall have the demonstrated ability to produce the specified integrated ceiling system of the required quality and the proven capacity to complete an installation of this size and type within the required time limits.

C. This subcontractor (and Bidders) shall have an established resident local representative in the Minneapolis-St. Paul Metropolitan Area who is fully qualified in integrated ceiling system and has the authority to make decisions and act for the subcontractor.

D. The manufacture shall be responsible for the interface, structural requirements, air distribution characteristics and color match of these components. (All components shall be completely supplied by or through the manufacturer as a single responsibility source.)

E. Acceptance of Bidders: Acceptance of manufacturers to bid the work of this section, as listed herein, or in addenda, indicates that by preliminary samples and other data submitted, the manufacturers appear capable of providing integrated

ceiling systems to meet the design intent. The acceptance for bidding does not indicate acceptance of preliminary samples, except for general construction, nor acceptance of deviations proposed by the samples or by other data. Provide all materials, equipment and other items in strict conformance with, and to meet all performance criteria called for by the Contract Documents. Any additional permissible deviations from the basic Contract Documents will be as listed in addenda.

F. Qualified Bidders: The following firms prequalified for bidding integrated ceiling systems in previous projects, through the procedure outlined under paragraphs of this article, demonstrating a generally satisfactory level of quality of workmanship. Submit to meeting all specified requirements, they are accepted as qualified to bid this project:

1. Lok Products Company
2. Southern Extrusions, Inc.
3. Ceiling Dynamics, Inc.

G. Qualification of other Bidders: In addition to the requirements of Article 12 of the Instructions to Bidders and Article 7 of the General Conditions, other manufacturers wishing to bid this work shall request pre-bid evaluations of their proposed products by submitting the following information and samples to the Architect not later than 21 days prior to bid date. Samples shall be uncrated and assembled, ready for inspection.

1. Submit a list of representative installations complete during the last 5 years, listing the Owner, the year and approximate dollar value of each installation.

2. Submit certified reports of tests of the performance capabilities of systems. Tests shall have been conducted by a nationally recognized, independent testing laboratory, equipped and qualified to perform the tests, at no cost to the Owner or Architect. Reports shall indicate and testing procedures and certificates provided in accordance with Section 01400. Performance requirements shall be as specified hereinafter.

3. Submit a detailed, written list of proposed deviations to the Architect for acceptance. Deviations shall include any items or products which are specified by named brands or producers. Such list shall specifically identify and describe in detail each proposed deviation. Manufacturer's standard catalogs, drawings and other information may be submitted to supplement the list of proposed deviations but will not in themselves be considered as an adequate list or description.

4. Submit the following samples at no cost or obligation to the Owner or Architect. Deliver, uncrate and set up samples at a location in the Metropolitan Minneapolis-St. Paul Area, designated by the Architect. Remove samples when directed by Architect. Samples shall be of the quality and construction specified and proposed for the work for the Project.

- a. Two samples of each panel material, size 24" by 60.
- b. One piece of each member of the ceiling grid and each joint in such grid, size - 12" long sections.

H. Pre-Bid Evaluation: The University and Architect reserve the right to make such investigations of bidders and their products as specified under "Qualification of Bidder" in the Instructions to Bidders. The decisions of the University and

Architect shall be final and binding.

1. Minor variations in construction and fabrication techniques inherent between manufacturers of the integrated ceiling systems will be considered, provided the specified standards of design, function, dimensions, appearance, durability, strength, quality and performance are met. The burden of proof rests with the party making the request.

2. The acceptance or rejection of a proposed deviation of sample is vested in the Architect whose decision shall be final and binding. The determination may or may not express the reason for the decision. Bidders shall be notified in addenda which deviations have been accepted by the Architect. If proposed deviations are not submitted as specified, or are not accepted, it will be held there are no deviations and none will be permitted in the work provided.

3. The samples of the successful bidder may be retained by the University for purposed of comparison in the determination of the acceptability of the samples specified under Article 1.3.B above.

I. Acceptable Manufacturers: Additional acceptable manufacturers, as determined through the process described above, will be listed in Addenda.

J. Erector or Installer:

1. Installation of the ceiling system shall be done by the grid manufacturer's franchised applicator or authorized representative and shall have at least three years experience in the installation of integrated ceilings.

2. Erector shall present evidence that he is capable of installing the various components within his own organization, and without resorting to additional sub-contractors. In addition, he shall present written evidence that he is experienced in the satisfactory installation of the products specified, including a written approval from the manufacturer of the products he proposes to use, that he is an acceptable and authorized applicator of these products.

#### 1.5 PRODUCT HANDLING

A. Package, handle, transport and store materials and the jobsite in a manner that will avoid damage. Repair or replace all damaged material.

B. Ceiling materials shall be delivered in manufacturer's original labeled unopened cartons, suitably stored within the building and protected from damage until ready for installation.

#### 1.6 JOB CONDITIONS

A. Inspection: Before commencing integrated ceiling work, inspect all surfaced and structural elements to receive work of this Section to assure that conditions are suitable for installation of the work. Notify Architect in writing of unsatisfactory conditions and do not proceed with the work until Architect's instructions have been received. Commencement of work shall be construed as acceptance of conditions.

B. Environmental Conditions: The building shall be glazed and have a relative humidity of 50%  $\pm$  15%, before materials are delivered to the site or work is



begun. Uniform temperature of at least 60<sup>o</sup>F shall be maintained during and after the installation.

C. Coordination: Coordinate integrated ceiling work with that of related trades. Ceilings shall be suspended from structural elements only, completely independent of all mechanical and electrical systems and their suspension.

D. Supervision: The manufacturer of the ceiling system shall personally or through an authorized competent representative satisfactory to the Architect, constantly supervise the work and shall whenever possible, keep the same foreman on the work from commencement to completion.

E. Responsibility and Cooperation: Subcontractor shall consult architectural, structural, electrical and mechanical plans and check them with his work, as he will be held responsible for conditions shown on one or called for by one and not indicated or called for on the other that may affect his contract. Subcontractor shall consult with the Superintendent of other trades and General Contractor's Superintendent to insure complete coordination of all work.

## PART 2: PRODUCTS

### 2.1 SUSPENSION SYSTEM

A. Design: The suspension system shall be designed to accommodate differential deflection of floor to floor in any story of the building with partitions anchored to the floor and ceiling grid system. The design shall provide for differential deflection after installation of all ceiling system elements and with partitions located in any position in either direction. The design shall provide for the positive or negative differential deflection or not less than 1/2" in either direction and shall include a spring supported or other approved resilient suspension system designed to permit the required movement without failure or excessive distortion of any grid member. Provide spring suspension as detailed in area bounded by grids S2, B13, S6, E29.

B. Ceiling Inserts: Brock-White 3308 Drive-in Type or shell type inserts or approved equal, or powder driven eye pins at the subcontractor's option, capable of supporting 150 pounds without pulling out.

### 2.2 GRID SYSTEM

A. Aluminum Grid System shall be compatibly designed to function as a structural supporting system or the related ceiling system components and also serve as an indirect means of partition connection without pre-determined partition locations. The 6'-2" modular layout shall be rigidly adhered to with the exception of air distribution diffuser locations which shall remain flexible to accommodate room interior air distribution requirements as set forth herein. The minimum section properties of the primary ceiling grid members shall equal 1x0.245 in. and S 0.16 in. The secondary grid members shall have a minimum of 1 0.127 in. and S 0.11 in.

B. Partition Connection Slots: The primary ceiling grid members (main runners, cross runners, split runners and edge runners) shall have not less than a 5/8" deep 5/16" - 18 thread extruded linear slot which will form a continuous opening to accept National coarse threaded 5/16" - 18 screws. Where main runner, split runner or edge runner intersect with another slotted runner, the flange or flanges

of the continuous runner shall be interrupted and the intersecting runner shall be coped so that the intersecting slot is through to the continuous slot.

C. Service Panel and Light Fixture Connection Slots: Main runners shall have not less than 3/8" deep 7/32" - 24 thread extruded linear slot forming a continuous opening to accept 7/32" - 24 screws.

D. Grid Connections: The main runners shall interlock with the cross runners by means of a horizontal threaded connector or other approved system so that cross runners when installed shall have a torsional resistance of 300 inch pounds. Said connections shall also be designed to resist tension stresses of 300 pounds. All exposed joints of the ceiling grid members shall be drawn tight and not exceed the allowed tolerances as set forth in the American Society for Testing and Materials ASTM designation: C635-69.

E. Material: Suspended ceiling grid shall be extruded of 6063-T5 alloy aluminum with configuration and straightness tolerances not to exceed those established by the Aluminum Extrusion Association and with manufacturing dimensional tolerance maximums as established by the Acoustical Materials Association. All exposed surfaces (including service panels, etc.) shall be chemically treated in accordance with ASTM D-1730 and given two coats of baked enamel. Color to be selected by Architect.

F. Grid Members. All grid members shall be of the general configuration shown on the drawings. Visual and functional shapes and dimensions shall be adhered to strictly. Minor dimensional variations in concealed portions of members which are necessary to satisfy requirements for structural performance or extrusion or fabrication techniques are acceptable. Maximum acceptable height of any grid member, shall be 2 1/4".

G. Hold Down Clips: Provide hold down clips at all units over partitions. Furnish 10% additional clips and turn over to Owner for future changes.

H. Provide all miscellaneous angles, runners and other supports for acoustic material where other materials or systems pass through ceilings as at service columns.

### 2.3 SERVICE PANELS

A. Furnish and install service panel area covers for hardware items such as supplementary lighting, service drops, service columns, communication terminals, fire sprinkler heads, smoke detectors, fire speakers and paging speakers, and items as indicated in other sections of the specifications. Furnish the service panel air register- boot as herein described, and overhead light mounting panel.

B. Service panel covers shall have compatible mounting hole locations to mate with the extruded top vertical linear thread provided by the main runners of the ceiling grid.

C. Construction of the service panels shall be as shown on the architectural plans and shall be manufactured of 18 gauge steel painted with 2 coats of baked enamel to match grid members.

D. Acoustical damping: Apply full bedding of acoustic tile adhesive and imbed one layer of specified, or approved, acoustic board.

#### 2.4 RADIANT HEAT PANELS

A. Provide modular radiant heating panels at all locations (in all ceiling types) shown on drawings. Refer to Reflected Ceiling Plans for types and sizes.

B. Provide the following types as indicated:

Type A: Airtex HPH, 6 pass high output Radiant Ceiling Panels, output 225 BTU/hr/sq.ft.

Type B: Airtex H, 3 pass, regular output Radiant Ceiling Panels, output 200 BTU/hr/sq.ft.

C. Provide panel trim according to type to ceiling and as detailed on the drawings.

#### 2.5 LINEAR AIR PLENUMS

A. Linear Air Plenum shall be constructed on no less than 26-gauge galvanized metal and the side rails and end pieces shall be of extruded aluminum 6063T5 alloy, .062 minimum wall thickness. The diffuser side rails shall be end coped and factory painted to match the ceiling suspension members. The interior including end and center spacers, weirs, and plenum shall be factory painted, flat black.

B. Plenum shall be complete with spin-in collar with quick coupler clips attached, locking clips and stabilizing angles.

C. Plenum shall straddle and ceiling cross runner to form one or two one (1) inch slots.

D. The plenum when in position as a supply air diffuser shall have a minimum of two (2) separate pairs of air pattern control weirs in each slot. The diffuser shall also use the ceiling suspension member as an air diffusing member. Each unit shall include an internally mounted and adjustable spread control device.

E. Each plenum shall be relocatable in the field to any cross runner and shall be supported at both ends on the ceiling grid. The linear air plenums shall be of two types with performance characteristics as follows:

1. Lok Products Co. Model EGS-1.00-2HS-59-R10-2 slot, Titus, Tuttle and Bailey, or approved equal.

- a. Total pressure at 350CFM of air shall not exceed .105" H<sub>2</sub>O.
- b. Maximum NC of 34 based on 15 db room absorption.
- c. Minimum NC of 30 based on 15 db room absorption.

2. Lok Products Co. Model EGS-1.00-2-HS-59-R7-1 slot, Titus, Tuttle and Bailey, or approved equal.

- a. Total pressure at 185 CFM not to exceed .105" H<sub>2</sub>O.
- b. Maximum NC of 34 base on 15 db room absorption.
- c. Minimum NC of 30 based on 15 db room absorption.

3. Maximum entry velocity shall not exceed 900 FPM. All tests and performance data shall be made in accordance with procedures set forth in ADC Equipment Test Code 1062R2.

4. The performance of the air diffuser will be such that the room air motion rate in the occupied space will not exceed 50 FPM terminal velocity.

5. The total system including ceiling grid, lights, ceiling panels, service module and air diffuser member shall be tested as a system and shall fulfill the design criteria as set forth by the plans and specifications.

## 2.6 ACOUSTICAL MATERIALS

A. General Description: Ceiling lay-in panels shall be 2' x 5' (Approx.) size and shall be of thickness required to meet all structural, acoustical and other requirements specified herein or implied. Material shall conform to Federal Specification SS-S-118a (GSA-FSS) and shall be as described in the current edition of the Acoustical and Insulating Materials Association (AIMA) Bulletin "Performance Data".

B. Performance Criteria: Laboratory test data shall be submitted along with samples of the panels to be used for final approval of the Architect in accordance with Article 1.3 above. Test data submitted shall include at least the following:

1. Sound absorption coefficients determined by ASTM test method C423 for individual frequencies at octave intervals from 125 to 4000 hertz (Hz) with the test sample in a Mounting 7 configuration. The NRC range shall be .65 - .75.

2. Sound attenuation factors determined by "Ceiling Sound Transmission Test by Two-Room Method", Tentative Method of Test AMA-1-11-1967 for sixteen third octave intervals from 125 to 4,000 hertz (Hz). The test data may be on a smaller size sample of the material to be used in the final installation (for example 12" by 12" or 12" by 24" units). The test sample shall be measured with a "continuous" mounting arrangement at the test room dividing partition designated "C" by AIMA. The test results shall indicate that the material is capable of yielding a ceiling Sound Transmission Class (STC) range of 45-49 as determined by ASTM document E413-70T.

3. Manufacturer's certification that the material will provide a ceiling Sound Transmission Class (STC) range of 40-44 when installed in the suspension system specified herein using 2' x 5' lay-in panels. The submission of laboratory test data giving sound attenuation factors as determined by AIMA test designation AMA-1-11-1967 and Ceiling Sound Transmission Class (STC) values as determined by ASTM document E413-70T for a Test installation of the material in a lay-in suspension configuration continuous at the test room dividing partition shall be included with the manufacturer's certification.

4. Light reflectance values determined by ASTM test method C523 indicating that the new material will have a light reflectance of .75 or greater.

5. Flame Spread test data as determined by ASTM E84 indicating that the material falls within Flame Spread Index Range 0-25.

6. Any available test data to indicate to the satisfaction of the Architect that the material will satisfy long term maintainability requirements (washability,

scrubability, self-sanitization, etc.)

C. Acceptable Materials: Ceiling lay-in panel materials meeting the above performance requirements include the following, or approved equal.

1. Armstrong, Minaboard with Attenu-Guard Treatment, Classic Design, plastic coated.
2. National Gypsum, Solitude, Needle Perforate, plastic coated.
3. Conwed, Lo-Ton AF, Constellation, plastic coated.
4. Keene Corporation, Hansoboard Hansostar AF, plastic coated.
5. US gypsum Auratone, pin-perforated, attenntreated, plastic coated.

D. Where "Vinyl Clad" tile is indicated, provide ceiling lay-in panel material from above listed manufacturers, mineral fiber lay-in panels with non-perforated mylar facing sheet.

## 2.7 PLENUM SOUND BARRIER

A. Plenum sound barriers shall be Asarco Acousti-lead sheet or approved equal, 1/64 inch thick weighing one pound per square foot, conforming to ASTM Specifications B-29-55.

B. Fiberglass blanket to be 3" thickness batts or blankets by Owens-Corning, Zonolite or U.S. Gypsum.

## PART 3: EXECUTION

### 3.1 GENERAL WORKMANSHIP

A. All materials shall be installed in strict accordance with manufacturer's specifications, to details shown on the Drawings under conditions as outlined in the current bulletin of the "Acoustical Materials Association" Section on "job conditions" as may be applicable for portions of work herein.

B. The suspension systems and acoustical tile units specified herein shall be installed by the manufacturer or an approved representative recommended by the manufacturer.

C. Cutting and Repairing: Do all cutting necessary for the proper installation of this work and repair any damage to other materials or systems. Corodinate this work with that of other Subcontractors. Patch and repair all surfaces where other materials are removed. The patch surfaces shall match surrounding surfaces in material and finish, and all repairs shall be done to the satisfaction of the Supervising Engineer.

D. All workmanship shall be first class and the best type in every case. Nothing herein is to be construed as calling for other than first class workmanship and any not so fulfilling this requirement shall be removed and replaced with proper material and workmanship.

### 3.2 INSTALLING SUSPENSION SYSTEM

A. Hanger Tabs and Fittings: Hanger tabs capable of supporting 100 pounds are

provided 1'-0" o.c. on all side joints of metal deck by ECS Contractor or under Section 05302. Where hanging fittings are not provided (as under concrete slabs) suitable fittings shall be provided under this section as required to support the ceiling system and all applied loads. Use manufacturer's recommended method of attachment to structural framing. Powder-drive eye pins or cast in inserts will be permitted in concrete, but each pin or insert shall be tested after installation for 150# load (weight of one (1) workman).

B. Hanger wires for the suspended ceiling system shall be attached to the hanger tabs or fittings. Suspension system shall not be attached to ductwork, conduit, equipment or other than the building structure. Where ductwork, conduit or equipment arrangement make it impossible to provide direct-to-structure hanging within the maximum allowable spacing, provide approved trapeze suspension for ceiling. Wires shall be threaded through the ceiling grid members and wrapped a minimum of 4 full turns to insure gaining full strength of the suspension system. Hanger wire spacing shall average no more than 6'-2" maximum along any major load carrying member. The entire ceiling system installation shall be closely coordinated with all other trades. No suspension from ducts will be permitted.

### 3.3 INSTALLING CEILING GRID

A. Location of ceiling grid members shall be as shown on architectural reflected ceiling plans.

B. Install all members according to the approved installation details with the ceiling plan level, all jointery with the specified tolerances and all fastenings drawn up tight.

C. Accurately align all visible grid members.

D. The installation of all mechanical components of the integrated ceiling and coordination of the installation of the lighting fixtures (by Electrical Contractor) shall be the responsibility of the Subcontractor for this Section and the various classes of work shall be done by the proper trades. Refer to Article 3.5 below, for installation of mechanical components.

### 3.4 INSTALLING PLENUM SOUND BARRIER

A. Plenum Barriers: Provide continuous soft lead sheet plenum barriers above partitions where shown on drawing - see Note 5 on drawing sheet 12-5, and as suffic "A" in partition types - see drawing sheet 11-4.

B. Provide "ceiling blanket", horizontal sound barrier over ceilings in basement room schedule where note "5" is indicated as follows:

1. Install 3" thick fiberglass blanket, progressively as the ceiling is erected. Tape all penetrations and tightly butt all joints.

2. Lay lead sheet over blanket, progressively as the ceiling is erected. Lap joints 2" and dress by hand. Carry lead sheet up diffusers, and over any obstacles such as ceiling runners.

3. Bond lead sheet, using adhesive, to light fixtures before installation. Leave 2" lap on all edges. Lap ceiling blanket over laps of light fixtures.

4. Extend the sheet 4' beyond area to be treated, carry sheet minimum 6" up walls and secure in place. Caulk as required for effective seal.

C. Provide plenum sound barriers to hang vertically between underside of floor above and top of ceiling partitions, at all partition types on all floors with the suffix "A"; except at basement rooms scheduled with horizontal sound barriers, as follows:

1. Fasten continuous blocking to deck or slab, positioned so lead sheet will drape onto ceiling directly over the partition. If slab is uneven, apply acoustic caulking between blocking and slab. For fluted decks, install preformed neoprene filler strips to conform to flutes in steel and insure a tight fit between blocking and deck.

2. Cut lead sheets sufficiently long to drape at least 2" onto the ceiling surface. Fold upper edge over batten and attach to continuous blocking. If ceiling is uneven, tape or dress lower edge to ceiling surface. When vertical joints are necessary, joint adjacent sheets with folded, lock seams.

3. Make cutouts to accommodate ducts, conduit, pipes or beams passing through the plenum barriers, slit barrier from bottom of sheet to point of penetration and make orange peel slits to accommodate obstruction. Drape lead over obstruction and collar flaps tightly against it. Tape flaps tight to object passing through.

D. Do not anchor into cells of floor deck above. Powder driven fasteners into slab or non cellular portions of deck are acceptable.

E. Provide air and sound tight barrier in accordance with manufacturer's instructions.

### 3.5 INSTALLING SERVICE PANELS, LINEAR AIR PLENUMS, CEILING AIR DIFFUSERS, REGISTERS AND RADIANT HEAT PANELS

A. Install service panels, linear air plenums, ceiling air diffusers, registers and radiant heat panels in the ceiling grid in accordance with the approved design details and ceiling plan.

B. Accurately align all visible items with the ceiling grid.

C. Securely anchor all items to the ceiling grid using 3/8" - 24 thread cadmium plated machine screws. Service panels, shall lay flat and flush with bottom of runners.

D. After installing, move or adjust all moving or adjustable parts through their full range to assure proper and free functioning in the completed installation. Repair or replace any malfunctioning items.

### 3.6 INSTALLING ACOUSTICAL MATERIAL

A. Ceiling lay-in panels shall be installed in strict accordance with the patterns and arrangements shown in the drawings and in accordance with the recommendations of the manufacturer. Cut panels to fit at steel channel framing by Section 05500.

### 3.7 AIR BALANCE RESPONSIBILITY

A. Subcontractor for this section shall cooperate with the selected test and

balancing agency in the following manner:

1. He shall coordinate his schedule with the Air Conditioning Contractor to have his system in operating condition in sufficient time before final completion date so that the testing and balancing can be accomplished.

2. He shall provide the labor and tools to make corrections when required, without undue delay at no additional cost to the Owner.

3. He shall advise the Test and Balance Contractor of any major changes made in his system during construction.

4. He shall be responsible for removing and replacing ceiling panels necessary to the testing and balancing of the air distribution system.

### 3.8 FIELD QUALITY CONTROL

A. Field Tests: Field tests on the final installation may be performed at the discretion of the Owner to insure that the actual materials and methods meet the specified requirements in all respects. Field tests shall include the following:

1. Sound Absorption tests on selected samples of the materials actually being installed by the impedance Tube Method (ASTM C384-58).

2. Sound Attenuation tests between selected adjacent completed rooms in accordance with ASTM E-336-78T).

3. Light Reflectance tests on selected samples of the materials actually being installed in accordance with ASTM C523-68.

B. Tests shall be performed by an independent test agency retained and paid by the Owner except that where test results indicate failure of the installation to meet the required performance cost of such tests and any retesting required shall be paid by the Subcontractor for this Section.

### 3.9 CLEANING AND TOUCHING-UP

A. After installation of entire suspended ceiling system has been completed, clean the entire surfaces thereof, removing any discolorations or foreign matter and touch up all abraded spots and edges (if any) with the same paint as was used in the factory-applied finish of the components, to the acceptance of the University.

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## PART 1: GENERAL

1.1 SCOPE

A. Conditions of Contract and Division 1 - General Requirements, apply to all work of this section. Refer to Article 12 of the Instructions to Bidders, Article 7 of the General Conditions and Section 01600 - Materials and Equipment, for requirements on pre-bid and post-bid evaluation of proposed substitute products, methods and other conditions.

B. Work under this section includes furnishing and installing greenhouse structure, framing, glass, glazing, operating sash, doors located in greenhouse enclosure and all accessories and incidentals required for a complete installation.

C. Related work specified elsewhere:

1. Masonry: Sections 04100, 04200.
2. Concrete: Sections 03100, 03200, 03300, 03410, 03450.
3. Insulated Metal Panels: Section 07411.
4. Insulated Roof Membrane: Section 07520.
5. Sheet Metal and Flashing: Section 07600.
6. Planting Benches: Sections 11611 and 11613.

1.2 QUALITY ASSURANCE

A. Manufacturer: Manufacturer of greenhouse shall be a firm experienced in the design and fabrication of greenhouse structures.

B. Erection: Greenhouse shall be erected by the manufacturer or under his direct supervision.

C. Acceptable manufacturers:

1. Lord and Burnham Division, Burnham Corporation.
2. IBG Division, Roper Corporation.
3. J.A. Nearing Company, Inc.

1.3 SUBMITTALS

A. Submit complete fabrication and erection drawings showing complete greenhouse, all assemblies and components and adaptations for the supporting masonry curbs.

## PART 2: PRODUCTS

2.1 GENERAL SYSTEM

A. Enclosure shall be of rigid frame aluminum construction, free of interior bracing, having straight eaves as indicated on drawings. The minimum standard of

quality throughout shall be the Solarspan Rigid Frame Glasshouse as manufactured by Lord & Burnham, Irvington-on-Hudson, N.Y. 10533. Widths, lengths, masonry dimensions, side wall designs, and construction details shall be according to plans. Approved shop drawings shall be used to make all masonry installations. Dimensions may vary slightly to accommodate manufacturer's standard.

## 2.2 SUPERSTRUCTURE

A. The aluminum frame shall be furnished in accordance with good engineering practices. All extruded aluminum members shall be mill finish of alloy 6063T-6 or 6063T-5. Side walls shall have straight eaves as shown on drawings, with operating side vent sash (or a combination of sash and fixed glazing). Aluminum I-beam rafters shall be spaced on 10'-3-3/4" centers; each bay to have 5 lites of 24" wide glass. Rafters shall be supported from an 8" masonry wall on aluminum cap sill, held in place by anchor bolts supplied by the enclosure manufacturer and installed by the masonry contractor according to approved shop drawings.

## 2.3 DESIGN CRITERIA

A. Materials shall be designed to carry the following loads:

1. Dead load.
2. Live load - 15 lbs. per sq. ft. on horizontal area.
3. Wind load - 20 lbs. per sq. ft. on vertically projected area.

B. In designing for above, loads may be considered to act in any of the following combinations:

1. Dead load plus live load.
2. Dead load plus wind load plus 1/2 live load.
3. In addition to above, roof bars shall be required to carry a 100 lb. load at the center of any span.

## 2.4 GLASS AND BARCAPS

A. All glass shall be double-strength laid with lapped joints. Glass in sash and doors shall be in one piece - completely filling openings. All glass, excepting doors shall be held in place with aluminum L & B Barcaps to cover and seal the glazing, secure and prevent the glass from slipping, and maintain tight glass laps for conserving heat. Screws which hold Barcaps shall not be spaced over 15" apart nor shall any screw be placed closer than 1-1/2" from the end of the cap. Glass shall be bedded on extruded putty with a bead of gun grade compound on the outside under the Barcap.

B. Adequate provisions shall be made in design for expansion and contraction. All glazing bars shall have condensation gutters, and shall be raised a minimum of 3/8" from the purlins by a device that will allow clear passage of condensation on the underside of the bar without obstruction. No washer spacers shall be used. Condensation shall be channeled to the outside of the structure.

## 2.5 VENTILATION

A. Roof and wall ventilating sash shall be aluminum and glass with continuous weather-tight hook hinges and L & B Barcaps. Each line of sash shall be operated from a single point and run in a continuous line for each compartment. Roof vent apparatus shall be rack-and-pinion.

B. Furnish and install at the peak in the Temperate Room #104 and Tropical Room #103 a direct drive propeller type exhaust fan with a capacity of 3500 CFM at 1/8" static pressure with a 120V, 1/3 HP motor. Fan shall be complete with fan guard and backdraft damper. Frame for fans as required.

C. Refer to Division 15 for heating/cooling units and controls.

## 2.6 SUN SHADES

A. Provide manufacturer's standard sun shades of translucent fabric with traversing mechanism operable from floor.

## PART 3: EXECUTION

### 3.1 ERECTION

A. Erect greenhouse in strict accordance with approved erection drawings.

B. Install all components and accessories and adjust for proper operation.

### 3.2 CLEANING AND PROTECTION

A. Clean all glass and framing as part of the work of this section. Replace or repair any broken or damaged parts.

B. Instruct General Contractor in proper protection of greenhouse during remainder of construction period.

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## PART 1: GENERAL

1.1 SCOPE

A. Conditions of Contract and Division 1 - General Requirements, apply to all work of this section. Refer to article 12 of the Instructions to Bidders, Article 7 of the General Conditions and Section 01600-Materials and Equipment for requirements on pre-bid and post-bid evaluation of proposed substitute products, methods and other conditions.

B. Work under this section includes prefabricated environmentally controlled rooms as scheduled and specified herein. Refer to mechanical plans for location of remote units. Coordinate piping and connections to building systems.

C. Related work specified elsewhere:

1. Laboratory Equipment: Section 11600.
2. Laboratory Casework: Section 11611.
3. Building Mechanical System: Division 15.
4. Building Electrical System: Division 16.

1.2 QUALIFICATIONS OF AND ACCEPTABLE MANUFACTURERS

A. The environmental rooms covered by this specification shall be a product of an established manufacturer of this type equipment with similar satisfactory installations in use over three years.

B. The products of Calumet Scientific; Forma Scientific, Inc.; Warren Sherer Division of Kysor Industrial Corporation, Hotpack Lab-Line Instruments, Inc. are acceptable subject to meeting the qualifications specified herein and shown on the drawings and schedules.

C. The panels called for in this project require special construction features. Acceptable panel manufacturer who is able to meet of these requirements is Widmen Manufacturing Co. of St. Paul, Minnesota. Manufacturer furnishing environmental rooms shall modify his panel design to provide these special features or he may furnish custom fabricated panels.

1.3 TESTING

A. Each room shall be completely set-up and tested. Test shall include mechanical, electrical, and uniformity-control test by strip chart recorder. Test shall be recorded and copies of report supplied to University.

1.4 SUBMITTALS

A. Shop Drawings: Submit fabrication and erection drawings, flow sheets and performance data in accord with Section 01300. Submit complete refrigeration and control schematics for approval prior to fabrication. Provide typical details for condensing unit mountings, concrete pads, vibration isolators and other features.

B. Samples: Submit for approval in accord with Section 01300 all materials, finishes, colors, etc., to be used in fabrication.

C. Operating Instructions: Submit five brochures, each containing complete information on equipment furnished. The equipment brochure shall include operating and maintenance instructions, complete with parts lists and a source of supply for equipment furnished. Contractor shall instruct operating personnel in the operation of all equipment.

PART 2: SCOPE OF WORK

2.1 ROOM CONSTRUCTION

A. Panels:

*smooth pre-painted white acrylic finish*

1. Floor, wall and ceiling panels shall be of prefabricated aluminum clad construction with a minimum of 3½" foamed-in-place urethane insulation. Aluminum skin shall be no less than .040" thick ~~embossed type for extra strength~~. Section edges must have tongues and grooves "foamed-in-place" and integral gaskets will not be considered adequate for proper panel to panel slab. Joints must be sealed with silicone caulking compound to assure air-tight vapor-proof joints.

2. Floor panels shall be capable of withstanding a distributed load of up to 300 pounds per square foot. Joints shall be sealed as described above for wall panels. Wearing surface shall be galvanized steel covered with matting or coated by General Contractor as noted in equipment schedules. See equipment schedule for description of which rooms are to have floors and which will not.

3. Insulation: Panels shall be constructed as described in 2.1 with an overall "u" value not to exceed .030 BTUH/°F/sq.ft. Urethane insulation shall be of the self-extinguishing type and must meet building codes applicable at time of installation. (Flame spread rating not to exceed 75, when total floor area of environmental room does not exceed 400 square feet. If total floor area exceeds 400 square feet, maximum flame spread rating is to be 25.)

4. Panel Locking Devices: All panels shall lock together from the interior by cam locking arms and pins secured in the center of the sections by the urethane insulation. Ceiling section shall be locked to the vertical panels utilizing the same type of locking devices. Wrench access ports for cam locks shall be covered by inserting plastic snap buttons at completion of installation.

5. Special wood members shall be included as an integral part of the panel construction. In general, these wooden members shall consist of: a 5/8" plywood sheet to reinforce each floor panel as required, and 2-2x6 cast into each wall panel ~~to support wall mounted equipment and casework shown on the elevations.~~ *Verify location with casework supplier. per detail*

6. Ramps: Floor panels shall be fabricated to provide a built-in entry ramp, as shown on schedule and detail 34/A11-6.

7. Lighting:

a. Lighting system shall utilize cool white, fluorescent lamps or GTE gro-lux lamps where indicated in schedule. Lamps and ballast to be enclosed in vapor proof, gasketed U.L. listed fixtures rated to operate at temperatures as low as -20°F. Light fixtures to be mounted above diffusion grating in the ceiling plenum area and are to be provided in sufficient quantity to maintain light intensities as indicated in the equipment schedule, measured 40 in. above the room floor at a temperature of 20°C.

B. Incandescent lighting to be provided in 2-107 in sufficient quantity to provide light intensities from 5 to 100 f.c. with variable intensity controlled by dimming system provided under electrical contract and installed in adjacent room.

C. Room numbers 8-129, 9-144 and 9-145 to be provided with high light intensity lamp banks to meet intensities specified on equipment schedule. Shelving units within room number 8-129 to be provided with a custom built sheet metal air diffuser duct with blower to circulate horizontal air flow across the lighted shelves to eliminate temperature gradient problems. Room numbers 9-144 and 9-145 to be provided with two, crank adjustable plant beds of approximately 21 sq.ft. each location below the 5,000 f.c. lamp banks. Sheet metal ducts with air diffuser grills and blowers provided to circulate air upwards through the plant benches.

#### B. Doors

1. Door openings shall be 34" wide x 78" high clear opening, unless otherwise noted on equipment schedules. Door swing and location, as indicated on drawings. Doors shall have insulation and thickness to match construction of wall panels. Interior and exterior door skin to be, ~~paint lock steel, minimum of 20 ga. for durability.~~

*Same as wall panels (2.1/A/1)*

2. Door gaskets shall be thermal plastic with an adjustable rubber wiper gasket on the bottom of the door. Doors must be of self-closing and latching type. Use of magnetic gaskets for this purpose shall be acceptable.

3. Door hardware shall be heavy-duty polished aluminum or chrome plated cast metal. The two hinges shall be of self-closing type, with nylon cam brushings. Door handle to be of the type to facilitate self-closing and latching without slamming. Door hardware to be safety type and a padlock, suitable for master-keyed cylinders, must be provided, anchored to a safety chain on the front of the door. A stainless steel wear plate shall be provided to prevent scratches on door finish by padlock or safety chain. A separate hasp to be mounted on outside of door for storage of padlock when it is not in the door latch. Provide inside safety latch inside of each door to unlock door even if locked outside.

4. Door jamb gasket shall be provided on all rooms operating below 4°C with built-in electrical heating tapes to prevent freezing.

5. Each door shall be provided with a 12" x 12" multi-pane observation window, located in the center of the door at eye level. All observation windows must be provided with light-tight latching covers. An exception shall be made for doors which open from a freezer into a cold room (9-123) and no observation window is to be provided in such doors.

#### C. Finishes:

1. Interior: All interior walls and ceilings shall be finished in a baked white epoxy or acrylic enamel. Submit color samples of "whites" to architect for approval.

2. Exterior: All exposed exterior walls shall be finished in a baked white epoxy or acrylic enamel, same as interior walls, with exception of entry door and control consoles which shall be finished in baked black enamel.

## 2.2 ENVIRONMENTAL CONDITIONING SYSTEM

### A. Refrigeration:

1. Refrigeration compressor shall be of the reciprocating semi-hermetic type, using R-12 refrigerant. Compressors shall be designed to operate continuously through the use of a liquid injection system to provide cooling and/or dehumidification, as required. Compressors shall be remote mounted, as indicated on drawing.

2. Condensers shall be air-cooled, utilizing air from the mechanical rooms. Condensers shall be size for a maximum 95°F entering air temperature.

3. Evaporators for cooling shall be of the direct expansion type. Evaporators shall be copper tubes, expanded into collared, aluminum fins and located in the conditioning compartment. All connections shall be copper welded and special circuiting provided to minimize pressure drop and maintain proper internal tube velocity for maximum efficiency.

4. Evaporator fans in humidified rooms shall be of the totally enclosed type with integral oil reservoirs. Open type motors are allowable in rooms that are not humidified with the exception of explosion-proof rooms, as treated in Section 13150.

5. An evaporator coil defrost system shall be provided for each room, designed to operate below 5°C. Defrost system may be of the electric or hot-gas type, designed for minimum temperature rise in the chamber. Defrost for Room 8-116 shall be explosion proof.

### B. Ceiling Plenum:

1. A positive pressure plenum shall be provided, extending across the ceiling of the room. This plenum shall be separated from the room proper by perforated material that will allow uniform distribution of air and light and will provide total access to equipment space, when needed.

2. Air handling equipment in humidified rooms shall be located in a wall-mounted plenum, which shall also contain fans, evaporators, humidification and dehumidification equipment, heaters, junction boxes and drip pans. Room air shall be continuously circulated through the conditioning system with provision for the introduction of fresh air at a point which will assure proper mixing before entering the evaporator coil.

3. Nonhumidified rooms shall be equipped with ceiling mounted air handlers which shall contain evaporator coils, air circulating fan, heaters, junction boxes and drip pans.

### C. Control System

#### 1. Control Panel:

a. The control panel shall be installed adjacent to the door, except as shown otherwise on drawings. Panel shall include full length hinge to provide access to all components, mounted within the control panel. Instrumentation incorporated in the control panel shall include a single point, electronic temperature controller, high and low limit safety controls with audible and visible alarm, a dial thermometer, calibrated in both Fahrenheit and Celsius scales, and circuit breakers to protect all individual circuits. Refer to equipment schedules for control components not common to all chambers.

b. Provide clear, lockable cover over controls to prevent unauthorized adjustment. A complete control schematic shall be provided with each control panel. All set point scales, thermometers, and recording instruments shall be calibrated in Celsius scale. Dual Fahrenheit markings are permissible and encouraged.

2. Temperature Controller: The main temperature controller shall be transistorized, solid state type with electrical resistance type sensor. Special sensor is required for explosion-proof room(2).

3. Humidity Controls:

a. The main humidity controller shall be transistorized, solid state type with wet/dry bulb sensor for fast reaction to changing conditions that cannot be damaged by inadvertent saturation. Controller is fully temperature compensated with set point calibrated in direct % RH. A digital display is provided for either dry bulb temperature or direct % RH as desired by positioning the indicator selector switch.

b. Room number 8-127 to include a transistorized, solid state type humidity controller with a temperature compensated, solid state, lithium chloride type sensor in lieu of the wet/dry bulb type sensor specified above. This instrument includes a dual scale set point calibrated in % RH as well as a dual scale indicating meter for direct % RH.

4. Safety Controls:

a. High and low limit temperature safety controls shall incorporate thermostats, calibrated in Celsius scale, so installed to cancel all electrical circuits within the room and to sound an audible and visible alarm in the event of a decrease, or increase, in temperature from the control set point to the limit set point. This Controller shall be fully adjustable and designed so that it can be set within 2°C. of the main control temperature. There shall be a control panel mounted switch, allowing cancellation of the audible alarm, while leaving the visible alarm lit.

b. Rooms requiring "power failure" alarms, (see equipment schedule), shall be equipped with an audible and visible alarm, powered by a rechargeable, nickel cadmium batteries. Alarm shall be triggered by a loss of power to the control panel. Alarm shall be equipped with a "trickle charging" device to allow recharging of the batteries, upon reinstatement of power.

5. Remote Safety Control: Provide terminals for future connection to building alarm system at each room.

6. Defrost Control: The electric defrost system shall be time initiated, temperature terminated. System must switch off evaporator fans during defrost and delay fan start-up at defrost termination. Switching shall also be provided to manually defeat the defrost cycle, should experiments in progress demand this. Automatic switching shall be provided to prevent defrost cycle, when room is being operated above 5°C. A pilot light shall be provided, which will indicate when the unit is in the defrost cycle.



7. Explosion Proofing: Special precautions must be used in Room 8-116 to create explosion proof conditions suitable for use of flammable solvents. Special features include non-sparkling fan blades, air tight seals on all penetrations of the insulated panels and explosion proof electrical fixtures and wiring.

8. Emergency power to rooms shown on schedule by Electrical.

### 2.3 INSTRUMENTATION

A. Pilot Lights: Neon-type pilot lights shall be provided for monitoring of control system functions on all rooms.

B. Dial Thermometer: A pen-mounted, remote bulb, dial thermometer, calibrated in Celsius, shall indicate room temperature at all times. Range shall cover rooms' specified temperature.

C. Recording Thermometer: Rooms requiring recording thermometers shall be equipped with a seven day, 10" diameter, circular chart recorder with chart calibrations in Celsius scale. Humidified rooms shall incorporate wet bulb and dry bulb recorders with both movements enclosed in the same housing and inscribing on a common chart. Rooms requiring light records shall utilize a dry bulb temperature recorder with the sensing bulb clamped to a light fixture to indicate, on the recording chart, "lights on" periods.

### 2.4 CONTROL AND PERFORMANCE PARAMETERS

A. Room Performance Requirements: Refer to Environmental Control Room Schedule.

B. Control Parameters:

1. Control Sensitivity: + or - 0.2°C or better, actual control at thermistor.

2. Temperature Uniformity: + or - 0.5° of better, measured by a multipoint strip chart recorder utilizing a minimum of 12 selected thermocouple locations throughout the work chamber.

C. Testing:

1. General: Upon completion of the installation of these environmental chambers, to the supplier's satisfaction, their performance will be tested and evaluated by an independent testing agency, to be contracted by the Owner. The purpose of the testing will be to establish whether or not the rooms conform to the parameters required by the specification and to establish the limits of performance to be expected from them.

2. Test Procedures: In general testing of the chambers the following points will be included:

a. Noise level inside each room with evaporator fans operating at full capacity.

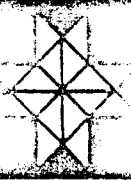
b. Level of illumination throughout at bench level (approximately 36" off floor). Allowance shall be made for the shading effect from any wall mounted shelving.

c. Temperature tests at both the highest and lowest temperatures, specified for the room and both no-load and full-specified-load conditions. Tests will utilize a twelve point Honeywell Recording Thermometer with thermocouple sensors. Eleven of these sensors will be distributed through the work space. The deviation of temperature from the set point, (as selected on the set point potentiometer), will be determined by the ability of at least one of these eleven points to maintain the set point temperature. The uniformity will be determined by the total span from lowest to highest temperature recorded during each test duration. The twelfth sensor will be immersed in an ice water bath during the entire duration of testing to establish the calibration of the test instrument.

SEE SCHEDULE FOLLOWING

- - -

ROOM NO.		2-107	2-110	8-127	8-128	8-129	8-130
EXTERIOR DIMENSION	USE OF ROOM	PHYSIOLOGY TESTING	CHEMIA - TOGRAPHY	MEDIA STORAGE	BUG CULTURES	PLANT CULTURES	ANIMAL CULTURES
	WIDTH	10'-0"	12'-6"	14'-5"	4'-7 1/2" INTERIOR	15'-5" INTERIOR	4'-7 1/2" INTERIOR
	DEPTH	12'-6"	17'-5"	7'-9"	5'-10"	5'-10"	5'-10"
TEMPERATURE RANGES	HEIGHT	8'-7"	8'-7"	8'-7"	0'-3"	8'-3"	8'-3"
	TEMPERATURE RANGES	10° TO 40° C	4° C CONSTANT	4° C CONSTANT	13° C TO 40° C	15° C TO 40° C	15° C TO 40° C
POWER REQUIREMENTS	VOLTS / PHASE	120/208/3	120/208/3	120/208/3	240/208/3	120/208/3	120/208/3
	AMPS	30 AMP	30 AMP	30 AMP	30 AMP	30 AMP	30 AMP
	RECEPTACLES	4-120V (4)	3-208V (4)	PLUG AND BY ELEC.	3-120V (4)	2-120V (4)	3-120V (4)
CONDENSING UNIT	SIZE	3 H.P.	5 H.P.	2 H.P.	1 H.P.	1 H.P.	1 H.P.
	VOLTS / PHASE	208/60/3	208/60/3	208/60/3	208/60/3	208/60/3	208/60/3
	AMPS	13.7 AMP	17.8 AMP	5.9 AMP	4.4 AMP	4.4 AMP	4.4 AMP
PIPING CONNECTIONS AND PUCTWORK	MISCELLANEOUS	-	EXPLORATION FROM ROOM	-	(13)	(13)	(13)
	LIQUID	1/2"	5/8"	1/2"	3/8"	3/8"	3/8"
	SUCTION	1 1/8"	1 3/8"	7/8"	5/8"	5/8"	5/8"
	ALARMS	(6)	NONE	(6)(7)	(7)	(7)	(7)
	OTHER	STEAM BY MECH	H2O/NIT/VA2 BY MECH	O2/NIT BY MECH	-	-	-
	FLOOR DRAIN	NONE	NONE	ONE	NONE	NONE	NONE
	VENTILATION	25 CFM W/ 6" DUCT BY MECH	25 CFM W/ 6" DUCT BY MECH	25 CFM W/ 6" DUCT BY MECH	NONE	NONE	NONE
RELATIVE HUMIDITY	TEMPERATURE CONTROL	SOLID STATE SINGLE SET POINT	SOLID STATE SINGLE SET POINT	SOLID STATE SINGLE SET POINT	SOLID STATE SINGLE SET POINT	SOLID STATE DUAL SET W/ 24 HR. DUAL SET POINT	SOLID STATE SINGLE SET POINT
	RECORDERS	10" CIRCULAR 2 PEN 7 DAY	10" CIRCULAR 1 PEN 7 DAY	10" CIRCULAR 2 PEN 7 DAY	10" CIRCULAR 1 PEN 7 DAY	10" CIRCULAR 2 PEN 7 DAY	10" CIRCULAR 1 PEN 7 DAY
	RANGES % ± 5%	20% TO 90%	50% TO 70%	NOT TO EXCEED 40%	NONE	NONE	NONE
LIGHTS	HUMIDIFIER	CENTRIFUGAL ATOMIZER (STEAM)	NONE	NONE	NONE	NONE	NONE
	DEHUMIDIFIER	CHEMICAL DESICCANT DRYER	NONE	CHEMICAL DESICCANT DRYER	NONE	NONE	NONE
	LEVEL	5-100 P.C.	70 P.C.	70 P.C.	70 P.C.	100 P.C. PER SHELF	70 P.C.
FLOORING	TYPE	INDAND. (5) CONTROL IN 106	FLUORESCENT	FLUORESCENT	FLUORESCENT (10)	FLUORESCENT (9)(10) FLUORESCENT	FLUORESCENT (10)
	FLOORING	SEALED CONC. FLR SLAB - NO RAMP	INSUL. FLR. W/ RAMP RESIN. FLOOR MAT	INSUL. FLR. W/ RAMP SEAMLESS COMP. FLR. APPLIED	CONG. FLR. NO RAMP SEAMLESS COMP. FLRING	CONG. FLR. NO RAMP SEAMLESS COMP. FLRING	CONG. FLR. NO RAMP SEAMLESS COMP. FLRING
	SHELVING	NONE	BY OTHERS	BY OTHERS	BY OTHERS	3 TIER LAMP BAYED EA. SHELVING W/ 4 PAPER TOWEL	BY OTHERS
EMERGENCY POWER	NONE	UNIT ON EM. POWER BY ELEC.	NONE	UNIT ON EMER. POWER BY ELEC.	UNIT ON EMER. POWER BY ELEC.	UNIT ON EMER. POWER BY ELEC.	



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ENVIRONMENTAL  
CONTROL ROOMS  
SCHEDULE

SHEET NO  
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ROOM NO.		9-111	9-122	9-123	9-144	9-145	
EXTERIOR DIMENSION	USE OF ROOM	LAB WORK	LAB WORK	LAB TISSUE STORAGE	PLANT GROWTH	PLANT GROWTH	
	WIDTH	7'-9"	11'-7"	11'-7"	7'-9"	7'-9"	
	DEPTH	12'-6"	COMB. → 16'-5" ← COMB. 10'-7" INTERIOR 5'-10" INTERIOR	9'-8"	9'-8"	9'-8"	
	HEIGHT	8'-7"	8'-7"	8'-7"	8'-3"	8'-3"	
	TEMPERATURE RANGE	4° C CONSTANT	4° C TO 60° C	(-25° C) TO 5° C	15° TO 35° C	15° TO 35° C	
FITTING CONNECTIONS, POWER REQUIREMENTS AND DISTANCE	ROOM SERVICE	VOLTS / PHASE	208/208/3	208/208/3	208/208/3	208/208/3	
		AMPS	30 AMP	30 AMP	30 AMP	60 AMP	60 AMP
		RECEPTACLES	PLUG-MOLD BY ELEC.	PLUG-MOLD BY ELEC.	PLUG-MOLD BY ELEC.	NONE	NONE
	REFRIG. CONDENSING UNIT	SIZE	1/2 H.P.	2 H.P.	3 H.P.	5 H.P.	5 H.P.
		VOLTS / PHASE	208/60/3	208/60/3	208/60/3	208/60/3	208/60/3
		AMPS	5 AMP	5.9 AMP	13.7 AMP	17.8 AMP	17.3 AMP
		MISCELLANEOUS	(12)	-	-	(13)	(13)
	REFRIG. UNIT	LIQUID	3/8"	1/2"	1/2"	5/8"	5/8"
		SUCTION	7/8"	7/8"	1 1/8"	1 3/8"	1 3/8"
		ALARMS	(6)	(6)	NONE	(6)	(6)
OTHER	HW/CW BY MECH.	HW/CW/NIT/VAC BY MECH.	NIT/VAC BY MECH.	CN/AIR/STN BY MECH.	CN/AIR/STN BY MECH.		
FLOOR DRAIN	NONE	NONE	NONE	NONE	NONE		
VENTILATION	25 CFM W/ 6" DUCT BY MECH.	25 CFM W/ 6" DUCT BY MECH.	NONE	25 CFM W/ 6" DUCT BY MECH.	25 CFM W/ 6" DUCT BY MECH.		
TEMPERATURE CONTROL	SOLID STATE SINGLE SET POINT	SOLID STATE SINGLE SET POINT	SOLID STATE SINGLE SET POINT	SOLID STATE DUAL SET W/ 24 HR. TIMER FOR JOURNAL	SOLID STATE DUAL SET W/ 24 HR. TIMER FOR JOURNAL		
RECORDERS	10" CIRCULAR 1 PEN 7 DAY	10" CIRCULAR 1 PEN 7 DAY	10" CIRCULAR 1 PEN 7 DAY	10" CIRCULAR 2 PEN 7 DAY	10" CIRCULAR 2 PEN 7 DAY		
RELATIVE HUMIDITY	RANGE % ± 5%	50% TO 70%	50% TO 70%	NONE	50% TO 90%	50% TO 90%	
	HUMIDIFIER	NONE	NONE	NONE	CENTRIFUGAL ADMIXER (STEAM)	CENTRIFUGAL ADMIXER (STEAM)	
	DEHUMIDIFIER	NONE	NONE	NONE	COIL	COIL	
LIGHTING	LEVEL	70 F.C.	70 F.C.	50 F.C.	2-5000 F.C. LAMP BANK	2-5000 F.C. LAMP BANK	
	TYPE	FLUORESCENT	FLUORESCENT	INCANDESCENT	FLOOR (8) (10) INSAND. (11) INSAND. (11)	FLOOR (8) (10) INSAND. (11) INSAND. (11)	
FLOORING	INSUL. FLR. W/ RAMP RESIL FLOOR MAT	INSUL. FLR. W/ RAMP RESIL FLOOR MAT	INSUL. FLR. NO RAMP, RESIL FLOOR MAT	SEALED CONG. FLR. SLAB, NO RAMP	SEALED CONG. FLR. SLAB, NO RAMP		
SHELVING	BY OTHERS	BY OTHERS	BY OTHERS	(8)	(8)		
EMERGENCY POWER	NONE	NONE	UNIT ON EMER. POWER BY ELEC.	NONE	NONE		

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ENVIRONMENTAL  
CONTROL ROOMS  
SCHEDULES

SHEET NO.

2

OF 3

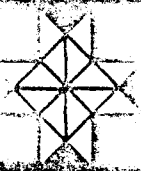
## NOTES

(ALL PROVIDED IN SECTION 13713)

- (1) PROVIDE BATTERY POWER LOCAL ALARM
- (2) PROVIDE HIGH LIMIT ALARM AND ELECTRICAL CUTOFF
- (3) PROVIDE LOW LIMIT ALARM AND ELECTRICAL CUTOFF
- (4) PROVIDE RECEPTACLES: (LOCATION SHOWN ON PLAN)  
 120V DUPLEX W/ VAPORPROOF COVERS, 15 AMP  
 208V EXPLOSION PROOF, 20 AMP
- (5) BY ELEC - LIGHT DIMMER - (INCANDESCENT) (LOCATED SWITCH IN RM 2-106)
- (6) PROVIDE POWER FAILURE ALARM, (BATTERY OPERATED 2HR)
- (7) PROVIDE HIGH AND LOW LIMIT ALARMS W/ ELEC. CUTOFFS.
- (8) PROVIDE RABABLE 2 1/2" WIRE ROD BENCH UNDER LAMP BANKS, (CRANK OPERATED)
- (9) PROVIDE ETC, GED-LUX FLUORESCENT LAMPS,
- (10) PROVIDE LIGHT TIMERS
- (11) PROVIDE 3 TIMERS PER LAMP BANK
- (12) PROVIDE 36" SQ. WINDOW IN SIDE WALL PANEL. (SEE DRNGS.)
- (13) PROVIDE 30" DOOR
- (14) PROVIDE DIURNAL CONTROL FA, SIDE.

GENERAL

SEAMLESS COMPOSITION FLOORING BY GENERAL CONTRACTOR.  
 SEE SHEET A11-6 FOR ADDITIONAL DETAILS OF EOR RMS @ CORNERS, ETC.



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ENVIRONMENTAL  
 CONTROL ROOMS  
 SCHEDULES

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## PART 1: GENERAL

1.1 SCOPE

A. Conditions of Contract and Division 1 - General Requirements, apply to all work of this section. Refer to Article 12 of the Instructions to Bidders, Article 7 of the General Conditions and Section 01600 - Materials and Equipment for requirements on pre-bid and post-bid evaluation of proposed substitute products, methods and other conditions.

B. Work under this section includes the fabrication and installation of dog runs, Equipment Item L334.

1.2 SUBMITTALS

A. Shop Drawings: Submit complete fabrication and erection drawings showing complete installation rough-ins, arrangement of components and assembly details.

## PART 2: PRODUCTS

2.1 MATERIALS

A. Manufacturer: Long Environmental Systems, as manufactured by the Kennel Division of Long's Fence Company, Inc., Gambrills, Maryland 21054, as set forth in the following specifications:

B. Fabric: Fabric shall be woven from #11 gauge, aluminum coated steel wire in accordance with ASTM designation A-491 in its entirety. The fabric shall be thoroughly cleaned and given a clean, organic coating after fabrication by the complete immersion process. The aluminum coating shall be a minimum of 0.35 ounces per square foot. The weight of coating shall be determined by the strip test as defined in ASTM specifications A-428.

C. Mesh: There shall be a uniform diamond square mesh of approximately  $1\frac{1}{4}$ " between parallel sides after weaving the No. 11 gauge wire into chain link fabric. Fabric shall be knuckled at both ends to insure safety.

D. Framework: All vertical uprights and horizontal bracing shall be 1-3/8" O.D. galvanized steel pipe weighing 1.06 lbs. per linear foot. Panels 8' to 11' in width shall have one centered vertical brace and panels over 11' shall have two equally spaced vertical braces. All panels shall have  $1\frac{1}{2}$ " extensions at bottom to provide easy flushing. Panels to be installed on graded floors shall be constructed to follow pitch. Example: if drop in floor is 3" over a 12' span, pitch equals  $\frac{1}{4}$ " per linear foot of panel.

E. Welds: All joints shall be electrically arc welded, then the slab removed and wire-brushed clean. A primer coat of zinc dust, zinc oxide shall be applied on all welds. The finish coat shall be aluminum paint 65% by weight of pure aluminum flakes. The vehicle shall be a phenolic resin varnish with alkali refined linseed oil.

F. Fabric Attachment: The fabric shall be stretched taut and secured to spaced vertical end uprights with flat tension bars  $3/16'' \times 5/8''$ , installed in the mesh of the end lace of fabric and bolted to the uprights with tension bands  $1-3/8'' \times 7/8''$  by 14 gauge, spaced 14" apart. The carriage bolts shall be  $5/16'' \times 1''$ . The fabric shall be secured to horizontal rails and vertical braces with No. 11 gauge Bethanized "AA" tie wire. Spacing of ties shall not exceed 9".

G. Isolation Panels: Upper portion of panels between runs shall be  $1-1/4''$  Aluminized fabric with  $1-3/8''$  O.C. horizontal brace between isolation section and fabric. Bottom portion of isolation panel shall be filled with:

1. Stainless Steel Sheets (18-8 Type 304-2B) of No. 20 gauge shall be fastened in bottom sections of panels with 20 gauge stainless steel 1" wide keyhole straps spaced 9" apart. The keyhole straps shall be fastened to the 20 gauge stainless steel with an aluminum  $1/4''$  Huck bolt and collar. Height 36".

H. Top Panels: Security top cover panels shall have a  $1-3/8''$  O.D. frame and braces of galvanized steel pipe, weighting 1.06 lbs. per linear foot. (Brace spacing same as specified under "Frame work".) Fabric to be secured to frame and braces with No. 11 gauge Bethanized "AA" tie wire, spacing of ties shall not exceed 9". (Fabric same as specified under "Fabric").

I. Slide-Gate Unit Design: Slide-gates shall be prehung in overhead track and bottom guide with locking device in which no adjustment is required. Roller wheels shall be formed from heavy steel, zinc plated and chromated to resist rust. Wide wheel tread shall give a long wearing contact with enclosed track. Hardened steel axle shall have solid steel shoulders for accurate wheel spacing and spin riveting to secure the wheels solidly to the axle. ( $1/2''$  bolt connection of trolley to the hanger straps incorporates an equalizing feature to distribute the weight on all four wheels.) A grey iron casting forms the hanger body. (Heavy wall thickness properly ribbed making a sturdy one piece unit.) Bearings shall be sealed with long lasting grease at assembly, keeping grease in, and foreign matter out. The track shall be 16 gauge galvanized steel,  $1-3/4''$  I.D. in width, by  $2-1/4''$  I.D. in height. Sturdy, snug end fittings shall be pressed into rail and spot welded to eliminate bird nests and weather problems.

J. Self-Locking Gate Latch: Latch shall be constructed of galvanized solid steel. When gate is closed the gravity latch shall automatically drop to prevent accidental opening. Latch shall have swivel lock plate attached.

K. Panel Clamps: Two panel clamps shall be provided for each panel. Clamps shall be galvanized pressed steel  $1-1/4''$  14 gauge metal, secured with  $1/4''$  by  $3/4''$  galvanized stove bolt.

L. Masonry Clamps: Two clamps shall be provided for each panel being attached to wall. Clamps shall be 14 gauge steel, galvanized,  $1-3/8''$  rigid push-on straps  $7/8''$  wide.

M. Spacing: In clamping panels together and attaching fabric to uprights, there shall be no opening larger than  $1-1/4''$  to insure security and to conform to the overall appearance of the  $1-1/4''$  mesh.

## 2.2 ACCESSORIES

A. Resting Bench: Vacuum formed polyvinyl chloride sheet, .070 thickness with .125" fiberglass backing. All corners shall have a radius of 2-1/2". All swivel-up bench fittings to be galvanized steel.

B. Automatic Feeder: Automatic feeders shall be fabricated of 20 gauge stainless steel type 304-2B. Design of the feeder shall permit feeding from outside of the enclosure.

C. Automatic Watering System Components:

1. PV110 Pivoting Stem Drinking Valve will have a 1/2" male pipe thread for connecting to the water distribution system and is used for dogs, swine, sheep, goats and large non-human primates. The drinking tip of the valve body will be slanted to allow natural actuation by the animal's teeth, lips or tongue. The valve will be insensitive to water pressure and positive valve closure will be insured by a high strength silicone rubber diaphragm. Materials are: valve body-brass double nickel plated; valve stem - 305 stainless steel; diaphragm - high strength silicone rubber; "O" ring - ethylene propylene.

2. All CPVC rigid piping, CPVC fittings and assembly procedures will meet the requirements of ASTM D2846. The material used in both pipe and fittings is CPVC4120 and is approved by the National Sanitation Foundation for potable drinking water.

3. All flexible tubing used is black non-toxic PVC and is approved for use by the National Sanitation Foundation.

4. The material for barbed fittings used with the flexible PVC tubing is high density polyethylene and is approved by the National Sanitation Foundation.

5. PR511 Pressure Control Station - will provide a precision system shut-off valve, a 0-15 PSIG pressure regulator, a 5 micron filter, and a 3-1/2" 0-15 PSIG pressure gauge mounted on a 11" x 16" 304 stainless steel panel.

6. PR520 Pressure Control Station - provides a precision system shut-off valve, a 0-15 PSIG pressure regulator, a 5 micron filter, and an easy reading 4 1/2" 0-15 PSIG pressure indicating gauge. These instruments are housed in a 304 polished stainless steel enclosure which has a hinged cover which opens from right to left allowing access to all components. The pressure gauge is located in the cover for external monitoring. The enclosure is 11" high x 16" wide x 8" deep.

7. All rigid pipe mounting brackets and clamps are stainless steel.

## PART 3: EXECUTION

### 3.1 Installation

A. Install dog runs in strict accordance with approved shop drawings and manufacturer's assembly and installation instructions.

B. Test all working parts and accessories for proper operation and adjust, replace or repair as required.

- - -



## PART 1: GENERAL

1.1 SCOPE

A. Conditions of Contract and Division 1 - General Requirements - apply to all work of this section. Refer to Article 12 of the Instructions to Bidders, Article 7 of the General Conditions and Section 01600 - Materials and Equipment - for requirements on pre-bid and post-bid evaluation of proposed substitute products, methods, and other conditions.

B. Work under this section includes all labor, materials, tools, appliances and equipment, and performing all operations necessary for the complete execution of the installation of sound isolation as shown, detailed, and/or scheduled on the drawings and/or as specified herein. The work in general shall include but not necessarily be limited to the following:

1. Concrete floors and masonry partitions where indicated shall be isolated from the building structure by means of sound isolation panels.

2. The perimeter of floating floors shall be isolated from the adjoining walls, curbs and columns by means of isolation board.

C. Related work specified elsewhere:

1. Cast-in-place concrete: Section 03100, 03200, 03300.
2. Unit Masonry: Sections 04100, 04200.
3. Waterproofing: Section 07110.
4. Sealants: Section 07900.
5. Plaster Ceiling Isolation: Section 09100.
6. Mechanical Work including vibration isolation of mechanical equipment: Division 15.
7. Electrical Work: Division 16.

E. Material furnished, but not installed under this section:

1. Isolation panels for masonry partitions: Installed under Section 04200.

1.2 QUALITY OF MANUFACTURE

A. Materials and systems specified are the products of Consolidated Kinetics Corporation to establish standards of quality and performance.

1. All sound isolation materials specified herein shall be provided by a single manufacturer to assure single responsibility for the proper performance of all isolation materials used.

2. Substitutes for the isolation materials specified, incorporating non-permanent materials such as Cork, Rubber, Wood Pulp Products, or Thermal Type Fiberglas will not be acceptable.

3. Support media, both initially and permanently, must be of a load versus

deflection predictability that uniform deflection of the "floating floor" can be engineered, by the supplier, to control variation of deflection of the "floating floor" to within the bending limits of the "floating floor" slab, designed for this project, to eliminate cracking of the slab caused by excessive deflection.

4. Support media "noise and vibration isolation pads" shall be resistant to oil, water, acids, and fungus, and shall be capable of sustaining a 300% overload without damage, permanent set, collapse, or permanent loss in natural frequency.

5. Technical data supporting performance characteristics of the support media shall include dynamic, and static load deflection, and natural frequency test, as performed and reported by a nationally recognized independent testing agency. Test reports shall include data on longevity, creep rate, and details of test procedure used to establish reported data.

6. The intent of this specification is to assure that the support media used for floating floors will be of a nature that it will continue to perform properly for the life of the installation. Any information requested by the Architect, to assure that the intent of the specification will be met, shall be provided.

B. Type FSN Jack-Up Floating Floor System as manufactured by Mason Industries is acceptable, subject to all costs of redesign and additional materials being borne by Mason Industries and subject to Architect's approval of minor deviation in details of performance.

### 1.3 SUBMITTALS

#### A. Shop Drawings:

1. The contractor shall have prepared and shall submit shop drawings of the sound isolation work for the approval of the Architect in accordance with the requirements of Section 01300.

2. These drawings shall show the construction of the various part of the work, the layout of the isolation panels and the various perimeter conditions.

B. Samples: The Contractor shall submit to the Architect for approval, samples in triplicate, of sound isolation material and all components as specified herein.

### 1.4 EXAMINATION OF EXISTING CONDITIONS

A. The sub-contractor shall carefully examine conditions at the job before commencing his work. He shall report any work not properly prepared to receive the work of this Division to the General Contractor and University for correction. Commencement signifies acceptance of all work prepared to receive work of this Division.

## PART 2: PRODUCTS

### 2.1 MATERIALS

A. Isolation panels for concrete slabs (identified in details as "resilient supports 12" o.c." and "2" rigid insulation" used together between concrete slabs):

Panels shall consist of:  $\frac{1}{4}$ " tempered hardboard, pressure oil saturated factory-bonded to and supported by precompressed molded fiberglass noise and vibration Isolation pads. Isolation pads shall be Type Q, 2" high, shall be made of glass fiber diameters not to exceed .00018 inches, shall be individually coated with a flexible moisture impervious membrane, and shall be spaced on 1'-0" centers each way. Isolation Pads shall have a load range of 40-200 lb per pad to maintain an essentially constant natural frequency of 10.6 Hz. Low density, fiberglass noise absorption material, NRC .87, 25% less thick than the Isolation Pad, shall be bonded to the entire area between the Isolation Pads. Prefabricated Isolation Panels shall be Type FQP as manufactured by Consolidated Kinetics Corporation.

1. Isolation panels at exhaust air plenums shall be the same construction except shall be pad type 1, 2" thick, load range 30-150 psf, constant natural frequency 9.9 Hz (Prefabricated panel type FIP).

B. Isolation board (identified in details as "sound insulation" and shown in vertical plane): The perimeter of the floating floor shall be isolated from adjoining floors, walls and columns, by means of Perimeter Isolation Board. Board shall be type P1B, as manufactured by Consolidated Kinetics Corporation.

C. Partitions Isolation, masonry (identified in details as "sound insulation" and shown in horizontal plane under masonry partitions on curbs): Masonry partitions, as designated on the drawings, shall be isolated from the concrete curbs by means of partition isolation material and shall be Type FPC, as manufactured by Consolidated Kinetics Corporation.

D. Clips: Clips for attaching isolation panels to each other shall be plyclips or proper dimension.

E. Adhesive: The adhesive used to cement the isolation board to the adjoining walls, columns, etc., shall be a bituminous flashing cement.

F. Penetration: Piping, conduit, or ductwork penetrations of the "floating floor" or isolated wall shall be isolated with 1" thick molded fiberglass pipe sleeves, or low density fiberglass.

G. Moisture Protection: Provide minimum moisture protection of 2 layers of 6 mil polyethylene film placed on top of isolation panels during concrete pouring. All joints lapped and taped.

## 2.2 PERFORMANCE CRITERIA

A. Sound isolation performance of the specified floating floor system has been evaluated at the Riverbank Acoustical Laboratories and rated at STC 72, INR +18.

## PART 3: EXECUTION

### 3.1 INSTALLATION

A. The installation of all sound isolation materials specified herein shall be accomplished following the isolation material manufacturers written instructions. Installation instructions shall be submitted to the Architect for approval prior to beginning the work.

### 3.2 FIELD QUALITY CONTROL

A. Notification shall be given by the Contractor to the University and to the field representative of the isolation material manufacturer to inspect the installation at the following stages:

1. Upon completion of all areas prior to the placement of isolation materials. All surfaces shall receive their approval before installation of isolated materials.

2. Upon completion of placement of isolation materials prior to placement of concrete topping. The manufacturer's representative shall be on hand to assist in the initial stages of the placement of isolation material to insure the proper procedures and techniques are strictly followed.

3. Upon completion of finished floor surface installation and installation of sealants. The final inspection of sound isolation shall be made at this time. Any evidence of faulty performance shall be evaluated and such imperfections shall be corrected. Any area subject to short circuiting, shall be cut out and properly installed to insure a satisfactory sound isolation performance. The cost of such repairs including that of the topping slabs and flooring shall be borne by the installing sub-contractor. Any evidence of faulty performance due to isolation materials used shall be corrected by replacement or alteration of the isolation material, with all cost of such correction, and cost of related work to accomplish correction, borne by the manufacturer of the isolation materials.

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1.1 SCOPE OF THIS SECTION

A. Conditions of Contract and Division 1 General Requirements apply to all provisions of this section. Refer to Article 20 of the Information for Bidders and Article 1.17 of the General Conditions for requirements on pre-bid and post-bid evaluation of proposed substitute products, methods and other conditions.

B. The provisions of this section apply to the work of all sections of Division 14. Wherever the term "Elevator Contractor" is used, it shall mean "Elevator Subcontractor".

1.2 SCOPE OF WORK - VERTICAL TRANSPORTATION

A. Work of this Contract includes furnishing and installing a complete elevator plant as shown on the drawings. All work and materials necessary to accomplish this installation in a complete and workmanlike manner, except that specifically excluded as "Related Work under the Other Contracts", shall be provided.

B. The work shall be done in accordance with local codes which may govern the requirements of the installation, and the latest edition of the American National Standard Safety Code for Elevators (referred to as the ANSI Code), including revisions and authorized changes in effect on the date of these specifications. In case requirements differ between codes, the more stringent shall apply.

C. In all cases where a device or part of the equipment is referred to in the singular number, it is intended that such reference shall apply to as many devices as are required to complete the installation.

1.3 RELATED WORK UNDER OTHER CONTRACTS (PRIME CONTRACTOR OR HIS SUBCONTRACTORS)

## A. General Construction:

1. Elevator pits, including access doors, ladders, etc.
2. Support for machine.
3. Protection of hoistway openings during construction.
4. Hoistway structure and walls.
5. Machine room structure, floors, walls, openings, hatches, gratings, doors, etc.
6. Concrete work including grouting, filling, installation of guide rail inserts (furnished by elevator contractor).

## B. Mechanical Construction:

1. Heating and ventilating of machine rooms.

2. Pit drainage.

C. Electrical Construction:

1. Pit and machine room lighting and power.

2. Normal and emergency 3-phase mainline power via feeders and disconnect switch to terminals in each controller unit.

3. Normal and emergency single-phase car lighting and blower power via 20-amp circuit breaker with feeders to terminals in each controller unit.

4. 30-amp single-phase power feeders with disconnect switch to one elevator control panel. (This may later be changed to 3 phase by Elevator Contractor as this varies from contractor to contractor.)

5. A pair of conductors to a control panel in the elevator machine room to signal the presence of emergency power.

D. Other Contractors or Vendors:

1. Install telephone unit in the elevator car and connect circuit to each elevator hatch junction box: by telephone company.

2. Position indicator negatives.

1.4 PERFORMANCE REQUIREMENTS

A. Contract Speed: The contract speed shall be provided for up direction travel with full-capacity load. The speed in either direction under any loading condition shall not vary more than 5% of the contract speed.

B. Capacity: In accordance with the ANSI Code, the elevator shall be designed and adjusted to safely lower, stop and hold the car with a load of 125% of the rated capacity.

C. Door Times: The front door opening time shall not be longer than 1.6 seconds on all units. Rear door opening time on elevator No. 1 shall not exceed 2.5 seconds. Door opening time shall be measured from the instant the doors start to open until 1" from the fully open position. When the car stops level with the floor, the doors shall not be open more than 3/4's of their fully open position. A kinetic energy of not more than 7 ft. lbs. shall be required to stop the closing doors at any point in their travel.

D. Floor-to-Floor Time: The time for an elevator to travel from floor to floor under any loading condition and utilizing the front entrances shall not exceed 8.0 seconds. Floor-to-floor time shall be measured from the instant the doors start to close at one floor until the car is level and stopped at the next floor with the doors 3/4's open and with the car level and stopped. The above time shall be obtainable with dependable, consistent operation without undue wear or stress on the equipment and without excessive maintenance. Furthermore, the elevator shall provide a comfortable ride with smooth acceleration and retardation and a soft stop.

E. Retention: The owner reserves the right to withhold payment of the final retainage portion of the contract amount until such time as all performance requirements as specified herein are satisfactorily met.

#### 1.5 MAINTENANCE

A. Included in New Equipment Contract: The Elevator Contractor shall furnish maintenance throughout the one-year basic guarantee period. The maintenance service shall include: 24-hour callback on all equipment of Division 14; at least once a month systematic examination, adjustment and lubrication of equipment; maintenance of the specific performance requirement; monthly reports of inspections and repairs made, including safety test reports with details of tests performed; repair or replacement of parts as required, without additional cost to the Owner; oil, grease and all items required to completely service the equipment, without additional cost to the Owner. Only genuine, standard parts of the manufacturer of the equipment installed shall be used and all work shall be performed by competent personnel under the supervision and in the employ of the Elevator Contractor.

B. Interim: Completed or uncompleted elevators shall not be used by trades other than the Elevator Contractor without written permission of the Owner and as provided in Article 4.3 of Section 0150. In the event this permission is given, the responsible Contractor and Owner shall assume full responsibility for protection of the passengers, equipment, cab and doors, including cleanup and refinishing as may be required, and shall pay the Elevator Contractor his standard rates for servicing the elevator during the period of such temporary usage.

#### 1.6 FINISHES AND SAMPLES

A. Field Painting: The following equipment shall be thoroughly cleaned of oil, grease, scale and other foreign matter and given one coat of machinery enamel by the Elevator Contractor. Enamel color shall be Contractor's standard.

1. Hoistway: All equipment and metal work installed as a part of this work, which does not have a special architectural finish, and which is exposed in the hoistway.

2. Machine Room: Machine, motor generator, controller, governor, selector and duct work.

B. Baked Enamel:

1. Prime: All surfaces, receiving a baked enamel finish shall be thoroughly cleaned of oil, grease, scale and other foreign matter before any finish is applied. All material shall receive one coat of rust-resisting mineral paint. After which a filler coat shall be applied over all uneven surfaces. The filler coat shall be sanded and ground off level and smooth, and a final coat of mineral paint applied.

2. Final: In addition to the prime finish specified above, 3 additional coats of best-grade enamel, solid color as selected, shall be applied and baked.

C. Stainless Steel: All stainless steel shall be stretcher-leveled, resquared sheets. Sheets shall be .063" minimum for door facings and .074" minimum for entrance frames and front returns. The grain of belting shall run in the direction of the longest dimension. A satin finish shall be provided by first removing tool and die marks and then finishing with sanding belts. All surfaces shall be perfectly smooth and without waves. Stainless steel shall be ASTM A167, Type 302 or 304 with No. 4 satin finish.

D. Machined Surfaces: Machine-finished surfaces shall be protected against corrosion by a coat of lead or tallow or other effective means as soon as the machining is completed.

E. Samples: Samples of all finishes and materials shall be submitted for the Architect's approval in accordance with Section 0130.

### 1.7 QUALIFIED BIDDERS

A. Elevators: The Elevator Contractor shall be one regularly engaged in the business of design, engineering, manufacturing, installation and servicing elevators of the type and character specified. In the interest of unified responsibility and to avoid the use of field-assembled equipment of various manufacturers which has not been specifically designed and engineers to operate in conjunction with other related devices, the Bidder must be a bona fide manufacturer of the controller (except relays), selector, related control signal apparatus, governor, safety, door operator and signal fixtures. The hoisting machine motor and motor-generator set shall either be manufactured by the Elevator Contractor or shall be manufactured to the specifications of the Elevator Contractor and as governed by these specifications.

B. Entrances: The entrances shall be manufactured and installed by Haughton Elevator Company, Otis Elevator Company, Westinghouse Elevator Company, Dahlstrom Manufacturing Company, Hauenstein & Burmeister, Inc., Globe Van Doorn Corporation, The Tyler Company, or approved equal.

C. Cabs: The cabs shall be manufactured by Haughton Elevator Company, Otis Elevator Company, Westinghouse Elevator Company, Dahlstrom Manufacturing Company, Hauenstein & Bermeister, Inc., Globe Van Doorn Corporation, The Tyler Company, or approved equal. Installation shall be by the Elevator Contractor.

### 1.8 INSPECTION AND ACCEPTANCE

A. Inspection: Upon completion of the equipment installation, a team of competent men with instruments shall be provided to assist the Owner and/or his representative in making the following tests and inspections:

1. Verification of completeness of installation.
2. Contract speed check and floor-to-floor time check for compliance with performance requirements of these specifications (test weights required for this purpose shall be furnished by the contractor).
3. A complete check of performance, including:



- a. Starting, accelerating, running.
- b. Decelerating, leveling, stopping.
- c. Door operation.

B. Final Acceptance: Final acceptance of the entire installation shall be made only after all equipment has satisfactorily passed the aforementioned inspection and tests and the electrical diagrams have been provided.

C. Temporary Acceptance: Refer to Article 4.3 of Section 0150. When each elevator has been installed to a stage near completion and declared ready for service before entire erection of all elevators has been completed, the Owner may accept the elevator use and place it in regular service.

#### 1.9 SHOP DRAWINGS, WIRING DIAGRAMS AND PRINTED INSTRUCTIONS

A. Shop Drawings: Shop drawings shall be required for all work. Before beginning fabrication and work, shop drawings showing the plan views of the pits, hoistway, machine room, elevation view of the hoistway, cab and entrance details and details of the signals shall be prepared and submitted for approval. Refer to the Section 0130 for number and manner of submittals. Shop drawings shall be submitted within 60 days of contract award.

B. Wiring Diagrams: A complete reproducible set of "As Installed" straight-line wiring diagrams showing the electrical connections of all equipment, in the hoistway, as well as the machine room, shall be furnished prior to final acceptance. Also, a complete set of diagrams shall be mounted on 1/8" masonite sheets and mounted in a wall-hung rack in the machine room. A legend sheet shall be furnished with each set of drawings containing the following information:

1. Name and symbol of each relay, switch or other electrical apparatus.
2. Location on drawings, drawing sheet number and area of switches and relays, etc., and location of all contacts.
3. Location of apparatus - whether on controller, selector, motor-generator starter, hoistway or elevator car.

C. Printed Instructions: The following printed information shall be furnished prior to final acceptance:

1. A set of neatly bound instructions explaining all operating features, including all apparatus in the car control panels.
2. A set of printed instructions and recommendations for maintenance of all elevator equipment.
3. A lubrication chart, indicating all lubrication points and type of lubrication recommended for all equipment.
4. A complete parts catalog for all replaceable parts.

1.10 GUARANTEE

A. The materials and workmanship of the apparatus installed shall comply in every respect with these specifications and all defects not due to ordinary wear and tear or improper use or care, which may develop within one year from date of final acceptance of project shall be corrected to the satisfaction of the Architect at no additional cost. Refer to Article 1.56 of the General Conditions.

1.11 PERMITS

Elevator Contractor shall obtain and pay for necessary municipal or state inspections and permits and make such tests as are called for by the regulations of such authorities. These tests shall be made in the presence of the authorized representatives of such authorities.

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## PART 1: GENERAL

1.1 SCOPE

A. Conditions of Contract, Division 1 General Requirements and Section 1401 General Provisions - Vertical Transportation apply to all work of this section. Refer to Article 20 of the Information for Bidders and Article 1.17 of the General Conditions for requirements on pre-bid evaluation of proposed substitute products, methods and other conditions.

B. Work under this section includes traction elevators as shown on drawings and specified herein.

## C. Related Work Specified Elsewhere:

- |                        |              |
|------------------------|--------------|
| 1. General Provisions: | Section 1401 |
| 2. Elevator Cabs:      | Section 1423 |
| 3. Elevator Entrances: | Section 1424 |

## D. Equipment Summary:

- |                      |  |                             |
|----------------------|--|-----------------------------|
| 1. ELEVATORS NUMBER: | 1  | 2,3,4                       |
| 2. CAPACITY:         | 3000#                                      | 3000#                       |
| 3. SPEED:            | 500 F.P.M.                                 |                             |
| 4. OPERATION:        | GROUP AUTOMATIC                            |                             |
| 5. MOTOR CONTROL:    | VARIABLE VOLTAGE WITH AUTOMATIC LEVELING   |                             |
| 6. NUMBER OF STOPS:  | 11 (10 FRONT, 5 REVERSE 9 IN LINE)         |                             |
| 7. FLOORS SERVED:    | B, 1 THROUGH 10                            | 1 THROUGH 9                 |
| 8. TRAVEL:           | 82' -8"                                    | 115'-4"                     |
| 9. PLATFORM SIZE:    | 6'-2" x 7'-6"                              | 6'-8" x 6'-2"               |
| 10. ENTRANCE SIZE:   | FRONT: 3'-6" x 7'-0"                       | REAR: 4'-2" x 7'-0"         |
| 11. ENTRANCE TYPE:   | FRONT: CENTER OPENING                      | REAR: 2 SPEED, SIDE OPENING |
| 12. DOOR OPERATION:  | HIGH SPEED, HEAVY DUTY, DC MASTER OPERATOR |                             |
| 13. MACHINE:         | OVERHEAD, GEARLESS TRACTION                |                             |

#### 14. SIGNALS:

ILLUMINATING PUSHBUTTONS:	CAR AND HALL STATIONS
POSITION INDICATORS:	CAR AND MAIN LOBBY AT FRONT ONLY
HALL LANTERNS:	ALL FLOORS AT FRONT ENTRANCES
CAR DIRECTION INDICATOR:	CAR NO. 1, REAR ENTRANCE

#### 15. ADDITIONAL FEATURES:

EMERGENCY LIGHTING:	ALL UNITS
EMERGENCY-POWER TRANSFER:	ALL UNITS
FIREMAN'S EMERGENCY RETURN OPERATION	ALL UNITS
INDEPENDENT SERVICE:	ALL UNITS
TELEPHONE CABINET AND TRAVELING CABLE:	ALL UNITS
CAR TOP INSPECTION STATION:	ALL UNITS
HOISTWAY ACCESS SWITCHES:	ALL UNITS
2-CAR OPERATING PANELS:	ALL UNITS
PLATFORM ISOLATION:	ALL UNITS
LIGHT RAYS, SAFE EDGE, TIME SAVER AND NUDGING:	ALL UNITS EXCEPT NO TIME SAVER OR NUDGING ON REAR ENTRANCE OF NO. 1
12-MONTH MAINTENANCE WITH 24-HOUR CALLBACK:	ALL UNITS
CAR AND COUNTERWEIGHT ROLLER GUIDES:	ALL UNITS
NICKEL-SILVER CAR SILLS:	ALL UNITS
EMERGENCY EXIT CONTRACT:	ALL UNITS
RAIL BACKING (AS REQUIRED):	ALL UNITS
LOBBY CONTROL PANEL:	ALL UNITS
PROTECTIVE SCREEN BEHIND TRAVELING CABLES:	ALL UNITS
LOAD-WEIGHING DEVICE:	ALL UNITS
HANDICAPPED ACCOMMODA- TIONS:	ALL UNITS
HOSPITAL EMERGENCY SERVICE:	NO. 1 ONLY
DOOR HOLD OPEN BUTTON:	NO. 1 ONLY

#### PART 2: PRODUCTS AND INSTALLATION

##### 2.1 OPERATION

A. General: Hall buttons shall be located at each floor, with buttons in each car corresponding to the floors served. One riser of pushbuttons shall be provided between the South entrances of Elevators No. 2 and 3 and one riser of pushbuttons shall be provided near the East jamb of the North

entrance on Elevator No. 1. Elevators shall be operable without an attendant and shall automatically start in response to calls registered by momentary pressure on the car or hall buttons. The elevator cars shall slow down and stop automatically at the landing corresponding to the call registered on the hall or car button. The stops shall be made in the order in which they are approached by the elevator for each direction of travel, irrespective of the order in which they were registered. Only one car, traveling in the corresponding direction, shall stop in response to a hall button call. Simultaneous to the initiation of the slow down of a car for a hall call, the call shall be automatically canceled and shall remain so and the hall button corresponding to the elevator's direction of travel shall remain ineffective until after the car leaves the floor. The calls registered on the car buttons shall cancel in the same manner as the hall buttons.

B. Operational Control:

1. Group Supervisory Control: The elevators shall be provided with automatic group supervisory control systems operating to meet changing traffic conditions on demand response. The system shall include provision for handling traffic which is predominately in the up direction, predominately in the down direction, 2-way direction with periods in which traffic may be heavier in either direction, and intermittent or very light. As these traffic demands vary, the supervisory system shall automatically and continually provide any necessary changes in the mode of operation to provide the most effective means of handling the existing traffic condition. When operating on group supervisory control, Elevator No. 1 shall not respond to the North (rear) hall pushbutton stations nor shall the North car doors operate.

2. Special Freight Operation (Elevator No. 1 Only): Actuation of a switch in the car service panel or of a pushbutton in any North (rear) hall pushbutton station shall cause control of the elevator to be removed from the group supervisory control system and be placed on special freight operation. When on special freight operation the elevator shall respond to the pushbuttons contained in the North (rear) hall pushbutton stations and shall not respond to the South (front) hall pushbutton stations. A timing mechanism shall be provided to return the elevator to group operation if a call has not been registered on the North car control station for a predetermined length of time.

C. Independent Service: It shall be possible to remove each elevator from service individually and operate it as a single elevator with an attendant, independently of the dispatching signals and landing buttons. When operated on independent service, the hall lanterns for this elevator shall not function.

D. Motor Control: The motor control on all elevators shall be generator field control type; suitable for the operation specified and capable of providing smooth, comfortable acceleration, retardation and dynamic braking, limiting the difference in speed between full load and no load to not more than 5% of the contract speed.

E. Motor-Generator Timing: An automatic timing device shall be provided which will shut down each motor-generator set in the order in which the car becomes idle. This device shall be adjustable to keep the motor-generator set running up to 3 minutes after the last call.

F. Automatic Leveling: An automatic 2-way leveling device shall be provided to govern the leveling of the car to within 3/8" above or below the landing sill. The leveling operation shall be effective to avoid overtravel, as well as undertravel, of the car and maintain the leveling accuracy regardless of the load in the car, direction of travel, rope slippage or stretch in ropes.

G. Load Weighing: A means shall be provided for weighing the load in the elevator car. This device shall be designed into the control system to provide dispatching in advance of normal dispatch and provide landing call by-pass when the elevator is filled to approximately 80% of full-capacity load. The setting shall be manually adjustable.

H. Door Operation:

1. Elevators No. 2, 3 and 4: Doors shall open automatically when a car arrives at a terminal to permit egress of passengers whether or not the terminal floor call has been registered in the car. When another car is at the terminal and is loading for departure or upon expiration of a timed interval, the doors shall close and remain closed, until this car is scheduled for loading. If no other car is at the terminal, an arriving car shall have its doors open until the car is dispatched or expiration of a timed interval with no demand.

2. Elevator No. 1: Elevator No. 1 shall be provided with North and South entrances.

a. Freight Operation: When freight operation is in use the car shall respond to calls registered on the North or South car control station pushbuttons and on the North hall pushbuttons. Selective door operation shall be provided by registering the car calls on the car control station which is adjacent to the doors which are to be opened, i.e., the rear station shall control the rear doors and the front station shall control the front doors.

b. Passenger Operation: When passenger operation is in use the car shall operate with the elevator group as previously specified.

I. Emergency Features:

1. Emergency Lighting: Emergency power for the car lights and blower shall be provided via the normal power conductors. Emergency car lights and blower shall function in the event of a normal power failure. Provide backup battery power unit per code on each elevator.

2. Emergency Power Transfer: In the event of normal power failure, the elevators shall be controlled by a manual selector switch located in the lobby control panel. This manual switch will select the elevator to receive emergency power. After receiving emergency power, the elevator will automatically express directly to the lobby floor. After all elevators have been returned to this floor, a single elevator may be selected to continue to operate. Operational features such as independent service shall be overridden to allow the return of the elevator. Emergency power will be supplied through the normal machine room feeders. A separate pair of wires carrying emergency power will be supplied to the control panel designated by the Elevator Contractor in the machine room to supply a signal indicating power failure and activate the emergency operation.

All other control and provision for operation of the elevator on emergency power supply shall be provided and installed by the Elevator Contractor.

3. Firemen's Return: Emergency operation in accordance with Section 221 of the ANSI Code shall be provided. Return switch shall be located at the 3rd floor in a stainless steel faceplate. Automatic return actuation by sensor at the 3rd floor shall cause elevators to return to the 2nd floor.

4. Out-of-Service Adjustment: In the event an elevator becomes shutdown or delayed for a predetermined interval of time, it shall automatically be taken out of the dispatching system and shall not cause delays in the dispatching of the other cars. The circuits shall also be designed to enable normal answering of all landing calls by other elevators in the group, regardless of where the OUT-OF-SERVICE elevator is parked.

5. Auxiliary Dispatching: If for any reason the elevator dispatching system should fail to operate, provisions shall be made for auxiliary dispatching until normal automatic dispatching is restored.

6. Successive Starting: In the event the power interruption, motor-generator sets shall not start up simultaneously when power is restored.

7. Hospital Emergency Service: Elevator No. 1 shall be provided with a key-operated, spring-return switch adjacent to each front hoistway entrance at all floors to call the elevator to that floor. Any existing car calls shall be canceled and the elevator shall express directly to the floor where the emergency key has been momentarily actuated. After the elevator arrives, the doors shall open and remain open until the car is placed on emergency service by means of a 2-position, key-operated switch in the car station faceplate. If this action is not taken within approximately 60 seconds, the car shall return to normal service. When on emergency service, actuation of the desired floor button shall immediately cause the elevator doors to automatically close. The car shall then express directly to the selected floor by-passing all hall calls. The elevator shall be returned to normal service when the car emergency key is removed from the switch. This service shall override Independent Service and selective door operations.

J. Anti-Nuisance Feature (Group Operation Only): Controls shall be provided to recognize a condition where an abnormal number of calls are registered without the appropriate number of passengers requiring service. When this condition is "recognized", registered calls shall be canceled.

## 2.2 MACHINE ROOM EQUIPMENT

A. General: All equipment specified hereafter, except the governor-tension sheaves, shall be located in the machine spaces as indicated in the drawings. Alternate arrangements must be approved by the Architect. The machine, controller, selector, motor generator, starter, governor, mainline and auxiliary switches shall be provided with identifying decals or painted numerals.

B. Gearless Machine:

1. General: The machine shall consist of a motor, a drive sheave and a brake, all grouped on a single bedplate. Rotating parts shall be securely mounted in proper alignment on a forged-steel shaft. The shaft shall rotate on ball or roller bearings. Bearings shall be provided with automatic, self-lubrication from oil reservoirs. Oil gage and drain cocks shall be provided.

2. Bedplate: The bedplate shall be heavy structural steel shapes welded together. Plane or mill seal surface for parts secured to bedplate. Use cap

screws or tap bolts to secure parts to bedplate where practical. Use of brackets or other extensions, bolted to bedplate shall not be permitted.

3. Motor: The motor shall be direct-current, shunt-wound, slow-speed type, designed to develop required high-starting torque with low-starting current. The field coils shall be form or spool wound with windings in both the armature and fields arranged to permit reasonably easy renewal. The armature shall be electrically balanced and the sheave and brake drum shall be mechanically balanced. The commutator and brushes shall have sufficient area to prevent sparking or overheating under full load and shall have an individual-tension adjustment with means to adjust and lock brush holder as a unit. The motor shall run in either direction under full load without excessive heating or sparking and with one brush setting for loads and speeds within the specified duty range. The actual motor speed with any load from empty car to full-rated capacity, shall not vary more than 5% from normal-rated speed. The motor coils shall be impregnated and baked to prevent moisture absorption. Insulation resistance between conductors and frame of motor shall be not less than one megohm. Dielectric shall successfully pass breakdown test of 1500 volts alternating current applied for not less than one minute.

4. Sheave: The driving sheave shall be hard cast iron or semi-steel, suitably grooved to produce proper traction, and shall be thick enough to provide for future wear in grooves. The diameter of the driving sheave shall not be less than 52 times the diameter of the hoist ropes. The drive sheave grooves and flanges shall be smooth turned and shall run true. The sheave shall be free from cracks, sand holes, or other imperfections that would injure the ropes. The drive sheave and brake drum shall be keyed and secured to the rotating element. The secondary sheave shall be mounted to the machine beams in proper alignment with driving sheave.

5. Brake: An electromechanical brake shall be provided which shall consist of a brake drum cast integrally with the traction sheave, 2 brake shoes, 2 heavy springs to actuate the brake and an electromagnet to release brake. The brake shoes and springs shall be of sufficient size and strength to stop and hold a downward traveling car carrying 125% of its rated load. The brake drum wearing surface and edges shall be smooth turned. The brake shoe lining shall be fireproof-friction material and shall be shaped so that the drum will run free with a minimum clearance. Helical springs shall operate in compression to apply the brake when the electromagnet is deenergized. The electromagnet shall be deenergized by open safety devices. Power failure, failure of any unit to function for safe operation of car, and upon normal stopping of car.

6. Roping: The machine shall be arranged for 2:1 roping.

#### C. Motor-Generator Set:

1. General: The motor-generator set shall run at 1200 or 1800 r.p.m. with an AC induction motor, suitable for the power supply characteristics, all in accordance with A.I.E.E. Standards for 70 degrees F. continuous operation. Both motor and generator shall be compactly mounted on a single-forged steel shaft which turns on sleeve, ball or roller type bearings. The entire rotating element shall be statically and dynamically balanced. The selenium dry-plate



rectifiers or an exciter shall be provided to supply the direct-current power for operation of controller, brake, etc. Power supply characteristics: 480 volts, 3 phase. Solid state power conversion unit may be provided in lieu of motor generator set. Unit shall be designed to limit current, suppress noise and prevent feed back of transient voltages into building power supply.

2. Bedplate: All units of the set shall be mounted on a single bedplate or on a unit frame with supporting feet. The entire unit shall be mounted on rubber, or equal, isolation pads to eliminate the vibration.

3. Commutation: The set shall be designed for maximum efficiency and minimum noise and vibration. The commutation must be sparkless when running full speed with full load. No more than pin-point sparking shall be visible when accelerating and decelerating.

D. Selector: The floor selector shall be solid state, stepping switch and relay, or moving crosshead type. It shall simulate movement of the elevator, either by direct connection to the elevator car, or by electrical coupling. The mechanical features and electrical circuits shall be designed to permit accurate control and rapid acceleration and retardation without passenger discomfort, and shall also provide electrical contact for operation of signal equipment. All relays, switches, contacts, mounting panels, terminal boards, etc., shall conform to the specifications for the controller. The design of mechanical selectors shall provide easy access to mechanical parts and electrical equipment for adjustment or renewal.

#### E. Controller:

1. Frame: All controller switches, relays and other items of control equipment shall be mounted on panels made of moisture-resisting, noncombustible material. The panels shall be securely mounted on substantial, self-supporting steel frames with suitable fastenings. A vibration-absorbing mounting shall be provided for the steel frame to eliminate vibration transmission to the building structure.

2. Switch and Relay Design: Switches and relays shall be of the direct-current, magnet-operated type with contacts of design and material to insure maximum conductivity, long life and reliable operation without overheating or excessive wear. A wiping action between contacts shall be used to prevent sticking due to fusion. Switches carrying highly inductive currents shall be provided with arc-deflectors or suppressors.

3. Component Mounting: All switches and relays shall be mounted on the front of panels together with any small electronic components. Large capacity resistors shall be mounted on the rear or top of panels. All components shall be readily accessible and easily renewable.

4. Protective Devices: Equipment shall be provided to protect the driving motor of the generator against phase reversal, overload and single phasing in all 3 phases of the "Delta" connection. The generator shall be protected against overload.

5. Time Delay Relay Design: Where time delay relays are employed in the circuits, they shall be of an accepted design that is reliable and consistent, such as condenser or electronic timing circuits. Air or oil dash pot time relays shall not be acceptable.

6. Wiring: Wiring on the controller, whether factory or field wired, shall be done in a neat, workmanlike manner with all connections made to studs and/or terminals by means of grommets, solderless lugs or similar connections.

7. Terminal Blocks: Terminal blocks with identified studs shall be provided on the controller for connection of controller board circuitry with external wiring.

8. Marking: Identifying symbols or letters shall be permanently marked on or adjacent to each device on the controller and the marking shall be identical with markings used on the wiring diagrams. In addition to the identifying marks, the ampere rating shall be marked adjacent to all fuse holders.

9. Cabinet Design: A metal cabinet, with hinged doors or gates at front and back with adequate ventilation to dissipate heat, shall completely enclose the controller.

#### F. Governor and Tension Sheave:

1. General: The governor shall be centrifugally operated and shall conform to the ANSI Code. It shall be mounted over the hoistway and be connected to the car safety tripping mechanism by means of a wire rope. The governor rope shall pass over the governor sheave and the weighted tension sheave in the pit.

2. Tension Sheave: The tension sheave in the pit shall be mounted in a weighted steel frame securely fastened to the main car or counterweight guide rails and provided with guides or pivot points to enable free vertical movement.

3. Jaw Design: The governor jaws shall grip the cable in a minimum time after the governor reaches its tripping speed and shall be held in engagement with the cable by springs and the tension of the governor cable. The governor jaws shall be designed so that the governor cable may slide through them after the safety has set, without damage to the cable.

4. Adjustment: The governor shall be accurately adjusted to operate within limits specified by the ANSI Code. All adjustable parts shall be sealed.

5. Switches: The operation of the governor on overpseed shall open a switch disconnecting the power from the elevator before the safety mechanism has tripped. A 2nd switch shall be provided to reduce the speed of the elevator prior to the operation of the disconnect switch.

6. Marking Plate: A metal marking plate shall be securely fastened to the governor and marked with governor tripping speed and rope size and construction.

#### G. Machine Beams:

1. General: Provide the structural steel beams required for support of the elevator machine, deflector sheave, etc. The elevator shop drawings shall show size and location of any beam pockets required for support of these beams. Also, bearing plates, anchors, shelf angles, blocking, etc., shall be provided to securely support beams, slab and equipment.

H. Templates, Forms, Sleeves and Guards: All templates, forms and sleeves for providing necessary opening in the concrete slab over the hoistway shall be provided as part of this work. Sleeves for conduit and other small holes shall project 2" above the concrete slab and 2" steel angle guards shall be provided around the cable or duct slots.

I. Vibration Isolation: The machines, selectors, governors and controllers shall be isolated from the building structure to eliminate transmission of noise and vibration from these units into the structure. Metal-to-metal and metal-to-concrete contact between these units and the structure shall be eliminated.

### 2.3 HOISTWAY EQUIPMENT

#### A. Secondary, Compensation and 2:1 Sheaves:

1. General: The secondary, compensation and car and counterweight 2:1 sheaves shall be of hard cast iron, cast steel or semi steel of approved composition with accurately machined grooves.

2. Mounting: The secondary sheave shall be securely mounted to the underside of the machine beams and in proper alignment with the driving sheave. The compensation shall be mounted in a steel frame, provided with slide-type shoes to ride on steel guides securely mounted to the pit floor. An electrical contact shall be mounted on the compensation sheave frame and shall be electrically connected into the control circuits to prevent operation of the elevator when the sheave approaches the upper or lower limit of travel. The car and counterweight 2:1 sheaves shall be securely mounted between the car and counterweight crosshead structural members.

3. Lubrication and Bearings: The sheaves shall have provision for self-lubrication from an integral oil or grease reservoir and shall have drain cocks or plugs. The sheave bearings shall be of the roller type.

4. Guards: A sturdily constructed metal sheave guard and drip pan mounted beneath all sheaves shall be designed to withstand shock and prevent ropes from leaving their proper grooves, and shall collect lubricant drippings. The compensation and 2:1 sheaves shall be protected to keep objects from falling between the ropes and sheave grooves.

#### B. Guide Rails and Brackets:

1. General: T-section guide rails shall be provided with a weight per foot as determined by the ANSI Code.

2. Fastenings: All guide rails shall be fastened to substantial steel brackets by heavy rail clips. Rails shall extend from the pit floor to the underside of the overhead slab. They shall be erected plumb and parallel and shall not deviate more than 1/8". Guide rails shall be fastened to structural forms on the pit floor. Where guide rail brackets are fastened to concrete beams or walls, suitable inserts, together with all information relative to their location, shall be furnished as part of this work.

3. Joints: All guide rails shall have accurately machined tongue and groove joints and shall be machined on the back surfaces to take the machined, steel-joining plates.

4. Shimming: All shimming used to mount guide rails or brackets shall be of metal and shall not depend on friction alone to retain its location.

5. Backing: Only those supports so indicated on the drawings shall be furnished as work in other section. Structural steel guide rail backing shall be furnished and installed to stiffen rails whenever necessary. Intermediate tie brackets shall be provided for counterweight rails as required by the ANSI Code.

6. Drawing Information: Guide rail loads upon safety application, bracket spacing schedule and rail backing location shall be shown on the shop drawings.

#### C. Oil Buffers:

1. General: Oil buffers shall be located in the pits under the car and counterweight, together with all necessary blocking and supports. The buffers shall be anchored to structural forms on the pit floor and shall be arranged to avoid puncturing of pit waterproofing.

2. Design: The buffers shall be of the spring-return type except the counterweight buffer shall be of the gravity-return type, if fastened to the counterweight. Permanent means shall be provided for easy inspection of the oil level in the buffers.

3. Marking Plate: Buffer marking plates required by the ANSI Code shall be of corrosion-resistant metal and shall indicate the buffer stroke.

4. Drawing Information: Buffer load reactions and buffer stroke shall be indicated in the shop drawings.

#### D. Counterweight and Roller Guides:

1. General: The counterweight shall weigh the same as the complete elevator car plus approximately 40% of the specified capacity load. It shall consist of a structural steel frame and cast iron or steel plate filler weights all held securely in alignment with tie rods passing through holes in the weights and frame members. Rods shall be equipped with locknuts secured by cotter pins at each end.

2. Roller Guides: The counterweight frame shall be provided with 4 sets of roller guides to provide smooth, quiet travel. The guide shoes shall consist of at least 3 rollers of a durable, resilient, oil-resistant material, mounted on a substantial metal base. The design of the roller guides shall be such that all rollers shall have continuous contact with the corresponding guide rail surface under all conditions of loading.

#### E. Hoisting, Compensation and Governor Ropes:

1. Hoisting Ropes: Hoisting ropes shall be of proper size and number to insure good wearing qualities. As a minimum, the number of ropes shall comply with the factor of safety requirements of the ANSI Code, Rule 212.3.

2. Governor Rope: The governor rope shall be of construction and composition required for the governor furnished. Under normal operation of the elevator, the governor rope shall run free and clear of governor jaws, rope guards and other stationary parts.

3. Shackles: Adjustable rope shackles with individual tapered, babbitted sockets shall be provided for each end of the ropes.

F. Normal and Final Terminal Stopping Devices:

1. Normal Device Operation: Normal terminal stopping devices shall be provided, consisting of electrical contacts located on top of the elevator car which are operated by cams mounted at the top and bottom of the hoistway or shall consist of electrical contacts located at the top and bottom of the hoistway and operated by a cam or cams located on top of the elevator car. This device shall automatically bring the elevator to a stop at the top and bottom terminal landings with any load up to and including 125% of the contract capacity from any speed attained in normal operation. This device shall operate independently of any other operating devices and shall continue to function until the final limit switch operates.

2. Final Device Operation: Final limit switches located at the top and bottom of the hoistway shall be arranged to automatically stop the car and counterweight within the predetermined overtravel limits, independently of all other operating devices.

3. Rollers: Switches shall be equipped with engaging arms provided with rubber-tired rollers for engagement with cams.

G. Electrical Wiring:

1. General: All wiring between machine room, hoistway junction box, car junction box, landings, pit and other associated equipment shall be furnished and installed as part of this work. Wiring shall be properly insulated and have a flame-retarding and moisture-resisting outer cover and shall be run in galvanized metallic conduit or duct, using strain boxes as required. All material used and method of installation shall conform to the National Electrical Code.

2. In accord with Section 0130 and Article 1.9 of Section 1401, Contractor shall submit for approval shop drawings of electrical metallic tubing or metal wireways prior to installation. If metallic tubing is used, extra care shall be used to insure satisfactory mechanical installation.

3. Conduit: Except for the DC Loop, each conduit run or duct run shall contain 10% spare wires and in any event not less than one spare wire. Except as follows, conductors shall be run in rigid steel conduit, electrical metallic tubing or metal wireways, 1/2" and larger:

a. Traveling cable to elevator cars.

b. Connections not exceeding 36" in length between risers and limit switches, interlocks, pushbutton boxes, door operator motors and similar devices may be run in flexible metal conduit.

c. Flexible hard service cord, Type SO, between fixed car wiring and car door switches.

4. Traveling Cables: The car operating panel, position indicator and other electrical equipment in the car shall be connected with the controller by means of flexible cable run from the bottom of the car to an approved outlet in the hoistway. Cables shall have a flame-retarding and moisture-resisting outer cover, shall have steel-supporting fillers and shall be suspended directly by them to relieve the conductors of strain. Each traveling cable shall contain 10% spare wires and in any event not less than one spare wire. A protective screen shall be installed behind the traveling cables to prevent chafing and wear.

5. Terminal Connections: Terminal connections for all conductors shall be made on terminal blocks or studs having identifying numbers. All conductor connections shall be made with terminal eyelets of the solderless type.

6. Communications: Traveling cable shall extend from the hoistway junction box to the car junction box and communication cabinet. Provide a minimum of 4 sets of shielded communication wires in traveling cables.

#### H. Entrance Equipment:

##### 1. Hangers and Tracks:

a. Hangers: Each door panel shall be equipped with sheave-type, 2-point suspension hangers with provisions for vertical and lateral adjustments. The hangers shall consist of a malleable iron or steel bracket, approximately 1/4" thick, equipped with 2 sheaves, provided with ball-type bearings, properly sealed to retain grease lubrication.

b. Upthrust Rollers: Rollers, provided with ball-type bearings, sealed to retain grease lubrication, shall be provided on the hanger bracket to take the upthrust of doors. An eccentric shaft mounting shall permit fine upthrust roller adjustments.

c. Tracks: Tracks for hangers shall be of basic open-hearth steel, approximately 190 Brinell hardness, not less than 2" x 2" x 1/2" thick, and be cold drawn to a smooth finish. The upper edge of the track shall have a contour to match that of the main sheave. Alternately, tracks may be formed, cold-drawn steel with smooth track finish. Track shall be fastened to the header at frequent intervals to insure permanent track alignment and be removable for repair or replacement.

d. Interlocks: Hoistway doors shall be equipped with an electro-mechanical interlock, designed to prevent the starting of the car until the doors are closed and locked. Engaging components of the mechanical-locking device shall be free of noises.

e. Closers: A mechanical door-closing device shall be provided for each entrance to assure automatic closing of the hoistway doors and prevent the hoistway doors from standing open when the car is not at the landing. Weighted closers shall not run in frames attached to door panels.

1. Pit Stop Switch: An emergency stop switch shall be provided adjacent to the access in each elevator pit and shall function similar to the switch in the elevator car. It shall conform to the requirements of the ANSI Code, Rule 210.2.g.

## 2.4 CAR EQUIPMENT

### A. Car Frame and Safety:

1. Frame: The car frame shall consist of steel channels securely fastened together, reinforced and braced to provide a rigid structure for mounting the platform and car enclosure. The car frame height shall be sufficient to enable installation of the specified car enclosure.

2. Safety: A flexible guide clamp type car safety shall be securely mounted integrally with the plank channels and shall be provided with linkage and lever arms for connection with the governor rope. The safety shall be so designed so that in the event of excessive descending speed, the tripping of the governor shall cause the safety jaws to grip the guide rails and bring the car to a gradual stop in accordance with the requirements of the ANSI Code. The safety shall be reset by lifting the elevator car.

3. Safety Contact: An electrical contact, connected electrically in the safety circuit, and mechanically to the safety device, shall be arranged to shut off the power to the elevator motor upon engagement of the safety jaws.

B. Guides: The car frame shall be provided with 4 sets of roller guides to provide smooth, quiet elevator travel through the hoistway. The roller guides shall consist of at least 3 rollers, of a durable, resilient, oil-resistant material, mounted on a substantial metal base. Each roller shall rotate on precision-grade ball bearings. The entire elevator car shall be properly balanced to equalize pressures on all guide rollers. All rollers shall have continuous contact with the corresponding guide rail surface under all conditions of loading. The maximum speed of rotation of the car rollers shall not exceed 350 r.p.m.

C. Platform: The car platform shall be constructed of wood, steel, or steel-and-wood sandwich and shall be suitably braced to meet ANSI Code deflection requirements. The platform shall be mounted on rubber, or equal, vibration and sound-absorbing pads, within a steel frame. This frame shall be securely fastened to the car enclosure. The underside of the platform, if of wood, shall be covered with sheet steel not less than No. 26 U. S. gage.

D. Floor Covering: 1/8" thick vinyl asbestos floor tile shall be laid on 1/16" thick asphalt felt. Both tile and felt shall be securely cemented in place. The finish surface of the tile shall be flush with the top surface of the sill. The tile shall match the tile chosen by the Architect for other parts of the building as specified in Section 0965.

E. Sill: A narrow extruded white bronze or nickel-silver sill shall be securely fastened to the platform. The sill shall have accurately machined slots for guiding the door gibs. It shall be of sufficient height above the platform to provide a flush line with the floor covering and shall be arranged so that no tripping hazard exists across the entrance where the sill meets the floor covering. The nosing of the threshold shall have a machined rabbet to receive the toe guard and shall be of such depth to provide a flush surface from the nosing to the toe guard.

F. Toe Guard: An apron, or guard, constructed of not less than No. 14 U. S. gage steel, shall be fastened to the car sill and shall be securely braced to the platform. It shall extend 3" beyond both sides of the widest hoistway opening and shall conform to the ANSI Code, Rule 203.9.

G. Door Operator:

1. General: A high-speed, heavy-duty, master-type door operator shall automatically open the car and hoistway doors simultaneously when the car is leveling into a landing and automatically close the doors simultaneously at the expiration of the open timing.

2. Construction: The direct-current motor shall be of the high-interval resistance type, capable of withstanding high currents without damage to the motor. All door operating arms shall be constructed of substantial steel members, and pivot points shall have ball or roller bearings.

3. Operation and Speed: The door operator shall be capable of opening a car door and hoistway door simultaneously at a maximum speed of not less than 2-1/2 f.p.s. A reversal of direction of the doors from the closing to opening position, whether initiated by the door edge reopening device, the photo-electric device, or the door open button, shall be accomplished within no more than 2-1/2" of door movement. Particular emphasis is to be placed on obtaining quiet interlock and door operation, and smooth, fast, dynamic braking for door reversals and stopping of the doors at both extremes of travel. The door operating mechanism shall be arranged so that in case of interruption of power, or failure of the operating circuits, the car and hoistway doors can be readily opened by hand from within the elevator car.

H. Car Door Electrical Contact: An electrical contact shall be provided to operate in conjunction with the car doors so that the elevator cannot be operated unless the doors are closed or within the tolerance allowed by the ANSI Code.

I. Header: A header shall be installed which shall be constructed of at least 3/16" thick steel and shall be shaped to provide stiffening flanges at top and bottom, extending its entire length.

J. Car Door Hangers and Tracks: The car door hangers and track shall conform to the specification on the Hoistway Entrance Hangers and Track, Paragraph H.1.



K. Door Reopening and Control Devices:

1. Safe Edge Device: A mechanical device shall extend the full length of each leading car door panel and project no less than 1-3/4" nor more than 2-1/2" beyond the edge of both car and hall door panels. This device shall be so arranged that should it touch a person or any object in its path while closing, it shall automatically cause both the car door and hoistway doors to return to the open position. Safety edge movement or compression of not greater than 1/2" shall initiate door reversal. The safety edge shall retract to a position flush with the car and hoistway doors when in the fully open position. The door edge shall function at all times when the doors are not closed, irrespective of all other operating features.

2. Photoelectric Beam Control: Photoelectric devices, consisting of photoelectric tubes and light sources shall be located on the elevator car on the hoistway side of the car door. The tubes shall project 2 parallel light beams across the elevator car entrance. The beams shall be located at the heights of 5" and 29" above the platform. The light sources shall be housed in light-tight enclosures with infrared filters over the lens. The interruption of the light beams when the doors are closing shall automatically cause the doors to fully reopen and remain open until the light beams are reestablished. A switch in the car control station shall permit disconnecting the photoelectric device, when desired.

3. Door Open Timing Device (Front Entrances Only): A timing device shall operate in conjunction with the photoelectric door control device to enable the following variations in door operation:

a. Separately adjustable timers to enable varying the time that the hoistway doors remain open after the stopping in response to a car call or a landing call. The timing for a car call stop shall be adjustable between 1 and 4 seconds, and the timing for a landing call stop shall be adjustable between 3 and 6 seconds. If a stop is made in response to both landing call and a car call, the timing of the landing call shall predominate.

b. In the event the light beam is interrupted while the doors are opening or after the doors are fully open, the time that the doors remain open after the light beam has been reestablished shall be reduced to an adjustable time between 1/2 and 1 second, depending upon whether a landing call or a car call predominated. This time shall also be a minimum time that the doors remain open if the beam is interrupted and reestablished before the door is fully open.

c. In the event a light beam is obstructed for more than 20 seconds after automatic door closing has been initiated, the beam control shall be cut out, a buzzer shall sound and the doors shall close at a gentle, reduced speed.

4. Electronic Detector Edge: The Elevator Contractor shall have the option of providing an electronic detector edge with a nudging feature in lieu of the safety edge, photoelectric beams and door timing device. The provision of an electronic detector edge shall include the provision of tenite sight guards for all hoistway entrances.

L. Car Control Stations: Car Control Stations, each consisting of a metal box containing the operating fixtures, shall be mounted as shown on the drawings. The faceplate shall match the cab material and shall be engraved with the identifying number of the elevator and its capacity. The floor buttons, alarm button, door open button and emergency stop switch shall be suitably identified by engraved and painted letters or by inlaid plastic or metal inserts. Provide permanently attached identifying number and symbols for all controls per NEII recommendations (adhesive fastening not acceptable) keyed switches, except for fireman's service shall be "best" cylinder locks, keyed per university direction.

1. Car floor buttons with 1/2" numbers in the face of the button corresponding to the floors served for registration of car stops. Car buttons shall not protrude beyond the faceplate when in the normal position. Call registered lights, located within or behind the buttons, shall illuminate the floor number corresponding to the call registered. Maximum height of these buttons shall be 48" above the car floor.

2. An ALARM button shall be provided at the bottom of the car station to ring a bell located in the hoistway near the lower lobby.

3. A red EMERGENCY STOP switch shall be provided at the bottom of the car station to interrupt the power supply to the elevator motor and apply the brake independently of the regular operating devices. The switch shall be so arranged that when operated, it will sound the alarm bell. The actuation of this switch shall not cancel registered landing calls.

4. A DOOR OPEN button which shall stop closing motion of doors and cause them to return automatically to their fully open position. This button shall be effective while the car is at a landing and until the car starts into motion, regardless of any special operational features.

5. A DOOR HOLD OPEN button to extend the door hold open time an adjustable time period (20 to 60 seconds) to permit movement of carts, etc., without door interference on Elevator No. 1 only. Registration of subsequent car call shall cancel hold open time. Provide separate button for front and rear doors.

6. A key operated EMERGENCY SERVICE switch in a front car control station of Elevator No. 1 to place the car on hospital emergency service.

7. A DOOR CLOSE button for closing the doors and starting the elevator when on independent service if such button is required by manufacturer's standard design.

8. A cabinet for a TELEPHONE unit which shall be located above the auxiliary car control station and shall have a faceplate fabricated of the same material and finish as the station faceplate.

9. A locable SERVICE panel shall be located above the main car control station. The service panel shall contain the following controls with each control and its operating positions identified by engraved letters painted black:

a. A LIGHT RAY cutout switch to disconnect the light rays from the door-closing circuits.

b. An INSPECTION switch for disconnecting all automatic operation, limiting the car speed and rendering effective the hoistway access switch when the car is at the top or bottom terminal, conforming to the ANSI Code.

c. A LIGHT switch.

d. A 3-position FAN switch.

e. An INDEPENDENT SERVICE switch to select independent or automatic operation.

f. A single 110-volt AC electrical convenience outlet.

10. A keyed FREIGHT SERVICE switch in the rear door car control panel of Elevator No. 1 to permit registration of rear door calls. When car is operating with this switch actuated the car will not respond to south (front) hall calls.

11. The station faceplate shall be engraved adjacent to the floor push-buttons corresponding to the building entry levels to identify such levels as follows:

a. Floor 2: "CONCOURSE"

b. Floor 3: "STREET"

M. Inspector's Control Station: A permanently installed control station shall be provided on top of each elevator car for inspection purposes in accordance with ANSI Code, Rule 210.1.d. The control station shall consist of a metal box securely mounted to or from the car crosshead and shall contain the following:

1. Up and down constant-pressure pushbutton.

2. A switch to disconnect all automatic features, including all buttons and switches in the car and landing stations.

3. A switch to disconnect all power to the elevator car.

N. Work Light and Plug Receptacle: A lamp receptacle fitted with guard, together with a plug receptacle, shall be mounted on top of the elevator car. The fixture shall be subject to an ON-OFF switch in an easily accessible position.

## 2.5 LANDING CONTROL STATIONS

A. Faceplate Materials: The landing control station equipment faceplates shall be fabricated from the Elevator Contractor's standard finish stainless steel.

B. Pushbutton Stations: A single riser of pushbuttons shall be provided at front entrances between elevators No. 2 and 3. Standard pushbutton units shall also be provided adjacent to the East jamb of the North entrance of Elevator No. 1 for freight operation. At all intermediate or typical floors, each fixture shall contain an up and down button for registering calls and call registered lights in the buttons to indicate when a call has been registered. At the terminal floors, a single button with a call registered light shall be mounted in the center of the faceplate. The up or down registered light shall illuminate when an up or down call is registered and shall be extinguished when an elevator traveling in the corresponding direction initiates its stop in answer to the call. The faceplate shall be flush mounted with a fixture design as selected from the Elevator Contractor's standard line.

C. Hospital Emergency Service Switch: Provided keyed switch in stainless steel faceplate adjacent to the left entrance jamb of Elevator No. 1 at each floor (front entrances except at basement and 10th floors).

D. Hoistway Access Switches: Hoistway access switches shall be located at the top landing on all elevators and at the bottom landing on Elevator No. 1. A continuous-pressure, spring-return, key-operated switch shall be provided in the left-hand jamb of the entrance frame. The switch shall protrude through a cutout in the entrance jamb with no separate faceplate. The access switch shall be made operative at the same time that all automatic features are disconnected. The car shall be limited to a speed of 150 f.p.m. by actuating a switch in the car operating panel when the car is at the floor where the hoistway access switch is located.

E. Fire Control Panel: A panel containing the following indicators and controls shall be provided in Room 107 on Level 3:

1. A key-operated switch and pilot light numbered to designate the particular elevator controlled by the switch. This switch shall operate to place that specific elevator in or out of service. The pilot light shall illuminate to indicate cars in service.

2. Indicators for each elevator to show location and motion.

3. Emergency power selection switch and indicators to show operation on emergency power.

4. Fireman's Return control Switch and Indicators to show actuation of car control switch.

## 2.6 SIGNALS

A. Faceplate Materials: The signal equipment faceplates shall be fabricated from the Elevator Contractor's standard finish stainless steel.

B. Hall Lanterns: The hall lanterns shall be provided near the front entrances on all elevators. The lanterns shall be installed near the corresponding elevator entrance to indicate the intended direction of travel of the elevator to waiting passengers. The fixture shall contain 2 incandescent lights, suitably shielded, and a gong mounted in a metal box fastened in the wall. When illuminated, the lens indicating UP shall be WHITE and the lens indicating DOWN shall be a bright RED color. The up or down light shall be illuminated and a gong sound once for UP, once for DOWN at least 4 seconds prior to the car's arrival at the floor. The light shall remain illuminated until shortly before the elevator doors start to close. The design shall be as selected from the Elevator Contractor's standard line. The hall lanterns shall be combined integrally with the position indicator at the main lobby floor.

C. Hall Position Indicator: Hall position indicators shall be provided at the main lobby floor. The position indicator shall be installed above the entrance at each elevator. Each fixture shall consist of a metal box mounted in the wall containing incandescent light fixtures representing the floor served and the direction of car travel. Each fixture shall also contain a single-stroke gong. The faceplate shall be flush mounted on the wall and shall contain numeral cutouts with plastic inserts not less than 1" high. They shall also contain 2 arrow cutouts with plastic inserts approximately 3" high. The cutouts shall be arranged so that shielded light bulbs shall illuminate the numerals and arrows. When a car leaves or passes a floor, the respective light in the position indicator shall be extinguished and the numeral representing the next floor shall be illuminated, etc., thereby indicating the position of the car in the hoistway at all times. The position indicator lights shall be so wired that they will automatically shut off when the elevator is idle and the motor-generator set shuts down. If the motor-generator set shuts down for any reason other than absence of calls, or power failure, the position indicator lights shall remain illuminated. The arrows and gong shall operate in the manner specified for the hall lanterns.

D. Car Position Indicator: A director-type position indicator shall be provided above the front entrance of each car by the car enclosure supplier. General illumination shall be provided to light fixtures for all floors and individual position indicator light fixtures shall be provided for each floor served. When the car leaves or passes a floor, the respective position indicator light shall be extinguished and the position indicator light representing the next floor shall be illuminated, etc., thereby indicating the position of the car in the hoistway at all times. The general illumination light fixtures shall be continuously illuminated to simultaneously illuminate all lenses.

E. Car Direction Indicator: A signal fixture shall be provided on the strike jamb of the rear cab entrance on Elevator No. 1 to indicate the direction of elevator travel to waiting passengers. Fixture shall consist of a metal box containing the incandescent light fixture suitably shielded to prevent light leakage. The faceplate shall contain 2 lucite or plexiglass acrylic arrows approximately 3" high, one pointing up and one pointing down. The arrows corresponding to the direction of travel of the elevator shall be illuminated when the doors are open until the car reverses for travel in the opposite direction. When illuminated, the UP arrows shall be a bright WHITE and the DOWN arrows shall be a bright RED color. A single-stroke gong shall sound once as the doors are opening.

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## PART 1: GENERAL

1.1 SCOPE

A. Conditions of Contract, Division 1 General Requirements and Section 1401 General Provisions - Vertical Transportation apply to all work of this section. Refer to Article 20 of the Information for Bidders and Article 1.17 of the General Conditions for requirements on pre-bid and post-bid evaluation of proposed substitute products, methods and other conditions.

B. Work under this section includes elevator cabs for traction and hydraulic elevators.

## C. Related Work Specified Elsewhere:

- |                        |              |
|------------------------|--------------|
| 1. General Provisions: | Section 1401 |
| 2. Traction Elevators: | Section 1421 |

## D. Equipment Summary:

- |                         |   |
|-------------------------|---|
| 1. ELEVATORS NUMBER:    | 1, 2, 3 AND 4                                 |
| 2. WAINSCOTING:         | PLASTIC LAMINATE                              |
| 3. FRONT RETURN PANELS: | PLASTIC LAMINATE                              |
| 4. ENTRANCE COLUMNS:    | STAINLESS STEEL                               |
| 5. TRANSOM:             | STAINLESS STEEL ABOVE REAR ENTRANCE ON NO. 1  |
| 6. POSITION INDICATOR:  | DEPARTMENT STORE DIRECTORY TYPE               |
| 7. BASE:                | BLACK RUBBER (COVELESS)                       |
| 8. FLOOR COVERING: *    | VINYL ASBESTOS                                |
| 9. LIGHTING:            | FLUORESCENT                                   |
| 10. CEILING:            | PLASTIC LAMINATE                              |
| 11. HANDRAIL:           | PLASTIC LAMINATE                              |
| 12. VENTILATION:        | 2-SPEED BLOWER                                |
| 13. DOOR PANELS:        | PLASTIC LAMINATE WITH STAINLESS STEEL BINDERS |
| 14. PADS AND HOOKS:     | NO. 1 ONLY                                    |

\* specified in Section 1421 and is not included as part of this section

15. DOOR SIZE:

FRONT: 3'-6" X 7'-0"

REAR: 4'-2" X 7'-0"

16. DOOR TYPE:

NO. 1: TWO SPEED, SIDE OPENING

NO. 2, 3 AND 4: SINGLE SPEED, CENTER OPENING

## PART 2: PRODUCTS AND INSTALLATION

### 2.1 SHELL

A. The sheet steel outer shell shall be constructed of not lighter than No. 14 U. S. gage furniture steel, amply reinforced. The shell shall be securely mounted on the platform so that the inner surface of the enclosure shall be not more than 2" from the edge of the platform at the sides and rear. The shell shall have cutouts for the car operating panels, signal fixtures and ventilation. The exterior surface of the shell shall be coated with a sound-deadening material no less than 1/16" thick.

### 2.2 CANOPY

A. The canopy shall be constructed of not less than No. 12 U. S. gage furniture steel and shall be amply reinforced to comply with the ANSI Code. It shall extend from the top of the steel shell a sufficient distance to contain the light fixtures and provide uniform lighting through the car enclosure. A cutout shall be provided for the exhaust blower with a diffuser below the blower. A hinged emergency exit panel shall be provided to conform to the ANSI Code. The canopy shall have a baked enamel finish.

### 2.3 WAINSCOT

A. Removable panels shall be provided on the walls of the cab not containing entrances. The panel core shall be constructed of a 5-ply plywood Grade B-D, or 40# density particle board similar to U. S. Plywood "Monoply". A selected finish, standard grade 1/16" thick plastic laminate shall be bonded to the exposed face and to all edges of the core. Laminated plastic shall also be bonded to the unexposed face of the panel to prevent warpage. The upper edge of the panels shall be approximately 7'-8" above the platform. The bottom edge of the panels shall be approximately 4" above the platform and shall conceal the ventilation holes in the base. The panels shall be readily removable from within the elevator car. The plastic laminate shall have a color and texture as selected by the Architect from any manufacturer selected by the Architect. The Architect reserves the right to select different colors of plastic laminate used in the different elevator cabs.

### 2.4 ENTRANCE COLUMNS

A. The entrance columns shall be fabricated from not less than No. 14 gage stainless steel and shall extend from the floor to the ceiling of the cab.

### 2.5 FRONT RETURN PANELS

A. Each front return panel shall be covered with a plastic laminate panel. Construction of the panels shall be as specified for the wainscot panels. The top of the panel shall terminate at the position indicator.

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## 2.6 TRANSOM (ELEVATOR NO. 1 REAR ENTRANCE)

A. The transom panel shall be fabricated from not less than No. 14 gage stainless steel and shall extend between the entrance columns.

## 2.7 BASE

A. Elevators shall have a 4" high coveless black rubber base applied to the sides, front and rear of the car enclosure.

## 2.8 DOOR PANELS

A. The door panels shall be of the flush hollow metal type formed from not less than No. 16 U. S. gage furniture steel. The sheet metal surfaces shall be separated by a sound-deadening, fire-resistant material and shall be reinforced by steel shapes welded to the surface plates at frequent intervals. Top and bottom of door panels shall have a continuous stiffener channel welded to the surface plates. Reinforcing shall be provided where necessary for 2-point suspension hangers, power operation, door reopening device, etc. All joints of the surface plates shall be welded and ground off smooth. Each door panel shall be provided with a removable gib to run in a sill slot with a minimum running clearance. The gib mounting shall permit easy replacement of gib without removing door panels from hanger tracks. The door panel finish shall be as outlined in the Equipment Summary.

## 2.9 CEILING

A. A plastic laminate-faced dropped ceiling with provision for lighting shall be provided as detailed.

## 2.10 LIGHTING

A. Fluorescent lights shall be provided as detailed to give approximately 35 foot candle of light in the center of the car at a height of 5'-0". All fluorescent tubes shall be furnished with light qualities similar to General Electric's warm white deluxe. High-power factor ballasts and instant starters shall be provided.

## 2.11 VENTILATION

A. An exhaust-type blower shall be provided as outlined in the Equipment Summary. The exhaust blower shall be capable of moving 1-1/2 times the volume of air contained in the cab in one minute at a uniform rate on high speed and shall be capable of moving the volume of air contained in the cab in one minute at a uniform rate on low speed. It shall be located near the center of the canopy and be mounted on rubber, or equal, sound-isolation pads to keep the vibration and noise to a minimum. A diffuser shall be securely mounted below the cutout in the canopy.

## 2.12 HANDRAILS

A. The elevator cab shall have handrails as detailed. The mounting bars shall be fastened to the steel enclosure. All handrail fastenings shall be concealed and the handrail shall be removable from inside the car enclosure.

### 2.13 PADS AND HOOKS

A. Car No. 1 Only: Removable, protective pads shall cover the sides, rear, return panels and entrance columns. All pads shall be of heavy quality, fire-resistant, treated canvas with 2 layers of cotton batting, or equal, securely sewed between canvas. The pads shall have heavy eyelets, properly spaced to suit pad hooks and shall have a neatly bound opening for the main car operating panel. Natural metal pad hooks shall be permanently installed.

### 2.14 SOUND DEADENING

A. The entire enclosure shall be mounted on a sound-isolated platform and provisions shall be made for isolating the car enclosure from the side stiles by means of rubber, or equal-quality, vibration-absorbing pads.

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## PART 1: GENERAL

1.1 SCOPE

- A. Conditions of Contract, Division 1 General Requirements and Section 1401 General Provisions - Vertical Transportation apply to all work of this section. Refer to Article 20 of the Information for Bidders and Article 1.17 of the General Conditions for requirements on pre-bid and post-bid evaluation of proposed substitute products, methods and other conditions.
- B. Work under this section includes hoistway entrances for traction and hydraulic elevators.
- C. Related Work Specified Elsewhere:
- |                        |              |
|------------------------|--------------|
| 1. General Provisions: | Section 1401 |
| 2. Traction Elevators: | Section 1421 |
- D. Equipment Summary:
- |                      |  |
|----------------------|--|
| 1. ELEVATORS NUMBER: | 1, 2, 3 AND 4  |
| 2. TYPE:             | FRONT: SINGLE SPEED, CENTER OPENING<br>REAR: TWO SPEED, SIDE OPENING |
| 3. SIZE:             | FRONT: 3'-6" X 7'-0"<br>REAR: 4'-2" X 7'-0"                          |
| 4. FINISH:           | BAKED ENAMEL   |
| 5. SILLS:            | EXTRUDED ALUMINUM  |

## PART 2: PRODUCTS AND INSTALLATION

2.1 STRUCTURAL MEMBERS

- A. Struts: The struts shall be constructed of steel angles not less than 3" X 3" X 1/4" and shall extend from the sill to the structural beam overhead or to the guide rails and shall be securely fastened to both.
- B. Headers: The header or hanger support shall be formed of at least 3/16" thick steel and shall extend between, and be bolted to, the vertical steel struts with not less than 2 bolts to each end. The top and bottom of the hanger support shall have a vertical and horizontal stiffening flange, respectively, approximately 2" wide and extending its entire length. The upper stiffener shall be designed to receive the fascia plate or duct cover.

2.2 SILLS

- A. Narrow-type extruded aluminum sills shall be provided at all entrances of all elevators. Sills shall extend the entire width of the hoistway and shall be not less than 3/8" thick with uniform nonslip wearing surfaces and machine-planed door guide grooves. A nosing, approximately 1" deep along the full length of the sill on the hoistway side shall have a machined rabbet to receive the toe guard or fascia plate. The rabbet shall be of a depth to provide a flush surface from the nosing to the toe guard or fascia. Sill support brackets or

blocking shall be provided at each strut location, at each jamb and midway between jambs. Supports shall be secured to building floor.

### 2.3 ENTRANCE FRAMES

- A. Construction: Entrance jamb and header shall be fabricated from not less than No. 14 U. S. gage steel. Frame shall be hollow-metal type with jambs welded to head with an invisible joint. The unexposed side of the frame shall be coated with a sound-deadening material approximately 1/16" thick. Jamb and head profile shall be as shown on the bid drawings.
- B. Erection: The jambs shall be fastened to the header and to the floor by the use of an angle clip welded to the bottom of each jamb. Finish wall treatment will be applied after the entrances have been installed.
- C. Finish: The frame finish shall be baked enamel. Each baked enamel entrance frame shall have a single color finish, however, the Architect reserves the right to select different colors for use on the frames at the different entrances and/or floors.
- D. Floor Designations: Provide raised floor designations per NEII recommendations on all front entrance frames. Designations shall be permanently attached.

### 2.4 DOOR PANELS

- A. Panels: The door panels shall be of flush-type, hollow, fire-test construction, 1-1/4" thick. They shall be formed of not lighter than No. 16 U. S. gage furniture steel. The 2 surface plates shall be separated by a sound-deadening, fire-resistant material and shall be reinforced by steel shapes welded to the plates at frequent intervals. Top and bottom panels shall have a continuous stiffener channel welded to the 2 plates. All joints in the surface plates shall be welded the full length and ground off smooth before finishing.
- B. Gibs: Each door panel shall be provided with two removable gibs and fire stop to run in a sill slot with a minimum running clearance. The gib mounting shall permit easy replacement of the gib without removing the door panel from the tracks.
- C. Bumpers: Gum rubber bumpers shall be provided to cushion each door panel on overtravel in the open position and shall be securely fastened.
- D. Astragal: The leading edge of one center-opening door panel shall be provided with a rubber astragal and the leading edge of the opposite panel shall have a shallow-curved groove. The rubber astragal shall run the entire height of the door panel and shall be readily replaceable.
- E. Finish: The door panel finish shall be baked enamel. Each baked enamel door panel shall have a single color finish, however, the Architect reserves the right to select different colors for use on the door panels at the different entrances and/or floors.

### 2.5 NONVISION WINGS

- A. A metal sight guard shall be provided on the leading edge of each panel. The finish shall be the same as for the door panel to which the nonvision wing

is attached.

If the Elevator Contractor requires sight guards fabricated from any material other than metal, provision of such sight guards shall be included in Section 1421.

## 2.6 INSIDE THE HOISTWAY

A. Fascia Plates: Fascia plates shall be constructed of not less than No. 14 U. S. gage steel, reinforced to insure a flat-even surface throughout, and shall be securely fastened to the hanger support at one floor and the sill at the floor above. Intermediate fastenings shall be made where necessary to insure against waves or buckling. They shall extend the full width of the opening plus 3" on each side at all entrances, except below the bottom terminal and above the top terminal. The fascia plates shall have an enamel finish.

B. Toe Guards: A toe guard shall be constructed of not less than No. 14 U. S. gage steel and shall extend the full width of the opening plus 3" on each side at all bottom terminal entrance. The top of the guard shall be positioned in the rabbet provided in the sill, securely fastened with flat-head screws, and extend down and return to the wall at an angle of not greater than 30 degrees with the vertical. The lower edge of the toe guard shall be firmly secured to the hoistway wall. Toe guards shall have an enamel finish.

C. Dust Cover: A cover plate shall be provided above the hanger supports at the top terminal entrance and shall extend the entire length of the door travel. It shall be constructed of not less than No. 14 U. S. gage steel and shall be fastened to the hanger support at one edge, returned to the hoistway wall at an angle to the vertical of not greater than 30 degrees and be securely fastened to the hoistway wall. The dust cover shall have an enamel finish.

D. Hanger Covers: Hanger cover plates shall be constructed of not less than No. 14 U. S. gage steel in 3 sections. The center section shall be of the hinged or removable type, approximately the same length as the opening, and shall permit easy access to hangers from within the elevator car for servicing. The 2 side sections shall permit easy opening or removal, without special tools, by nonremovable fasteners. The hanger covers shall have an enamel finish.

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University of Minnesota

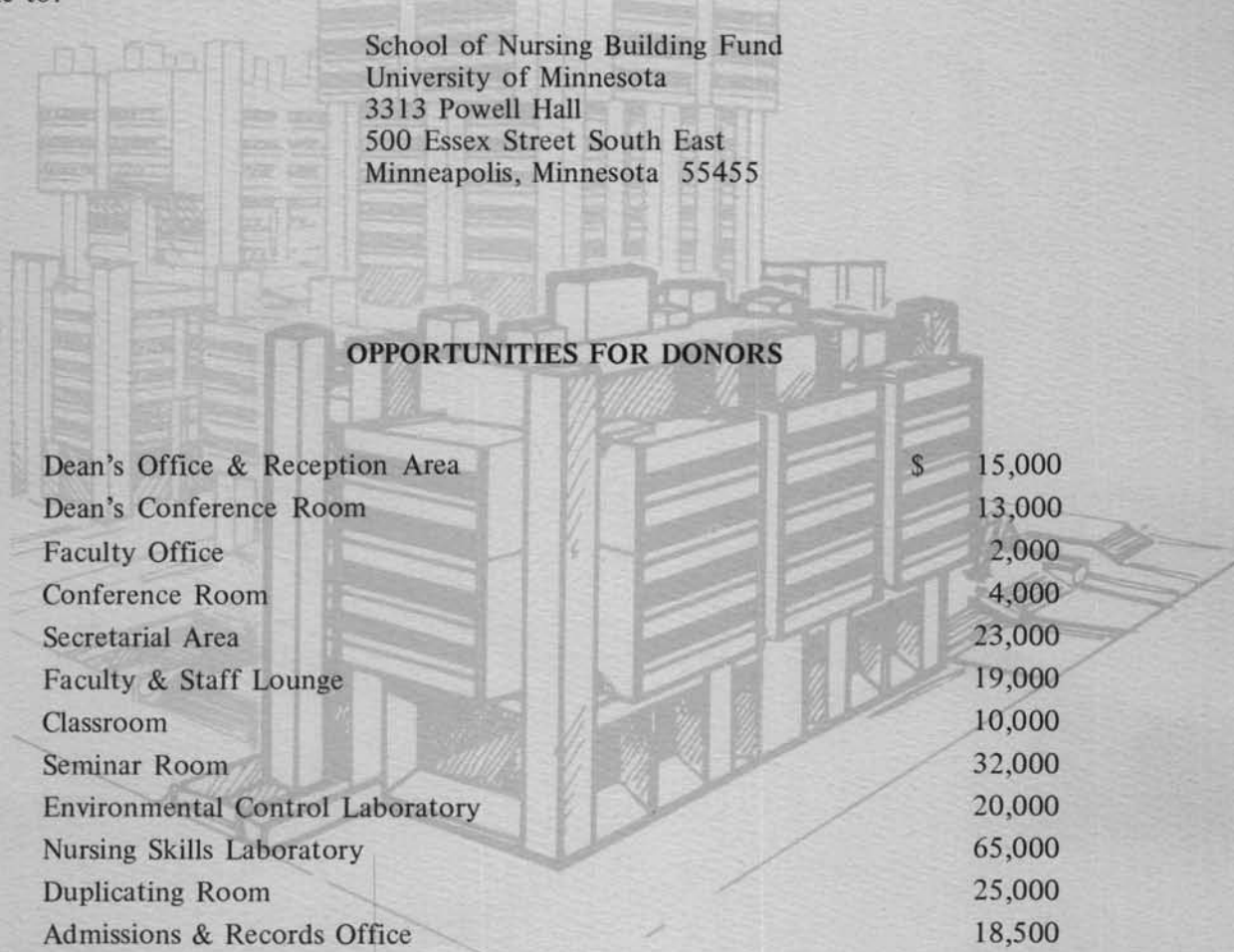
# SCHOOL OF NURSING

## EQUIPMENT & FURNITURE NEEDED FOR UNIT F

The appropriation by the Legislature and the construction grant from the Division of Nursing for the new building, Unit F, will not cover the costs of all the equipment and furniture that will be needed. The total needs for the School of Nursing will be \$750,000. Donations are being sought, especially for research and teaching equipment, and for facilities which the School does not have at the present time. The following is a list of opportunities for donors who wish to specify that their contribution to the Pharmacy-Nursing Building be used to build a specific room or area. An identification plaque bearing the name of the donor will be displayed in a prominent place in the new building. An alternative choice should be indicated. Contributions in any amount may be made payable to:

School of Nursing Building Fund  
University of Minnesota  
3313 Powell Hall  
500 Essex Street South East  
Minneapolis, Minnesota 55455

### OPPORTUNITIES FOR DONORS



Dean's Office & Reception Area	\$ 15,000
Dean's Conference Room	13,000
Faculty Office	2,000
Conference Room	4,000
Secretarial Area	23,000
Faculty & Staff Lounge	19,000
Classroom	10,000
Seminar Room	32,000
Environmental Control Laboratory	20,000
Nursing Skills Laboratory	65,000
Duplicating Room	25,000
Admissions & Records Office	18,500
Nursing Research Equipment	130,000
Nursing Research Staff Offices	14,000

# SCHOOL OF NURSING

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### OPPORTUNITIES FOR DONORS

Polygraph System	\$ 21,535	Circo-electric Bed	\$ 2,600
Biotelemetry System	10,530	Overbed Table	85
Oscilloscope System	8,932	Infant Crib	200
Treadmill	12,085	Striker Frame	1,200
Feedback Monitor	509	Treatment Cabinet	200
EEG	14,760	Examining Table	800
Exercise Sphygmomanometer	156	Desk & Chair, Exam Room	650
ECG/Phonocardiograph	7,500	Exam Stool	100
Controlled Environment, Room & Equipment	12,336	Wheelchair	300
Pneumotach	11,400	Isolation Cart	600
EMG	7,200	Equipment Cart	250
Transducers	1,400	Stretcher	500
Alternating Pressure Mattress	1,200	Hydraulic Patient Lift	550
Hypo-hyperthermia Unit	1,434	EKG Machine & Stand	2,000
Spectrophotometer	3,360	Cardiac Monitor	3,000
Refrigerator	720	Gastric Suction Machine	275
Gas Chromatograph	4,260	Oral Suction Machine	400
Thermister-Thermometer	474	Sphygmomanometer, Wall Model	175
Digital pH Meter	1,374	Oto/Ophthalmoscope, Wall Model	275
Condensor Microphone	258	Laryngoscope	100
Keypunch Machine	3,500	Q <sub>2</sub> Flow Meters	75
Information Processor/ Document Printer	35,000	Catherization Models	850
— Desk, Secretarial	986	Practice Mannequins	1,000
— Chair, Secretarial	170	Resuscianes	600
— Filing Cabinet	518	IGMM Sound Projector	1,250
— Conference Table	1,500	Video Playback/Recorder	1,150
— Conference Chair	600	Overhead Projector	500
— Bookcase	250	Video-monitor	1,000
— Work Table	480	½" Videotape Recorder	2,500
Hospital Bed with Siderails	450	Video Camera	2,000
Bedside Stand	100	TV Monitor	500
		Central Video Antenna	3,500