RATIO ARCHITECTS, INC.

ADDENDUM NO. #4

DATE: May 16, 2019

PROJECT: FOUNDATIONAL SCIENCES BUILDING
BALL STATE UNIVERSITY
MUNCIE, INDIANA

PROJECT NUMBER: RATIO #17099 / BSU# 2017-085.01 FS

OWNER: Ball State University
2000 West University Ave.
Muncie, Indiana 47306
Phone: (765) 289-1241

ARCHITECT / LANDSCAPE ARCHITECT:
RATIO ARCHITECTS, INC.
101 South Pennsylvania Street
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Phone: (317) 633-4040
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MEP ENGINEER:
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5975 Castle Creek Parkway N Drive, Suite 300
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Phone: (317) 810-4141

STRUCTURAL ENGINEER:
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Indianapolis, Indiana 46240
Phone: (317) 872-8400

CIVIL ENGINEER:
Cripe
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Indianapolis, Indiana 46240
(317) 844-6777

ACOUSTICAL / AV CONSULTANT /
TECHNOLOGY AND COMMUNICATION:
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5336 Winthrop Avenue
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Phone: (317) 536-8000

LAB PLANNER:
Research Facilities Design
3965 Fifth Avenue, Suite 400
San Diego, CA 92103
(619) 297-0159
This Addendum is issued in accordance with the provisions of Contract Documents and becomes a part of the Contract Documents as provided therein. The information contained herein modifies the original Bidding Documents dated April 16, 2019 and all prior Addenda as applicable. Requirements of the original Bidding Documents and previous Addenda remain in effect except as modified by this Addendum. Acknowledge receipt of this Addendum in the space provided on the Bid Form. Failure to do so may subject the Bidder to disqualification.

PART 1 – GENERAL CLARIFICATIONS

1. Domestic Water Well is existing on the site and now has a test pump installed. This water well, as shown on the drawings, is to be piped to the Lower Level Aquatics area. New pump, controls, well tank, and piping are to be installed. The Well Driller provided the test well is to be contacted for installation of the new well pump. Jack Wymer, (765) 584-8648 for details.

2. Alternate No. 3: Heated Pavement Clarification. The main heated pavement piping system (Heat exchanger, pumps, glycol tank, controls and accessories) is to be included with item c. North Entries / courtyard system. All other areas are to be “added-on” to the main system.

PART 2 - PROJECT MANUAL CHANGES

1. SECTION 033000 – CAST-IN-PLACE CONCRETE
   a. Add sub-paragraph 2.3.N.7:

   7. Class 5 concrete:

   a. Compressive strength at 28 days: 5000 psi.
   b. Minimum cement content: 611 lb/cu yd.
   c. Maximum water-cementitious ratio: 0.40.
   d. Air content: 0 to 3 percent.
   e. High range water-reducing admixture required.
   f. SCC: Performance mix design to meet 5000 psi, noted CSC finish level, installation in columns with noted reinforcing.

2. Section 042000 - UNIT MASONRY
   3.14, A. Revise as follows:

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


   G. Prism Test: For each type of construction provided, according to ASTM C 1314 at 7 days and at 28 days.

3. SECTION 057300 DECORATIVE METAL RAILINGS

   A. Add the following sub-paragraph 2.1, A to read as follows:

   c. Seco South

4. Section 071326 - SELF-ADHERING SHEET WATERPROOFING

   D. Two-Ply Application: Install sheets to form a membrane with lap widths not less than 50 percent of sheet widths, to provide a minimum of two thicknesses of sheet membrane over areas to receive waterproofing.
5. Section 072713 - MODIFIED BITUMINOUS SHEET AIR BARRIERS
   Replace 3.4 Field Quality Control in its entirety with the following:
   A. Reference Section 019115 Exterior Facility Enclosure Commissioning for submittal, requirements and
      coordination with the commissioning agent.
   B. Add the following to sub-paragraph 2.3, A.1 to read as follows:
      e. Protecto Wrap

6. Section 074213.13 - FORMED METAL WALL PANELS
   Replace 3.4 Field Quality Control in its entirety with the following:
   A. Reference Section 019115 Exterior Facility Enclosure Commissioning for submittal, requirements and
      coordination with the commissioning agent.

7. Section 074213.23 - METAL COMPOSITE MATERIAL PANELS
   2.5, A. 1. Revise to read as follows:
   1. Two Three-Coat Fluoropolymer: AAMA 2605. Fluoropolymer finish containing not less than 70 percent PVDF resin by
      weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to
      comply with coating and resin manufacturers' written instructions.
   3.3, Revise to read as follows:
   3.3 Field Quality Control
   A. Reference Section 019115 Exterior Facility Enclosure Commissioning for submittal, requirements and coordination
      with the commissioning agent. Testing Agency: Owner will engage a site representative qualified by metal
      composite material manufacturer's warranty conditions to perform field tests and inspections.
   4. Water Spray Test: After installation, test area of assembly as directed by Architect for water
      penetration according to AAMA 501.2.

8. Section 075419 - POLYVINYL-CHLORIDE (PVC) ROOFING
   Revise 3.10, A as follows:
   B. Testing Agency: Owner will engage at their discretion a qualified testing agency to perform the following tests
      in to be determined areas: agency to inspect substrate conditions, surface preparation, membrane application,
      flashings, protection, and drainage components, and to furnish reports to Architect.
     1. Electric Field Vector Mapping (EFVM): Testing agency shall survey entire roof area for potential leaks
        using electric field vector mapping (EFVM).
     2. Flood Testing: Flood test each roofing area for leaks, according to recommendations in ASTM D 5957, after
        completing roofing and flashing but before overlying construction is placed. Install temporary containment assemblies,
        plug or dam drains, and flood with potable water.
        a. Flood to an average depth of 2-1/2 inches with a minimum depth of 1 inch and not exceeding a depth of 4
           inches. Maintain 2 inches of clearance from top of base flashing.
        b. Flood each area for 24 hours.
        c. After flood testing, repair leaks, repeat flood tests, and make further repairs until roofing and flashing
           installations are watertight.
9. Section 077273 - VEGETATED ROOF SYSTEMS
3.12 Revise to read as follows:

3.12 FIELD QUALITY CONTROL
A. Testing Agency: Owner will engage at their discretion a qualified testing agency to perform tests.
B. Perform the following tests:
1. Flood Testing: Flood test each deck area for leaks, according to procedures in ASTM D5957, after completing and protecting roofing membrane but before placing overlying construction. Install temporary containment assemblies, plug or dam drains, and flood with potable water.
   a. Flood to an average depth of 2-1/2 inches (64 mm), with a minimum depth of 1 inch (25 mm) and a maximum depth of 4 inches (100 mm). Maintain 2 inches (50 mm) of clearance from top of sheet flashings.
   b. Flood each area for 24 hours.
2. Proceed with installation of vegetated roof assembly only after unsatisfactory conditions have been corrected.
C. Manufacturer's Field Service: Engage roofing membrane manufacturer's authorized service representative to provide full-time inspection of vegetated roof assembly installation and prepare inspection reports.
D. Correct deficiencies in work that do not comply with requirements.
E. Prepare test and inspection reports.

10. Section 078100 - APPLIED FIREPROOFING
Revise 3.4, A. to read as follows:

A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:
   1. Test and inspect as required by the IBC, Subsection 1705.13, "Sprayed Fire-Resistant Materials." (as indicated on Schedule of Special Inspections.) Insert requirement.

11. Section 084113 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS
Revise 1.8, F. o read as follows:

F. Accessible Entrances: Comply with applicable provisions in 2014 Indiana Building Code Chapter 11 – Accessibility, [the U.S. Architectural & Transportation Barriers Compliance Board's ADA–ABA Accessibility Guidelines] [and] [ICC/ANSI A117.1].

12. SECTION 115310, Laboratory Casework & Other Furnishings
b. ADD Pegboard
   2.20 PEGBOARD
   A. Pegboard: ¼ inch (6 mm) thick tempered hardboard, with 9/32 inch (7 mm) diameter holes on 1 inch (25 mm) straight centers.
   B. Perimeter Frame: Select white maple, clean and free of defects. All lumber kiln-dried to uniform moisture content of six percent, with clear polyurethane finish.

c. ADD Fold-Down Write Up Station
   2.25 FOLD-DOWN WRITE UP STATION
   A. Manufacturers:
      1. Life Science Products, Inc., 105 Dixon Drive, Chestertown, MD 21620 Tel: 800 638-9874.
2. Approved substitution.

B. Basis of Design: File station.

C. Description:

1. Shell: 15.0” x 24.0” x 2.75” deep; 5052-H32 Aluminum Alloy, .062” thick, Federal Specification #QQA-250-8.
4. Drop Table Hinge: 1/2” x 1/2” Guden Continuous Hinge #60504, Reverse Offset.
5. All Aluminum: Clear Irridited per Military Specification #C-5541 Type 1 Class 3.
7. Magnetic Catch: Two each #1676A12
8. Hardware: All stainless steel hardware with press fit studs and nylon insert lock nuts.
9. Table Support Hinges: Stainless steel #13 bead chain with stainless steel end couplings -115 lbs. tensile strength.
10. Cabinet Fabrication: All outside perimeter edges of cabinet hemmed and corners lapped and riveted with .0625 aluminum truss head rivets.

13. SECTION 224213.13 Commercial Water Closets
d. In paragraph 2.1, A., 1. add the following:
i. d. Sloan China.

14. SECTION 224212.16 Commercial Urinals
e. In paragraph 2.2, A. add the following:
d. 4. Sloan China.

15. SECTION 224216.13 Commercial Lavatories
a. In paragraph 2.2, B. add the following:
a. 4. Sloan China
b. In paragraph 2.3, B. add the following:
b. 5. T&S Brass

16. SECTION 226119 Compressed-Air Equipment for Laboratories and Healthcare Facilities
a. In paragraph 2.2, A., 1. add the following:
c. f. BeaconMedaes.

17. SECTION 226219 Vacuum Equipment for Laboratories and Healthcare Facilities
a. In paragraph 2.3, A., 1. add the following:
i. BeaconMedaes.

18. SECTION 230910 Laboratory Airflow Control System
a. Paragraph 230910.2.3.A - update reference product model numbers to AVT6000/AVT4000.
b. Paragraph 230910.2.3.A.1 - update reference product model numbers to AVT6000/AVT4000.
c. Paragraph 230910.2.3.A.2 - update reference product model numbers to AVC6000/AVC4000.
d. Paragraph 230910.2.3.R Revise to read “Airflow control valves shall have factory installed high speed electric actuator (in spaces without operable sash fume hoods, it is acceptable to use airflow control valves with standard speed electric actuators) specifically adapted to the stroke of the valve which shall operate on 24VAC. Power requirement for each airflow valve actuator shall not exceed 24VA.
e. Add paragraph 230910.2.3.U attached.

19. SECTION 230519 Meters and Gauges for HVAC Piping
a. Refer to Part 2 – Products, Para. 2.1 A. DELETE: Metal Case, Industrial Style, Liquid in Glass Thermometers.
b. Refer to Part 2 – Products, Para. 2.2 A ADD: Weksler
c. Refer to Part 2 – Products, Para. 2.5 A.1 ADD: Weksler
d. Refer to Part 2 – Products, Para. 2.7 A. ADD: Weksler, and Peterson.

20. SECTION 230548.13 Vibration Controls for HVAC
a. Refer to Part 2 – Products, Para. 2.1A.1 ADD: c. VMC Corporation
b. Refer to Part 2 – Products, Para. 2.2A.1 ADD: c. VMC Corporation  
c. Refer to Part 2 – Products, Para. 2.3 A.1 ADD: c. VMC Corporation  
d. Refer to Part 2 – Products, Para. 2.4 A.1 ADD: c. VMC Corporation  
e. Refer to Part 2 – Products, Para. 2.7 A.1 ADD: c. VMC Corporation  
f. Refer to Part 2 – Products, Para. 2.8 A.1 ADD: b. VMC Corporation  

21. SECTION 230923 Direct Digital Controls (DDC) for HVAC  
a. Refer to Part 1 General, Section 1.2 Summary, ADD the following: J. Provide BACnet connection to each Gas Fired Humidifier and provide graphic display of humidifier status, alarm condition, and steam output.  
b. Refer to Part 1 General, Section 1.2 Summary, ADD the following: K. To measure building pressure provide pressure sensor in the corridor on each floor and measure outside air pressure on the north wall of the penthouse.  

22. SECTION 232116 Hydronic Piping Specialties.  
a. Refer to Part 2 – Products, Para. 2.1 E.1. ADD: e. Victaulic (Mfr. By Tour-Anderson)  

23. SECTION 233113 Metal Ducts  

24. SECTION 233300 Air Duct Accessories  
a. In Paragraph 2.3, 2.4, 2.5, 2.6, and 2.9 ADD United Entertech as acceptable manufacturer.  

25. SECTION 233301 Louvers and Penthouses  
a. Refer to Part 2 – Products, Para. 2.3A. ADD: C. Greenheck, D. AWV Architectural, and E. United Entertech  

26. SECTION 233600 Air Terminal Units  
a. Refer to Paragraph 2.4.F ADD “Coil shall be minimum of 2 rows.”  

27. SECTION 235123 Gas Vents  
a. ADD this section to the specifications in its entirety. Section attached to this addendum.  

28. SECTION 235133 Insulated Sectional Chimneys  
a. DELETE this section from the specifications in its entirety.  

29. SECTION 237313 INDOOR, SEMI-CUSTOM AIR HANDLING UNITS  
a. Refer to paragraph 2.7 ADD: K. Provide supply and return fan motorized inlet dampers - Tamco 1000  

30. SECTION 237343 OUTDOOR, SEMI-CUSTOM AIR HANDLING UNITS  
a. Refer to paragraph 2.3.A. DELETE: “or 2 ½ inch foam”  
b. Refer to paragraph 2.3.B. ADD: Provide 6” wide and deep commercial aluminum gutter and downspouts along the entire length of the unit to convey water off the top of the unit down to the roof. Provide concrete splash block on roof at downspout locations.  
c. Refer to paragraph 2.4 REPLACE with the following: 2.4 STRUCTURAL SUPPLY AND RETURN AIR PLENUM SUPPORT CURB (AS DESIGNED ON THE PLANS)  
A. Provide a structural supply and return air plenum to be installed on top of a 18” outdoor curb with curb skirt. The air handler will fit on the structural supply and return air plenum. Full perimeter insulated structural plenum support curb for outdoor unit.  
B. Structural supply and return air plenum shall be the same construction as the air handler. Curb to have a minimum of 4” thick rigid fiberglass board insulation with FSK cover to the inside of curb. Plenum shall be a minimum of 4”-0” high (see dimensions on the plans) and have air and waterproof 36” x 36” access door to inside of curb. Access door shall be constructed as the doors for the unit.  
C. Plenum to have cant at bottom for transition of roofing material up the face of the curb. Top of curb to have treated ‘SYP’ 2” x 4” nailing strip all along top of curb.  
D. Under scheduled supply air temperature and design conditions on the exterior of the unit, condensation shall not form on the casing exterior (doors included).  
E. Top of curb and bottom of unit to be sealed with 1” thick expanded foam gasket.  
F. Skirt shall be provided by the unit manufacturer. Skirt shall be minimum 18 gauge painted flashing supplied by unit manufacturer and installed by others.  
d. Refer to paragraph 2.5 ADD: E. The fan base shall be fitted with necessary rebar and bottom skin for concrete inertia base. The available fill space provided in the base shall allow for enough fill weight to equal or exceed 1.5 times the weight of the rotating mass. Concrete inertia bases are only required for plenum fans.  
e. Refer to paragraph 2.7 ADD: K. Provide supply and return fan motorized inlet dampers - Tamco 1000  
f. Refer to paragraph 2.10 ADD: D. All motors shall be wired to an external junction box.  
g. ADD paragraph 2.12 as follows: 2.12 SERVICE VESTIBULE
A. Provide a service corridor the entire length of the penthouse air handing unit. The dimensions of the width and height shall match the mechanical plans of the project. Casing construction is the same as the rest of the air handler.

B. Shipping splits across the corridor shall be constructed and designed to have a flush floor. Any trip hazards across the shipping splits will not be acceptable. The basis of design unit will have 3/16” aluminum strips to be welded in the field across all shipping split seams to provide a watertight floor. (Welding and installation shall be by the mechanical contractor).

C. Pipe support system for the hot water and the chilled water piping shall be supported from the floor and shall be provided by the unit manufacturer. The pipe support system shall be coordinated with the mechanical contractor. Penetrations in the floor of the unit or into the casing of the air handler is not acceptable.

D. Ventilation fan and motorized inlet louver for ventilation shall be provided, installed, and wired. The means of supporting, hanging, controlling and powering the unit is by the unit manufacturer.

E. The external walking platform and stair system shall be provided by the air handling manufacturer. Manufacturer shall provide a system as wide as the door x 60” deep. The external walking platform shall be made from a minimum of 0.12” thick aluminum checker plate floor with a steel base. OSHA railings and ladder/stair shall be constructed from steel. Air handling manufacturer shall provide the necessary post to support the external walking platform. The external platform shall be constructed to support 1000#’s. Label shall be provided for weight limits for the platform.

F. Indoor service corridor vapor proof LED lights complete with duplex receptacle and switch with indicator light. Mount the switch inside the unit. Factory wire from switch to all lights in EMT conduit. Electric power is 120 volt.

G. Install lockable access doors with a removable center mullions on the east side and the west side of the unit. The door system shall be sized in a manner that does not interfere with the other components.

H. Provide pipe/electrical chases complete with 22 gauge galvanized cover through the base including 1 ½” perimeter collar to maintain watertight integrity.

i. ADD paragraph 2.13 as follows: 2.13 UNIT MOUNTED SILENCERS
   A. Each silencer pod shall consist of radiused noses and tails, perforated metal panels, stiffened for flatness.
   B. Acoustic media shall be compressed and supported to minimized dusting and erosion. Mineral wool is not acceptable. (Encapsulate the insulation with Tedlar.)
   C. Silencer pods shall be full height and full width of the plenum.

j. ADD paragraph 2.14 as follows: 2.14 LOUVERS
   A. Louvers blades shall be fixed on a 45° angle, and on 4” centers extruded aluminum construction.
   B. Frames shall be equal to extruded aluminum, minimum 4” wide.
   C. Bird screen shall be galvanized mesh with 0.5” x 0.5” openings and shall be fixed to the rear with cadmium plated screws.
   D. Finish shall be natural mill finish.

31. SECTION 238216.11 Hydronic Air Coils
   a. Refer to Paragraph 2.2.J. ADD “2. Heating water coils on terminal boxes and supply air valves shall be minimum of 2 rows.”

32. SECTION 238219 Fan Coil Units
   a. Refer to Part 2 – Products, Para. 2.2 A. ADD: Williams
   b. Refer to Part 2 – Products, Para. 2.3 A. ADD: Williams

33. SECTION 263353 Static Uninterruptible Power Supply
   a. Refer to Part 1 – general, Paragraph 1.2 A.1. Change to read “Three-phase, on-line, double-conversion, static-type, UPS unit rated 30kVA, 0.9PF, 120/208VAC, with the following features:”

34. SECTION 264313 Surge Protection For Low Voltage Electrical Power Circuits
   a. Refer to Part 2 – Surge Suppressor, Paragraph 2.2 A. Add Current Technology to the approved list of manufacturers.

35. SECTION 274116 – INTEGRATED AUDIO VIDEO SYSTEMS AND EQUIPMENT
   a. Modified the following sub-paragraph 2.25.A.3. to read as follows “Shall have tabletop space for a tabletop touch panel, document camera, mouse, cable grommet, and keyboard.
37. SECTION 105113 METAL LOCKERS
   1. Add the following to sub-paragraph 2.3 A to read as follows:
   7. Lockers Mfg.

38. SECTION 087100 DOOR HARDWARE
   1. Remove Door 361-1 from Hardware Group No. 12
   2. Add Hardware Group No. 12A to read as follows:

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3. Remove Door 131 from Hardware Group No. 13
4. Add Hardware Group No. 13A to read as follows

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5. Remove Door 246-1 from Hardware Group No. 25
6. Add Door 246-1 to Hardware Group No. 32
7. Remove Door 362-1 from Hardware Group No. 35
8. Add Door 137 to Hardware Group No. 39
9. Add Doors 362-1 and B1-2 to Hardware Group No. 40
10. Revise Hardware Group No. 41 to read as follows:

FOR USE ON DOOR #(S):

100J-1

PROVIDE EACH OPENING WITH THE FOLLOWING:

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DOOR NORMALLY CLOSED AND LOCKED. PRESENTING VALID CREDENTIAL TO READER MOMENTARILY RETRACTS PANIC DEVICE LATCH, ALLOWING ACCESS. DOOR REMAINS LOCKED WITH LOSS OF POWER. FREE EGRESS AT ALL TIMES.

DOOR NORMALLY CLOSED AND LOCKED. PRESENTING VALID CREDENTIAL TO READER WILL MOMENTARILY UNLOCK LOCKSET, ALLOWING ACCESS. DOOR REMAINS LOCKED UPON LOSS OF POWER. FREE EGRESS AT ALL TIMES.

Remove Door 363-1 from Hardware Group No. 47
Remove Door 137 from Hardware Group No. 50
Add Door 363-1 to Hardware Group No. 51
Revise Hardware Group No. 52 to read as follows:

FOR USE ON DOOR #(S):

133-1

PROVIDE EACH OPENING WITH THE FOLLOWING:

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<td>BK</td>
<td>ZER</td>
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<tr>
<td>1</td>
<td>Power Supply</td>
<td>By DIV 28</td>
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DOOR NORMALLY CLOSED AND LOCKED. PRESENTING VALID CREDENTIAL TO READER WILL MOMENTARILY UNLOCK LOCKSET, ALLOWING ACCESS. DOOR REMAINS LOCKED UPON LOSS OF POWER. FREE EGRESS AT ALL TIMES.

Remove Door 134-2 from Hardware Group No. 63
Add Hardware Group No. 63A to read as follows:

FOR USE ON DOOR #(S):

134-2

PROVIDE EACH OPENING WITH THE FOLLOWING:

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<th>QTY</th>
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<tr>
<td>3</td>
<td>Silencer</td>
<td>SR64</td>
<td>GRY</td>
<td>IVE</td>
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17. Remove Doors 362-2 and 362-3 from Hardware Group No. 66
18. Add Hardware Group No. 66A to read as follows:

**FOR USE ON DOOR #(#S):**

<table>
<thead>
<tr>
<th>QTY</th>
<th>DESCRIPTION</th>
<th>CATALOG NUMBER</th>
<th>FINISH</th>
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<tr>
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<td>44STST</td>
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<td>SMOKE GASKET</td>
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<td>BK</td>
<td>ZER</td>
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</table>

**PROVIDE EACH OPENING WITH THE FOLLOWING:**

**DOOR(S) NORMALLY HELD OPEN BY ELEC HOLDER(S). ELEC HOLDER(S) TIED TO FIRE ALARM. WHEN FIRE ALARM IS ACTIVATED, HOLDER(S) RELEASE, AND DOOR(S) CLOSE AND LOCK. DOOR(S) CAN ALSO BE MANUALLY RELEASED FROM HOLDERS(S). FREE EGRESS AT ALL TIMES.**

19. Revise Hardware Group No. 75A to read as follows
   a. Replace Kickplate with 1 Ea Armor Plate 8402 34” x 1 ½” LDW B-CS 630 IVE

20. Remove Door B1-2 from Hardware Group No. 80

39. 123661.16 – SOLID SURFACE COUNTERTOPS
   a. Revise sub-paragraph 2.3 D to read as follows:
      D. Support legs for Countertop:
         1. Aluminum Extrusions: ASTM B 221, Alloy 6063-T6
         2. Finish: Clear Anodic, AAMA 611, Class 1, AA-M12C22A41.

40. Remove 281600 INTRUSION DETECTION from the Table of Contents

**PART 3 - DRAWING CHANGES**

1. SHEET C101 UTILITY DEMOLITION PLAN (NOT REISSUED)
   a. Revise southern layback extents line to match the proposed water main easement line. This is approximately 5 feet north of previous location.

2. SHEET C401 STORMWATER POLLUTION PREVENTION PLAN (NOT REISSUED)
   a. Revise southern layback extents line to match the proposed water main easement line. This is approximately 5 feet north of previous location.

3. SHEET C501 UTILITY PLAN
   a. Revise 12” water main extension location by INAW to be outside of the right-of-way within a 10’ proposed easement.
   b. Revise southern layback extents line to match the proposed water main easement line. This is approximately 5 feet north of previous location.
   c. Revise water and fire service line connection locations to match the revised INAW 12” water main route.
   d. Add keynote 10A and revise hydrant keynote 10 to clarify the difference between the hydrant on the existing water main and the hydrant on the INAW water main extension.

4. SHEET C602 MAINTANANCE OF TRAFFIC PLAN – PEDESTRIAN
   a. Add temp walk notes between Dill Street and Dicks Street.
b. Revise pedestrian signage between Dill Street and Dicks Street.

c. Remove pedestrian signage along University Avenue.

5. SHEET L-101 SITE PREPARATION PLAN
   a. Revised dates in ‘reference notes schedule’.

6. SHEET L-401 GRADING PLAN
   a. Added existing major contour labels throughout referenced survey.

7. SHEET L-402 GRADING PLAN
   a. Added existing major contour labels throughout referenced survey.

8. SHEET L-601 PLAN ENLARGEMENTS
   a. Added sheet which includes temporary walk as part of Maintenance of Traffic Plan.

9. SHEET L-701 SITE DETAILS
   a. Added detail F5.

    a. At all callouts for elevator rail support steel, replace callout with (4) – HSS8x4x3/8 w/ EP7s TOP AND BOTT.

11. SHEETS S-100-B, S-100-B ALT, S-101-B, S-102-B, S-103-B, S-104-B, S-105-B
    a. At all callouts for elevator rail support steel, replace callout with (3) – HSS8x4x3/8 w/ EP7s TOP AND BOTT.

12. SHEET S-100-A
    a. Revise dimension to north side of elevator pit wall to 1’-0” in lieu of 1’-0 ¼”.

13. SHEET S-101-B
    a. Append callout for HSS6x6x3/8 screen wall posts at service yard wall with GALV.

14. SHEET S-101-B ALT
    a. Append callout for HSS6x6x3/8 screen wall posts at service yard wall with GALV.

15. SHEET S-102-B
    a. Add note at HSS 5x5x5/16 girts for service yard screen wall along line B to be GALV.

16. SHEETS S-102-A, S-102-B
    a. Add plan note 15 to read as follows: SEE 10/S-370 FOR PERIMETER EMBED WHERE GRATING FLOOR OCCURS. SEE 12/S-500 FOR SUPPORT ANGLE WHERE GRATING FLOOR OCCURS.
    b. Add plan note 15 callout to all chases east of column line 2.
    c. Replace perimeter relief and embed callout note to read as follows: PROVIDE EP5s AT 3’-0” AT PERIMETER TO SUPPORT RELIEF ANGLE. SEE S-57X SERIES ELEVATIONS FOR EXTENTS OF RELIEF. SEE S-370 FOR EMBED PLATE DETAIL. SEE 14/S-575 FOR RELIEF ANGLE DETAIL.

17. SHEETS S-103-A, S-103-B, S-104-A, S-104-B, S-105-A, S-105-B
    a. Add plan note 16 to read as follows: SEE 10/S-370 FOR PERIMETER EMBED WHERE GRATING FLOOR OCCURS. SEE 12/S-500 FOR SUPPORT ANGLE WHERE GRATING FLOOR OCCURS.
    b. Add plan note 16 callout to all chases east of column line 2.
    c. Replace perimeter relief and embed callout note to read as follows: PROVIDE ¾” LONG MALLEABLE IRON INSERTS AT 3’-0” AT PERIMETER TO SUPPORT RELIEF ANGLE. SEE S-57X SERIES ELEVATIONS FOR EXTENTS OF RELIEF. SEE S-370 FOR EMBED DETAIL. SEE 15/S-575 FOR RELIEF ANGLE DETAIL.

18. SHEETS S-106-A, S-106-B
    a. Reissue sheets with clouded modifications.

19. SHEET S-107-B
    a. Add section cut 9/S-350 through 2’-0” slab step between column lines 12 and 13.

20. SHEET S-350
    a. Reissue sheet with new details.

21. SHEET S-366
    a. Reissue sheet with clouded modifications.

22. SHEET S-370
    a. Reissue sheet with clouded modifications.

23. SHEET S-500
24. SHEET S-501
   a. Reissue sheet with clouded modifications.

25. SHEET S-570
   a. Reissue sheet with clouded modifications.

26. SHEET S-571
   a. Reissue sheet with clouded modifications.

27. SHEET S-572
   a. Reissue sheet with clouded modifications.

28. SHEET S-575
   a. Reissue sheet with clouded modifications.

29. SHEET A-xxx
   a. Reissue sheet with clouded modifications.

30. SHEET A-401
   a. Reissue sheet with clouded modifications showing extents of grated floors at chases.

31. SHEET A-201
   a. Remove trellis and all Alternate #9 notations

32. SHEET A-530 - CASEWORK DETAILS
   a. Reissue sheet with clouded modifications to details A7, B1, B2 and G5

33. SHEET A-531 - CASEWORK DETAILS
   a. A4/a-531 – change “fabric wrapped ⅜” plywood panel w/steel sheet mounted with z-clips” to “fabric wrapped ⅜” mdf panel mounted with clips”
   b. A7/a-531 – change “fabric wrapped ⅜” plywood panel w/steel sheet mounted with z-clips” to “fabric wrapped ⅜” mdf panel mounted with clips”
   c. C3/a-531 – add 3/4” plywood substrate note

34. SHEET A-540

35. SHEET A-601
   a. Reissue sheet with clouded modifications.

36. SHEET A-602
   a. Reissue sheet with clouded modifications.

37. SHEET A-650 - FINISH SCHEDULE AND FINISH DETAILS
   a. F7/a650 – remove metal sheet notes
   b. Make the following changes to the finish schedule:
      i. Act-01 change product number: 1915
      ii. Act-01 and act-02 add 9/16” grid
      iii. Act-02 remove 6”x 24” tile
      iv. Wdv-01 change style: white maple, plain slice, bookmatch, veneer on 3/4” fr plywood substrate, color: clear finish, full fill, low sheen
      v. Rf-02 remove 6” flash cove base with stainless steel top cap
      vi. Ssm-02 change size: ⅜” thick, refer to drawings
      vii. Ssm-02 change size: ⅜” thick, refer to drawings

38. SHEET A-651 - FINISH DETAILS
   a. Reissue sheet with clouded modifications to details C2 and F6

39. SHEET LF-001
   a. See revisions on Laboratory Furnishings Key Sheet

40. SHEET LF-002
   a. See revisions on Laboratory Furnishings Exhaust Schedule

41. SHEET LF-413
   a. See revisions on Laboratory Furnishings Casework Legend

42. SHEET LF-452
   a. See revisions on plans

43. SHEET LF-503
a. Addition of missing detail for industrial shelving unit 2/LF-503

44. SHEET LF-505
   a. Updates to laser shelf details 6/LF-505 and 7/LF-505

45. SHEET M-300-A Lower Level HVAC Plan – West
   a. Added two (2) VAVs serving corridors 000B and 000C.
   b. Reissued drawing in its entirety.

46. SHEET M-301-B First Level HVAC Plan – East
   a. Revise exhaust to Hazardous Waste 135 and Solvent Storage 136 as shown.
   b. Reissued drawing in its entirety.

47. SHEET M-302-A Second Level HVAC Plan – West
   a. Change two (2) diffusers in Lounge 249 to type LDSC Linear slot diffusers balanced for 225 CFM Ea.
   b. Reissued drawing in its entirety.

48. SHEET M-302-B Second Level HVAC Plan – East
   a. Cell/Molec/Gen 239 – Add note to diffuser near fume hood to read “Blank off side of diffuser towards fume hood.”
   b. Womens RR 244 – Chan
   c. Mens RR 344 – Change first exhaust duct branch from 10”dia. to 12x10.
   d. Add EF-135 and EF-136 on roof of first level as shown.
   e. Reissued drawing in its entirety.

49. SHEET M-303-A Third Level HVAC Plan – West
   a. Change two (2) diffusers in Open Study 349A to type LDSC Linear slot diffusers balanced for 225 CFM Ea.
   b. Reissued drawing in its entirety.

50. SHEET M-303-B Third Level HVAC Plan – East
   a. Storage 345 – Add volume dampers in exhaust system serving Storage 345, Men’s and Women’s restrooms, and associated spaces.
   b. Mens RR 344 – Change first exhaust duct branch from 10”dia. to 12x10.
   c. Reissued drawing in its entirety.

51. SHEET M-304-A Fourth Level HVAC Plan – West
   a. Change two (2) diffusers at Monumental Stair Landing to type LDSC Linear slot diffusers balanced for 225 CFM Ea.
   b. Reissued drawing in its entirety.

52. SHEET M-304-B Fourth Level HVAC Plan – East
   a. Elec 443 – Add volume dampers in exhaust system serving Elec 443, Men’s and Women’s restrooms, and associated spaces.
   b. Elec 443 – Change supply and exhaust grilles to 12”x12”. Change supply air flow to 400 cfm. Change exhaust air flow to 300 cfm.
   c. Added linear slot diffuser to TB-4-4-400K and increased airflow.
   d. Reissued drawing in its entirety.

53. SHEET M-305-B Fifth Level HVAC Plan – East
   a. Added linear slot diffuser to TB-5-4-500H and increased airflow.
   b. Reissued drawing in its entirety.

54. SHEET M-306-A Penthouse HVAC Plan – West
   a. At column line 6 revise note to flue to terminate at 6’0” above the roof deck.

55. SHEET M-306-B Penthouse HVAC Plan – East
   a. Added exhaust duct and revise note in Section 2.
   b. Reissued drawing in its entirety.

56. SHEET M-310-A Lower Level Piping Plan – West
   a. Added piping to new VAVs serving corridors 000B and 000C.
   b. Added piping to drain condensate from FCU-024A and FCU-024B.
   c. Added piping to drain condensate from FCU-001 and FCU-003.
   d. Corrected erroneous display of first floor finned tube radiation on lower level.
   e. Reissued drawing in its entirety.

57. SHEET M-310-B Lower Level Piping Plan – East
   a. Removed piping to supply heating to FCU-0-026 and FCU-0-027.
b. Corrected erroneous display of first floor finned tube radiation on lower level.
c. Reissued drawing in its entirety.

58. SHEET M-311-A First Floor Piping Plan – West
   a. Moved balance valve to removable tile ceiling for access.
   b. Reissued drawing in its entirety.

59. SHEET M-311-B First Floor Piping Plan – East
   a. Redesigned finned tube radiation above northeast entrance for improved air venting and removal.
   b. Reissued drawing in its entirety.

60. SHEET M-315-B Fifth Floor Piping Plan – East
   a. Added missing branch isolation valves.
   b. Reissued drawing in its entirety.

61. SHEET M-501 Mechanical Details
   a. Revise AHU-5 supply fan HP to 10 HP.

62. SHEET M-505 Mechanical Details
   a. Added floor mounted fire damper detail, boiler piping detail, and flue stack detail.
   b. Reissued drawing in its entirety.

63. SHEET M601 Mechanical Schedules
   a. Add expansion tank and air control system schedule.
   b. Reissued drawing in its entirety.

64. SHEET M603 Mechanical Schedules
   a. Laboratory Exhaust Fume Hood Air Control Valve Schedule Lower Floor – Add note to read “ALL LABORATORY AIR CONTROL VALVES (DESIGNATED SAV, LAV, HAV) SHALL EMPLOY HIGH SPEED ACTUATOR AS DEFINED IN SPECIFICATION 230910. IN SPACES THAT DO NOT CONTAIN FUME HOODS WITH OPERABLE SASHES, IT IS ACCEPTABLE TO USE LABORATORY AIR VALVES WITH STANDARD SPEED ACTUATORS.”
   b. Laboratory Exhaust Fume Hood Air Control Valve Schedule First Floor – Add note to read “ALL LABORATORY AIR CONTROL VALVES (DESIGNATED SAV, LAV, HAV) SHALL EMPLOY HIGH SPEED ACTUATOR AS DEFINED IN SPECIFICATION 230910. IN SPACES THAT DO NOT CONTAIN FUME HOODS WITH OPERABLE SASHES, IT IS ACCEPTABLE TO USE LABORATORY AIR VALVES WITH STANDARD SPEED ACTUATORS.”
   c. Laboratory Exhaust Fume Hood Air Control Valve Schedule Second Floor – Add note to read “ALL LABORATORY AIR CONTROL VALVES (DESIGNATED SAV, LAV, HAV) SHALL EMPLOY HIGH SPEED ACTUATOR AS DEFINED IN SPECIFICATION 230910. IN SPACES THAT DO NOT CONTAIN FUME HOODS WITH OPERABLE SASHES, IT IS ACCEPTABLE TO USE LABORATORY AIR VALVES WITH STANDARD SPEED ACTUATORS.”
   d. Laboratory Exhaust Fume Hood Air Control Valve Schedule Third Floor – Add note to read “ALL LABORATORY AIR CONTROL VALVES (DESIGNATED SAV, LAV, HAV) SHALL EMPLOY HIGH SPEED ACTUATOR AS DEFINED IN SPECIFICATION 230910. IN SPACES THAT DO NOT CONTAIN FUME HOODS WITH OPERABLE SASHES, IT IS ACCEPTABLE TO USE LABORATORY AIR VALVES WITH STANDARD SPEED ACTUATORS.”
   e. Laboratory Exhaust Fume Hood Air Control Valve Schedule Fifth Floor – Add note to read “ALL LABORATORY AIR CONTROL VALVES (DESIGNATED SAV, LAV, HAV) SHALL EMPLOY HIGH SPEED ACTUATOR AS DEFINED IN SPECIFICATION 230910. IN SPACES THAT DO NOT CONTAIN FUME HOODS WITH OPERABLE SASHES, IT IS ACCEPTABLE TO USE LABORATORY AIR VALVES WITH STANDARD SPEED ACTUATORS.”

65. SHEET M604 Mechanical Schedules
   a. Laboratory Exhaust Air Control Valve Schedule Lower Floor – Add note to read “ALL LABORATORY AIR CONTROL VALVES (DESIGNATED SAV, LAV, HAV) SHALL EMPLOY HIGH SPEED ACTUATOR AS DEFINED IN SPECIFICATION 230910. IN SPACES THAT DO NOT CONTAIN FUME HOODS WITH OPERABLE SASHES, IT IS ACCEPTABLE TO USE LABORATORY AIR VALVES WITH STANDARD SPEED ACTUATORS.”
   b. Laboratory Exhaust Air Control Valve Schedule First Floor – Add note to read “ALL LABORATORY AIR CONTROL VALVES (DESIGNATED SAV, LAV, HAV) SHALL EMPLOY HIGH SPEED ACTUATOR AS
DEFINED IN SPECIFICATION 230910. IN SPACES THAT DO NOT CONTAIN FUME HOODS WITH OPERABLE SASHES, IT IS ACCEPTABLE TO USE LABORATORY AIR VALVES WITH STANDARD SPEED ACTUATORS."

c. Laboratory Exhaust Air Control Valve Schedule Second Floor – Add note to read “ALL LABORATORY AIR CONTROL VALVES (DESIGNATED SAV, LAV, HAV) SHALL EMPLOY HIGH SPEED ACTUATOR AS DEFINED IN SPECIFICATION 230910. IN SPACES THAT DO NOT CONTAIN FUME HOODS WITH OPERABLE SASHES, IT IS ACCEPTABLE TO USE LABORATORY AIR VALVES WITH STANDARD SPEED ACTUATORS.”

d. Laboratory Exhaust Air Control Valve Schedule Third Floor – Add note to read “ALL LABORATORY AIR CONTROL VALVES (DESIGNATED SAV, LAV, HAV) SHALL EMPLOY HIGH SPEED ACTUATOR AS DEFINED IN SPECIFICATION 230910. IN SPACES THAT DO NOT CONTAIN FUME HOODS WITH OPERABLE SASHES, IT IS ACCEPTABLE TO USE LABORATORY AIR VALVES WITH STANDARD SPEED ACTUATORS.”

e. Laboratory Exhaust Air Control Valve Schedule Fourth Floor – Add note to read “ALL LABORATORY AIR CONTROL VALVES (DESIGNATED SAV, LAV, HAV) SHALL EMPLOY HIGH SPEED ACTUATOR AS DEFINED IN SPECIFICATION 230910. IN SPACES THAT DO NOT CONTAIN FUME HOODS WITH OPERABLE SASHES, IT IS ACCEPTABLE TO USE LABORATORY AIR VALVES WITH STANDARD SPEED ACTUATORS.”

66. SHEET M605 Mechanical Schedules

a. Laboratory Supply Air Control Valve Schedule Lower Floor – Add note to read “ALL LABORATORY AIR CONTROL VALVES (DESIGNATED SAV, LAV, HAV) SHALL EMPLOY HIGH SPEED ACTUATOR AS DEFINED IN SPECIFICATION 230910. IN SPACES THAT DO NOT CONTAIN FUME HOODS WITH OPERABLE SASHES, IT IS ACCEPTABLE TO USE LABORATORY AIR VALVES WITH STANDARD SPEED ACTUATORS.”

b. Laboratory Supply Air Control Valve Schedule First Floor – Add note to read “ALL LABORATORY AIR CONTROL VALVES (DESIGNATED SAV, LAV, HAV) SHALL EMPLOY HIGH SPEED ACTUATOR AS DEFINED IN SPECIFICATION 230910. IN SPACES THAT DO NOT CONTAIN FUME HOODS WITH OPERABLE SASHES, IT IS ACCEPTABLE TO USE LABORATORY AIR VALVES WITH STANDARD SPEED ACTUATORS.”

c. Laboratory Supply Air Control Valve Schedule Second Floor – Add note to read “ALL LABORATORY AIR CONTROL VALVES (DESIGNATED SAV, LAV, HAV) SHALL EMPLOY HIGH SPEED ACTUATOR AS DEFINED IN SPECIFICATION 230910. IN SPACES THAT DO NOT CONTAIN FUME HOODS WITH OPERABLE SASHES, IT IS ACCEPTABLE TO USE LABORATORY AIR VALVES WITH STANDARD SPEED ACTUATORS.”

67. SHEET M606 Mechanical Schedules

a. Laboratory Supply Air Control Valve Schedule Third Floor – Add note to read “ALL LABORATORY AIR CONTROL VALVES (DESIGNATED SAV, LAV, HAV) SHALL EMPLOY HIGH SPEED ACTUATOR AS DEFINED IN SPECIFICATION 230910. IN SPACES THAT DO NOT CONTAIN FUME HOODS WITH OPERABLE SASHES, IT IS ACCEPTABLE TO USE LABORATORY AIR VALVES WITH STANDARD SPEED ACTUATORS.”

b. Laboratory Supply Air Control Valve Schedule Fourth Floor – Add note to read “ALL LABORATORY AIR CONTROL VALVES (DESIGNATED SAV, LAV, HAV) SHALL EMPLOY HIGH SPEED ACTUATOR AS DEFINED IN SPECIFICATION 230910. IN SPACES THAT DO NOT CONTAIN FUME HOODS WITH OPERABLE SASHES, IT IS ACCEPTABLE TO USE LABORATORY AIR VALVES WITH STANDARD SPEED ACTUATORS.”

c. Laboratory Supply Air Control Valve Schedule Fifth Floor – Add note to read “ALL LABORATORY AIR CONTROL VALVES (DESIGNATED SAV, LAV, HAV) SHALL EMPLOY HIGH SPEED ACTUATOR AS DEFINED IN SPECIFICATION 230910. IN SPACES THAT DO NOT CONTAIN FUME HOODS WITH
OPERABLE SASHES, IT IS ACCEPTABLE TO USE LABORATORY AIR VALVES WITH STANDARD SPEED ACTUATORS.”

68. SHEET M607 Mechanical Schedules
a. Laboratory Exhaust Fume Hood Air Control Valve Schedule Fourth Floor – Add note to read “ALL LABORATORY AIR CONTROL VALVES (DESIGNATED SAV, LAV, HAV) SHALL EMPLOY HIGH SPEED ACTUATOR AS DEFINED IN SPECIFICATION 230910. IN SPACES THAT DO NOT CONTAIN FUME HOODS WITH OPERABLE SASHES, IT IS ACCEPTABLE TO USE LABORATORY AIR VALVES WITH STANDARD SPEED ACTUATORS.”
b. Added TB-0-5-000B and TB-0-5-000C serving corridors.
c. Reissued drawing in its entirety.

69. SHEET M-609 Mechanical Schedules
a. Changed airflow of TB-4-4-400K and TB-5-4-500H.
b. Reissued drawing in its entirety.

70. SHEET M-705 GE. HEATING AND CHILLED WATER CONTROL DIAGRAMS.
   a. Change flow meter at each boiler to flow switch.
   b. Delete communications link for VFD’s.
   c. Reissued drawing in its entirety.

71. SHEET M-804 Chilled Water Flow Schematic
   a. Revise chilled water piping sizes from basement to AHU-1 at West Wing from 4” to 6”
   b. Revise coil piping arrangement to AHU-1, AHU-2, AHU-3, AHU-4 to reflect vertically and horizontally split coils with six (6) coil sections per AHU.
   c. Revise coil piping arrangement to AHU-5 to reflect single chilled water coil in lieu of stacked coil.
   d. Reissued drawing in its entirety.

72. SHEET M-805 Heating Water Flow Schematic
   a. Delete CP-5A shown in heating water supply pipe to AHU-5.

73. SHEET P-400 Plumbing lower level mechanical room enlarged Plan - east
   a. In Mechanical 025, Add FS-1 located on column line 8 between column lines B and C at northeast corner of humidifier and west of sump pump.
   b. Run 4” waste pipe below slab north to nearest 4” waste pipe.

74. SHEET P-502 Plumbing Details
   a. Refer to Plumbing Details #3, #4, and #5 Laboratory Gas Manifold Piping. Contractor is responsible for all piping, shut-off valves, manifolds and regulators shown on details. Manifolds and regulators to be similar to Concoa 529 Series stations and Concoa Series 412 Regulators.

75. SHEET E-200 Electrical Site Plan
   a. Shifted 2 light poles.
   b. Added existing well head location with plan note.
   c. Reissued drawing in its entirety.

76. SHEET E-316-A Penthouse Power Plan - West
   a. Moved roof top fan REF-1 to the north of its current location.
   b. Moved equipment in AHU-1 vestibule from its current location to the east side of the AHU.
   c. Reissued drawing in its entirety.

77. SHEET E-321-A First Level Systems Plan - West
   a. Moved fire alarm notification appliance in Corridor 100G.
   b. Reissued drawing in its entirety.

78. SHEET E-322-A Second Level Systems Plan - West
   a. Moved smoke detector in Corridor 200A two feet to the west.
   b. Moved fire alarm notification appliances in Corridor 200HJ two feet to the south.
   c. Reissued drawing in its entirety.

79. SHEET E-322-B Second Level Systems Plan - East
   a. Moved fire alarm notification appliances in Corridor 200J two feet to the north.
   b. Added fire alarm notification appliance in Corridor 200H.
   c. Reissued drawing in its entirety.
80. SHEET E-323-A Third Level Systems Plan - West
   a. Moved smoke detector in Student Lounge 300 three feet to the west.
   b. Moved fire alarm notification appliance in Student Lounge 300 two feet to the south.
   c. Moved fire alarm notification appliances in Corridor 300H two feet to the south.
   d. Reissued drawing in its entirety.
81. SHEET E-323-B Third Level Systems Plan - East
   a. Moved fire alarm notification appliances in Corridor 300J two feet to the south.
   b. Moved smoke detector at Elevator E3.
   c. Added fire alarm notification appliance in Corridor 300H.
   d. Reissued drawing in its entirety.
82. SHEET E-324-A Fourth Level Systems Plan - West
   a. Moved fire alarm notification appliances in Corridor 400H.
   b. Moved smoke detector in Student Lounge 400 three feet to the west.
   c. Reissued drawing in its entirety.
83. SHEET E-324-B Fourth Level Systems Plan - East
   a. Moved fire alarm notification appliances in Corridor 400H and 400K.
   b. Reissued drawing in its entirety.
84. SHEET E-325-A Fifth Level Systems Plan - West
   a. Moved smoke detector in Student Lounge 500 two feet to the west.
   b. Moved fire alarm notification appliances in Corridor 500G to the south.
   c. Reissued drawing in its entirety.
85. SHEET E-402 Enlarged Lower Level Lab Power Plans
   a. Added well pump control panel and well pump disconnect in Aquatics Room 024.
   b. Added Plan Note 14.
   c. Reissued drawing in its entirety.
86. SHEET E-403 Enlarged Lower Level Mechanical Rooms
   a. Moved power panel LNL1.
   b. Reissued drawing in its entirety.
87. SHEET E-442 Enlarged Fourth Floor Power Plans
   a. Delete two receptacles from Room 433.
   b. Reissued drawing in its entirety.
88. SHEET E-443 Enlarged Fourth Floor Power Plans
   a. Moved gas shut off switch in Room 457 from east side of door to west side of door.
89. SHEET E-503 Electrical Details
   a. Detail 7 – Light Pole Typical Detail – Change base width.
   b. Reissued drawing in its entirety.
90. SHEET E-505 Electrical Details
   a. Added well pump wiring schematic.
   b. Reissued drawing in its entirety.
91. SHEET E-601 Electrical Schedules
   a. Various fixtures changed in schedule.
   b. Reissued drawing in its entirety.
92. SHEET E-605 Electrical Schedules
93. SHEET T201-B – FIRST LEVEL TELECOM PLAN - EAST
   a. Added Ceiling Mounted WAP – 1152 to Gen. Bio. 1 146
94. SHEET T202-A – SECOND LEVEL TELECOM PLAN - WEST
   a. Added Ceiling Mounted WAP – 2197 to Corridor 200B
95. SHEET T202-B – SECOND LEVEL TELECOM PLAN - EAST
   a. Added Ceiling Mounted WAP – 2198 to Cell/ Molec./ Gen. 239
   b. Relocated Ceiling Mounted WAP – 2156 in Microbiology 256
96. SHEET T202-A – SECOND LEVEL TELECOM PLAN - WEST
97. SHEET T300 – TELECOM ROOM LAYOUTS
   a. Added Key Note #14: OFOI DATA DEVICE THEFT PANEL LOCATION to show device locations now visible in enlarged views.
   b. MDF 001 Enlarged TR Layout
      a. Added OFOI data device theft panel to south wall.
   c. IDF 110 Enlarged TR Layout
      a. Added OFOI data device theft panel to south wall.
   d. IDF 243 Enlarged TR Layout
      a. Added OFOI data device theft panel to east wall.
   e. IDF 324 Enlarged TR Layout
      a. Added OFOI data device theft panel to south wall.
   f. IDF 441 Enlarged TR Layout
      a. Added OFOI data device theft panel to east wall.
   g. IDF 512 Enlarged TR Layout
      a. Added OFOI data device theft panel to south wall.

98. SHEET T303 – TELECOM ROOM ELEVATIONS
   a. Added Key Note #14: OFOI DATA DEVICE THEFT PANEL LOCATION to show device locations now visible in elevation views.
   b. Replaced Detail #4: MDF 001 – SOUTH – LOWER LEVEL to show new OFOI data device theft panel devices on south wall of MDF.

99. SHEET T304 – TELECOM ROOM ELEVATIONS
   a. Added Key Note #14: OFOI DATA DEVICE THEFT PANEL to show device locations now visible in elevation views.
   b. Replaced Detail #4: IDF 110, IDF 324, & IDF 512 – SOUTH to show new OFOI data device theft panel devices on south wall of IDF.

100. SHEET T305 – TELECOM ROOM ELEVATIONS
    a. Added Key Note #14: OFOI DATA DEVICE THEFT PANEL LOCATION to show device locations now visible in elevation views.
    b. Updated Detail #3: IDF 243 & IDF 441 – EAST to show new OFOI data device theft panel devices on east wall of IDF.

101. SHEET T406 – AV DIAGRAMS
    a. Updated Detail #2: AV 02 – CONFERENCE ROOM AV DIAGRAM to now include TABLE POCKET and note to read “TABLE POCKET PROVIDED BY FURNITURE CONTRACTOR. PROVIDED FOR ROOM 232 ONLY”.

102. SHEET T407 – AV DIAGRAMS
    a. Updated Detail #1: AV 06 – 112 PERSON ALC AV DIAGRAM to now include note for ALC VIDEO CAMERA which reads “PROVIDED BY LAB FURNISHING CONTRACTOR. REFER TO SECTION 11 53 10 FOR MORE INFORMATION” and note for TABLE POCKET to read “TABLE POCKET PROVIDED BY FURNITURE CONTRACTOR.”

103. SHEET T500 – TELECOM SCHEDULES
    a. Updated 1st Floor – East Telecom Schedule to include added WAP – 1152
    b. Updated 2nd Floor – West Telecom Schedule to include added WAP – 2197
    c. Updated 2nd Floor – East Telecom Schedule to include added WAP – 2198

104. SHEET T501 – TELECOM SCHEDULES
    a. Updated 3rd Floor – East Telecom Schedule to include added WAP – 3179
PART 4 – GENERAL QUESTIONS

1. QUESTION: Specification 211313 says that the maximum protection area per sprinkler in office spaces is 120 sq. ft. Per NFPA 13, standard spray heads can have a protection area up to 225 sq. ft. in light hazard areas. Is this acceptable?
   RESPONSE: Please provide sprinkler layout in conformance with the specifications.

2. QUESTION: Will the fire protection system need to comply with FM Global requirements?

3. QUESTION: Are extended coverage sprinklers acceptable? Please note, there are currently no FM approved extended coverage concealed pendent.
   RESPONSE: Since the design is to comply with FM Global requirements, extended coverage sprinklers are not acceptable.

4. QUESTION: Is galvanized pipe required for dry-prefaction systems?
   RESPONSE: Yes, please see 211316 Dry-Pipe Sprinkler Systems, Part 2 Products, Paragraph 2.2.A.

5. QUESTION: Does alternate 16 include piping for dry-prefaction systems?
   RESPONSE: No, dry-prefaction piping to be galvanized steel sch 40 2” and below and sch 30 2 ½” and above.

6. QUESTION: Please confirm if galvanized fittings are required to be used with galvanized pipe applications.
   RESPONSE: Yes, galvanized fittings are required to be used with galvanized pipe applications.

7. QUESTION: Are we allowed to reduce the remote area per NFPA 13 when using quick response sprinklers?
   RESPONSE: Since the design is to comply with FM Global requirements, reduction of the remote area is not acceptable.

8. QUESTION: Specification section for louvers is not included in the project manual.
   RESPONSE: See section 23 33 01 for louvers.

9. QUESTION: Reference sheet S-107-A & similar. Does the top of concrete elevation @ roof areas slope to the drains or is the sloping accomplished with tapered insulation?
   RESPONSE: The concrete does not slope. This is accomplished with tapered insulation.

10. QUESTION: Reference sheet S-107-B. Please provide sections for 24” slab step & how the beams at the lower slab terminate at the upper slab.
    RESPONSE: Section provided in Addendum #4.

11. QUESTION: The elevator specs call for a service elevator with passenger doors, cab, etc. The drawing (A-431) shows a freight car with bi-parting freight doors. Please advise which is correct and/or provide updated drawings/specs.
    RESPONSE: The drawings show the correct elevator configuration. There will be a freight elevator with horizontal bi-parting doors.

12. QUESTION: Please confirm if it is acceptable to utilize Smartrize controllers for the elevators.
    RESPONSE: The University does not accept Smartrize controllers.

13. QUESTION: Alternate 6 regarding definition of “Fit Out” needs clarification. Are any finishes to be installed in the base bid including drywall, acoustic ceiling, floor and wall finishes? Or will rooms noted be “bare”?
    RESPONSE: See section 012300 Paragraph 1.2, A.3.

14. QUESTION: Specification 115353 Biological Safety Cabinets was issued in Addendum 2 however drawing LF-001 notes these are OFOI. Please confirm these are still OFOI.
    RESPONSE: All BSC’s are to be OFOI.

15. QUESTION: Sample AIA A101 Contract included in specification references an Exhibit A Insurances and Bonds but this has not been included. Can this be provided? We need to verify the required insurance coverage.
    RESPONSE: Include via Addendum #4.

16. QUESTION: Sample AIA A201, Article 11.1.1.3 regarding builders Risk insurance has conflicting language. It notes deductible as both equal to the lesser of the deductible currently at $100,000 and also notes no greater than $5,000.00. Please confirm minimum deductible. Most insurance companies will not provide a $5000.00 deductible.
    RESPONSE: 11.1.1.3 is stating that BSU has a policy with a $100,000 deductible, BSU requires the contractor to have a policy that covers builders risk below that $100,000 amount, with a $5,000 deductible. Essentially this is a gap policy.
covering that $95,000 in BSU’s coverage.

19. QUESTION: Are we to carry the cost of building permit fees in our bid? Who is the AHJ on this project?  
RESPONSE: Yes, the GC is to carry the cost of building permit fees. The AHJ is the City of Muncie.

20. QUESTION: Are we to carry the cost of any utility tap or connection fees?  
RESPONSE: Contractor is to carry these costs. BSU will pay for city water meters.

21. QUESTION: Regarding the requirement for subcontactor pre-qualification noted in 4.1.11 of the A701 Instructions to Bidders, will this apply to the numerous specialty trades (mostly division 11 but also other) required for the project? Has the A/E confirmed all the companies listed thru-out these specifications are also pre-qualified?  
RESPONSE: Only the contractors and subcontractors are required to be qualified, not material suppliers or manufacturers. (basically, Bid Form Supplements Appendix D subs over $300,000)

22. QUESTION: Specification Section 074200 Part 2 Products 2.1/B states the terracotta panel unit color as “manufacturer’s standard colors as required to provide blended mix as shown on the drawings.” No terracotta colors were found upon inspection of the Keynote Legend, Terracotta Profile Legend, Drawings, or Addendums. Please provide color name for each panel type.

RESPONSE: Basis of Design colors are a random mix of 60% Clay Grey and 40% Sahara Beige. Architect will choose colors from other manufacturers standard colors if needed.

23. QUESTION: Specification Section 074200 Part 2 Products 2.1/F states the terracotta sunshade color “as selected from manufacturer’s standard colors.” Please provide color name for each baguette type.

RESPONSE: Basis of Design color for sunshades to be Clay Grey for all terracotta sunshades

24. QUESTION: The Keynote legend on Drawing A-210 Mockup Wall from Bid Documents Dated 4.16.19 describes label 07 46 00.B1 as Terracotta Sunshade system. Detail A2/A-210 includes a wall section labelled with Terracotta Sunshade. However, the detail appears to show Terracotta Rainscreen. Please confirm Terracotta type and location in the mockup.

RESPONSE: On A2/A-210 replace the Terracotta Sunshade note with note 07 46 00.A2 for terracotta rainscreen. On elevation A6/A-210 the material in question is metal panel - replace the top right note with note 07 46 00.A2. Terra Cotta is only located where section A2/A-210 is located on the elevation.

25. QUESTION: Spec section 084113 calls out a related spec – 089119 – Fixed Louvers for units installed with aluminum framed systems. However, I do not see this spec in the documents. Can you advise/ provide?

RESPONSE: See spec section 233301 for all louvers

26. QUESTION: A1/A202 at the top left of the elevation has the keynote 074213.23.A1. Section A4/A301 has this area referencing to F4/A325. In section F4/A325 it has the horizontal runs noted as 074213.13.A3 as does the detail D2/A509. A4/A509 does not have a keynote calling the material out but the joinery on the panels appears to match the concealed fastener wall panel. Do the panels in this area need to be 074213.A1 ACM or 074213.A3 Concealed Fastener Aluminum Wall Panels?

RESPONSE: These panels are ACM - section A4/A-509 notes to refer to detail A1/A-509 for typical notes.

27. QUESTION: reference ceiling type ACT-02 , drwg. A-650. Ultima #1912 is used with 9/16” width grid. The only grid specified is 15/16” width. Do they want #1912, 9/16” grid or #1911, 15/16” grid?

RESPONSE: 9/16” grid should be included.

28. QUESTION: Also the following rooms do not have a type specified on the RCP; 1235A 236 237 264 267 268 269 331 332 335 357 426A 428 436A & 525A. There are numerous room like “Faculty Office” marked “typical. What ceiling type is intended for the other un marked rooms?

RESPONSE: See General Ceiling Plan Note B "INSTALL NEW CEILINGS AT +10” A.F.F. UNLESS NOTED OTHERWISE. CEILING TILE SHALL BE ACT-02 UNLESS NOTED OTHERWISE"

29. QUESTION: Room 146, Gen Bio I has a Class II Type 2A Recirculated 6' BSC. All others on project at OFOI. Is this a unique item or should it be marked as OFOI?

RESPONSE: All BSC’s are to be OFOI

30. QUESTION: Rooms 546 & 556 have 12 5’ FVH fume hoods that are not on the fume hood schedule.

RESPONSE: This will be addressed via Addendum #4

31. QUESTION: Room 259 Microbio Prep has a 6' LFH that is not on the fume hood schedule. Are we to include this hood?

RESPONSE: Yes, it is to be included. It is not shown in the fume hood schedule as it does not need to be exhausted.

32. QUESTION: What does lab casework mark LVP30 shown in rooms 453 and 454 refer to?

RESPONSE: LVP30 is a sitting height Vacuum Pump cabinet, 30” wide (see casework legend and notes on LF-004)

33. QUESTION: There is a note on the concrete framing plans (eg $102A) noting the aesthetic joints (see arch drawings for...
layout). Where on the arch drawings are these shown?
RESPONSE: Aesthetic joints are shown on the architectural dimension plans.
34. QUESTION: Do all three panels types (Standard A and Accents B & C) have multiple colors? Specification Item 2.1.B.6 call for a blended mix of colors per the drawings but there don’t appear to be any color designations noted. Please clarify.
RESPONSE: All panel types are to have a mix as described in question 22
35. QUESTION: The vertical baguette at curtainwall show (2) 6” pieces bonded to form an overall 12” depth (ref. D7/A-634). Would a 12” deep baguette be acceptable here?
RESPONSE: Yes - this is acceptable
36. QUESTION: The support for the 2” x 12” vertical baguette at curtainwall shows an end plate attached to a steel angle anchored to the vertical mullion. Is the terra cotta manufacturer responsible for baguettes only here? Or are they required to pick up the aluminum cap to close off the baguettes? Please clarify.
RESPONSE: The curtain wall manufacturer/installer is to provide the anchors for the system and the terra cotta manufacturer supplies necessary clips to attach to the anchors and all closures/caps.
37. QUESTION: The 2”x 6” horizontal baguette shown at F7/A-507 do not indicate any supports. Detail D7/A-507 shows a 2” x 2” baguette supported by a horizontal member attached back to the curtainwall mullion. What is the terra cotta manufactured expected to be providing here? Please clarify.
RESPONSE: The curtain wall manufacturer/installer is to provide the anchors for the system and the terra cotta manufacturer supplies necessary clips to attach to the anchors.
38. QUESTION: The Northeast and Northwest return walls show 76” lengths with a vertical joint at the terra cotta tile but not the baguettes. Vertical joints from baguettes to tiles align throughout except at these locations. Please verify if this is the intention.
RESPONSE: If joints are needed here due to material lengths, align with the vertical joint at the terracotta rainscreen. If not required, provide a single piece.
39. QUESTION: Is the ¼” thick plate shown at the curtainwall system transition (ref. A7 & C7/A-523) a structural member or is this a piece of trim being used to close off the c/w-tile transition?
RESPONSE: This is a trim piece.
40. QUESTION: There is one mock-up shown at sheet A-210. There are (3) called out in the specifications (Comprehensive, Performance and Integrated Exterior). Are tiles and baguettes (not shown on A-210) required for multiple mock-ups?
RESPONSE: Terra Cotta is located on the mockup where section A2/A-210 is located on the elevation. Baguettes are not required for the exterior material mockup.
41. QUESTION: The column footings east of the basement have a wide variety of top of footing elevations. Is this necessary or can we get a more consistent elevation to avoid additional mobilizations for the aggregate piers? (i.e. Y5/YC & Y5/YB)
RESPONSE: Contractor can propose modified elevations with the following restrictions: Revised elevations shall not affect capacity of adjacent footings, shall not induce pressures on basement walls or other pieces of new work, and shall not affect underground work without proper coordination and inclusion of any additional costs.
42. QUESTION: What finish is expected, galvanize or paint? Does this finish apply to all components or just the brick shelf?
RESPONSE: Per note 5 on S-570, all steel outside the building envelope to be HDG. All others to be primed.
43. QUESTION: Are locations specific or are they typical for all windows?
RESPONSE: Items on these sheets are considered miscellaneous steel, so coordination with architectural drawings is required for locations relative to architectural work. I.E. jamb post locations to be coordinated with window system and typical window jamb details.
44. QUESTION: How do the HSS 8x4x3/8 elevator divider beams get attached (no details)?
RESPONSE: Details included in Addendum #4.
45. QUESTION: A-201 shows an Alternate #9 for a trellis system but the alternate spec says this alternate is not used. Is the trellis to be included in the base bid? If so please provide additional information.
RESPONSE: Alternate #9 was removed from the project - no trellis is to be included.
46. QUESTION: Spec section 074213.23 calls for a 2 part Fluor primer in 2.2D while 2.A calls for a 3 part. Please confirm what is required.
RESPONSE: 2 part is required
47. QUESTION: Mobile shelving (spec 105626) references a "Part 4 of this specification" for various sizing of the shelving units. However, there is no part 4 of the spec. Can this be provided?
RESPONSE: See Questions and Responses 31 and 32 in Addendum 2.
48. QUESTION: At the louvered screen wall shown on A1/A-201, there is a note for 074213.G5 - factory formed metal wall
49. QUESTION: LF-400 Lower Level. There are two Scullery Sinks designated as OFCI. They are detailed on 9/LF-506. The sinks are also specified in 115310.2.22.G. Please clarify the responsibility for these items.
RESPONSE: Scullery Sinks show as OFCI in LF-400 are to remain OFCI. The scullery details included in our CD package are for covering scullery sinks located in AQUATIC-024 and GLASS CLEANING-431
50. QUESTION: LF-001 Key Sheet - Item 7 Open Industrial Shelving designated as OFOI. This item is also specified in 115310.2.9.1. Please clarify the responsibility for this item.
RESPONSE: Open Industrial Shelving note has been updated on Key Sheet and detail 2/LF-503 has been added.
51. QUESTION: On sheet A-101B - what are items along walls of wader storage room? Please provide a keynote and elevation.
RESPONSE: These are OFOI wader storage racks. Provide continuous blocking around room at stud walls at 5'-0" high and 3'-0" high.
52. QUESTION: Spec 105626 - There is a reference to diagrams for power and control wiring in the spec. Please confirm that these systems are mechanically aided and not motorized.
RESPONSE: Correct.
53. QUESTION: 105626 2.5.H - how many bin dividers and plastic bins are required? Are rubber mats on all shelves?
RESPONSE: See Questions and Responses 31 and 32 in Addendum 2.
54. QUESTION: Spec 105626 - are seismic design calculations required to be included in the performance of this system?
RESPONSE: Yes, these calculations are required.
55. QUESTION: Sheet LF-400 Lower Level. There is a note in (5) rooms for Flip Up Writing Tables. If these are to be provided by the contractor, provide additional information to price.
RESPONSE: This item will be added to the specs for addendum #4
56. QUESTION: Sheet LF-432 and LF-452. There is a note in the Stockroom on both sheets in a closet referring to a peg board. If this is to be provided by the contractor, provide additional information to price.
RESPONSE: This item will be added to the specs addendum #4
57. QUESTION: Specification Section 321313 Concrete Paving Section 2.1 C and D describe the paving as having wire mesh reinforcement. Sheet L-701 A1 and B1 show typical sections of the paving with micro and macro fibers but no weld wire reinforcing. Does the LD and HD pavement require wire reinforcing in addition to the two types of fiber in the concrete mix?
RESPONSE: No, this is not required.
58. QUESTION: Per L202 issue in addendum 2, is the area indicated to receive a snow melt system to also receive Heavy Duty pavement or would it be Light Duty?
RESPONSE: Areas shown on L-201 are light duty. The area shown on L-202 is part of the Loading Dock which is shown on the structural drawings.
59. QUESTION: Note D2/A203 references a 8 91 19 louver spec at the Utility yard. A1/A-203 references a 08 91 19 at the penthouse.
RESPONSE: See spec section 233301 for all louvers
60. QUESTION: Written spec states UPS rated at20k/VA but one line shows UPS at 30VA. Which is correct.
RESPONSE: The 30KVA rating as shown on the drawing is correct. The addendum will include a change to the specification.
61. QUESTION: ACT-01 is Armstrong 1906 Ultima Airguard, ACT-02 is standard Ultima. Is the Airguard tile required at ACT-01 or is standard Ultima 1914 acceptable?
RESPONSE: Standard Ultima is acceptable.
62. QUESTION: Can General Partitions be an acceptable manufacturer for toilet compartments?
RESPONSE: More information is required to review substitution requests - this was not received with sufficient time prior to the Addendum, we cannot accept the substitution.
63. QUESTION: How many RAP load tests are required per 316410 1.8.G.2.a
RESPONSE: The Designer is the Delegated Design Engineer for the Aggregate Pier system; they would set the requirement for the number of load tests as part of their delegated design prior to construction.
64. QUESTION: In most of the exterior wall sections mineral wool insulation is shown in the wall cavity to the top of the parapet and spray foam is shown in the cavity below. At what point should insulation type switch from spray foam to mineral wool. See F1/A-506
RESPONSE: Spray foam can be installed from the interior and switched to mineral wool as req'd
65. QUESTION: The dimension plans (see A102/A) reference including blocking for OFOI items like grab bars and visual display surfaces. In order to include enough blocking, how large are we to assume the visual display surface will be? 
RESPONSE: Reference Visual Display Schedule on A-002 for marker boards and tack boards. See Standard Mounting Heights on A-002 for all other items. See Accessory Schedule for OFCI and CFCI items.

66. QUESTION: The mounting description for panels within spec section 097723 varies from what the drawings indicated. For example, the spec indicates AWP 01-04 to be mounted in a modular wall system specified under 097000 but the drawings indicate it to be mounted with z-clips. Please advise.
RESPONSE: 
- AWP-01 – 04 & FWP-01 – 02 are to be mounted on z-clips.
- DWP-01 – 02 & FWP-03 – 06 are to be mounted with a modular wall system. (Fry Reglet Graph System is BOD)
- This information can be found on finish schedule on sheet A-650.

67. QUESTION: Is D3/A-226 showing markerboard built into a modular wall system? If so, what type of panel is around the wall system?
RESPONSE: This elevation is showing ptd. Reveals in the gypsum board.

68. QUESTION: Are FWP 01, 02 used? 
RESPONSE: Yes, FWP 01 & 02 are used behind the benches. The locations are called out in the finish plans on sheets A-150-A – A-155-B.

69. QUESTION: The height of the glazing on the north elev (W238) limits competition. Apparently Old Castle cannot provide a piece of glass that high. Can we shift the bottom mullion up so the height of the glass is 142” or less? 
RESPONSE: If required by the winning bid, the architect will rearrange the mullions per maximum glass size available – visible glass to be no smaller than 140” tall. Preference is for the design as shown in the documents.

70. QUESTION: Note at the top of D1/A-202 calls for 07 46 00.B1 - Terra Cotta Clay Sunshade System. Is this note intended to say 7 46 00.A1? 
RESPONSE: Correct

71. QUESTION: At the rooftop louver screen walls, horizontal steel members are shown to receive 04 20 00.A3 - Factory formed aluminum wall panels (A4A09 and other details). Are the vertical steel members of that assembly to receive panels as well? 
RESPONSE: Vertical members are to be painted

72. QUESTION: At elevation A5/A203, a note 07 46 00.A1 is pointing to what appears to be a brick façade. Please verify that this façade is intended to be brick. 
RESPONSE: Correct - change this note to 04 20 00.A1

73. QUESTION: At elevation A5/A-203 a note 07 46 00.B1 occurs at the top of the elevation. Is this note intended to say 07 46 00.A1? 
RESPONSE: Correct - change this note to 07 46 00.A1

74. QUESTION: Is the deduct to utilize MC cable ilo conduit and wire to include branch wiring and home runs? 
RESPONSE: Deduct is to use MC cable in lieu of conduit and wire to include branch circuit wiring and home runs back to the designated panelboard.

75. QUESTION: I am looking to provide voluntary alternate pricing for the exterior granite cladding on the Foundational Sciences Building project. Can you please tell me if there is a “Buy American” clause associated with this material? 
RESPONSE: Approved products are listed in the specifications. Alternate products are to be submitted to the architect and owner through the Substitution Request Process for final approval.

76. QUESTION: Note A200/E calls for moisture resistant gyp in all rooms with a plumbing fixture. Is this limited to 4’ on either side of the fixture or the entire room? 
RESPONSE: Provide moisture resistant gyp. in the entire room in restrooms and janitor closets - otherwise provide 4’ on either side of the fixture.

77. QUESTION: Who is to supply the Steel and Aluminum Counter Supports. B6/A530? 
RESPONSE: Countertop contractor is to supply

78. QUESTION: The metal thickness for a typical pro stud is 18 Mils. The spec minimum is 20 mils. Is 18 mils. Acceptable? 
RESPONSE: Yes, embossed studs are acceptable if they meet the min. 20 ga. Equivalent.

79. QUESTION: The design criteria is 5#L240. The limiting height for standard 6” 20g eq (18mil) pro studs is over 23’. Is the standard pro stud acceptable according to the limiting height table or is 30 mil steel required? 
RESPONSE: Embossed studs are acceptable if they meet the min. 20 ga. Equivalent and deflection requirements.
80. QUESTION: Per spec section 111319, section 1.1.A.2 calls for 10 year structural warranty. We see 10 year warranty requests on higher end pit levelers but never before on EOD’s. EOD’s are completely manual, and their life depends heavily on how they are used. Because of variation in usage, extended warranty is not offered by the manufacturer on this product (at any kind of reasonable cost). Please advise if warranty is required.
RESPONSE: Only 1 year standard warranty is required.

81. QUESTION: Per spec section 111319, section 2.1.F calls for a 1” hinged lip. Standard lip thickness for 20,000 and 25,000 lb rated EOD’s is 3/8”. It is possible to offer a 25,000 lb rated EOD with 1 ¼” hinge tube diameter and 3/8” lip thickness. Would this be acceptable?
RESPONSE: Yes, manufacturers standard for rated load is acceptable.

82. QUESTION: On page 5 of spec. 071326, paragraph 3.3.D. indicates that the membrane shall lap “...not less than 50% of sheet widths, to provide a minimum of two thicknesses of sheet membrane….”. This will result in 120 ml of waterproofing membrane. Is this the intent of the sheet waterproofing scope of work?
RESPONSE: A double layer is not the intent. That section has been deleted in the specification. Intent is a 2 1/2” overlap.

83. QUESTION: A5/A540 Grating and Support Angles—Where does this cut occur on the Plans?
RESPONSE: See updated Sheet A-401 in Addendum #4

84. QUESTION: D1/A550 Where does this cut occur on the Plans?
RESPONSE: See F5/A-323 which references E1/A550

PART 5 – ATTACHMENTS

A. Specification Section:
   SECTION 005214.02 INSURANCE EXHIBIT (A101 EXHIBIT A-2017)
   SECTION 111530 LAB CASEWORK
   SECTION 230910 Paragraph 2.3.U
   SECTION 235123 – Gas Vents
   SECTION 111319 STATIONARY LOADING DOCK EQUIPMENT
   SECTION 017419 CONSTRUCTION WASTE MANAGEMENT

B. Drawings:
   SHEET C501 UTILITY PLAN
   SHEET C602 MAINTANANCE OF TRAFFIC PLAN – PEDESTRIAN
   SHEET L-101 SITE PREPARATION PLAN
   SHEET L-401 GRADING PLAN
   SHEET L-402 GRADING PLAN
   SHEET L-601 PLAN ENLARGEMENTS
   SHEET L-701 SITE DETAILS
   SHEET S-350 – TYPICAL SLAB REINFORCEMENT DETAILS
   SHEET S-366 – CONCRETE BEAM SCHEDULE
   SHEET S-370 – EMBED PLATES
   SHEET S-500 – TYPICAL STEEL DETAILS
   SHEET S-501 – STEEL SECTIONS AND DETAILS
   SHEET S-570 – CLADDING BACKUP STEEL ELEVATIONS
   SHEET S-571 – CLADDING BACKUP STEEL ELEVATIONS
   SHEET S-572 – CLADDING BACKUP STEEL ELEVATIONS
   SHEET S-575 – CLADDING BACKUP DETAILS
   SHEET A-401 – ENLARGED PLANS
   SHEET A-530 – CASEWORK DETAILS
   SHEET A-540 – CEILING DETAILS
   SHEET A-601 – DOOR SCHEDULE
   SHEET A-602 – DOOR SCHEDULE
   SHEET A-651 – FINISH DETAILS
   SHEET LF-001
   SHEET LF-002
   SHEET LF-413
Insurance and Bonds

This Insurance and Bonds Exhibit is part of the Agreement, between the Owner and the Contractor, dated the day of in the year
(In words, indicate day, month and year.)

for the following PROJECT:
(Name and location or address)

THE OWNER:
(Name, legal status and address)

Ball State University
2000 West University Avenue (AD 208)
Muncie, Indiana 47306

THE CONTRACTOR:
(Name, legal status and address)

ADDITIONS AND DELETIONS:
The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An Additions and Deletions Report that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

This document is intended to be used in conjunction with AIA Document A201™–2017, General Conditions of the Contract for Construction. Article 11 of A201™–2017 contains additional insurance provisions.
§ A.2.2 Liability Insurance
The Owner shall be responsible for purchasing and maintaining the Owner’s usual general liability insurance.

§ A.2.3 Required Property Insurance
§ A.2.3.1 Unless this obligation is placed on the Contractor pursuant to Section A.3.3.2, the Owner shall purchase and maintain, from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located, property insurance written on a builder’s risk ”all-risks” completed value or equivalent policy form and sufficient to cover the total value of the entire Project on a replacement cost basis. The Owner’s property insurance coverage shall be no less than the amount of the initial Contract Sum, plus the value of subsequent Modifications and labor performed and materials or equipment supplied by others. The property insurance shall be maintained until Substantial Completion and thereafter as provided in Section A.2.3.1.3, unless otherwise provided in the Contract Documents or otherwise agreed in writing by the parties to this Agreement. This insurance shall include the interests of the Owner, Contractor, Subcontractors, and Sub-subcontractors in the project as insureds.

§ A.2.3.1.1 Causes of Loss. The insurance required by this Section A.2.3.1 shall provide coverage for direct physical loss or damage, and shall not exclude the risks of fire (with extended coverage), explosion, water damage, theft, vandalism, malicious mischief, collapse, earthquake, flood, or windstorm. The insurance shall also provide coverage for ensuing loss or resulting damage from error, omission, or deficiency in construction methods, design, specifications, workmanship, or materials. Sub-limits, if any, are as follows:

(Indicate below the cause of loss and any applicable sub-limit.)

<table>
<thead>
<tr>
<th>Causes of Loss</th>
<th>Sub-Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

§ A.2.3.1.2 Specific Required Coverages. The insurance required by this Section A.2.3.1 shall provide, without limitation, coverage for loss or damage to falsework and other temporary structures, and to building systems from testing and startup. The insurance shall also cover debris removal, including demolition occasioned by enforcement of any applicable legal requirements, temporary buildings, and reasonable compensation for the Architect’s and Contractor’s services and expenses required as a result of such insured loss, including claim preparation expenses. Sub-limits, if any, are as follows:

(Indicate below type of coverage and any applicable sub-limit for specific required coverages.)

<table>
<thead>
<tr>
<th>Coverage</th>
<th>Sub-Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Portions of the Work stored off the site and in transit.</td>
<td>Full replacement cost.</td>
</tr>
</tbody>
</table>

§ A.2.3.1.3 Unless the parties agree otherwise, upon Substantial Completion, the Owner shall continue the insurance required by Section A.2.3.1 or, if necessary, replace the insurance policy required under Section A.2.3.1 with property insurance written for the total value of the Project that shall remain in effect until expiration of the period for correction of the Work set forth in Section 12.2.2 of the General Conditions.

(Paragraph deleted)

§ A.2.3.2 Occupancy or Use Prior to Substantial Completion. The Owner’s occupancy or use of any completed or partially completed portion of the Work prior to Substantial Completion shall not commence until the insurance company or companies providing the insurance under Section A.2.3.1 have consented in writing to the continuance of coverage. The Owner and the Contractor shall take no action with respect to partial occupancy or use that would cause cancellation, lapse, or reduction of insurance, unless they agree otherwise in writing.

§ A.2.3.3 Insurance for Existing Structures
If the Work involves remodeling an existing structure or constructing an addition to an existing structure, the Owner shall purchase and maintain, until the expiration of the period for correction of Work as set forth in Section 12.2.2 of the General Conditions, ”all-risks” property insurance, on a replacement cost basis, protecting the existing structure against direct physical loss or damage from the causes of loss identified in Section A.2.3.1, notwithstanding the undertaking of the Work. The Owner shall be responsible for all co-insurance penalties.
§ A.2.4 Optional Extended Property Insurance.
The Owner shall purchase and maintain the insurance selected and described below.
(Select the types of insurance the Owner is required to purchase and maintain by placing an X in the box(es) next to the description(s) of selected insurance. For each type of insurance selected, indicate applicable limits of coverage or other conditions in the fill point below the selected item.)

[X] § A.2.4.1 Loss of Use, Business Interruption, and Delay in Completion Insurance, to reimburse the Owner for loss of use of the Owner’s property, or the inability to conduct normal operations due to a covered cause of loss.

[ ] § A.2.4.2 Ordinance or Law Insurance, for the reasonable and necessary costs to satisfy the minimum requirements of the enforcement of any law or ordinance regulating the demolition, construction, repair, replacement or use of the Project.

[ ] § A.2.4.3 Expediting Cost Insurance, for the reasonable and necessary costs for the temporary repair of damage to insured property, and to expedite the permanent repair or replacement of the damaged property.

[ ] § A.2.4.4 Extra Expense Insurance, to provide reimbursement of the reasonable and necessary excess costs incurred during the period of restoration or repair of the damaged property that are over and above the total costs that would normally have been incurred during the same period of time had no loss or damage occurred.

[ ] § A.2.4.5 Civil Authority Insurance, for losses or costs arising from an order of a civil authority prohibiting access to the Project, provided such order is the direct result of physical damage covered under the required property insurance.

[ ] § A.2.4.6 Ingress/Egress Insurance, for loss due to the necessary interruption of the insured’s business due to physical prevention of ingress to, or egress from, the Project as a direct result of physical damage.

[ ] § A.2.4.7 Soft Costs Insurance, to reimburse the Owner for costs due to the delay of completion of the Work, arising out of physical loss or damage covered by the required property insurance: including construction loan fees; leasing and marketing expenses; additional fees, including those of architects, engineers, consultants, attorneys and accountants, needed for the completion of the construction, repairs, or reconstruction; and carrying costs such as property taxes, building permits, additional interest on loans, realty taxes, and insurance premiums over and above normal expenses.

§ A.2.5 Other Optional Insurance.
The Owner shall purchase and maintain the insurance selected below.
(Select the types of insurance the Owner is required to purchase and maintain by placing an X in the box(es) next to the description(s) of selected insurance.)
§ A.2.5.1 Cyber Security Insurance for loss to the Owner due to data security and privacy breach, including costs of investigating a potential or actual breach of confidential or private information. (Indicate applicable limits of coverage or other conditions in the fill point below.)

§ A.2.5.2 Other Insurance
(List below any other insurance coverage to be provided by the Owner and any applicable limits.)

<table>
<thead>
<tr>
<th>Coverage</th>
<th>Limits</th>
</tr>
</thead>
</table>

ARTICLE A.3 CONTRACTOR’S INSURANCE AND BONDS
§ A.3.1 General
§ A.3.1.1 Certificates of Insurance. The Contractor shall provide certificates of insurance acceptable to the Owner evidencing compliance with the requirements in this Article A.3 at the following times: (1) prior to commencement of the Work; (2) upon renewal or replacement of each required policy of insurance; and (3) upon the Owner’s written request. An additional certificate evidencing continuation of commercial liability coverage, including coverage for completed operations, shall be submitted with the final Application for Payment and thereafter upon renewal or replacement of such coverage until the expiration of the periods required by Section A.3.2.1 and Section A.3.3.1. The certificates will show the Owner as an additional insured on the Contractor’s Commercial General Liability and excess or umbrella liability policy or policies.

The form of Certificates of Insurance shall be the current ACORD 25, or other form acceptable to the Owner, submitted in duplicate. The Contractor shall furnish to the Owner copies of endorsements that are subsequently issued amending coverage or limits.

§ A.3.1.2 Deductibles and Self-Insured Retentions. The Contractor shall disclose to the Owner any deductible or self-insured retentions applicable to any insurance required to be provided by the Contractor.

§ A.3.1.3 Additional Insured Obligations. To the fullest extent permitted by law, the Contractor shall cause the commercial general liability coverage to include (1) the Owner, the Architect, and the Architect’s consultants as additional insureds for claims caused in whole or in part by the Contractor’s negligent acts or omissions during the Contractor’s operations; and (2) the Owner as an additional insured for claims caused in whole or in part by the Contractor’s negligent acts or omissions for which loss occurs during completed operations. The additional insured coverage shall be primary and non-contributory to any of the Owner’s general liability insurance policies and shall apply to all ongoing and completed operations. To the extent commercially available, the additional insured coverage shall be no less than that provided by Insurance Services Office, Inc. (ISO) forms CG 20 10 07 04, CG 20 37 07 04, and, with respect to the Architect and the Architect’s consultants, CG 20 32 07 04, through the period of repose.

§ A.3.2 Contractor’s Required Insurance Coverage
§ A.3.2.1 The Contractor shall purchase and maintain the following types and limits of insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Contractor shall maintain the required insurance until the expiration of the period for correction of Work as set forth in Section 12.2.2 of the General Conditions, unless a different duration is stated below: (If the Contractor is required to maintain insurance for a duration other than the expiration of the period for correction of Work, state the duration.)

§ A.3.2.2 Commercial General Liability
§ A.3.2.2.1 Commercial General Liability insurance for the Project written on an occurrence form with policy limits of not less than One Million Dollars and Zero Cents ($1,000,000.00) each occurrence, Two Million Dollars and Zero Cents ($2,000,000.00) general aggregate, and Two Million Dollars and Zero Cents ($2,000,000.00) aggregate for products-completed operations hazard, providing coverage for claims including
damages because of bodily injury, sickness or disease, including occupational sickness or disease, and death of any person;
2. personal injury and advertising injury;
3. damages because of physical damage to or destruction of tangible property, including the loss of use of such property;
4. bodily injury or property damage arising out of completed operations; and
5. the Contractor's indemnity obligations under Section 3.18 of the General Conditions.

§ A.3.2.2 The Contractor's Commercial General Liability policy under this Section A.3.2.2 shall not contain an exclusion or restriction of coverage for the following:

1. Claims by one insured against another insured, if the exclusion or restriction is based solely on the fact that the claimant is an insured, and there would otherwise be coverage for the claim.
2. Claims for property damage to the Contractor's Work arising out of the products-completed operations hazard where the damaged Work or the Work out of which the damage arises was performed by a Subcontractor.
3. Claims for bodily injury other than to employees of the insured.
4. Claims for indemnity under Section 3.18 of the General Conditions arising out of injury to employees of the insured.
5. Claims or loss excluded under a prior work endorsement or other similar exclusionary language.
6. Claims or loss due to physical damage under a prior injury endorsement or similar exclusionary language.
7. Claims related to residential, multi-family, or other habitational projects, if the Work is to be performed on such a project.
8. Claims related to roofing, if the Work involves roofing.
9. Claims related to exterior insulation finish systems (EIFS), synthetic stucco or similar exterior coatings or surfaces, if the Work involves such coatings or surfaces.
10. Claims related to earth subsidence or movement, where the Work involves such hazards.
11. Claims related to explosion, collapse and underground hazards, where the Work involves such hazards.

§ A.3.2.3 Automobile Liability covering vehicles owned, and non-owned vehicles used, by the Contractor, with policy limits of not less than One Million Dollars and Zero Cents ($1,000,000.00) per accident, for bodily injury, death of any person, and property damage arising out of the ownership, maintenance and use of those motor vehicles along with any other statutorily required automobile coverage.

§ A.3.2.4 The Contractor may achieve the required limits and coverage for Commercial General Liability and Automobile Liability through a combination of primary and umbrella liability insurance, provided such primary and excess or umbrella insurance policies result in the same or greater coverage as the coverages required under Section A.3.2.2 and A.3.2.3, and in no event shall any umbrella liability insurance provide narrower coverage than the primary policy.

§ A.3.2.4.1 The Contractor shall obtain and maintain an Umbrella Liability policy for Commercial General Liability, Automobile Liability, and other risks, pursuant to Section A.3.2.4, with policy limits according to the Cost of Construction as follows:

1. Less than five million dollars ($5,000,000): two million dollars ($2,000,000) per occurrence, two million dollars ($2,000,000) per aggregate.

2. Between five million dollars ($5,000,000) and ten million dollars ($10,000,000): four million dollars ($4,000,000) per occurrence, four million dollars ($4,000,000) per aggregate.

3. More than ten million dollars ($10,000,000): seven million dollars ($7,000,000) per occurrence, seven million dollars ($7,000,000) per aggregate.

§ A.3.2.5 Workers' Compensation at statutory limits. The Contractor and/or Subcontractors of all Tiers shall obtain and maintain during the life of this Contract Workers' Compensation and Occupational Disease Insurance, Disability Benefits, Unemployment Compensation as required by all applicable Indiana and Federal laws with limits in full compliance with those laws.
§ A.3.2.6 Employers’ Liability with policy limits not less than One Million Dollars and Zero Cents ($1,000,000.00) each accident, One Million Dollars and Zero Cents ($1,000,000.00) bodily injury by disease, each employee, and One Million Dollars and Zero Cents ($1,000,000.00) policy limit, as required by applicable Indiana and Federal laws with limits in full compliance with those laws.

§ A.3.2.7 Jones Act, and the Longshore & Harbor Workers’ Compensation Act, as required, if the Work involves hazards arising from work on or near navigable waterways, including vessels and docks.

§ A.3.2.8 If the Contractor is required to furnish professional services as part of the Work, the Contractor shall procure Professional Liability insurance covering performance of the professional services, with policy limits of not less than One Million Dollars and Zero Cents ($1,000,000.00) per claim and Two Million Dollars and Zero Cents ($2,000,000.00) in the aggregate.

(Paragraphs deleted)

§ A.3.2.8.1 The person or entity providing delegated design services shall maintain the professional liability insurance required under Section A.3.2.8 for a period of ten (10) years following Substantial Completion of the Work. The Contractor shall provide to the Owner, beginning prior to commencement of the design or installation of the delegated design Work, Certificates of Insurance in accordance with Section A.3.1.1.

§ A.3.2.12 Insurance for the use or operation of manned or unmanned aircraft, if the Work requires such activities, with policy limits of not less than One Million Dollars and Zero Cents ($1,000,000.00) per claim and One Million Dollars and Zero Cents ($1,000,000.00) in the aggregate, in accordance with the Owner’s Policy for the Use of Unmanned Aircraft Systems (Drones).

§ A.3.3 Contractor’s Other Insurance Coverage
§ A.3.3.1 Insurance selected and described in this Section A.3.3 shall be purchased from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Contractor shall maintain the required insurance until the expiration of the period for correction of Work as set forth in Section 12.2.2 of the General Conditions, unless a different duration is stated below:
(If the Contractor is required to maintain any of the types of insurance selected below for a duration other than the expiration of the period for correction of Work, state the duration.)

§ A.3.3.2 The Contractor shall purchase and maintain the following types and limits of insurance in accordance with Section A.3.3.1.
(Select the types of insurance the Contractor is required to purchase and maintain by placing an X in the box(es) next to the description(s) of selected insurance. Where policy limits are provided, include the policy limit in the appropriate fill point.)

[ ] § A.3.3.2.1 Property insurance of the same type and scope satisfying the requirements identified in Section A.2.3, which, if selected in this section A.3.3.2.1, relieves the Owner of the responsibility to purchase and maintain such insurance except insurance required by Section A.2.3.1.3 and Section A.2.3.3. The Contractor shall comply with all obligations of the Owner under Section A.2.3 except to the extent provided below. The Contractor shall disclose to the Owner the amount of any deductible, and the Owner shall be responsible for losses within the deductible. Upon request, the Contractor shall provide the Owner with a copy of the property insurance policy or policies required. The Owner shall adjust and settle the loss with the insurer and be the trustee of the proceeds of the property insurance in accordance with Article 11 of the General Conditions unless otherwise set forth below:
(Where the Contractor’s obligation to provide property insurance differs from the Owner’s obligations as described under Section A.2.3, indicate such differences in the space below. Additionally, if a party other than the Owner will be responsible for adjusting and settling a loss with the insurer and acting as the trustee of the proceeds of property insurance in accordance with Article 11 of the General Conditions, indicate the responsible party below.)
§ A.3.3.2.2 Railroad Protective Liability Insurance, with policy limits of not less than ($ ) per claim and ($ ) in the aggregate, for Work within fifty (50) feet of railroad property.

§ A.3.3.2.3 Asbestos Abatement Liability Insurance, with policy limits of not less than ($ ) per claim and ($ ) in the aggregate, for liability arising from the encapsulation, removal, handling, storage, transportation, and disposal of asbestos-containing materials.

[X] § A.3.3.2.4 Insurance for physical damage to property while it is in storage and in transit to the construction site on an "all-risks" completed value form.

[X] § A.3.3.2.5 Property insurance on an "all-risks" completed value form, covering property owned by the Contractor and used on the Project, including scaffolding and other equipment.

[X] § A.3.3.2.6 Other Insurance

(List below any other insurance coverage to be provided by the Contractor and any applicable limits.)

Coverage

Property insurance in the form of a Builder’s Risk or Installation Floater or other such policy acceptable to the Owner, of the same type and scope satisfying the requirements identified in Section A.2.3, except insurance required by Section A.2.3.1.3 and Section A.2.3.3. The Contractor shall comply with all obligations of the Owner under Section A.2.3. The Contractor shall disclose to the Owner the amount of any deductible, and the Owner shall be responsible for losses within the deductible. Upon request, the Contractor shall provide the Owner with a copy of the property insurance policy or policies required. The Contractor shall adjust and settle the loss with the insurer and be the trustee of the proceeds of the property insurance in accordance with Article 11 of the General Conditions.

Limits

An amount equal to the lesser of the deductible, currently at $100,000, under the Owner’s property insurance or the cost of construction. The deductible under this Policy shall be an amount no greater than $5,000.

§ A.3.4 Performance Bond and Payment Bond

The Contractor shall provide surety bonds, from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located, as follows:

(Specify type and penal sum of bonds.)

<table>
<thead>
<tr>
<th>Type</th>
<th>Penal Sum ($9.00)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Payment Bond</td>
<td>One-hundred percent (100%) of the Project Sum.</td>
</tr>
<tr>
<td>Performance Bond</td>
<td>One-hundred percent (100%) of the Project Sum.</td>
</tr>
</tbody>
</table>

Payment and Performance Bonds shall be AIA Document A312™, Payment Bond and Performance Bond, or contain provisions identical to AIA Document A312™, current as of the date of this Agreement.
ARTICLE A.4  SPECIAL TERMS AND CONDITIONS
Special terms and conditions that modify this Insurance and Bonds Exhibit, if any, are as follows:

§ A.4.1 If the Owner at any time, for justifiable cause shall be or become dissatisfied with any surety or sureties related to the currently held Performance and/or Payment Bonds, the Contractor shall within five (5) days after written notice from the Owner, substitute an acceptable bond (or bonds) in such form and sum and signed by such other surety or sureties that may be satisfactory to the Owner. The Premiums on such bond(s) shall be paid by the Contractor. No further payments shall be deemed due or shall be made until the new surety or sureties have furnished an acceptable bond to the Owner.
Additions and Deletions Report for
AIA® Document A101™ – 2017 Exhibit A

This Additions and Deletions Report, as defined on page 1 of the associated document, reproduces below all text the author has added to the standard form AIA document in order to complete it, as well as any text the author may have added to or deleted from the original AIA text. Added text is shown underlined. Deleted text is indicated with a horizontal line through the original AIA text.

Note: This Additions and Deletions Report is provided for information purposes only and is not incorporated into or constitute any part of the associated AIA document. This Additions and Deletions Report and its associated document were generated simultaneously by AIA software at 16:34:06 ET on 03/22/2019.

PAGE 1

Ball State University
2000 West University Avenue (AD 208)
Muncie, Indiana 47306

... The Owner and Contractor shall purchase and maintain insurance, and provide bonds, as set forth in this Exhibit. As used in this Exhibit, the term General Conditions refers to AIA Document A201™–2017, General Conditions of the Contract for Construction, as modified by the Owner.

PAGE 2

§ A.2.3.1 Unless this obligation is placed on the Contractor pursuant to Section A.3.3.2.1, the Owner shall purchase and maintain, from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located, property insurance written on a builder’s risk "all-risks" completed value or equivalent policy form and sufficient to cover the total value of the entire Project on a replacement cost basis. The Owner’s property insurance coverage shall be no less than the amount of the initial Contract Sum, plus the value of subsequent Modifications and labor performed and materials or equipment supplied by others. The property insurance shall be maintained until Substantial Completion and thereafter as provided in Section A.2.3.1.3, unless otherwise provided in the Contract Documents or otherwise agreed in writing by the parties to this Agreement. This insurance shall include the interests of the Owner, Contractor, Subcontractors, and Sub-subcontractors in the Project as insureds. This insurance shall include the interests of mortgagees as loss payees.

§ A.2.3.1.1 Causes of Loss. The insurance required by this Section A.2.3.1 shall provide coverage for direct physical loss or damage, and shall not exclude the risks of fire, explosion, fire (with extended coverage), explosion, water damage, theft, vandalism, malicious mischief, collapse, earthquake, flood, or windstorm. The insurance shall also provide coverage for ensuing loss or resulting damage from error, omission, or deficiency in construction methods, design, specifications, workmanship, or materials. Sub-limits, if any, are as follows:

... The insurance shall provide, without limitation, coverage for loss or damage to falsework and other temporary structures, and to building systems from testing and startup. The insurance shall also cover debris removal, including demolition occasioned by enforcement of any applicable legal requirements, temporary buildings, and reasonable compensation for the Architect’s and Contractor’s services and expenses required as a result of such insured loss, including claim preparation expenses. Sub-limits, if any, are as follows:

... Portions of the Work stored off the site and Work in transit.

Full replacement cost.
§ A.2.3.1.4 Deductibles and Self-Insured Retentions. If the insurance required by this Section A.2.3 is subject to deductibles or self-insured retentions, the Owner shall be responsible for all loss not covered because of such deductibles or retentions.

§ A.2.4.1 Loss of Use, Business Interruption, and Delay in Completion Insurance, to reimburse the Owner for loss of use of the Owner’s property, or the inability to conduct normal operations due to a covered cause of loss.

§ A.3.1.3 Additional Insured Obligations. To the fullest extent permitted by law, the Contractor shall cause the commercial general liability coverage to include (1) the Owner, the Architect, and the Architect’s consultants as additional insureds for claims caused in whole or in part by the Contractor’s negligent acts or omissions during the Contractor’s operations; and (2) the Owner as an additional insured for claims caused in whole or in part by the Contractor’s negligent acts or omissions for which loss occurs during completed operations. The additional insured coverage shall be primary and non-contributory to any of the Owner’s general liability insurance policies and shall apply to both ongoing and completed operations. To the extent commercially available, the additional insured coverage shall be no less than that provided by Insurance Services Office, Inc. (ISO) forms CG 20 10 07 04, CG 20 37 07 04, and, with respect to the Architect and the Architect’s consultants, CG 20 32 07 04-04, through the period of repose.

§ A.3.2.2.1 Commercial General Liability insurance for the Project written on an occurrence form with policy limits of not less than One Million Dollars and Zero Cents ($ 1,000,000.00 ) each occurrence, Two Million Dollars and Zero Cents ($ 2,000,000.00 ) general aggregate, and Two Million Dollars and Zero Cents ($ 2,000,000.00 ) aggregate for products-completed operations hazard, providing coverage for claims including...

§ A.3.2.3 Automobile Liability covering vehicles owned, and non-owned vehicles used, by the Contractor, with policy limits of not less than One Million Dollars and Zero Cents ($ 1,000,000.00 ) per accident, for bodily injury, death of any person, and property damage arising out of the ownership, maintenance and use of those motor vehicles along with any other statutorily required automobile coverage.

§ A.3.2.4 The Contractor may achieve the required limits and coverage for Commercial General Liability and Automobile Liability through a combination of primary and excess or umbrella liability insurance, provided such primary and excess or umbrella insurance policies result in the same or greater coverage as the coverages required under Section A.3.2.2 and A.3.2.3, and in no event shall any excess or umbrella liability insurance provide narrower coverage than the primary policy. The excess policy shall not require the exhaustion of the underlying limits only through the actual payment by the underlying insurers.

§ A.3.2.4.1 The Contractor shall obtain and maintain an Umbrella Liability policy for Commercial General Liability, Automobile Liability, and other risks, pursuant to Section A.3.2.4, with policy limits according to the Cost of Construction as follows:

1. Less than five million dollars ($5,000,000): two million dollars ($2,000,000) per occurrence, two million dollars ($2,000,000) per aggregate.
2 Between five million dollars ($5,000,000) and ten million dollars ($10,000,000): four million dollars ($4,000,000) per occurrence, four million dollars ($4,000,000) per aggregate.

3 More than ten million dollars ($10,000,000): seven million dollars ($7,000,000) per occurrence, seven million dollars ($7,000,000) per aggregate.

§ A.3.2.5 Workers’ Compensation at statutory limits. The Contractor and/or Subcontractors of all Tiers shall obtain and maintain during the life of this Contract Workers’ Compensation and Occupational Disease Insurance, Disability Benefits, Unemployment Compensation as required by all applicable Indiana and Federal laws with limits in full compliance with those laws.

§ A.3.2.6 Employers’ Liability with policy limits not less than (§ — ) each accident, (§ — ) each employee, and (§ — ) policy limit. One Million Dollars and Zero Cents ($ 1,000,000.00 ) each accident, One Million Dollars and Zero Cents ($ 1,000,000.00 ) bodily injury by disease, each employee, and One Million Dollars and Zero Cents ($ 1,000,000.00 ) policy limit, as required by applicable Indiana and Federal laws with limits in full compliance with those laws.

PAGE 6

§ A.3.2.8 If the Contractor is required to furnish professional services as part of the Work, the Contractor shall procure Professional Liability insurance covering performance of the professional services, with policy limits of not less than One Million Dollars and Zero Cents ($ 1,000,000.00 ) per claim and Two Million Dollars and Zero Cents ($ 2,000,000.00 ) in the aggregate.

§ A.3.2.9 If the Work involves the transport, dissemination, use, or release of pollutants, the Contractor shall procure Pollution Liability insurance, with policy limits of not less than (§ — ) per claim and (§ — ) in the aggregate.

§ A.3.2.10 Coverage under Sections A.3.2.8 and A.3.2.9 may be procured through a Combined Professional Liability and Pollution Liability insurance policy, with combined policy limits of not less than (§ — ) per claim and (§ — ) in the aggregate.

§ A.3.2.11 Insurance for maritime liability risks associated with the operation of a vessel, if the Work requires such activities, with policy limits of not less than (§ — ) per claim and (§ — ) in the aggregate.

§ A.3.2.12 Insurance for the use or operation of manned or unmanned aircraft, if the Work requires such activities, with policy limits of not less than (§ — ) per claim and (§ — ) in the aggregate. One Million Dollars and Zero Cents ($ 1,000,000.00 ) per claim and One Million Dollars and Zero Cents ($ 1,000,000.00 ) in the aggregate, in accordance with the Owner’s Policy for the Use of Unmanned Aircraft Systems (Drones).

PAGE 7

[ X ] § A.3.2.4 Insurance for physical damage to property while it is in storage and in transit to the construction site on an "all-risks" completed value form.

[ X ] § A.3.2.5 Property insurance on an "all-risks" completed value form, covering property owned by the Contractor and used on the Project, including scaffolding and other equipment.

[ X ] § A.3.2.6 Other Insurance

Property insurance in the form of a Builder’s Risk or Installation Floater or other such policy acceptable to the Owner, of the same type and scope satisfying the

An amount equal to the lesser of the deductible, currently at $100,000, under the Owner’s property insurance or the cost of construction. The deductible under this Policy shall be an amount no...
requirements identified in Section A.2.3, except insurance required by Section A.2.3.1.3 and Section A.2.3.3. The Contractor shall comply with all obligations of the Owner under Section A.2.3. The Contractor shall disclose to the Owner the amount of any deductible, and the Owner shall be responsible for losses within the deductible. Upon request, the Contractor shall provide the Owner with a copy of the property insurance policy or policies required. The Contractor shall adjust and settle the loss with the insurer and be the trustee of the proceeds of the property insurance in accordance with Article 11 of the General Conditions.

... Payment Bond One-hundred percent (100%) of the Project Sum.

Performance Bond One-hundred percent (100%) of the Project Sum.

PAGE 8

§ A.4.1 If the Owner at any time, for justifiable cause shall be or become dissatisfied with any surety or sureties related to the currently held Performance and/or Payment Bonds, the Contractor shall within five (5) days after written notice from the Owner, substitute an acceptable bond (or bonds) in such form and sum and signed by such other surety or sureties that may be satisfactory to the Owner. The Premiums on such bond(s) shall be paid by the Contractor. No further payments shall be deemed due or shall be made until the new surety or sureties have furnished an acceptable bond to the Owner.
SECTION 017419
CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   2. Construction waste recycling.
   3. Construction waste adaptive reuse.

B. Related Sections:
   1. Section 018113 - Sustainable Design Requirements: General LEED requirements.
   2. Section 019100 - Commissioning: General commissioning requirements.

1.2 REFERENCES

A. ASTM International:

B. US Green Building Council:
   2. USGBC LEED MRC2: Construction and Demolition Waste Management Planning.

1.3 PLAN REQUIREMENTS

A. Develop and implement a construction and demolition waste management plan in accordance with ASTM E1609 and as approved by Architect/Engineer for compliance with the following:

1. Establish waste diversion goals for the project by identifying at least five materials (both structural and nonstructural) targeted for diversion. Approximate a percentage of the overall project wastes that these materials represent.
2. Specify whether materials will be separated or commingled and describe the diversion strategies planned for the project. Describe where the material will be taken and how the recycling facility will process the material.

Provide a final report detailing all major waste streams generated, including disposal and diversion rates.

Alternative daily cover (ADC) does not qualify as material diverted from disposal. Land-clearing debris is not considered construction, demolition or renovation waste that can contribute to waste diversion.
B. **Commingled, source separated and counting material streams**

The following paragraphs provide clarifications about commingled waste in LEED that is applicable to the prerequisite and the M&R Credit: Construction & Demolition Waste Management.

Each source separated material sent to an individual recycler who processes that single materials is considered one material stream; materials sent to commingled facilities for mixed recyclable processing are considered one stream.

For a project to be able to count off-site sorted materials as multiple material streams, the following must be met:

1. Project team collects multiple materials on the jobsite (often in one bin),
2. The materials are taken to a location where they are separated prior to being processed or otherwise sent for recycling,
3. Each material that is sent to separate recyclers or processors are considered separate material streams. For example, wood separated and sent to wood recycling directly can count as one unique stream. If mixed materials are sent to a commingled recycling processor, that counts as one stream even if they are made up multiple materials.
4. Each material stream must be measured by weight or volume (and converted to a consistent format) and included in the Waste Management Plan.

C. **Commingled recycling facilities** must be regulated by a local or state authority. To determine the commingled facility recycling rate, projects must use an average diversion rate for the facility that generally corresponds to the time materials were generated on the project and sent to the facility. The average recycling rate for the facility must exclude ADC. Commingled materials that are processed in the same way (i.e. over the same recycling line) are counted as one “stream” in LEED, even if the processing facility separates the output into multiple materials for recovery after processing.

Since commingles recycling counts as one stream, projects are encouraged to seek additional material streams through waste prevention and diversion. Successful projects have implemented the following strategies to count as material streams in LEED:

1. Quantify waste prevention design and construction techniques that result in source reduction.
2. Stage collection bins onsite to correspond with construction phases and contractor schedules. If one trade is onsite for a defined period that has a recyclable waste stream, consider having a single bin for that type of waste instead of—or in addition to—a commingled bin (examples include a bin for concrete recycling during demolition, or separate bins for drywall, wood framing, or roofing waste during those phases).
3. Salvage components from the project renovation and reuse them in the project or for other projects.
4. Donate surplus materials.
5. Participate in manufacturer take-back programs for products like ceiling tiles or flooring.
6. Work with subcontractors and/or finish material suppliers to eliminate or recycle packaging waste and take-back extra materials.

All of the above strategies count as material streams. Multiple bins for source separated materials are not required throughout construction for them to count as a material stream, nor must they be significant portions of the total project waste generation. Material streams should account for 5% of project waste, but that requirement is negotiable for challenging project situations. In all cases, trash, ADC, and incineration do not count as material streams since they are not forms of waste diversion.

Reducing waste by thoughtful design results in the reduction of waste at the store.

D. Counting waste prevention techniques/source reduction as a material stream

Reducing waste by thoughtful design results in the redaction of waste at the source. Stopping waste before it is created is always higher priority than managing waste after construction, and therefore LEED V4.1 allows projects to quantify waste prevention through design.

1. Source reduction strategies should be incorporated into the design of the project and outlined in the CWM plan. These strategies include reusing existing materials and components, design for modular construction sizes and techniques, specify reduced packaging form vendors, design for industry-standard measurements, eliminate unnecessary finishes, and prefabrication of components or assemblies.
2. Calculate waste prevented through source reduction as compared to standard practice. Estimate the amount of materials that would have been required for the system or finish, plus any extras, and estimate an amount that would have gone to waste through typical construction practices. For example, many projects order 10-15% extra materials for finishes, and some portion of that extra supply likely would end up as waste. Source reduction should be provided on a weight or volume and included as a part of the CWM plan.

E. Waste recovery strategies

After exploring source reduction strategies to prevent waste, determine strategies for on-site and off-site waste collection during construction and consider the infrastructure needed for implementation. Projects may use a combination of on-site separation and commingled collection, depending on what is appropriate for project location, material stream, and available facilities and haulers.

1. Identify diversion options for materials and locate recyclers or organizations that provide diversion options for the material streams targeted. Confirm each facility can accept the types of materials the project plans to send for recycling. Estimate a diversion rate for the facility/organization receiving the material stream, including ADC amounts for commingles recyclables.
2. Incineration of some C&D materials may be considered diversion for international projects only if reuse and recycling methods are not readily available in the project’s location; this must be included in the CWM plan.
Wood-derived fuel, or wood combustion, is considered diversion and not subject to the additional requirements for other forms of incineration. See MR Credit Construction & Demolition Waste Management for additional details on waste-to-energy.

3. Using a recycling facility for which recycling rates have been independently certified by a third part, such as the Recycling Certification Institute (recyclingcertification.org) provides assurance that diversion rates are accurate and that materials are actually being diverted from landfills. See MR Credit 2 Construction and Demolition Waste Management for more information on third-party validated C&D recycling facilities.

F. Intent

1. Divert construction, demolition, and land clearing debris from landfill disposal.
2. Redirect recyclable material back to manufacturing process.
3. Generate cost savings or increase minimal additional cost to Project for waste disposal.

1.4 SUBMITTALS

A. Section 013300 - Submittal Procedures: Requirements for submittals.

B. Construction Plan: Submit construction and demolition waste management plan describing methods and procedures for implementation and monitoring compliance including the following:
   1. Transportation company hauling construction waste to waste processing facilities.
   2. Recycling and adaptive reuse processing facilities and waste type each facility will accept.
   3. Construction waste materials anticipated for recycling and adaptive reuse.
   4. On site sorting and site storage methods.

C. Submit documentation with each application for payment substantiating construction waste management plan was maintained and goals are being achieved.
   1. Trash: Quantity by weight deposited in landfills. Include associated fees, transportation costs, container rentals, and taxes for total cost of disposal.
   2. Salvaged Material: Quantity by weight with destination for each type of material salvaged for resale, recycling, or adaptive reuse. Include associated fees, transportation costs, container rentals, and taxes for total cost of disposal. Also include reimbursements due to salvage resale.
   3. Total Cost: Indicate total cost or savings for implementation of construction waste management plan.

1.5 CLOSEOUT SUBMITTALS

A. Section 017000 - Execution and Closeout Requirements: Requirements for submittals.

B. Project Record Documents: Submit completed USGBC LEED NC 4.1 Letter Template indicating diverted waste quantity, total waste quantity and percentage of waste diverted from landfills.
1.6 CONSTRUCTION WASTE MANAGEMENT PLAN

A. Construction Waste Landfill Diversion: Minimum 75 percent by weight of construction waste materials for duration of Project through resale, recycling, or adaptive reuse.

B. Implement construction waste management plan at start of construction.

C. Review construction waste management plan at pre-construction meeting and progress meetings specified in Section 013000.

D. Distribute approved construction waste management plan to subcontractors and others affected by Plan Requirements.

E. Oversee plan implementation, instruct construction personnel for plan compliance, and document plan results.

F. Purchase Products to prevent waste by:
   1. Ensuring correct quantity of each material is delivered to site.
   2. Choosing products with minimal or no packaging.
   3. Requiring suppliers to use returnable pallets or containers.
   4. Requiring suppliers to take or buy-back rejected or unused items.

G. Create a final report on the total construction and demolition waste produced by the and the total waste diverted, using the following equation:

\[
\text{Diversion rate} = \left(\frac{\text{Total waste diverted from landfill}}{\text{Total waste produced by project}}\right) \times 100
\]

Units may be weight or volume but must be consistent throughout.

If the project team is pursuing the corresponding credit, see MR Credit Construction and Demolition Waste Management for additional requirements for the final waste report.

1.7 CONSTRUCTION WASTE RECYCLING

A. Use source separation method or co-mingling method suitable to sorting and processing method of selected recycling center. Dispose non-recyclable trash separately into landfill.

B. Source Separation Method: Recyclable materials separated from trash and sorted into separate bins or containers, identified by waste type, prior to transportation to recycling center.

C. Co-Mingling Method: Recyclable materials separated from trash and placed in unsorted bins or container for sorting at recycling center.

D. Materials suggested for recycling include:
   1. Packing materials including paper, cardboard, foam plastic, and sheeting.
   2. Recyclable plastics.
3. Organic plant debris.
4. Earth materials.
5. Native stone and granular fill.
6. Asphalt and concrete paving.
7. Wood with and without embedded nails and staples.
8. Glass.
11. Acoustical ceiling tile.
12. Carpet.

1.8 CONSTRUCTION WASTE ADAPTIVE RE-USE

A. Arrange with processing facility for salvage of construction material and processing for reuse. Do not reuse construction materials on site except as accepted by Owner and Architect/Engineer.

B. Materials suggested for adaptive reuse include:
   1. Concrete and crushed concrete.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION

3.1 CONSTRUCTION WASTE COLLECTION

A. Collect construction waste materials in marked bins or containers and arrange for transportation to recycling centers or adaptive salvage and reuse processing facilities.

B. Maintain recycling and adaptive reuse storage and collection area in orderly arrangement with materials separated to eliminate co-mingling of materials required to be delivered separately to waste processing facility.

C. Store construction waste materials to prevent environmental pollution, fire hazards, hazards to persons and property, and contamination of stored materials.

D. Cover construction waste materials subject to disintegration, evaporation, settling, or runoff to prevent polluting air, water, and soil.

3.2 CONSTRUCTION WASTE DISPOSAL

A. Deliver construction waste to waste processing facilities. Obtain receipt for deliveries.

B. Dispose construction waste not capable of being recycled or adaptively reused by delivery to landfill, incinerator, or any legal disposal facility. Obtain receipt for deliveries.
3.3 APPENDICES

A. Complete the appended Construction Waste Management forms prior to the start of Work, with periodic revisions as needed to document variations from Construction Waste Management Plan. Provide updated copies of form CWM-7 with each application for payment.

B. List of Appendix Documents:
   1. CWM-1: Construction Waste Identification.

END OF SECTION
SECTION 111319 - STATIONARY LOADING DOCK EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Edge-of-dock loading dock levelers.

B. Related Requirements:
   1. Section 055000 "Metal Fabrications" for loading dock platform edge channels.

1.3 DEFINITIONS

A. Operating Range: Maximum amount of travel above and below the loading dock level.

B. Working Range: Recommended amount of travel above and below the loading dock level for which loading and unloading operations can take place.

1.4 COORDINATION

A. Coordinate size and location of loading dock equipment indicated to be attached to or recessed into concrete or masonry, and furnish anchoring devices with templates, diagrams, and instructions for their installation.

B. Coordinate installation of cast-in-place items. Furnish setting drawings and templates.

1.5 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.
   1. Inspect and discuss electrical roughing-in, equipment bases, and other preparatory work specified elsewhere.
   2. Review sequence of operation for each type of loading dock equipment.
   3. Review coordination of interlocked equipment specified in this Section and elsewhere.
   4. Review required testing, inspecting, and certifying procedures.
1.6 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for stationary loading dock equipment.
   2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings: For stationary loading dock equipment.
   1. Include plans, elevations, sections, and attachment details.
   2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of anchors and each field connection.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For stationary loading dock equipment to include in operation and maintenance manuals.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.
   1. Maintenance Proximity: Not more than [one] [two] <Insert number> hours' normal travel time from Installer's place of business to Project site.

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

1.9 FIELD CONDITIONS

A. Field Measurements: Verify actual dimensions of construction contiguous with stationary loading dock equipment, including height of loading dock, by field measurements before fabrication.

1.10 WARRANTY

A. Manufacturer's Special Warranty: Manufacturer agrees to repair or replace dock levelers that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
a. Structural failures including cracked or broken structural support members, load-bearing welds, and front and rear hinges.
b. Faulty operation of operators, control system, or hardware.
c. Deck plate failures including cracked plate or permanent deformation in excess of 1/4 inch between deck supports.
d. Hydraulic system failures including failure of hydraulic seals and cylinders.

2. Warranty Period for Structural Assembly: 1 year from date of Substantial Completion.

3. Warranty shall be for unlimited usage of leveler for the specified rated capacity over the term of the warranty.

PART 2 - PRODUCTS

2.1 EDGE-OF-DOCK LOADING DOCK LEVELERS

A. General: Surface-mounted, hinged-lip-type, edge-of-dock levelers designed for permanent installation on face of loading dock platform; of type, function, operation, capacity, size, and construction indicated; and complete with controls, safety devices, and accessories required.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. Blue Giant Equipment Corporation.
   b. Kelley; An Entrematic brand.
   c. DLM; A Division of Systems Inc..

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Standard: Comply with MH 30.1, except for structural testing to establish rated capacity.

D. Rated Capacity: Capable of supporting total gross load of 20,000 lb without permanent deflection or distortion.

E. Platform Ramp Width: 72 inches.

F. Hinged Lip: Manufacturer’s standard thickness to meet load requirements, nonskid steel tread plate.

G. Function: Dock levelers shall compensate for differences in height between truck bed and loading platform.

1. Vertical Travel: Operating range above platform level of sufficient height to enable lip to extend and clear truck bed before contact with the following minimum working range:

   a. Above Adjoining Platform: 5 inches.

2. Lip Operation: Manufacturer's standard mechanism, which automatically extends and supports hinged lip on ramp edge with lip resting on truck bed over dock leveler's working range, allows lip to yield under impact of incoming truck and automatically retracts lip when truck departs.

   a. Length of Lip Extension: Not less than 12 inches from face of dock bumpers and not less than 15 inches measured from ramp edge.

H. Mechanical Operating System: Manual control; counterbalance and spring operation.
   Spring-operated raising and walk-down lowering of unloaded ramp. Equip leveler with a torsion-spring counterbalancing mechanism controlled by a hold-down device.

   1. Lever Handle: Self-storing lever handle for raising unloaded ramp with minimal lifting force by pulling lever back to extend lip and pushing lever forward to lower ramp and lip.
   2. Removable Lifting Handle: For raising unloaded ramp by lifting action.

I. Integral Molded-Rubber Dock Bumpers: Fabricated from 6-inch thick, heavy molded-rubber compound reinforced with nylon, rayon, or polyester cord; with Shore A durometer hardness of 80, plus or minus 5, when tested according to ASTM D2240. Provide two dock bumpers for each recessed dock leveler, attached to face of loading dock with expansion bolts.

J. Materials:

   1. Steel Plates, Shapes, and Bars: ASTM A36/A36M.
   2. Rolled-Steel Floor Plate: ASTM A786/A786M, rolled from steel plate complying with ASTM A572/A572M, Grade 55.
   4. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

K. Dock-Leveler Finish: Manufacturer's standard prime-paint or baked-on factory finish.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for electrical systems for loading dock equipment to verify actual locations of connections before equipment installation.

C. Examine walls and floors of pits for suitable conditions where recessed loading dock equipment is to be installed. Pits shall be plumb and square and properly sloped for drainage from back to front of loading dock.
D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Set curb angles in concrete edges of dock-leveler recessed pits with tops flush with loading platform. Fit exposed connections together to form hairline joints.

B. Set curb angles in concrete edges of truck-leveler recessed pits with tops flush with driveway. Fit exposed connections together to form hairline joints.

C. Clean recessed pits of debris.

3.3 INSTALLATION, GENERAL

A. Install loading dock equipment as required for a complete installation.
   1. Rough-in electrical connections.

3.4 INSTALLATION OF EDGE-OF-Dock LOADING DOCK LEVELERS

A. Attach dock levelers to loading dock platform in a manner that complies with requirements indicated for arrangement and position relative to top of platform.
   1. Weld anchor holes in contact with continuous embedded loading dock edge channel. Weld or bolt bumper blocks to face of loading dock.

3.5 ADJUSTING

A. Adjust loading dock equipment to function smoothly and safely, and lubricate as recommended by manufacturer.

B. Test dock levelers for vertical travel and adjust to maintain operating range indicated.

C. After completing installation of exposed, factory-finished loading dock equipment, inspect exposed finishes and repair damaged finishes.

3.6 MAINTENANCE SERVICE

A. Beginning at Substantial Completion, maintenance service shall include 12 months' full maintenance by skilled employees of loading dock equipment Installer. Include preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper loading dock equipment operation at rated speed and capacity. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
3.7 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain loading dock equipment.

END OF SECTION 111319
PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Wood Laboratory Casework and Tables (Alternate #8)

B. Metal Laboratory Casework
   1. Metal Laboratory Casework and Tables (Alternate #8)
   2. Mobile Bench

C. Metal Laboratory Casework with Wood Door and Drawer Fronts and Tables (Alternate #8)

D. Special Laboratory Casework

E. Solid Phenolic Laboratory Casework

F. Cabinet Hardware

G. Narcotics Wall Cabinet

H. Laboratory Work Surfaces

I. Shelving Assemblies

J. Cylinder Restraint Assembly

K. Overhead Service Carriers

L. Cable Tray System

M. Utility Ceiling Tile

N. Laser Shelf

O. Pipe Drop Enclosure

P. Drying Rack

Q. Lattice Rod Assembly

R. Cable / Vacuum Line Through Port

S. Grommets and Accessories

T. Pegboard

U. Finish for Miscellaneous Wood Items

V. Metal Fabrications
W. Stainless Steel Fabrications
   1. Work Surfaces
   2. Laboratory Sinks and Cup Sinks
   3. Scullery Sinks
   4. Autoclave/Equipment Enclosure Panels

X. Mop Holder

Y. Fold-Down Write up Station

Z. Slotted Channel Framing (Strut)

AA. Sealant

1.2 RELATED SECTIONS

A. Division 01: Mockups

B. Division 09: Flooring (wall base)

C. Section 115313: Fume Hoods and Other Air Containment Units

D. Section 115343: Laboratory Service Fittings and Fixtures

E. Section 116150: Controlled Environment Rooms

F. Division 22: Plumbing

G. Division 23: Heating, Ventilated, and Air Conditioning (HVAC)

H. Division 26: Electrical

I. Division 27: Communications

1.3 REFERENCES


H. Scientific Equipment and Furniture Association: SEFA 8-M Recommended Practices for Laboratory Grade Metal Casework.

I. Scientific Equipment and Furniture Association: SEFA 10 Adaptable Laboratory Furniture Systems Recommended Practices.

J. Underwriters Laboratory: UL61010-1 Electrical Equipment for Laboratory Use.

K. Underwriters Laboratory: UL962 Standard for Commercial Furnishings.


1.4 SUBMITTALS

A. Refer to General Conditions and Division 1 “Submittal Procedures” for submittal requirements. In addition to these requirements, provide submittal requirements specified herein.

B. Submittal requirements:

1. Submittal shall be prepared individually for this specification section. Arrange product data, drawings and information for submission in a complete set for this specification section.
   a. Shop drawings and product data as applicable for required mockups may be submitted separately and should be expedited for submittal as soon as the contract is awarded.
   b. Shop drawings may be submitted on a floor-by-floor (building-by-building) basis. However, product data and details shall not be submitted redundantly with each submission.

2. Submittal shall contain complete data for all items of this specification section. Periodic or partial submittals of individual components within this specification section will be returned as incomplete and rejected.

3. Submittals shall be organized by specification sequence with section and paragraph number identified.

4. Equipment and components being proposed shall be clearly labeled with all options and accessories indicated and shall be for this specific project. All non-applicable items shall be deleted or struck.

5. Product data submittals provided in PDF format shall consist of fully collated PDF files allowing for collated printing from a single file.
6. Shop drawings shall meet the requirements of the Architectural Working Standards (AWS), except in cases where stricter requirements are identified in this section.

C. Materials List/Product Data: Submit complete materials list, including catalogue data, of all materials, equipment, and products for work in this section.
   1. Product data shall not be duplicative or redundant with shop drawings. Do not include drawings in the product data submittal that are included in the shop drawings.

D. Shop Drawings: Submit complete shop fabrication and installation drawings, including plans, elevations, sections, details and schedules.
   1. Show relationship to adjoining materials and construction.
   2. Show seaming pattern layout of all joints in work surfaces.
   3. Shop Drawings shall be in the form of reproducible, PDF files, or photocopies, to scale, sheet size not to exceed 11 inches by 17 inches (A3).
   4. Shop drawing submittals provided in PDF format shall consist of fully collated files allowing for collated printing from a single file. Blueline prints are not acceptable.

E. Approved Substitution/Approved Equal: In addition to the items required in Division 1, all substitution requests shall include item-by-item comparison of the proposed substitution to this project specification. A copy of the project specification shall be submitted, with each item and subsection of the project specification marked as “Comply” or “Not Comply.” In any cases where “Not Comply” is indicated, an explanation of the relative advantages of the proposed design shall be provided.
   1. Substitution shall not affect dimensions shown on Drawings.
   2. The Contractor shall pay for changes to the building design, including engineering design, detailing, utility and service requirements, and construction costs caused by the requested substitution.
   3. Substitutions shall have no adverse effect on other trades, the construction schedule, or specified warranty requirements.
   4. Maintenance and service parts shall be locally available for the proposed substitution.

F. LEED Submissions: Provide documentation and certification as required relative to the work of this section to support the project’s submission to the USGBC for the credits indicated below.

G. Submit detailed anchorage and attachment drawings provided by a licensed Structural Engineer complying with applicable codes, regulations, and guidelines in the state of installation.

H. Samples: Accompanying Materials List, submit for Architect's approval two (2) samples of each type of specified finish and color range available for casework, laboratory work surfaces, painted steel fabrications, cabinet hardware, and shelving.

I. Certifications/Test Data: Submit certifications and test data as required elsewhere in this section, including SEFA structural performance test reports, and finish performance test reports.

J. Operations/Maintenance Manuals: At project close-out, submit for Architect's review and Owner's use, complete operating and maintenance manuals that describe proper operating procedures, maintenance and replacement schedules, components parts list, and closest factory representative for components and service.
K. Warranty: Submit manufacturer’s warranty including any additional certifications as needed to meet the requirements specified.

1.5 MOCKUP

A. Provide and install products within this scope of work as part of the laboratory mockup, as indicated on the drawings. Refer to room 426.

B. Location of mockup: In an off-site location near the project site, provided by the Owner.

C. Disposition of mockup:
   1. Mockup items may be incorporated into the final project subject to approval and/or corrections as identified in the mockup review.
   2. Mockup items will remain the property of the laboratory subcontractor.

D. The mockup will be reviewed and appropriate comments documented. The mockup – and the associated comments - will become a quality sample against which the remainder of the product installation will be compared.

E. Coordinate delivery, installation, and review of the mockup with the contractor. The mockup should be complete and reviewed prior to fabrication of the remainder of the project. To the extent that the subcontractor elects to fabricate the project prior to review and approval of the mockup, it is understood that this is “at risk” and items may require re-fabrication to address issues that arise from the mockup review.

1.6 PRODUCT HANDLING

A. Protection: Use all means necessary to protect work of this section before, during and after installation including installed work and materials of other trades.

B. Replacement: Any damaged work shall be replaced, repaired and restored to original condition to the approval of the Architect at no additional cost or inconvenience to the Owner.

1.7 ENVIRONMENTAL CONDITIONS

A. It is the responsibility of the general contractor to provide appropriate environmental conditions within the laboratory spaces throughout the period of installation of wood and composite wood casework products until substantial completion of the project and turnover to the owner. The relative humidity standards as delineated by the Architectural Woodwork Standards should be followed.
   1. Humidity must be controlled between 25% and 55% in all areas where laboratory casework is stored and/or installed.
   2. The range of relative humidity change should not exceed 30 percentage points.

B. It is the responsibility of the laboratory furniture subcontractor to assess building environmental conditions prior to the delivery and installation of laboratory casework. Wood laboratory casework shall not, under any circumstances, be installed in spaces which do not comply with the requirements outlined above.
1.8 QUALIFICATIONS

A. Work in this section shall be manufactured by and installed by a company/companies having a minimum of eight years documented experience providing and installing products similar to those specified in laboratory applications; an established organization; and production facilities including all tools, equipment and special machinery necessary for specializing in the fabrication and installation of the type of products specified, with skilled personnel, factory trained workmen and an experienced engineering department. Each shall have the demonstrated knowledge, ability and the proven capability to produce the specified work of the required quality and the proven capacity to complete an installation of this size and type within the required time limits.

1.9 ENVIRONMENTAL COMPLIANCE

A. Certified Wood: All wood products used in the fabrication shall comply with the FSC’s (Forest Stewardship Council’s) Principles and Criteria as required to contribute towards USGBC LEED MR Credit 7.

   1. All lumber shall come from forestry sources that are certified under the Forestry Stewardship Council’s (FSC) Forest Management Certification program.
   2. The casework manufacturer must have FSC Chain-of-Custody (COC) Certification.
   3. Documentation:
      a. Provide manufacturer’s Chain of Custody Certification.
      b. Provide documentation of the cost, volume, and weight of all wood products provided for this project, including any non-FSC wood products or components.
      c. Provide documentation of the cost, volume, and weight of FSC wood products provided for this project.
      d. In the case of assemblies where some components are FSC-certified and other components are not – provide separate cost, volume, and weight information for each assembly component.

B. Low-Emitting Materials – Composite Wood and Agrifiber Products: Composite wood and agrifiber products used in casework products shall contain no added urea-formaldehyde resins, as required to meet USGBC LEED IEQ Credit 2.

   1. Laminating adhesives used to fabricate on-site and shop-applied composite wood and agrifiber assemblies shall contain no added urea-formaldehyde resins.
   2. Provide certification as required.

1.10 WARRANTY

A. All products shall be warranted to be free from defects in materials and workmanship for a period of one year following substantial completion. The manufacturer/dealer/subcontractor shall repair or replace any products (or parts thereof) that are found to be defective. Replacement will include any parts, labor, shipping, and travel expenses involved. Warranty replacement work must be scheduled in coordination with the Owner’s academic/research schedule, and may therefore require evening and/or weekend work.
PART 2 - PRODUCTS

2.1 WOOD LABORATORY CASEWORK AND TABLES

A. Manufacturers: Products complying with this specification may be provided by the following manufacturers. All products specified in this section shall be the provided by a single manufacturer.

1. CiF Lab Solutions, 53 Courtland Avenue, Vaughan, Ontario, Canada L4K 3T2 Tel: 905 738-5821.
2. Diversified Woodcrafts, Inc., 300 South Krueger Street, Suring, WI 54174 Tel: 920 842-2136.
3. ICI Scientific, 1865 Highway 641 North, Paris, TN 38242-8814 Tel: 731-642-4251.
4. Kewaunee Scientific Corporation, P O Box 1842, Statesville, NC 28687 Tel: 704 873-7202.
5. Mott Manufacturing Ltd., 452 Hardy Road, P. O. Box 1120, Brantford, ON, Canada N3T 5T3 Tel: 519 752-7825.
6. Approved substitution.

B. Quality Standards:

1. Wood casework shall comply with all requirements of AWS Custom Grade architectural cabinets, unless otherwise specified in this section.
2. Door and drawer design: Square edged full flush overlay design with eased edges. Applied panels may be required in areas such as sink cabinets and knee spaces with pencil drawers to complete the flush construction. Reveals shall be within the ranges indicated below; however, they shall be consistent across a given project.
   a. Reveal from top of door/drawer fronts to top of cabinet: 3/32 inch to 3/8 inch.
   b. Reveal from bottom of door/drawer fronts to bottom of cabinet bottom panel: Flush.
   c. Horizontal and vertical reveals between door and drawer fronts: 3/32 inch to 3/16 inch.
   d. Vertical reveal between side of door and drawer fronts and the side of the cabinet: one-half of the typical horizontal and vertical reveal.
3. Pulls on doors shall be mounted vertically and on drawers horizontally.
4. Grain Pattern:
   a. Vertical Matched Grain Pattern: Grain pattern on all exposed surfaces shall be vertical. Entire cabinet front must be cut from a single panel.
5. Toe Kicks/Toe Spaces:
   a. All tall storage cabinets to have toe space to match base units.
   b. Provide toe spaces at all fully-exposed sides of cabinets, including locations such as the end of island benches, the end of peninsula benches, and outside-corner cabinets. Toe spaces shall run continuously through all items such as knee opening side panels and end panels.
6. Full-Flush Construction and Installation: All finished panels and surfaces shall be in the same plane as the front of cabinet doors/drawers to provide a true flush overlay appearance.
a. Filler panels: Provide filler panels where casework units meet perpendicular walls to create a continuous appearance.

   1). Full-flush end-of-run filler panels are required at all conditions where the joint width is one inch or larger. At conditions where the joint width is less than one inch, filler panel should be flush with cabinet body.

b. Flush panels: Provide fixed fully-edgebanded flush panels at sink cabinets, knee opening drawer units, filler panels, and elsewhere, so that all finished panels are in the same plane as cabinet doors and drawers to provide a true flush overlay appearance.

c. Applied panels may be required in areas such as sink cabinets and knee spaces with pencil drawers to complete the flush construction.

d. At outside corners, align side panel of cabinet with the face of the door of adjacent cabinet.

e. At inside corners, mount filler panels flush with face of adjacent cabinet doors.

f. At open cabinets (without doors), at knee opening side panels, and similar conditions, align face of cabinet with face of adjacent cabinet door. Adjust the depth of the cabinet and toe kick accordingly.

g. Align other filler panels and applied panels with face of adjacent cabinet doors.

h. Align face of end panels and knee-opening side panels with face of adjacent cabinet doors.

i. Provide filler/trim panels at locations where undercounter dishwashers or glasswashers are shown and the units provided do not completely fill the opening indicated.

j. Where knee openings are located against a wall, provide a side/end panel against the wall.

k. Filler panels shall follow the profile of toe kicks.

7. Flush interiors: Set cupboard bottom flush with front-end facers. Surface mounted bottoms and offsets caused by front face frames that interfere with ease of cleaning are not acceptable.

8. Suspended casework: Provide as detailed on Laboratory Furnishing drawings for suspended casework units:

   a. Finish back on all cases.

   b. Do not provide toe base. Provide full bottom panel.

   c. Fixings and fastenings necessary for its attachment to the supporting structure.

9. Widths of drawer bodies in knee opening rails shall not be less than 18 inches (457 mm). As noted above, applied panel shall be provided to complete the flush construction on either side of the drawer head.

C. Materials and Finishes:

   1. Wood:

      a. Definition of cabinet components by surface visibility:

         1). Exposed Surfaces:
RESEARCH FACILITIES DESIGN

SECTION- 115310

LABORATORY CASEWORK & OTHER FURNISHINGS

PAGE 9

05/16/19 JGL  FOUNDATIONAL SCIENCES BUILDING  17099.000
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a). Surfaces exposed when doors and drawers are closed.
b). Surfaces visible when behind glass doors, including tops and bottoms of shelves.
c). All exterior surfaces of suspended casework.
d). Open units.
e). Bottoms of cabinets if 42 inches (1070 mm) or more above finished floor.
f). Tops of cabinets if less than 72 inches (1830 mm) above finished floor.
g). Front rail of web frames.

2). Semi-exposed surfaces:

a). Surfaces that are visible when solid (opaque) doors are open or drawers are extended, including backs of doors.
b). Tops of cabinets 72 inches (1830 mm) or more above finished floor when visible from an upper level.

3). Unexposed surfaces:

a). Surfaces not normally visible after installation with doors open and drawers extended.
b). Bottoms of cabinets less than 30 inches (750 mm) above finished floor.
c). Tops of cabinets over 78 inches (1980 mm) above finished floor and not visible from an upper level.

b. Wood Species and Veneer Cut: Provide materials that are selected and arranged for compatible grain and color. Do not use materials adjacent to one another that are noticeably dissimilar in color, grain, figure, or natural character markings.

c. Maple:

1). Lumber:

a). Exposed and semi-exposed: Plain sawn Maple, NHLA Grade FAS.
b). Unexposed: Select grade hardwood of a species suitable for the specified purpose.
c). All lumber shall be clean and free of defects; kiln and air dried to uniform moisture content of 6 percent.

2). Veneer:

a). Exposed: Plain sliced white select maple, grade A. Thickness: 1/50 inch (0.5 mm), minimum.

(1). Color and Matching:

(a). 100% sapwood, no heartwood allowed.
(b). Slight color streaks or marks.
(c). Slight color variation.
(d). No sharp contrast at veneer joints.

(2). Natural Characteristics:
(a). Small conspicuous burls: combined average not to exceed 4 per 10 square feet (1 m²).
(b). Conspicuous burl size: 3/8 inch (9.5 mm), maximum.
(c). Conspicuous pin knots: combined average not to exceed 4 per 32 square feet (3 square meters). Maximum pin knot size – dark part: 1/8 inch (3.2 mm). Maximum pin knot size – total: ¼ inch (6.4 mm).
(d). Scattered sound repair knots, bark pockets: not allowed.
(e). Slight mineral streaks, worm tracks, cross bars and vine marks.

(3). Manufacturing Characteristics:

(a). Rough cut or ruptured grain is not allowed.
(b). Blended repaired tapering hairline Splits: two 1/16 inch (1.6 mm) x 6 inch (152 mm) on end panels only.

(4). Repairs: Small blending allowed.
(5). Flitch Width, Face Components: 5 inches minimum, except for outside components.

b). Semi-Exposed: Plain sliced white select maple Grade B sapwood – no heartwood allowed.
c). Unexposed: Plain sliced hardwood veneer.

2. Plywood

a. Typical, Unless Otherwise Noted: Hardwood Veneer Plywood

1). Product shall be provided with hardwood face veneers as specified above.
2). Plies:
   a). ¾ inch (19 mm): minimum 7-ply, including face veneers.
   b). 1 inch (25 mm): minimum 9-ply, including face veneer.

3). Physical Properties:

   a). Screwholding: 355 lb at face.
   b). Average modulus of rupture: 7346 psi (50.65 N/mm²).

b. Drawer and Door Fronts: ANSI A208.1 M3 Grade Industrial Particleboard Core Plywood.

1). Product shall be provided with hardwood face veneers as specified above.
2). Plies:
   a). 3-ply, including face veneers.

3). Minimum Physical Properties:
a). Screwholding: 247 lbs at face, 225 pounds at edge.
b). Average modulus of rupture: 2,393 lb/in2.
d). Hardness: 500 lbs.

c. Drawer box back, front and sides: Finnish or Baltic Birch Plywood

3. Hardboard: Dry process S2S hardboard made from compressed exploded wood fibers.
4. Edgeband/Facer: 1/8 inch (3 mm) hardwood; species as described above.
5. Dowels: 8 mm, diameter, minimum, hardwood, laterally fluted with chamfered ends.
6. Glue: Type 2 or Type 3 water resistant glue with gluing done in clamps and jigs.
7. Finish for Wood Laboratory Components:

a. All wood components shall be fully sanded on all surfaces including the underside of exposed components, glazed door element inside edges, penetrations for the attachment of drawer heads, screws attaching adjacent cabinets, cutouts at grilles, and all other such locations. The final installation shall present no rough, splintered, or unfinished surfaces at any visible, exposed, semi-exposed, or touchable locations. This does not apply to components of surfaces which will be fully concealed in the final installation.
b. Finish processes (stains and finishes) shall be by means of compression spray or a UV roll coater, providing high-transfer efficiency low waste generation. Solvent applied coatings are not acceptable and will not be considered. Manufacturer shall supply documentation that waste generated during the finishing process, is a non-hazardous material, eliminating liquid waste disposal in landfills.

1). Chemically Resistance Finish: Finish for all wood products shall be environmentally friendly, highly chemically resistant, water-borne, laboratory-grade finish that satisfies the requirements specified herein for chemical and durability resistance. A letter from a third-party validator, verifying independent test results, shall be submitted.
2). Operator Protection: The application shall be convenient and easily mastered, in a custom spray booth. The finish process shall be cleanly contained and shall have no solvent odor, and shall be applied in an air-conditioned room.
3). VOC Emissions: Water-borne finishes shall be sprayed and cured with a near zero (2.0 lbs. per gallon for ‘clean finish’) VOC (Volatile Organic Compounds) emissions.
4). Offgasing: After all wood products have cooled from the curing ovens, the coating shall be firm and stable. No further emissions or “Offgasing/Decomposition” vapors shall occur at room temperature.

c. Manufacturer may uses either of the following finish systems:

1). Customized, high-solids, cross-linked, ultraviolet light (UV)-cured coating developed for durability, including abrasion, chemical, impact, and scratch resistance, for flat-line applications. Coatings shall have little or no VOCs.
2). Chemical-resistant modified acrylic urethane finish with built-in UV blocker, or equal, applied over permanent wood stain.

d. Stain Color: Stain color to match Architect’s sample.
e. Application:

1). Finish application and sequence shall be as recommended and designed by the manufacturer for a high quality, laboratory-grade wood casework finish.

2). Preparation: Sand exposed and semi-exposed surfaces smooth, free from dirt and defects.

3). Stain application: Apply stain of color selected to all exposed and semi-exposed casework surfaces. Apply in a manner to achieve a match with the selected color sample upon completion of application of the finish.

4). Finish application: Apply chemical resistant top finish to all stained surfaces. Apply to doors after any notching for hinges has been performed. Finished surfaces shall be even, water-clear and bright. Cloudy or muddy finishes carrying tinting pigments will not be acceptable.

8. Glass: Framed glass doors:

a. 1/8 inch (3mm) to 7/32 inch (5.5 mm) nominal tempered glass.

b. Without imperfections or marred surfaces.

c. All glass should have etched safety information, readable from outside the cabinet.

D. Construction:

1. Base Cabinets:

a. Assembly: Dowel and/or mortise-and-tenon joinery secured with countersunk screws and pressure-glued.

b. Cabinet Top:

1). Front rail of ¾ inch plywood x 2¼ inches (57 mm) or 1 inch (25 mm) x 3 inches (76 mm) hardwood. Back rail: ¾ inch plywood or hardwood, 3-3/4 inches tall.

2). At mobile cabinets (and other cabinets where tops are exposed): full ¾ inch plywood top with chemical-resistant plastic laminate, as specified below, set inside cabinet sides and back. Color to be selected by Architect.

c. Cabinet Bottom: ¾ inch (19 mm) thick plywood. Set flush and join to cabinet end panels. Front edge shall be edgebanded.

d. Cabinets Ends/Sides and Backs Exposed to View from the Outside: ¾ inch (19 mm) thick plywood.

1). Side panels and end panels: edgeband front edge and bottom edge.

e. Cabinet Backs, Exposed to View from the Inside at Open Units and Units with Glazed Doors: 1/4 inch (19 mm) thick veneer core plywood.

f. Cabinet Back, Semi-Exposed and Unexposed:

1). Removable hardboard, 1/4 inch (6 mm) thick.

2). Sink base back shall be half-height construction to allow for plumbing and sink waste connection.

3). Provide split back on drawer cabinets.
g. Cabinet Base: 3¾ inches (95 mm) x ¾ inch (19 mm) front hardwood or veneer core plywood toe space rail, mounted between end panels, forming a 4 inch (102 mm) high x 2½ inch (63 mm) deep toe space, closed to cupboard bottom. Secure rails to cabinet end panels.

1). If veneer core plywood option is used, edgeband bottom edge for moisture protection.

h. Shelves: 1 inch (25 mm) thick full-depth, 9-ply hardwood plywood. Full-depth is defined as a shelf whose front edge is within ½ inch (13 mm) of the face of the cabinet when the shelf is fully back in the cabinet.

1). Front edge of fixed shelves shall be edgebanded.
2). All edges of removable shelves shall be edgebanded.
3). Pull-Out Shelves: Construction shall be similar to drawer body mounted on a full-extension pull-out slide, with ½ inch (12 mm) hardwood plywood bottom.
4). Shelf Adjustment: All shelves shall be adjustable on 32 mm centers.
5). Shelf Tolerance: Shelves shall fit into cabinets or into shelf supports with a tolerance of 1/16 inch per side maximum.

i. Drawer construction:

1). Drawer box back, front and sides shall be of ½ inch (13 mm), 9-ply Finnish or Baltic Birch veneer plywood, with eased top edge, finished with a Gloss Level 7 polyester acrylic finish. The top edges of the completed drawer bodies shall be very smooth to the touch and shall not present any rough or splintered surfaces. Sides shall be full height with 1 inch (25 mm) clearance to frame opening. Drawers shall be a minimum of 18 inches front to back.
2). Acceptable drawer joinery options:
   a). Dowel: Glued under pressure; 32 mm, minimum, dowel spacing to 4 inches (102 mm) high, 64 mm dowel spacing above 4 inches (102 mm).
   b). Multiple Dovetail: Tight fitting and glued.

3). Drawer bottom shall be Baltic Birch veneer plywood. Bottom shall be grooved into the 4 sided drawer box and sealed with hot melt glue process around entire drawer bottom perimeter.
   a). Drawers up to 24 inches wide: 3/8 inch (9 mm) thick 7-ply Baltic Birch veneer plywood.
   b). Drawers greater than 24 inches wide: 1/2 inch (13 mm) thick 9-Ply Baltic Birch veneer plywood.

j. Pull-Out Writing Boards: 1 inch plywood top with chemical-resistant plastic laminate on top surface and balancing liner on bottom surface. Color to be selected by Architect. Edgeband sides with wood edgebanding. Provide head as specified below.

k. Door and Drawer Heads: shall be ¾ inch (19 mm) thick plywood with edgebanding. Edges shall be as specified previously in this section. Drawer heads shall be screwed to drawer box.
l. Flush Panels: As described in the Design Requirements section of this specification.
m. Vertical Dividers: Full height dividers shall be 1 ½ inch (38 mm) thick plywood. Edgeband exposed edge.
n. Front Horizontal Intermediate Rail: ¾ inch (19 mm) x 1 ½ inches (38 mm) exposed hardwood rail shall be provided between doors and drawers. Secure to cabinet end panels.
o. Front Horizontal Intermediate Rail: ¾ inch (19 mm) x 1 ½ inches (38 mm) exposed hardwood rail shall be provided between doors and drawers. For all drawer units at benches where service fitting connections are not accessible via an adjacent knee opening filler or cabinet filler panel, drawer units to be provided with Keku fasteners (Keku fasteners not required at other locations). The drawer unit intermediate horizontal and vertical box frames must be removable. These components shall be assembled with Keku suspension fittings as manufactured by Häfele America Co. or approved so these members are easily removable at any time with no special tools to gain access to concealed piped services behind.
p. Intermediate Back Rail: 1 ½ inch (38 mm) x ¾ inch (19 mm) hardwood lumber to accept hardboard security panel between drawers.
q. Security Panels: Provide hardboard security panels, 1/8 inch (3 mm) thick, in frames when keyed-different locks are specified, or where individual padlock hasps are indicated. Inset security panel into frame on all four sides.

2. Wall, upper and tall cases:
   
a. Shall be manufactured with materials and joinery methods as specified for base units, unless otherwise indicated.
b. Edgebanding:
   
   1). Wall cabinet side and end panels: Edgeband front and bottom edges.
   2). Wall cabinets side panels: Edgeband front and bottom edges. Wall cabinet end panels: Edgeband front, bottom, and top edges.
   3). Wall cabinet end and side panels: Edgeband front, bottom, and top edges.
   4). Wall cabinets: Fabricate underside of wall cabinets to comply with AWI type “B” flush configuration (refer to AWI 2005 Quality Standards). Edgeband front and top edges of all side and end panels.
   5). Edgeband front and top edges of upper cabinet side and end panels.
   6). Edgeband front, top, and bottom edges of tall cabinet side and end panels.

c. Cabinet Interior Backs: 1/4 inch thick veneer core plywood, typical for all exposed, and semi-exposed interior backs.
d. Hardwood plywood tops: 1 inch (25 mm) thick with front edge edgebanded.
e. Wall and upper case hardwood plywood bottoms: 1 inch (25 mm) thick. Tall case hardwood plywood bottoms ¾ inch (19 mm) thick. Edgeband front edges.
f. Bottom hardwood kick rail on tall cases: 3 ¾ inches (95 mm) x ¾ inch (19 mm) front hardwood or veneer core plywood toe space rail, mounted between end panels, forming a 4 inch (102 mm) high x 2 ½ inch (63 mm) deep toe space, closed to cupboard bottom. Secure rails to cabinet end panels.
g. Valance: 3/4 inch (19 mm) thick x 1 ¼ inch (32 mm) tall hardwood.
h. Solid doors shall be the same construction as specified for base cabinets.
i. Framed-glazed doors: Hardwood construction, ¾ inch (19 mm) x 2 ¼ inch (70 mm) machined to accept glass. Ease all edges, interior and exterior, including those that
frame the glazing. Provide extruded vinyl retaining molding on interior designed so glass can be replaced without tools.

j. Shelves: 1 inch (25 mm) thick full depth, 9-ply hardwood plywood. Full-depth is defined as a shelf whose front edge is within ½ inch (13 mm) of the face of the cabinet when the shelf is fully back in the cabinet.

1). Front edge of fixed shelves shall be edgebanded.
2). All edges of removable shelves shall be edgebanded.
3). Shelf adjustment:
   a). Wall units: All shelves shall be adjustable on 32 mm centers.
   b). General purpose tall units: One fixed shelf. All others shall be adjustable on 32 mm centers.

3. Wood-Framed Laboratory Tables
   a. Tops: Refer to Laboratory Furnishing drawings for top materials, as described in the Laboratory Work Surfaces section.
      1). Tops shall be mechanically attached to the table frame with a minimum of six concealed metal angle brackets screwed into the inside of the table frame and the bottom of the work surface. Metal angle bracket may be stainless steel, zinc-coated steel, or powder-coated steel. Screws shall be dome-head, with a minimum size of No. 5, ½ inch long, or otherwise sufficient to firmly and permanently secure the benchtop to the table frame allowing that the table may be picked up by the top.
   b. Electrical receptacles: Tables shown with electrical receptacles shall be pre-wired including cutouts for electrical receptacles, black cord, 90-degree NEMA 5-20P plug, back boxes, gray NEMA 5-20R decora-style electrical receptacles, stainless steel faceplates, wiring, and junction boxes as required for a complete functional assembly.
      1). The first electrical device wired from the main cord shall be a 20-amp GFCI outlet with downstream protection capability.
      2). Ensure wiring to downstream receptacles is connected to the downstream outlets such that GFCI protection is provided to downstream outlets.
      3). Cover plates of downstream outlets to be engraved to note that GFCI protection is provided via upstream receptacle.
      4). UL Listing: Tables shall be tested and labeled per one of the following UL standards: UL61010-1 or UL962.
   c. Leveling Glide and Leg Shoe: Each leg other than those fitted with casters, shall have leveling glides and leg shoes.
      1). Leveling glides: (2 inch) (48 mm) diameter, two-piece pivot construction, steel housing, non-marring, phenolic or translucent plastic insert, (1/2 inch) (12 mm) diameter, minimum (1 1/2 inch) (36 mm) long zinc plated stems. Each glide shall have a load bearing capacity of 150 lbs.
      2). Leg shoe: Black coved vinyl or rubber leg shoe, 2 inches (50 mm) in height.
d. Casters: Where indicated on Laboratory Furnishing drawings, provide sets of 3 ½ inch (89 mm) diameter wheels with self-lubricating bearing, rated to carry 250 pounds (113 kg) minimum each. Each caster must swivel and have a locking brake at front wheels. Wheel shall be of molded polyurethane tread mechanically locked to a polyolefin core. Moveable tables to have all 4 swivel and locking casters.

e. Table Drawers: Where indicated on the drawings, provide front and back rails; drawer unit, hardware and suspension same as specified for casework base unit drawers.

f. Rails: Not less than ¾ inch by 4-5/16 inch (19 x 110 mm) solid lumber with attached heavy duty steel corner braces, grooved and screwed into both rails at each corner. Groove rails for "Z" irons or drill for top attachment.

g. Reinforcing cross rails: Hardwood lumber doweled and glue into front and back rails and pinned at intervals not more than 33 inches (838 mm) on center in tables without drawers.

h. Legs: Not less than 2 inch by 2 inch (50 x 50 mm).

1). Construction: Either of the following is acceptable:

   a). Made of one solid piece of lumber
   b). Made from two pieces of solid lumber glued together. Individual components shall be carefully selected for color match. The glue joint shall be on the diagonal of the leg, as seen in plan. All legs shall be oriented so that the diagonals converge to create an “X” in plan.

2). Veneered lumber or wood of any type is not acceptable for leg components.

i. Leg rails and spreader rail: Not less than 1¼ inch x 2½ inch (32 x 63 mm) hardwood lumber.

j. All exposed edges of legs and rails shall be eased, sanded smooth, and finished per the requirements for wood laboratory casework components.

k. Low level shelf: If shown on Laboratory Furnishing drawings shall be of ¾ inch (18 mm) high-pressure phenolic sheet, as described in the Laboratory Work Surfaces section of this specification.

4. Aprons and leg assemblies:

   a. Apron: Not less than ¾ inch (19 mm) x 4-5/16 inch (110 mm) hardwood.
   b. Legs: Not less than 2 inch (50 mm) x 2 inch (50 mm) hardwood.
   c. Leg rails: Not less than 1¼ inch (32 mm) x 2½ inch (63 mm) hardwood.
   d. All exposed edges of legs and aprons shall be eased, sanded smooth, and finished per requirements described above for wood laboratory casework components.
   e. Low level shelf: If shown on Laboratory Furnishing drawings shall be of ¾ inch (18 mm) high-pressure phenolic sheet, as described in the Laboratory Work Surfaces section of this specification.
   f. Apron drawers: Where indicated on the Laboratory Furnishing drawings, provide support rails; drawer unit, hardware and suspension as specified for base unit drawers.

5. Vacuum Pump Cabinets:
a. Provide wood vacuum pump cabinets at locations not under fume hoods where adjacent cabinetry is wood.

b. Venting:
   1). Exhaust connection will be by mechanical contractor. Provide flange for interface with exhaust duct.
   2). Provide air intake grille as specified elsewhere in this section.

c. Acoustical Lining: Cabinet shall be provided with sound absorption and thermal heat reflecting quilted liner on door back, interior cabinet top, and interior cabinet sides, and interior cabinet back.
   1). Manufacturer: Acoustical Solutions product ABBC-13, no known equal.
   2). Attach along perimeter at 6 inches on center, typical.

d. Cable/ vacuum line through port: Provide as specified elsewhere in this section.

e. Pump Support: Stainless steel pull out tray supported by 150 pound full-extension drawer slides, with a watertight polypropylene pan insert. Vibration isolation shall be provided between tray and watertight pan insert.

f. Electrical: Provide NEMA 5-20R receptacle mounted to inside back of cabinet installed by Division 11 with final connection by Division 26.

g. Label: “VACUUM PUMP” in conspicuous silk-screened lettering. Stick-on decals are not acceptable. Size and style of lettering shall match that of the Corrosive Storage Cabinet label. Lettering shall be 2 1/2 inches tall. Color of lettering shall be red.

6. Wood Casework Construction Performance:

a. Base cabinets shall be constructed to support a uniformly distributed load of 200 lbs. minimum per square foot (1000 kg/m²) of cabinet top area (total maximum of 2000 lbs. (900 kg)), including working surface, without permanent distortion or interference with door and drawer operation.

b. Base cabinets shall be constructed so that when supported on both back corners and one front corner; with a counterweight load of 350 pounds placed on the rear corner behind the supported front corner; and with a load of 200 pounds placed on the unsupported corner – there shall be no permanent damage after 24 hours of loading. Maximum allowable deflection shall not exceed 1/8 inch.

c. Swinging doors mounted on base units shall support a 200 lb. (113 kg) load located at a test point 12 inches (305 mm) measured horizontally from hinge along the top edge of door through a swing of 160 degrees. Weight test shall allow nominal temporary deflection, but no permanent distortion. Door assembly shall be twist-resistant and rigid, and shall close in a flat plane against the cabinet to permit the door catch at top of door to function properly.

d. Drawers shall be constructed so that they will support a 150 pound load hung on the drawer head centerline, with the drawer opened 13 inches (330mm), for five minutes. There shall be no interference with the normal operation of the drawer and the drawer head should remain tightly fastened to the drawer.

e. Drawers shall be constructed so that a drawer that is removed and supported on four corners will support a 10 pound sand or shot bag dropped from a height of 24 inches (610mm) without damage.
f. Drawers shall be constructed so that a drawer that is removed and supported at a 45 degree angle shall be capable of withstanding three impacts of a 2 inch (51mm) diameter, 12 inch (305mm) long steel rod (approximately 10 pounds in weight) released from 13 inches (330mm) from the front and back of the drawer. The drawer joinery shall remain intact and the drawer shall operate normally when placed back into the casework cabinet.

g. Drawer mechanical suspension systems shall be designed and attached to that a drawer uniformly loaded with 75 pounds of sand or shot bags shall operate freely without binding over its full range for 50,000 cycles at a rate not exceeding 10 cycles per minute. The force required to open and close the loaded drawer for the purposes of this test shall not exceed 8 pounds.

h. Shelves shall be designed and supported to that they can support a load of 40 pounds per square foot, up to a maximum of 200 pounds per shelf, for 24 hours with no more than 0.35 inches (9mm) of deflection maximum.

E. Hardware: As specified elsewhere in this Section.

F. Wood Finish Chemical Resistance Performance Requirements:

1. Manufacturer shall submit wood finish chemical resistance performance test results. Testing to be performed by independent testing agency.

2. Procedure: Place panel on a flat surface, clean with soap and water and blot dry. Condition the panel for 48-hours at 73º +/- 3ºF (23º +/- 2ºC) and 50 +/- 5% relative humidity or the currently accepted guideline set by ASTM. Test the panel for chemical resistance using forty-nine different chemical reagents by one of the following methods. For both methods, leave the reagents on the panel for a period of one hour. Wash off the panel with water, clean with detergent and naptha, and rinse with deionized water. Dry with a towel and evaluate after 24-hours at 73º +/- 3ºF (23º +/- 2ºC) and 50 +/- 5% relative humidity, or the currently accepted guideline set by ASTM.

   a. Method A: Test volatile chemicals by placing a cotton ball saturated with reagent in the mouth of a 1 ounce (29.574cc) bottle and inverting the bottle on the surface of the panel.

   b. Method B: Test non-volatile chemicals by placing five drops of the reagent on the surface of the panel and covering with a 24mm watch glass, concave side down.

3. Rating System: Evaluations shall use the following rating system:

<table>
<thead>
<tr>
<th>Level</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No detectable change.</td>
</tr>
<tr>
<td>1</td>
<td>Slight change in color or gloss.</td>
</tr>
<tr>
<td>2</td>
<td>Slight surface etching or severe staining.</td>
</tr>
<tr>
<td>3</td>
<td>Pitting, cratering, swelling, or erosion of coating. Obvious and significant deterioration.</td>
</tr>
</tbody>
</table>

4. Acceptance Level:

   a. Individual test results for the specified 49 reagents shall be within the Range for that reagent as specified on the table below.

   b. There shall be no more than four (4) Level 3 conditions.

5. Table of reagents:
<table>
<thead>
<tr>
<th>Test No.</th>
<th>Chemical Reagent</th>
<th>Test Method</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Acetate, Amyl</td>
<td>A</td>
<td>0-1</td>
</tr>
<tr>
<td>2.</td>
<td>Acetate, Ethyl</td>
<td>A</td>
<td>0-1</td>
</tr>
<tr>
<td>3.</td>
<td>Acetic Acid, 98%</td>
<td>B</td>
<td>0-1</td>
</tr>
<tr>
<td>4.</td>
<td>Acetone</td>
<td>A</td>
<td>0</td>
</tr>
<tr>
<td>5.</td>
<td>Acid Dichromate, 5%</td>
<td>B</td>
<td>0-1</td>
</tr>
<tr>
<td>6.</td>
<td>Alcohol, Butyl</td>
<td>A</td>
<td>0-1</td>
</tr>
<tr>
<td>7.</td>
<td>Alcohol, Ethyl</td>
<td>A</td>
<td>0</td>
</tr>
<tr>
<td>8.</td>
<td>Alcohol, Methyl</td>
<td>A</td>
<td>0-1</td>
</tr>
<tr>
<td>9.</td>
<td>Ammonium Hydroxide, 28%</td>
<td>B</td>
<td>0-2</td>
</tr>
<tr>
<td>10.</td>
<td>Benzene</td>
<td>A</td>
<td>0-1</td>
</tr>
<tr>
<td>11.</td>
<td>Carbon Tetrachloride</td>
<td>A</td>
<td>0-1</td>
</tr>
<tr>
<td>12.</td>
<td>Chloroform</td>
<td>A</td>
<td>0</td>
</tr>
<tr>
<td>13.</td>
<td>Chromic Acid, 60%</td>
<td>B</td>
<td>0-1</td>
</tr>
<tr>
<td>14.</td>
<td>Cresol</td>
<td>A</td>
<td>0-2</td>
</tr>
<tr>
<td>15.</td>
<td>Dichloroacetic Acid</td>
<td>A</td>
<td>0-3</td>
</tr>
<tr>
<td>16.</td>
<td>Dimethylformamide</td>
<td>A</td>
<td>0-2</td>
</tr>
<tr>
<td>17.</td>
<td>Dioxane</td>
<td>A</td>
<td>0-1</td>
</tr>
<tr>
<td>18.</td>
<td>Ethyl Ether</td>
<td>A</td>
<td>0-1</td>
</tr>
<tr>
<td>19.</td>
<td>Formaldehyde, 37%</td>
<td>A</td>
<td>0</td>
</tr>
<tr>
<td>20.</td>
<td>Formic Acid, 90%</td>
<td>B</td>
<td>0-1</td>
</tr>
<tr>
<td>21.</td>
<td>Furfural</td>
<td>A</td>
<td>0-1</td>
</tr>
<tr>
<td>22.</td>
<td>Gasoline</td>
<td>A</td>
<td>0</td>
</tr>
<tr>
<td>23.</td>
<td>Hydrofluoric Acid, 37%</td>
<td>B</td>
<td>0-2</td>
</tr>
<tr>
<td>24.</td>
<td>Hydrofluoric Acid, 48%</td>
<td>B</td>
<td>0-2</td>
</tr>
<tr>
<td>25.</td>
<td>Hydrogen Peroxide, 30%</td>
<td>B</td>
<td>0-1</td>
</tr>
<tr>
<td>26.</td>
<td>Iodine, Tincture of</td>
<td>B</td>
<td>0-2</td>
</tr>
<tr>
<td>27.</td>
<td>Methyl Ethyl Ketone</td>
<td>A</td>
<td>0</td>
</tr>
<tr>
<td>28.</td>
<td>Methylene Chloride</td>
<td>A</td>
<td>0-1</td>
</tr>
<tr>
<td>29.</td>
<td>Monochlorobenzene</td>
<td>A</td>
<td>0-1</td>
</tr>
<tr>
<td>30.</td>
<td>Naphthalene</td>
<td>A</td>
<td>0</td>
</tr>
<tr>
<td>31.</td>
<td>Nitric Acid, 20%</td>
<td>B</td>
<td>0</td>
</tr>
<tr>
<td>32.</td>
<td>Nitric Acid, 30%</td>
<td>B</td>
<td>0-2</td>
</tr>
<tr>
<td>33.</td>
<td>Nitric Acid, 70%</td>
<td>B</td>
<td>2-3</td>
</tr>
<tr>
<td>34.</td>
<td>Phenol, 90%</td>
<td>A</td>
<td>0-2</td>
</tr>
<tr>
<td>35.</td>
<td>Phosphoric Acid, 85%</td>
<td>B</td>
<td>0-1</td>
</tr>
<tr>
<td>36.</td>
<td>Silver Nitrate Saturated</td>
<td>B</td>
<td>0-1</td>
</tr>
<tr>
<td>37.</td>
<td>Sodium Hydroxide 10%</td>
<td>B</td>
<td>0-2</td>
</tr>
<tr>
<td>38.</td>
<td>Sodium Hydroxide 20%</td>
<td>B</td>
<td>0-2</td>
</tr>
<tr>
<td>39.</td>
<td>Sodium Hydroxide 40%</td>
<td>B</td>
<td>0-2</td>
</tr>
<tr>
<td>40.</td>
<td>Sodium Hydroxide Flake</td>
<td>B</td>
<td>0</td>
</tr>
<tr>
<td>41.</td>
<td>Sodium Sulfide Saturated</td>
<td>B</td>
<td>0</td>
</tr>
<tr>
<td>42.</td>
<td>Sulfuric Acid, 33%</td>
<td>B</td>
<td>0-1</td>
</tr>
<tr>
<td>43.</td>
<td>Sulfuric Acid, 77%</td>
<td>B</td>
<td>0-1</td>
</tr>
<tr>
<td>44.</td>
<td>Sulfuric Acid, 96%</td>
<td>B</td>
<td>1-3</td>
</tr>
<tr>
<td>45.</td>
<td>Sulfuric Acid 77% &amp; Nitric Acid 70% equal parts</td>
<td>B</td>
<td>1-3</td>
</tr>
<tr>
<td>46.</td>
<td>Toluene</td>
<td>A</td>
<td>0</td>
</tr>
<tr>
<td>47.</td>
<td>Trichloroethylene</td>
<td>A</td>
<td>0</td>
</tr>
<tr>
<td>48.</td>
<td>Xylene</td>
<td>A</td>
<td>0</td>
</tr>
</tbody>
</table>
2.2 METAL LABORATORY CASEWORK, TABLES AND CASEWORK SYSTEMS

A. Manufacturers: Products complying with this specification may be provided by the following manufacturers. All products specified in this section shall be the provided by a single manufacturer.

1. Laboratory Casework:

   a. Air Master Systems, 6480 Norton Center Drive, Muskegon, MI 49441 Tel 231 798-1111.
   b. Bedcolab Ltd, 2305 Francis Hughes Avenue, Laval, Quebec, Canada H7S 1H5 Tel 514 384-2820.
   c. CiF Lab Solutions, 53 Courtland Avenue, Vaughan, Ontario, Canada L4K 3T2 Tel: 905 738-5821.
   d. ICIscientific, 1865 Highway 641 North, Paris, TN 38242-8814 Tel: 731-642-4251.
   e. Kewaunee Scientific Corporation, P O Box 1842, Statesville, NC 28687 Tel: 704 873-7202.
   f. Mott Manufacturing Ltd., 452 Hardy Road, P. O. Box 1120, Brantford, ON, Canada N3T 5T3 Tel: 519 752-7825
   g. Approved substitution.

B. Metal Laboratory Casework

1. Design Requirements:

   a. Door and drawer front design: Full flush overlay metal construction with door and drawer fronts overlaying the case unit ends, top and bottom rails.
   b. Pulls on doors shall be mounted vertically and on drawers horizontally.
   c. All tall cases shall be provided with toe space to match base units.
   d. All cabinets shall be constructed and finished to be suitable for use as stand-alone units and to permit future rearrangement without the need for additional parts or finish.
   e. Suspended casework: Provide as detailed on Laboratory Furnishing drawings. Construction of suspended casework units shall be the same as floor mounted cabinets with the following exceptions:

      1). Omit sub-base and provide casework with finished bottom panels.
      2). Fixings and fastenings necessary for its attachment to the supporting structure.

   f. Widths of drawers in knee opening rails shall not be less than 24 inches (600 mm) or the width of the rail whichever is the lesser.
   g. Cabinets below fume hoods that conflict with ductwork, cup sinks, or waste connections shall be 19 inches deep to accommodate any obstructions.
   h. Full-Flush Construction and Installation: All finished panels shall be in the same plane to provide a true flush overlay appearance.
1. Filler panels: Provide metal filler panels at inside corners, end-of-run conditions, and other similar locations, aligned with the face of adjacent metal cabinet bodies.

2. Outside corners:
   a. At outside corners, align side panel of cabinet with the face of the door of adjacent cabinet.

2. Materials:

   a. Steel: Cold-rolled furniture stock sheet steel, prime grade, roller leveled.
      1. Steel shall be treated at the mill to be free of scale, ragged edges, deep scratches, or other injurious effects.
      2. All gauges indicated are to be U.S. standard.

   b. Glass: Framed glass doors:
      1. 1/8 inch (3mm) to 7/32 inch (5.5 mm) thick tempered glass.
      2. Without imperfections or marred surfaces.
      3. All glass should have etched safety information, readable from outside the cabinet.

3. Base, Wall, Upper, and Tall Cabinets:

   a. General:
      1. Exterior corners: shall be spot and arc welded with heavy back up reinforcement at exterior corners. All face joints shall be arc welded and ground smooth to provide a continuous flat plane.
      2. All units shall have a cleanable smooth interior. Front and rear posts, reinforcing members or channel uprights shall be enclosed full heights on all cabinet openings.
      3. End Uprights shall be formed into not less than a channel formation at top, bottom, back and front.
      4. The edge of the vertical uprights shall be formed to provide a strike for doors and drawers, and shall be perforated for the support of drawer channels, intermediate rails and hinge screws.
      5. An upright filler shall be screwed in place in all cupboard units to close the back of the channel at front of the upright and to provide a smooth interior for the cupboard to facilitate cleaning.
      6. The upright filler shall be perforated with shelf adjustment holes at no more than ½ inch (12.7 mm) centers.
      7. The inside front of the upright shall be further reinforced with a full height 14 gauge (2.0 mm thick) hinge reinforcement angle.
      8. Die Formed Gussets: shall be furnished in each bottom corner of base units to insure rigidity, and a 3/8 inch (10 mm) -16 leveling bolt, 3 inches (75 mm) long, shall engage a clinch nut in each gusset. Each leveling bolt and gusset shall be capable of supporting 500 lbs (225 kg). (Each unit shall support 2000
lbs. (900 kg) uniformly distributed on a work top.) Provide caps at all penetrations provided to access leveling devices.

b. Cabinet Base:
   1). Case bottom and bottom rail shall be formed of one piece of metal except in corner units and shall have both sides and back formed up or down and shall be offset in front to provide a door and drawer recess rabbet.
   2). Toe Space Rail: shall extend up and forward to engage bottom rail to form a smooth surfaced toe space, 3 inches (75 mm) deep and 4 inches (100 mm) high. Whenever the base is omitted for units to be set on building bases or separate metal bases, the toe space rail shall extend back 4½ inches (115 mm).

c. Cabinet Back, Unexposed: Cabinet back shall consist of a top and bottom rail, channel formed for maximum strength and welded to back and top flange of end uprights, with space between left open for access to plumbing lines. All units shall be provided with removable back panels.
   1). Sink units shall be provided with fixed half-height backs to allow plumbing lines to enter and exit the cabinet through the open area.

d. Shelves: shall be full depth formed down ¾ inch (19 mm), back 7/8 inch (22 mm) and up ¼ inch (6 mm) at front and rear and formed down at ends ¾ inch (19 mm). Shelves over 36 inches (914 mm) in length shall be additionally reinforced by a flanged channel shaped member electro-welded to underside of shelf. Shelves shall be adjustable.
   1). Restraint: At open shelf units, front edge of shelf construction shall be bent to form a 1 inch high integral restraint edge. Fold top over to eliminate sharp edges.

e. Doors: shall be readily removable and hinges easily replaceable. Hinges shall be applied to the case and door with screws. Welding of hinges to either case or door will not be acceptable.

f. Door and Drawer Heads:
   1). Metal, Flush Overlay: shall be a two-piece sheet steel assembly of ¾ inch (19 mm) overall thickness to consist of an inner pan, an outer pan having a channel formation on all four sides, and the interior space filled with sound deadening at the time of assembly. Door Pans and Drawer Heads shall be painted inside and out prior to assembly.
      a). All four corners of door and drawer heads shall be welded closed and ground smooth to eliminate exposure of raw edges and open gaps.
      b). Glazed Hinged Door Construction: Glazed swinging doors shall be 3/4 inch thick and consist of an inner and outer door pan welded to form a single unit. Outer door pan shall be 18 gauge steel, formed into a channel or flanged shape at all four sides. It shall be pierced and formed to create a 3 inches wide frame with a beveled edge around the glass.
opening in the center of the door. Inner door pan shall be 18 gauge steel, flanged at all four sides, pierced for a glass opening in center of the door, with 16 gauge hinge reinforcements welded in place. Glazing shall be held in place by a rubber or vinyl gasket around the entire edge of the glass. Outer door pan shall be prepared as necessary to accept attachment of pulls as specified elsewhere in this section.

g. Drawer Construction:

1. Drawer bodies shall be made in one-piece construction including the bottom, two sides, back and inner front. They shall be fully coved at interior bottom on all four sides for easy cleaning. Sides shall be full height with ½ inch (13 mm) clearance to frame opening. Drawers shall be a minimum of 18 inches front to back.

2. Drawer Suspension: Refer to Drawer Slides under Hardware section.

3. Drawer stops: shall be provided to insure smooth, quiet operation at point of contact with cabinet front.

h. Top Horizontal Rail: Provide on base cabinets such that rail shall interlock within the flange at top of end panels for strength. Reinforcements shall be provided at all front corners for additional welded strength between vertical and horizontal case members.

i. Intermediate Rails: Provide on base cabinets such that rails shall be provided between doors and drawers, but shall not be provided between drawers unless made necessary by locks in drawers. When required, intermediate rails shall be recessed behind doors and drawer fronts, and designed so that security panels may be added as required.

j. Intermediate Vertical Uprights: shall be furnished to enclose cupboards when used in a unit in combination with a half width bank of drawers. However, to allow storage of large or bulky objects, no upright of any type shall be used at the center of double door cupboard units.

k. Security Panels: Provide security panels in frames between drawers and cabinets within a cabinet where keyed different locks are indicated.

l. Knee Space Service Strip Cover Panels where specified, shall be 18 gauge (1.3 mm thick) steel, of the same finish as cabinets, and shall be furnished at open spaces under counter top where no cabinets occur. They shall be easily removable and shall cover piping from underside of top of service ledge to floor.

m. Provide filler panels where required between cabinets, at corner intersections of cabinets, between cabinets and walls and wherever else required for a complete finished installation. For tall cabinets, filler panels shall be provided for vertical face and top. For wall cabinets, filler panels shall be provided for vertical face, top and bottom. Filler panels shall follow the profile of toe kicks.

4. Metal-Framed Laboratory Tables

a. Tops: Refer to Laboratory Furnishing drawings for top materials, as described in the Laboratory Work Surfaces section.

1. Tops shall be mechanically attached to the table frame with a minimum of six concealed metal angle brackets screwed into the inside of the table frame and
the bottom of the work surface. Metal angle bracket may be stainless steel, zinc-coated steel, or powder-coated steel. Screws shall be dome-head, with a minimum size of No. 5, ½ inch long, or otherwise sufficient to firmly and permanently secure the benchtop to the table frame allowing that the table may be picked up by the top.

2). Vibration absorbing isolation: Provide a continuous wide bead of clear silicone sealant to the top of all supporting rails. Allow complete cure before attachment of the work surface.

b. Electrical receptacles: Tables shown with electrical receptacles shall be pre-wired, including cutouts for electrical receptacles, black cord, 90-degree NEMA 5-20P plug, back boxes, gray NEMA 5-20R decora-style electrical receptacles, stainless steel faceplates, wiring, and junction boxes as required for a complete functional assembly.

1). The first electrical device wired from the main cord shall be a 20 amp, GFCI outlet with downstream protection capability.
2). Ensure wiring to downstream receptacles is connected to the downstream outlets such that GFCI protection is provided to downstream outlets.
3). Cover plates of downstream outlets to be engraved to note that GFCI protection is provided via upstream receptacle.
4). UL Listing: Tables shall be tested and labeled per one of the following UL standards: UL61010-1 or UL962.

c. Leveling Glides and Leg Shoes:

1). Each leg other than those fitted with casters shall have leveling glides: (2 inch) (48 mm) diameter, two-piece pivot construction, steel housing, non-marring, phenolic or translucent plastic insert, (1/2 inch) (12 mm) diameter, minimum (1 1/2 inch) (36 mm) long zinc plated stems. Each glide shall have a load bearing capacity of 150 lbs.
2). Each leg other than those fitted with casters and adjustable-height legs, shall have leg shoes: Black coved vinyl or rubber leg shoe, 2 inches (50 mm) in height.

d. Casters: Where indicated on Laboratory Furnishing drawings, provide sets of 3 ½ inch (89 mm) diameter wheels with self-lubricating bearing, rated to carry 250 pounds (113 kg) minimum each. Each caster must swivel and have a locking brake at front wheels. Wheel shall be of molded polyurethane tread mechanically locked to a polyolefin core. Movable tables to have all 4 swivel and locking casters.

e. Adjustable-Height Legs: Where indicated on Laboratory Furnishing drawings, provide a stainless steel insert at the bottom of each leg. Height of each insert shall be adjustable in 2 inch (50mm) increments using stainless steel pins. This shall result in a work-surface top height range between 30 inches (750mm) and 38 inches (1000mm). Include leveling glide at bottom of each insert.

f. Table Drawers: Where indicated on the drawings, provide front and back rails; drawer unit, hardware and suspension same as specified for casework base unit drawers.

g. Construction:
1). Table rails, legs, and spreader rails shall be fully welded into a single-piece table frame structure. No mechanical joints between members are permitted.

h. Rails: Not less than 1½ inch by 4½ inch 16 gauge (38 x 114 x 1.6 mm) channel steel sections, reinforced as necessary for leg attachment.

i. Legs: Not less than 2 inch by 2 inch 16 gauge (50 x 50 x 1.6 mm) square tubular steel sections.

j. Leg rails and spreader rail: Not less than 1¼ inch by 2½ inch 16 gauge (32 x 63 x 1.6 mm) steel sections, reinforced as necessary for leg attachment.

k. Materials and Finish: Refer to Metal Fabrications specifications in this Section for material and finish requirements.

l. Low level shelf: If shown on Laboratory Furnishing drawings shall be of ¾ inch (18 mm) high-pressure phenolic sheet, as described in the Laboratory Work Surfaces section of this specification.

5. Aprons and leg assemblies:

a. Apron: Not less than 1½ inch (38 mm) by 4 inch (114 mm) 16 gauge (by 1.6 mm thick) channel steel sections, reinforced as necessary for leg attachment.

b. Legs: Not less than 2 inch (50 mm) by 2 inch (50 mm) 16 gauge (by 1.6 mm thick) square tubular steel sections.

c. Leg rails: Not less than 1¼ inch (32 mm) by 2½ inch (63 mm) 16 gauge (by 1.6 mm thick) steel sections, reinforced as necessary for leg attachment. Each leg shall have a recessed leveling screw and a black, coved vinyl or rubber leg shoe, 2 inches (50 mm) in height.

d. Low level shelf: If shown on Laboratory Furnishing drawings shall be of ¾ inch (18 mm) high-pressure phenolic sheet, as described in the Laboratory Work Surfaces section of this specification.

e. Apron drawers: Where indicated on the Laboratory Furnishing drawings, provide support rails; drawer unit, hardware and suspension as specified for base unit drawers.

6. Metal Casework Construction Performance: Base cabinets shall be constructed to support a uniformly distributed load of 200 pounds. minimum per square foot (1000 kg/m²) of cabinet top area (total maximum of 2000 pounds (900 kg)), including working surface without objectionable distortion or interference with door and drawer operation.

a. Base cabinet corner gussets with leveling bolts shall support 500 pounds (225 kg) per corner, at 1½ inch (38 mm) projection of the leveling bolt below the gusset.

b. Each adjustable and fixed shelf 4 feet (1219 mm) or shorter in length shall support an evenly distributed load of 40 pounds per square foot (200 kgf/m²) up to a maximum of 200 pounds (90 kg), with nominal temporary deflection, but no permanent set.

c. Drawer assemblies shall automatically maintain alignment in cabinet opening and shall not bind during opening or closing of the drawer so as to minimize glass breakage and damage to fragile parts.

d. Swinging doors mounted on base units shall support a 250 lb. (113 kg) load located at a test point 14 inches (356 mm) measured horizontally from hinge along the top edge of door through a swing of 180 degrees. Weight test shall allow nominal temporary deflection, but no permanent distortion. Door assembly shall be
twist-resistant and rigid, and shall close in a flat plane against the cabinet to permit
the door catch at top of door to function properly.

C. Movable Bench System (MB)

1. A modular, manufactured, dimensioned system of movable h-frame-style laboratory
casework units and matching stand-alone table frames, as shown on the drawings.

2. Manufacturers: Products complying with this specification may be provided by the
following manufacturers. All products specified in this section shall be the provided by a
single manufacturer.

   a. Bedcolab Ltd, 2305 Francis Hughes Avenue, Laval, Quebec, Canada H7S 1H5 Tel
      514 384-2820.
   b. CiF Lab Solutions, 53 Courtland Avenue, Vaughan, Ontario, Canada L4K 3T2 Tel:
      905 738-5821.
   c. Kewaunee Scientific Corporation, P O Box 1842, Statesville, NC 28687 Tel: 704
      873-7202.
   d. Mott Manufacturing Ltd., 452 Hardy Road, P. O. Box 1120, Brantford, ON, Canada
      N3T 5T3 Tel: 519 752-7825.
   e. Approved substitution.

3. System requirements:

   a. The system shall consist of a fully-welded vertical framework with slotted uprights
to support work surface table frames and shelving components; and matching stand-
   alone table frames.
   b. System to be self-supporting and independent of the building structure.
   c. All welds shall be continuous and ground smooth.
   d. The vertical framework shall be designed to allow for piped utility service fixtures,
      electrical/data outlets and supply pipework/cabling lines utilizing the vertical frame
      system as a utility chase.
   e. The vertical height of work surfaces shall be adjustable from 30 inches high to 37
      inches high, in 1 inch increments.
   f. The upper shelving units shall be adjustable in 1 inch increments.
   g. The bench system shall ship complete with minimal final assembly. Assembly shall
      be accomplished with simple hand tools.

4. Vertical Framework: Support structure for worksurface table frames and shelves; and
service chase for all service lines, data and electrical cables.

   a. Vertical framework shall be fabricated as one fully-welded assembly and painted as
      one piece.
   b. Vertical uprights shall allow for internal plumbing, electrical and data cabling.

      1). Single frame uprights shall be 11 gauge tubular steel, nominal 2 inch outside
diameter.
      2). Shared rear frame upright shall be 11 gauge cold-rolled steel formed to a
         nominal 2 inch X 6 inch member.
      3). Gas piping and high/low voltage cabling shall be separated in opposite and
         separate vertical members.
4). Cabled vertical upright shall have two channels to separate low voltage from high voltage cabling.

5). Uprights shall include removable panels to allow access to piping and electrical services.

6). Removable panel can be on either the inside or the outside of the frame.

e. Frames exceeding 36 inches in width shall have a center top vertical support to accommodate split shelving.

d. Fully welded caps shall be provided at the top and bottom of the vertical support members, with penetrations only as required for levelers and for service connections as indicated.

e. Uprights shall have tapped holes to allow for attachment of worksurface table frames. The uprights shall incorporate machined inserts at these locations for stability and durability.

f. Upright to have slots punched on 1 inch increments starting at nominal 55 inches above the floor to the top of the uprights. Pattern shall match Knape & Vogt 85 ANO series uprights.

g. Upper and lower horizontal cross rails shall be 11 gauge for single frames and 14 gauge for shared frames.

1). Lower horizontal cross rail shall serve as an integral power/data raceway with removable bottom cover. Bottom cover shall be held in place with screws. Provide metal dividers within raceway between power and data cabling compartments.

2). Upper horizontal cross rail may be used for routing of power and electrical cables. Provide metal dividers between power and data cabling compartments. Upper horizontal cross rail shall be provided with a top enclosure panel secured with screws.

h. Provide piped utilities, power, and data services at each unit as shown on the drawings.

1). All utility services (plumbing, power, phone and data) shall terminate at one end of the top of the vertical framework.

2). Piped services shall comply with the requirements of Division 22.

a). Vertical framework shall be dimensionally able to accommodate up to three piped gas services.

b). Provide service fixtures as scheduled and as specified in section 115343, complete with all gaskets, grommets, and sleeves.

c). Provide gas service fixture mounting penetrations thru frame only for those services shown at each mobile bench.

d). Unless noted otherwise, internal plumbing lines shall be 3/8 inch OD copper tubing terminating at a quick disconnect attached to the tube with compression fittings at the top of the upright. Refer to section 115343 for quick disconnect valve specifications.

e). All burning gases internal piping shall be 3/8 inch OD black steel pipe or corrugated stainless steel tubing.

f). All vacuum internal piping shall be ½ inch OD copper tubing.
g). Provide whip or patch cord for each utility. Refer to the drawings and specification section 115343.

3). Electrical power devices shall comply with the requirements of Division 26.
   a). The units shall be UL 962 or UL61010-1 tested and labeled.
   b). Power services shall have a restrained cord and plug extending 4 foot above the top of the upright. Plug end to be twist lock, appropriate for the quantity of circuits at each bench as shown on the drawings.

4). Data devices and wiring shall comply with the requirements of Division 27.
   a). Internal data wiring shall extend 4 foot above the upright and terminate with a male connector.
   b). Provide a female plug mounted into the top of the bench. Provide a 4 foot long patch cord.

5). Worksurface Table Frames: Table framework units that attach to the vertical framework units to support work surfaces.
   a). Worksurface table frames shall be fabricated as one fully-welded assembly and painted as one piece.
   b). Legs: 2 inch outside diameter 11 gauge cold rolled steel with 1 ¾ inch diameter inner telescoping Type 304 stainless steel leg to allow for height adjustment.
      1). Height adjustment of inner leg shall be accomplished with a hole and pin system.
   c). Worksurface frame shall be 11 gauge formed steel. Rear corners shall have 2 ¼ inch diameter by 6 inch high, 11 gauge collar. The front half of the collar shall be welded to the worksurface frame with supporting gussets and the back half mechanically fastened to the rear uprights with socket head button cap and bolt.
   d). A back stop angle with full length rubber bumper shall be located under the worksurface frame so that the mobile base cabinets units are aligned 1 inch behind the front edge of the worksurface. Back stop angle shall overlap mobile cabinets vertically by no more than 3 inches.
   e). Worksurface table frame shall be able to detach from the rear frame and form a four-leg adjustable height table with the addition of two Add-A-Legs.
      1). Add-A-Table Legs: 2 inch outside diameter 11 gauge cold rolled steel with 1 ¾ inch diameter inner telescoping Type 304 stainless steel leg to allow for height adjustment.
      2). Height adjustment of inner leg shall be accomplished with a hole and pin system.
      3). Provide one set of add-a-table legs for 10% of the shared rear frame units on the project.

6). Levelers: Provide levelers at the bottom of each frame member.
   a). Levelers to be 3/8 inch diameter, 2 ½ inch long.
   b). Provide two levelers per shared vertical framework upright.
c. Provide one leveler per workstation framework table frame leg.
d. Provide one leveler per single vertical framework upright.
e. Provide one leveler per movable table frame leg.

7. Load rating:
   a. 100 lbs per linear foot of width to maximum of 800 lbs.
   b. With 800 lbs of uniformly distributed load the maximum allowable deflection shall be 0.125 inch measured at the front center rail.

8. Work Surfaces:
   a. As specified elsewhere in this section.
   b. There shall be no gap between the back of worksurfaces and the wall, or between the back of the worksurfaces at back-to-back units. The worksurfaces shall extend fully back to meet each other at this condition.

9. Adjustable Shelving
   a. High-Pressure Decorative Plastic Laminate Shelving as specified elsewhere in this section.
   b. Shelf depth: Unless indicated otherwise, the back of shelves shall be tight against the wall at single-sided units. At back-to-back units, the shelves shall be designed so that their backs meet each other at a hairline joint with no gap in between.
   c. Shelf Brackets: 11 gauge (1.6 mm thick) bookend type, as detailed on drawings.
   d. Safety edging: Front Edges.
      1). Type: Retainer rail.

10. Load capacity:
    a. Shelves shall have a load capacity of 40 pounds per square foot, up to a maximum of 200 pounds per shelf.
    b. Worksurface: SEFA 10 Loading Category 3 (1,000 Pounds).
    c. The SEFA-10 Stability Test for Anchored Units should be performed on all units (whether or not they are specified to be permanently anchored). Anchor one test unit and perform the test to ensure compliance with the limits established in SEFA-10.

11. Privacy Panels:
    a. Tackable acoustically-absorptive ⅜ inch thick wood fiber panel wrapped in fully-adhered flame-retardant fabric with metal channel perimeter frame.
    b. Wood fiber panel to be factory treated for protection against rot, fungus, and moisture absorption. Density: 30 to 40 pounds per cubic foot.
    c. Fabric to be tackable and self-healing. Color to be selected by the Architect.
    d. Fire rating: Class C.
    e. Frame panel in 14 gauge channel-shaped steel frame, ½ inch tall.

D. Hardware: As specified elsewhere in this Section.
E. Metal Casework Color: As selected by the Architect from manufacturer's full color line and complying with finish requirements described below.

F. Metal Casework Finish Requirements:

1. Paint finish for steel laboratory products shall utilize a dry coating process with minimal waste generation. Liquid-applied coatings shall not be acceptable. Manufacturer shall supply documentation that waste generated during the painting process, is a solid, non-hazardous material.
   a. Pretreatment: Finish process shall incorporate a phosphate conversion coating during the pretreatment/cleaning operation.
   b. Operator Protection: The painting process shall be cleanly contained, have no solvent odor and be performed in an air-conditioned room.
   c. VOC (Volatile Organic Compounds) emissions shall not exceed 0.29 lbs per gallon (35 g/L).
   d. Offgasing: No further emissions or “Offgasing/Decomposition” vapors shall occur at room temperature from installed finished parts.

2. Preparation: After the units have been completely welded together and before finishing, they shall be given a pre-paint treatment to provide excellent adhesion of the finish to the metal and to aid in the prevention of corrosion. Physical and chemical cleaning of the metal shall be accomplished by washing with an alkaline cleaner, followed by a spray treatment with a heated cleaner/phosphate solution and pretreated with iron phosphate spray followed by a neutral final seal prior to application of final finish. The strength of each solution shall be monitored by filtration to insure consistent quality. All treated parts shall be immediately dried in heated ovens and gradually cooled before application of the finish. Treated metal parts shall be clean and properly prepared to provide optimum adhesion of finish and resistance to corrosion.

3. Application: Electrostatically apply powder coat of selected color and bake in controlled high temperature oven to assure a smooth, hard satin finish. Surfaces shall have a chemical resistant, high grade laboratory furniture quality finish of the following thicknesses:
   a. All surfaces, exterior or interior, exposed to view, shall receive sufficient powder coat to achieve an average 1.5 mil (38 µm) film thickness with a minimum 1.2 mil (30 µm) film thickness and shall have smooth satin luster.
   b. Backs of cabinets and other surfaces not exposed to view shall have sufficient powder coat to achieve an average 1.0 mil (25 µm) film thickness.

4. All drawer bodies to be finished in matching color or in a uniform neutral color.
5. Concealed interior parts shall receive corrosion-resistant treatment.
6. Finish must be UV stable.

G. Metal Finish Performance Requirements:

1. Manufacturer shall submit metal finish performance testing results. Testing to be performed by independent testing agency.
2. Chemical resistance:
a. Test procedure: Place samples on a flat surface, clean with soap and water and blot dry. Condition the panel for 48-hours at 73 +/- 3 degrees Fahrenheit (23(+ 2°C) and 50+ 5% relative humidity, or the currently accepted guideline set by ASTM. Test the samples for chemical resistance using forty-nine different chemical reagents by one of the following methods. For both methods, leave the reagents on the sample for a period of one hour. Wash off the sample with water, clean with detergent and naphtha, and rinse with deionized water. Dry with a towel and evaluate after 24-hours at 73 ± 3 degrees Fahrenheit (23°± 2°C) and 50± 5% relative humidity, or the currently accepted guideline set by ASTM

1). Method A: Test volatile chemicals by placing a cotton ball saturated with reagent in the mouth of a 1 ounce (29.574cc) bottle and inverting the bottle on the surface of the sample. The cotton ball shall remain in contact with the sample for the duration of the test.

2). Method B: Test non-volatile chemicals by placing five drops of the reagent on the surface of the sample and covering with a 24mm watch glass, convex side down.

b. Rating System: Evaluations shall use the following rating system:

| Level 0 | No detectable change. |
| Level 1 | Slight change in color or gloss. |
| Level 2 | Slight surface etching or severe staining. |
| Level 3 | Pitting, cratering, swelling, or erosion of coating. Obvious and significant deterioration. |

c. Acceptance Level:

1). Individual test results for the specified 49 reagents shall be within the Range for that reagent as specified on the table below.

2). There shall be no more than four (4) Level 3 conditions.

d. Table of reagents:

<table>
<thead>
<tr>
<th>Test No.</th>
<th>Chemical Reagent</th>
<th>Test Method</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Acetate, Amyl</td>
<td>A</td>
<td>0-1</td>
</tr>
<tr>
<td>2.</td>
<td>Acetate, Ethyl</td>
<td>A</td>
<td>0-2</td>
</tr>
<tr>
<td>3.</td>
<td>Acetic Acid, 98%</td>
<td>B</td>
<td>0-3</td>
</tr>
<tr>
<td>4.</td>
<td>Acetone</td>
<td>A</td>
<td>0-1</td>
</tr>
<tr>
<td>5.</td>
<td>Acid Dichromate, 5%</td>
<td>B</td>
<td>0-1</td>
</tr>
<tr>
<td>6.</td>
<td>Alcohol, Butyl</td>
<td>A</td>
<td>0-1</td>
</tr>
<tr>
<td>7.</td>
<td>Alcohol, Ethyl</td>
<td>A</td>
<td>0-1</td>
</tr>
<tr>
<td>8.</td>
<td>Alcohol, Methyl</td>
<td>A</td>
<td>0-1</td>
</tr>
<tr>
<td>9.</td>
<td>Ammonium Hydroxide, 28%</td>
<td>B</td>
<td>0</td>
</tr>
<tr>
<td>10.</td>
<td>Benzene</td>
<td>A</td>
<td>0-2</td>
</tr>
<tr>
<td>11.</td>
<td>Carbon Tetrachloride</td>
<td>A</td>
<td>0-1</td>
</tr>
<tr>
<td>12.</td>
<td>Chloroform</td>
<td>A</td>
<td>0-2</td>
</tr>
<tr>
<td>13.</td>
<td>Chromic Acid, 60%</td>
<td>B</td>
<td>0-2</td>
</tr>
<tr>
<td>14.</td>
<td>Cresol</td>
<td>A</td>
<td>0-2</td>
</tr>
<tr>
<td>15.</td>
<td>Dichloroacetic Acid</td>
<td>A</td>
<td>0-3</td>
</tr>
<tr>
<td>16.</td>
<td>Dimethylformamide</td>
<td>A</td>
<td>0-2</td>
</tr>
<tr>
<td>17.</td>
<td>Dioxane</td>
<td>A</td>
<td>0-2</td>
</tr>
</tbody>
</table>
### Test Table

<table>
<thead>
<tr>
<th>Test No.</th>
<th>Chemical Reagent</th>
<th>Test Method</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>18.</td>
<td>Ethyl Ether</td>
<td>A</td>
<td>0-1</td>
</tr>
<tr>
<td>19.</td>
<td>Formaldehyde, 37%</td>
<td>A</td>
<td>0-1</td>
</tr>
<tr>
<td>20.</td>
<td>Formic Acid, 90%</td>
<td>B</td>
<td>0-3</td>
</tr>
<tr>
<td>21.</td>
<td>Furfural</td>
<td>A</td>
<td>0-3</td>
</tr>
<tr>
<td>22.</td>
<td>Gasoline</td>
<td>A</td>
<td>0</td>
</tr>
<tr>
<td>23.</td>
<td>Hydrofluoric Acid, 37%</td>
<td>B</td>
<td>0-2</td>
</tr>
<tr>
<td>24.</td>
<td>Hydrofluoric Acid, 48%</td>
<td>B</td>
<td>0-3</td>
</tr>
<tr>
<td>25.</td>
<td>Hydrogen Peroxide, 30%</td>
<td>B</td>
<td>0-1</td>
</tr>
<tr>
<td>26.</td>
<td>Iodine, Tincture of</td>
<td>B</td>
<td>0-2</td>
</tr>
<tr>
<td>27.</td>
<td>Methyl Ethyl Ketone</td>
<td>A</td>
<td>0-2</td>
</tr>
<tr>
<td>28.</td>
<td>Methylene Chloride</td>
<td>A</td>
<td>0-2</td>
</tr>
<tr>
<td>29.</td>
<td>Monochlorobenzene</td>
<td>A</td>
<td>0-2</td>
</tr>
<tr>
<td>30.</td>
<td>Naphthalene</td>
<td>A</td>
<td>0-1</td>
</tr>
<tr>
<td>31.</td>
<td>Nitric Acid, 20%</td>
<td>B</td>
<td>0-1</td>
</tr>
<tr>
<td>32.</td>
<td>Nitric Acid, 30%</td>
<td>B</td>
<td>0-1</td>
</tr>
<tr>
<td>33.</td>
<td>Nitric Acid, 70%</td>
<td>B</td>
<td>0-3</td>
</tr>
<tr>
<td>34.</td>
<td>Phenol, 90%</td>
<td>A</td>
<td>0-2</td>
</tr>
<tr>
<td>35.</td>
<td>Phosphoric Acid, 85%</td>
<td>B</td>
<td>0-1</td>
</tr>
<tr>
<td>36.</td>
<td>Silver Nitrate Saturated</td>
<td>B</td>
<td>0</td>
</tr>
<tr>
<td>37.</td>
<td>Sodium Hydroxide 10%</td>
<td>B</td>
<td>0</td>
</tr>
<tr>
<td>38.</td>
<td>Sodium Hydroxide 20%</td>
<td>B</td>
<td>0</td>
</tr>
<tr>
<td>39.</td>
<td>Sodium Hydroxide 40%</td>
<td>B</td>
<td>0-1</td>
</tr>
<tr>
<td>40.</td>
<td>Sodium Hydroxide Flake</td>
<td>B</td>
<td>0</td>
</tr>
<tr>
<td>41.</td>
<td>Sodium Sulfide Saturated</td>
<td>B</td>
<td>0</td>
</tr>
<tr>
<td>42.</td>
<td>Sulfuric Acid, 33%</td>
<td>B</td>
<td>0</td>
</tr>
<tr>
<td>43.</td>
<td>Sulfuric Acid, 77%</td>
<td>B</td>
<td>0</td>
</tr>
<tr>
<td>44.</td>
<td>Sulfuric Acid, 96%</td>
<td>B</td>
<td>2-3</td>
</tr>
<tr>
<td>45.</td>
<td>Sulfuric Acid 77% &amp; Nitric Acid</td>
<td>B</td>
<td>1-3</td>
</tr>
<tr>
<td></td>
<td>70% equal parts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>46.</td>
<td>Toluene</td>
<td>A</td>
<td>0-1</td>
</tr>
<tr>
<td>47.</td>
<td>Trichloroethylene</td>
<td>A</td>
<td>0-1</td>
</tr>
<tr>
<td>48.</td>
<td>Xylene</td>
<td>A</td>
<td>0-1</td>
</tr>
<tr>
<td>49.</td>
<td>Zinc Chloride, Saturated</td>
<td>B</td>
<td>0</td>
</tr>
</tbody>
</table>

### 3. Hot Water Test

- **Test Procedure:** 190 to 205 degrees Fahrenheit (88°C to 96°C) hot water shall be allowed to trickle (with a steady stream and at a rate of not less than 6 ounces (177.5 cc) per minute) on the finished surface, which shall be set at an angle of 45°, for a period of 5 minutes.
- **Acceptance Level:** After cooling and wiping dry, the finish shall show no visible effect from the hot water.

### 4. Paint Adhesion on Steel Test

- **Test Procedure:** Test shall be based on ASTM D2197-86 “Standard Method of Test for Adhesion of Organic Coating.” Two sets of eleven parallel lines 1/16 inch (1.587 mm) apart shall be cut with a razor blade to intersect at right angles thus forming a grid to 100 squares. The cuts shall be made just deep enough to go through the
coating, but not into the substrate. Brush surface lightly with a soft brush for one minute. Examine under 100 fc (1076 lux) of illumination.

b. Acceptance Level: Ninety or more of the squares shall show finish intact.

5. Impact Test

a. Test Procedure: Drop a 1 pound (0.4536 kg) ball (approximately 2 inch (50.8 mm) diameter from a distance of 12 inches (305 mm) onto a flat horizontal surface, coated to manufacturer’s standard manufacturing method.

b. Acceptance Level: No visual evidence to the naked eye of cracks in the finish due to impact.

6. Paint Hardness on Steel Test

a. Test Procedure: Paint film shall be tested with pencils of various hardnnesses. Pencils shall have a wide, sharp edge. Pencils shall be pushed across surface in a chisel-like manner.

b. Acceptance Level: Finish film shall not rupture from a sharpened 4H pencil.

2.3 METAL LABORATORY CASEWORK WITH WOOD DOOR AND DRAWER FRONTS

A. Manufacturers: Products complying with this specification may be provided by the following manufacturers. All products specified in this section shall be the provided by a single manufacturer.

1. Laboratory Casework:

a. CiF Lab Solutions, 53 Courtland Avenue, Vaughan, Ontario, Canada L4K 3T2 Tel: 905 738-5821.

b. ICIscientific, 1865 Highway 641 North, Paris, TN 38242-8814 Tel: 731-642-4251.

c. Kewaunee Scientific Corporation, P O Box 1842, Statesville, NC 28687 Tel: 704 873-7202.

d. Mott Manufacturing Ltd., 452 Hardy Road, P. O. Box 1120, Brantford, ON, Canada N3T 5T3 Tel: 519 752-7825.

e. Approved substitution.

B. Metal Laboratory Casework

1. Design Requirements:

a. Door and drawer front design: Square edged inset metal construction with all front surfaces above the toe space in the same plane.

1). Cabinet front shall have side rails, bottom rail, and top rail which create a complete four-sided flush frame around all doors and drawers. Fully weld and finish all corners of the four-sided flush frame, and any other additional intermediate flush rails as specified, to create a continuous flush plane

2). Cabinets with recessed top and bottom rails do not meet these requirements and will not be acceptable.
b. Door and drawer front design: Full flush overlay metal construction with door and drawer fronts overlaying the case unit ends, top and bottom rails.

c. Door and drawer front design: Flush overlay wood construction with eased edges and fronts overlaying the case unit ends, top and bottom rails.

d. Door and drawer front design: Flush overlay plastic laminate construction with door and drawer fronts overlaying the case unit ends, top and bottom rails.

e. Full-flush overlay design requirements:

1). Applied panels may be required in areas such as sink cabinets and knee spaces with pencil drawers to complete the flush construction.

2). Reveals shall be within the ranges indicated below – however, they shall be consistent across a given project.

   a). Reveal from top of door/drawer fronts to top of cabinet: 3/32 inch to ¼ inch.
   b). Reveal from bottom of door/drawer fronts to bottom of cabinet bottom panel: Flush.
   c). Horizontal and vertical reveals between door and drawer fronts: 3/32 inch to 3/16 inch.
   d). Vertical reveal between side of door and drawer fronts and the side of the cabinet: one-half of the typical horizontal and vertical reveal.

f. Grain Pattern:

   1). Vertical Matched Grain Pattern: Grain pattern on end panels, exposed backs, flush panels, and door and drawer fronts shall be vertical. Entire cabinet front must be cut from a single panel.

   2). Sequence match panels across each room elevation, island elevation, and peninsula elevation to ensure uniformity of color and grain.

g. Pulls on doors shall be mounted vertically and on drawers horizontally.

h. All tall cases shall be provided with toe space to match base units.

i. All cabinets shall be constructed and finished to be suitable for use as stand-alone units and to permit future rearrangement without the need for additional parts or finish.

j. Suspended casework: Provide as detailed on Laboratory Furnishing drawings. Construction of suspended casework units shall be the same as floor mounted cabinets with the following exceptions:

   1). Omit sub-base and provide casework with finished bottom panels.

   2). Fixings and fastenings necessary for its attachment to the supporting structure.

k. Widths of drawers in knee opening rails shall not be less than 24 inches (600 mm) or the width of the rail whichever is the lesser.

l. Cabinets below fume hoods that conflict with ductwork, cup sinks, or waste connections shall be 19 inches deep to accommodate any obstructions.

m. Full-Flush Construction and Installation: All finished panels shall be in the same plane to provide a true flush overlay appearance.
1. Flush panels: Provide fixed fully-edgebanded flush wood panels at sink cabinets, knee opening drawer units, and other similar conditions, so that all finished panels are in the same plane as cabinet doors and drawers to provide a true flush overlay appearance. Applied wood panels may be required in areas such as sink cabinets and knee spaces with pencil drawers to complete the flush construction.

2. Filler panels:
   a. Provide fixed fully-edgebanded flush wood filler panels at inside corners, end-of-run conditions, and other similar locations, so that all finished panels are in the same plane as cabinet doors and drawers to provide a true flush overlay appearance.

   (1). Full-flush end-of-run filler panels are required at all conditions where the joint width is one inch or larger. Where the joint width is less than one inch, filler panel may be flush with the cabinet body.

3. Outside corners:
   a. At outside corners, provide a wood applied panel to the side of exposed metal cabinets. Align with the face of adjacent wood doors or drawers.

2. Materials:
   a. Steel: Cold-rolled furniture stock sheet steel, prime grade, roller leveled.

      1). Steel shall be treated at the mill to be free of scale, ragged edges, deep scratches, or other injurious effects.

      2). All gauges indicated are to be U.S. standard.

   b. Maple Door and Drawer Fronts:

      1). Lumber:

         a). Plain sawn Maple, NHLA Grade FAS.

         b). All lumber shall be clean and free of defects; kiln and air dried to uniform moisture content of 6 percent.

      2). Veneer:

         a). Plain sliced white select maple, grade A. Thickness: 1/50 inch (0.5 mm), minimum.

             (1). Color and Matching:

                (a). 100% sapwood, no heartwood allowed.

                (b). Slight color streaks or marks.

                (c). Slight color variation.

                (d). No sharp contrast at veneer joints.
(2). Natural Characteristics:

(a). Small conspicuous burls: combined average not to exceed 4 per 10 square feet (1 m²).
(b). Conspicuous burl size: 3/8 inch (9.5 mm), maximum.
(c). Conspicuous pin knots: combined average not to exceed 4 per 32 square feet (3 square meters). Maximum pin knot size – dark part: 1/8 inch (3.2 mm). Maximum pin knot size – total: ¼ inch (6.4 mm).
(d). Scattered sound repair knots, bark pockets: not allowed.
(e). Slight mineral streaks, worm tracks, cross bars and vine marks.

(3). Manufacturing Characteristics:

(a). Rough cut or ruptured grain is not allowed.
(b). Blended repaired tapering hairline Splits: two 1/16 inch (1.6 mm) x 6 inch (152 mm) on end panels only.

(4). Repairs: Small blending allowed.
(5). Flitch Width, Face Components: 5 inches minimum, except for outside components.

b). Veneer shall be hand selected for uniformity of color and grain prior to fabrication of cabinet faces. The resulting selection shall provide a pleasing uniform appearance and shall not allow darker and lighter panels in the same area or room after installation.

c). Layup pattern: Slip matched.

3). Edgeband/Facer: 1/8 inch (3 mm) hardwood; species as described above. Edgeband all sides.
4). Finish for Wood Laboratory Components:

a). Finish processes (stains and finishes) shall be by means of compression spray, providing high-transfer efficiency low waste generation. Solvent applied coatings are not acceptable and will not be considered. Manufacturer shall supply documentation that waste generated during the finishing process, is a non-hazardous material, eliminating liquid waste disposal in landfills.

(1). Chemically Resistance Finish: Finish for all wood products shall be environmentally friendly, highly chemically resistant, water-borne, laboratory-grade finish that satisfies the requirements specified herein for chemical and durability resistance. A letter from a third-party validator, verifying independent test results, shall be submitted to the Architect for approval prior to award of contract.

(2). Operator Protection: The application shall be convenient and easily mastered, in a custom spray booth. The finish process
shall be cleanly contained and shall have no solvent odor, and shall be applied in an air-conditioned room.

(3). VOC Emissions: Water-borne finishes shall be sprayed and cured with a near zero (2.0 lbs. per gallon for ‘clean finish’) VOC (Volatile Organic Compounds) emissions.

(4). Offgasing: After all wood products have cooled from the curing ovens, the coating shall be firm and stable. No further emissions or “Offgasing/Decomposition” vapors shall occur at room temperature.

b). Manufacturer may uses either of the following finish systems:

(1). Customized, high-solids, cross-linked, ultraviolet light (UV)-cured coating developed for durability, including abrasion, chemical, impact, and scratch resistance, for flat-line applications. Coatings shall have little or no VOCs.

(2). Chemical-resistant modified acrylic urethane finish with built-in UV blocker, or equal, applied over permanent wood stain.

c). Stain Color: Stain color to match Architect’s sample.

d). Application:

(1). Finish application and sequence shall be as recommended and designed by the manufacturer for a high quality, laboratory-grade wood casework finish.

(2). Preparation: Sand exposed and semi-exposed surfaces smooth, free from dirt and defects.

(3). Stain application: Apply stain of color selected to all exposed and semi-exposed casework surfaces. Apply in a manner to achieve a match with the selected color sample upon completion of application of the finish.

(4). Finish application: Apply chemical resistant top finish to all stained surfaces. Finished surfaces shall be even, water-clear and bright. Cloudy or muddy finishes carrying tinting pigments will not be acceptable.

c. Glass: Framed glass doors:

1). 1/8 inch (3mm) to 7/32 inch (5.5 mm) thick tempered glass.

2). Without imperfections or marred surfaces.

3). All glass should have etched safety information, readable from outside the cabinet.

3. Base, Wall, Upper, and Tall Cabinets:

a. General:

1). Exterior corners: shall be spot and arc welded with heavy back up reinforcement at exterior corners. All face joints shall be arc welded and ground smooth to provide a continuous flat plane.
2). All units shall have a cleanable smooth interior. Front and rear posts, reinforcing members or channel uprights shall be enclosed full heights on all cabinet openings.

3). End Uprights shall be formed into not less than a channel formation at top, bottom, back and front.

4). The edge of the vertical uprights shall be formed to provide a strike for doors and drawers, and shall be perforated for the support of drawer channels, intermediate rails and hinge screws.

5). An upright filler shall be screwed in place in all cupboard units to close the back of the channel at front of the upright and to provide a smooth interior for the cupboard to facilitate cleaning.

6). The upright filler shall be perforated with shelf adjustment holes at no more than ½ inch (12.7 mm) centers.

7). The inside front of the upright shall be further reinforced with a full height 14 gauge (2.0 mm thick) hinge reinforcement angle.

8). Die Formed Gussets: shall be furnished in each bottom corner of base units to insure rigidity, and a 3/8 inch (10 mm) -16 leveling bolt, 3 inches (75 mm) long, shall engage a clinch nut in each gusset. Each leveling bolt and gusset shall be capable of supporting 500 lbs (225 kg). (Each unit shall support 2000 lbs. (900 kg) uniformly distributed on a work top.) Provide caps at all penetrations provided to access leveling devices.

b. Cabinet Base:

1). Case bottom and bottom rail shall be formed of one piece of metal except in corner units and shall have both sides and back formed up or down and shall be offset in front to provide a door and drawer recess rabbet.

2). Toe Space Rail: shall extend up and forward to engage bottom rail to form a smooth surfaced toe space, 3 inches (75 mm) deep and 4 inches (100 mm) high. Whenever the base is omitted for units to be set on building bases or separate metal bases, the toe space rail shall extend back 4½ inches (115 mm).

c. Cabinet Back, Unexposed: Cabinet back shall consist of a top and bottom rail, channel formed for maximum strength and welded to back and top flange of end uprights, with space between left open for access to plumbing lines. All units shall be provided with removable back panels.

1). Sink units shall be provided with fixed half-height backs to allow plumbing lines to enter and exit the cabinet through the open area.

d. Shelves: shall be full depth formed down ¾ inch (19 mm), back 7/8 inch (22 mm) and up ¼ inch (6 mm) at front and rear and formed down at ends ¾ inch (19 mm). Shelves over 36 inches (914 mm) in length shall be additionally reinforced by a flanged channel shaped member electro-welded to underside of shelf. Shelves shall be adjustable. Full-depth is defined as a shelf whose front edge is within ½ inch (13mm) of the face of the cabinet when the shelf is fully back in the cabinet.

1). Restraint: At open shelf units, provide retainer rail as specified elsewhere in this section and detailed on drawings.
e. Doors: shall be readily removable and hinges easily replaceable. Hinges shall be applied to the case and door with screws. Welding of hinges to either case or door will not be acceptable.

f. Door and Drawer Heads:

1). Wood:
   a). As specified above.
   b). Select and arrange fronts for compatible grain and color. Do not use materials adjacent to one another that are noticeably dissimilar in color, grain, figure, or natural character markings.

g. Drawer Construction:

1). Drawer bodies shall be made in one-piece construction including the bottom, two sides, back and inner front. They shall be fully coved at interior bottom on all four sides for easy cleaning. Sides shall be full height with ½ inch (13 mm) clearance to frame opening. Drawers shall be a minimum of 18 inches front to back.  
2). Drawer Suspension: Refer to Drawer Slides under Hardware section.
3). Drawer stops: shall be provided to insure smooth, quiet operation at point of contact with cabinet front.

h. Top Horizontal Rail: Provide on base cabinets such that rail shall interlock within the flange at top of end panels for strength. Reinforcements shall be provided at all front corners for additional welded strength between vertical and horizontal case members.

i. Intermediate Rails: Provide on base cabinets such that rails shall be provided between doors and drawers, but shall not be provided between drawers unless made necessary by locks in drawers. When required, intermediate rails shall be recessed behind doors and drawer fronts, and designed so that security panels may be added as required.

j. Intermediate Vertical Uprights: shall be furnished to enclose cupboards when used in a unit in combination with a half width bank of drawers. However, to allow storage of large or bulky objects, no upright of any type shall be used at the center of double door cupboard units.

k. Security Panels: Provide security panels in frames between drawers and cabinets within a cabinet where keyed different locks are indicated.

l. Knee Space Service Strip Cover Panels where specified, shall be 18 gauge (1.3 mm thick) steel, of the same finish as cabinets, and shall be furnished at open spaces under counter top where no cabinets occur. They shall be easily removable and shall cover piping from underside of top of service ledge to floor.

m. Provide filler panels where required between cabinets, at corner intersections of cabinets, between cabinets and walls and wherever else required for a complete finished installation. For tall cabinets, filler panels shall be provided for vertical face and top. For wall cabinets, filler panels shall be provided for vertical face, top and bottom. Filler panels shall follow the profile of toe kicks.

4. Metal-Framed Laboratory Tables
a. Tops: Refer to Laboratory Furnishing drawings for top materials, as described in the Laboratory Work Surfaces section.

1) Tops shall be mechanically attached to the table frame with a minimum of six concealed metal angle brackets screwed into the inside of the table frame and the bottom of the work surface. Metal angle bracket may be stainless steel, zinc-coated steel, or powder-coated steel. Screws shall be dome-head, with a minimum size of No. 5, ½ inch long, or otherwise sufficient to firmly and permanently secure the benchtop to the table frame allowing that the table may be picked up by the top.

2) Vibration absorbing isolation: Provide a continuous wide bead of clear silicone sealant to the top of all supporting rails. Allow complete cure before attachment of the work surface.

b. Electrical receptacles: Tables shown with electrical receptacles shall be pre-wired, including cutouts for electrical receptacles, black cord, 90-degree NEMA 5-20P plug, back boxes, gray NEMA 5-20R decora-style electrical receptacles, stainless steel faceplates, wiring, and junction boxes as required for a complete functional assembly.

1) The first electrical device wired from the main cord shall be a 20 amp, GFCI outlet with downstream protection capability.

2) Ensure wiring to downstream receptacles is connected to the downstream outlets such that GFCI protection is provided to downstream outlets.

3) Cover plates of downstream outlets to be engraved to note that GFCI protection is provided via upstream receptacle.

4) UL Listing: Tables shall be tested and labeled per one of the following UL standards: UL61010-1 or UL962.

c. Leveling Glides and Leg Shoes:

1) Each leg other than those fitted with casters shall have leveling glides: (2 inch) (48 mm) diameter, two-piece pivot construction, steel housing, non-marring, phenolic or translucent plastic insert, (1/2 inch) (12 mm) diameter, minimum (1 1/2 inch) (36 mm) long zinc plated stems. Each glide shall have a load bearing capacity of 150 lbs.

2) Each leg other than those fitted with casters and adjustable-height legs, shall have leg shoes: Black coved vinyl or rubber leg shoe, 2 inches (50 mm) in height.

d. Casters: Where indicated on Laboratory Furnishing drawings, provide sets of 3 ½ inch (89 mm) diameter wheels with self-lubricating bearing, rated to carry 250 pounds (113 kg) minimum each. Each caster must swivel and have a locking brake at front wheels. Wheel shall be of molded polyurethane tread mechanically locked to a polyolefin core. Movable tables to have all 4 swivel and locking casters.

e. Adjustable-Height Legs: Where indicated on Laboratory Furnishing drawings, provide a stainless steel insert at the bottom of each leg. Height of each insert shall be adjustable in 2 inch (50mm) increments using stainless steel pins. This shall result in a work-surface top height range between 30 inches (750mm) and 38 inches (1000mm). Include leveling glide at bottom of each insert.
f. Table Drawers: Where indicated on the drawings, provide front and back rails; drawer unit, hardware and suspension same as specified for casework base unit drawers.

g. Construction:

1). Table rails, legs, and spreader rails shall be fully welded into a single-piece table frame structure. No mechanical joints between members are permitted.

h. Rails: Not less than 1½ inch x 4½ inch 16 gauge (38 x 114 x 1.6 mm) channel steel sections, reinforced as necessary for leg attachment.

i. Legs: Not less than 2 inch x 2 inch 16 gauge (50 x 50 x 1.6 mm) square tubular steel sections.

j. Leg rails and spreader rail: Not less than 1¼ inch x 2½ inch 16 gauge (32 x 63 x 1.6 mm) steel sections, reinforced as necessary for leg attachment.

k. Materials and Finish: Refer to Metal Fabrications specifications in this Section for material and finish requirements.

l. Low level shelf: If shown on Laboratory Furnishing drawings shall be of ¾ inch (18 mm) high-pressure phenolic sheet, as described in the Laboratory Work Surfaces section of this specification.

5. Aprons and leg assemblies:

a. Apron: Not less than 1½ inch (38 mm) by 4 inch (114 mm) 16 gauge (x 1.6 mm thick) channel steel sections, reinforced as necessary for leg attachment.

b. Legs: Not less than 2 inch (50 mm) by 2 inch (50 mm) 16 gauge (x 1.6 mm thick) square tubular steel sections.

c. Leg rails: Not less than 1¼ inch (32 mm) by 2½ inch (63 mm) 16 gauge (x 1.6 mm thick) steel sections, reinforced as necessary for leg attachment. Each leg shall have a recessed leveling screw and a black, coved vinyl or rubber leg shoe, 2 inches (50 mm) in height.

d. Low level shelf: If shown on Laboratory Furnishing drawings shall be of ¾ inch (18 mm) high-pressure phenolic sheet, as described in the Laboratory Work Surfaces section of this specification.

e. Apron drawers: Where indicated on the Laboratory Furnishing drawings, provide support rails; drawer unit, hardware and suspension as specified for base unit drawers.

6. Metal Casework Construction Performance: Base cabinets shall be constructed to support a uniformly distributed load of 200 pounds. minimum per square foot (1000 kg/m²) of cabinet top area (total maximum of 2000 pounds (900 kg)), including working surface without objectionable distortion or interference with door and drawer operation.

a. Base cabinet corner gussets with leveling bolts shall support 500 pounds (225 kg) per corner, at 1½ inch (38 mm) projection of the leveling bolt below the gusset.

b. Each adjustable and fixed shelf 4 feet (1219 mm) or shorter in length shall support an evenly distributed load of 40 pounds per square foot (200 kgf/m²) up to a maximum of 200 pounds (90 kg), with nominal temporary deflection, but no permanent set.
c. Drawer assemblies shall automatically maintain alignment in cabinet opening and shall not bind during opening or closing of the drawer so as to minimize glass breakage and damage to fragile parts.

d. Swinging doors mounted on base units shall support a 250 lb. (113 kg) load located at a test point 14 inches (356 mm) measured horizontally from hinge along the top edge of door through a swing of 180 degrees. Weight test shall allow nominal temporary deflection, but no permanent distortion. Door assembly shall be twist-resistant and rigid, and shall close in a flat plane against the cabinet to permit the door catch at top of door to function properly.

C. Hardware: As specified elsewhere in this Section.

D. Metal Casework Color: As selected by the Architect from manufacturer's full color line and complying with finish requirements described below.

E. Metal Casework Finish Requirements: as specified elsewhere in this section.

F. Metal Finish Performance Requirements: as specified elsewhere in this section.

G. Wood Finish Chemical Resistance Performance Requirements: as specified elsewhere in this section.

2.4 SPECIAL LABORATORY CASEWORK

A. Manufacturers: Products complying with this specification may be provided by the following manufacturers. All products specified in this section shall be the provided by a single manufacturer.

1. Laboratory Casework:

a. CiF Lab Solutions, 53 Courtland Avenue, Vaughan, Ontario, Canada L4K 3T2 Tel: 905 738-5821.

b. Eagle Manufacturing Company, 2400 Charles St., Wellsburg, WV 26070 Tel: 304 737-3171.

c. ICI scientific, 1865 Highway 641 North, Paris, TN 38242-8814 Tel: 731-642-4251.

d. Justrite Manufacturing Company, 2454 Dempster St., Suite 300, Des Plaines, IL 60016 Tel: 800 798-9250.

e. Kewaunee Scientific Corporation, P O Box 1842, Statesville, NC 28687 Tel: 704 873-7202.

f. Mott Manufacturing Ltd., 452 Hardy Road, P. O. Box 1120, Brantford, ON, Canada N3T 5T3 Tel: 519 752-7825

g. Approved substitution.

B. Metal Laboratory Casework

1. Design Requirements:

a. Door and drawer front design: Square edged inset metal construction with all front surfaces above the toe space in the same plane.
1). Cabinet front shall have side rails, bottom rail, and top rail which create a complete four-sided flush frame around all doors and drawers. Fully weld and finish all corners of the four-sided flush frame, and any other additional intermediate flush rails as specified, to create a continuous flush plane.

2). Cabinets with recessed top and bottom rails do not meet these requirements and will not be acceptable.

b. Pulls on doors shall be mounted vertically.

c. All cabinets shall be constructed and finished to be suitable for use as stand-alone units and to permit future rearrangement without the need for additional parts or finish.

d. Cabinets below fume hoods that conflict with ductwork, cup sinks, or waste connections shall be 19 inches deep to accommodate any obstructions.

1). Filler panels: Provide metal filler panels at inside corners, end-of-run conditions, and other similar locations, aligned with the face of adjacent metal cabinet bodies.

2). Outside corners:

   a). At outside corners, align side panel of cabinet with the face of the door of adjacent cabinet.

2. Materials:

   a. Steel: Cold-rolled furniture stock sheet steel, prime grade, roller leveled.

      1). Steel shall be treated at the mill to be free of scale, ragged edges, deep scratches, or other injurious effects.

      2). All gauges indicated are to be U.S. standard.

3. Base cabinets:

   a. General:

      1). Exterior corners: shall be spot and arc welded with heavy back up reinforcement at exterior corners. All face joints shall be arc welded and ground smooth to provide a continuous flat plane.

      2). All units shall have a cleanable smooth interior. Front and rear posts, reinforcing members or channel uprights shall be enclosed full heights on all cabinet openings.

      3). End Uprights shall be formed into not less than a channel formation at top, bottom, back and front.

      4). The edge of the vertical uprights shall be formed to provide a strike for doors and drawers, and shall be perforated for the support of drawer channels, intermediate rails and hinge screws.

      5). An upright filler shall be screwed in place in all cupboard units to close the back of the channel at front of the upright and to provide a smooth interior for the cupboard to facilitate cleaning.

      6). The upright filler shall be perforated with shelf adjustment holes at no more than ½ inch (12.7 mm) centers.
7). The inside front of the upright shall be further reinforced with a full height 14 gauge (2.0 mm thick) hinge reinforcement angle.

8). Die Formed Gussets: shall be furnished in each bottom corner of base units to insure rigidity, and a 3/8 inch (10 mm) -16 leveling bolt, 3 inches (75 mm) long, shall engage a clinch nut in each gusset. Each leveling bolt and gusset shall be capable of supporting 500 lbs (225 kg). (Each unit shall support 2000 lbs. (900 kg) uniformly distributed on a work top.) Provide caps at all penetrations provided to access leveling devices.

b. Cabinet Base:

1). Case bottom and bottom rail shall be formed of one piece of metal except in corner units and shall have both sides and back formed up or down and shall be offset in front to provide a door and drawer recess rabbet.

2). Toe Space Rail: shall extend up and forward to engage bottom rail to form a smooth surfaced toe space, 3 inches (75 mm) deep and 4 inches (100 mm) high. Whenever the base is omitted for units to be set on building bases or separate metal bases, the toe space rail shall extend back 4½ inches (115 mm).

c. Cabinet Back, Unexposed: Cabinet back shall consist of a top and bottom rail, channel formed for maximum strength and welded to back and top flange of end uprights, with space between left open for access to plumbing lines. All units shall be provided with removable back panels.

d. Shelves: shall be full depth formed down ¾ inch (19 mm), back 7/8 inch (22 mm) and up ¼ inch (6 mm) at front and rear and formed down at ends ¾ inch (19 mm). Shelves over 36 inches (914 mm) in length shall be additionally reinforced by a flanged channel shaped member electro-welded to underside of shelf. Shelves shall be adjustable. Full-depth is defined as a shelf whose front edge is within ½ inch (13mm) of the face of the cabinet when the shelf is fully back in the cabinet.

e. Doors: shall be readily removable and hinges easily replaceable. Hinges shall be applied to the case and door with screws. Welding of hinges to either case or door will not be acceptable.

f. Doors:

1). Metal, Flush Inset: shall be a two-piece sheet steel assembly of ¾ inch (19 mm) overall thickness to consist of an inner pan formed as an extension of the drawer body, an outer pan having a channel formation on all four sides, and the interior space filled with a non-organic sound deadening material at the time of assembly. Door Pans and Drawer Heads shall be painted inside and out prior to assembly.

a). All four corners of door and drawer heads shall be welded closed and ground smooth to eliminate exposure of raw edges and open gaps.

g. Top Horizontal Rail: Provide on base cabinets such that rail shall interlock within the flange at top of end panels for strength. Reinforcements shall be provided at all front corners for additional welded strength between vertical and horizontal case members.

1). Top horizontal rail shall be flush at the face of the unit.
h. Intermediate Rails: Provide on base cabinets such that rails shall be provided between doors and drawers, but shall not be provided between drawers unless made necessary by locks in drawers. When required, intermediate rails shall be recessed behind doors and drawer fronts, and designed so that security panels may be added as required.

i. Intermediate Vertical Uprights: shall be furnished to enclose cupboards when used in a unit in combination with a half width bank of drawers. However, to allow storage of large or bulky objects, no upright of any type shall be used at the center of double door cupboard units.

j. Knee Space Service Strip Cover Panels where specified, shall be 18 gauge (1.3 mm thick) steel, of the same finish as cabinets, and shall be furnished at open spaces under counter top where no cabinets occur. They shall be easily removable and shall cover piping from underside of top of service ledge to floor.

k. Provide filler panels where required between cabinets, at corner intersections of cabinets, between cabinets and walls and wherever else required for a complete finished installation. Filler panels shall follow the profile of toe kicks.

4. Aprons and leg assemblies:
   a. Apron: Not less than 1½ inch (38 mm) by 4 inch (114 mm) 16 gauge (x 1.6 mm thick) channel steel sections, reinforced as necessary for leg attachment.
   b. Legs: Not less than 2 inch (50 mm) by 2 inch (50 mm) 16 gauge (x 1.6 mm thick) square tubular steel sections.
   c. Leg rails: Not less than 1¼ inch (32 mm) by 2½ inch (63 mm) 16 gauge (x 1.6 mm thick) steel sections, reinforced as necessary for leg attachment. Each leg shall have a recessed leveling screw and a black, coved vinyl or rubber leg shoe, 2 inches (50 mm) in height.

5. Fume Hood Cabinets:
   a. Purpose-designed metal cabinet with fixed panel above door to conceal cup sink and plumbing.
   b. Provide metal fume hood cabinets where adjacent cabinetry below a fume hood is also metal.

6. Corrosives Storage Cabinets:
   a. Purpose-designed lined metal cabinet.
   b. Lining: Cabinet shall be complete lined with a polypropylene or polyethylene liner with sealed or seamless intersections between panels. Liner shall be the full depth of the cabinet. No metal of any type shall be exposed within the lined interior of the cabinet. Screw-heads, if required, shall be covered with hinged-type (not snap-on) plastic screw-head covers.

1). Shelf: Removable full-depth polypropylene or polyethylene shelf. Full-depth is defined as a shelf whose front edge is within ½ inch (13mm) of the face of the cabinet when the shelf is fully back in the cabinet.

c. Label: "CORROSIVES" in conspicuous silk-screened lettering. Stick-on decals are not acceptable. Size and style of lettering shall match the Flammable Liquid/Solvent
Storage Cabinet label. Lettering shall be 2 1/2 inches tall. Color of lettering shall be red. If cabinet color is red, lettering shall be yellow.

d. Locks: Cabinet doors shall be lockable. Lock shall have not metal parts exposed within the lined interior.

e. Venting:

1). Cabinets below or adjacent to fume hoods: Provide and install 2 inch (50 mm) diameter schedule 40 PVC vent pipe and PVC fittings. Extend vent pipe up within the fume hood side wall and vent through the hood side wall liner behind the upper portion of the fume hood baffle.

2). Cabinets not below or adjacent to fume hoods: Vent connection to exhaust duct system shall be under Division 23. Provide hole in back of cabinet to accept exhaust connection.

f. Seismic Anchor: Provide seismic anchor for freestanding cabinets and cabinets located below fume hoods designated to be removable for access for persons with disabilities. Seismic anchors may be floor or wall attachments, but shall not attach to adjacent casework or work surfaces. Seismic anchors shall be accessible without removal of laboratory casework, furnishings, or equipment.

7. Flammable Liquid/Solvent Tall Storage Cabinets:

a. Purpose-designed double-walled metal cabinet for the storage of flammable, combustible and solvent liquids.


c. Label: "FLAMMABLE - KEEP FIRE AWAY" in conspicuous silk-screened lettering. Stick-on decals are not acceptable. Size and style of lettering shall match that of the Corrosive Storage Cabinet label. “FLAMMABLE” lettering shall be 2 1/2 inches tall. “KEEP FIRE AWAY” lettering shall be 2 inches tall. Color of lettering shall be red. If cabinet color is red, lettering shall be yellow.

d. Locks: Cabinet doors shall be lockable.

e. Floor pan: Provide a 2 inch (50 mm) deep liquid tight pan to cover the entire bottom of the cabinet to contain liquid leaks and spills.

f. Shelves: Provide heavy-duty full-depth metal shelves using pan-type construction to create a liquid-tight containment tray.

g. Standards:

1). Comply with the requirements of OSHA and NFPA 30.

2). Comply with the requirements of Uniform Fire Code and the International Fire Code.

3). Cabinets should be certified and labelled with UL 1275 and FM 6050 labels.

h. Venting: Remove both metal bungs from cabinet outlets and replace with flash arrestors provided by manufacturer. Connection with 2 inch (50 mm) black iron vent piping to the HVAC systems as shown on LF drawings shall be under Division 23.

1). Vents from multiple cabinets shall not be manifolded prior to connection to the building system.
i. Electrical grounding:
   1). Provide each flammable liquid / solvent storage cabinet with an externally mounted grounding conductor screw terminal for up to No. 8 AWG conductor, mounted at the top of the cabinet.
   2). Connection from the equipment grounding bus at the lab branch circuit panel to the storage cabinet terminal shall be under Division 26.

j. Seismic Anchor: Provide wall-mounted seismic anchorage. Anchor attachment shall not void UL listing.

8. Flammable Liquid/Solvent Storage (base) Cabinets:
   a. Purpose-designed double-walled metal cabinet for the storage of flammable, combustible and solvent liquids.
   c. Label: "FLAMMABLE - KEEP FIRE AWAY" in conspicuous silk-screened lettering. Stick-on decals are not acceptable. Size and style of lettering shall match that of the Corrosive Storage Cabinet label. “FLAMMABLE” lettering shall be 2 1/2 inches tall. “KEEP FIRE AWAY” lettering shall be 2 inches tall. Color of lettering shall be red. If cabinet color is red, lettering shall be yellow.
   d. Locks: Cabinet doors shall be lockable.
   e. Floor pan: Provide a 2 inch (50 mm) deep liquid tight pan to cover the entire bottom of the cabinet to contain liquid leaks and spills.
   f. Shelves: Provide heavy-duty full-depth metal shelves using pan-type construction to create a liquid-tight containment tray.
   g. Glides: Provide cabinets with adjustable non-marring glides where indicated on the Laboratory Furnishing drawings.
   h. Standards:
      1). Comply with the requirements of OSHA and NFPA 30.
      2). Comply with the requirements of Uniform Fire Code and the International Fire Code.
      3). Cabinets should be certified and labelled with UL 1275 and FM 6050 labels.
   i. Venting: Flammable liquid/solvent storage base cabinets shall not be vented. Seal vent openings with bungs as provided by manufacturer.
   j. Electrical grounding:
      1). Provide each flammable liquid / solvent storage cabinet with an externally mounted grounding conductor screw terminal for up to No. 8 AWG conductor, mounted at the top of the cabinet.
      2). Connection from the equipment grounding bus at the lab branch circuit panel to the storage cabinet terminal shall be under Division 26.
   k. Seismic Anchor: Provide seismic anchor for cabinets located below fume hoods designated to be removable for access for persons with disabilities. Seismic anchors may be floor or wall attachments and shall not attach to adjacent casework or work
surfaces. Seismic anchors shall be accessible without removal of laboratory
casework, furnishings, or equipment. Anchor attachment shall not void UL listing.

9. Vacuum Pump Cabinets:
   a. Provide wood vacuum pump cabinets at locations not under fume hoods where
      adjacent cabinetry is wood. Reference Wood Laboratory Casework requirements
      elsewhere in this section.
   b. Provide metal vacuum pump cabinets at:
      1). Locations where vacuum pump cabinets are located below fume hoods, and
          adjacent cabinets below fume hoods are also metal.
      2). At other locations where adjacent cabinets are metal.
   c. Label: "VACUUM PUMP" in conspicuous silk-screened lettering. Stick-on decals
      are not acceptable. Size and style of lettering shall match the Flammable
      Liquid/Solvent Storage Cabinet lettering. Lettering shall be 2 1/2 inches tall. Color
      of lettering shall be red. If cabinet color is red, lettering shall be yellow.
   d. Venting:
      1). Exhaust connection will be by mechanical contractor. Provide flange for
          interface with exhaust duct.
      2). Provide air intake grille as specified elsewhere in this section.
   e. Acoustical Lining: Cabinet shall be provided with sound absorption and thermal heat
      reflecting quilted liner on door back, interior cabinet top, and interior cabinet sides,
      and interior cabinet back.
      1). Manufacturer: Acoustical Solutions product ABBC-13, no known equal.
      2). Attach along perimeter at 6 inches on center, typical.
   f. Cable/ vacuum line through port: Provide as specified elsewhere in this section.
   g. Pump Support: Stainless steel pull-out tray supported by 150 pound full-extension
      drawer slides, with a watertight polypropylene pan insert. Vibration isolation shall
      be provided between tray and watertight pan insert.
   h. Electrical: Provide NEMA 5-20R receptacle mounted to inside back of cabinet
      installed under Division 11 with final connection under Division 26.

10. Metal Casework Construction Performance: Base cabinets shall be constructed to support
    a uniformly distributed load of 200 pounds. minimum per square foot (1000 kg/m²) of
    cabinet top area (total maximum of 2000 pounds (900 kg)), including working surface
    without objectionable distortion or interference with door and drawer operation.
    a. Base cabinet corner gussets with leveling bolts shall support 500 pounds (225 kg)
       per corner, at 1½ inch (38 mm) projection of the leveling bolt below the gusset.
    b. Each adjustable and fixed shelf 4 feet (1219 mm) or shorter in length shall support
       an evenly distributed load of 40 pounds per square foot (200 kgf/m²) up to a
       maximum of 200 pounds (90 kg), with nominal temporary deflection, but no
       permanent set.
c. Drawer assemblies shall automatically maintain alignment in cabinet opening and shall not bind during opening or closing of the drawer so as to minimize glass breakage and damage to fragile parts.

d. Swinging doors mounted on base units shall support a 250 lb. (113 kg) load located at a test point 14 inches (356 mm) measured horizontally from hinge along the top edge of door through a swing of 180 degrees. Weight test shall allow nominal temporary deflection, but no permanent distortion. Door assembly shall be twist-resistant and rigid, and shall close in a flat plane against the cabinet to permit the door catch at top of door to function properly.

C. Hardware: As specified elsewhere in this Section.

D. Metal Casework Color: As selected by the Architect from manufacturer's full color line and complying with finish requirements described below.

E. Metal Casework Finish Requirements: as specified elsewhere in this section.

F. Metal Finish Performance Requirements: as specified elsewhere in this section.

2.5 SOLID PHENOLIC LABORATORY CASEWORK

A. Manufacturer, Solid Phenolic: Products complying with this specification may be provided by the following manufacturers. All products specified in this section shall be provided by a single manufacturer.

1. Durcon Laboratory Tops, Inc., 206 Allison Drive, Taylor, TX 76574 Tel: 512 595-8000.
2. Fundermax NA, Inc. 2015 Ayrsley Town Boulevard, Charlotte, NC 28273 Tel: 980 505-4030.
3. Trespa North America, Ltd., Greene Street Ground Floor, New York, NY 10012 Tel: 800 487-3772.
4. Approved substitution.

B. Fabricator, Cabinets: Products complying with this specification may be provided by the following manufacturers. All products specified in this section shall be provided by a single manufacturer.

1. Adams Group, Northport, FL; Attn: Doug Sloan; Tel: 941 639-7188; email: dslaon@discoveradams.com
2. Caseworx, Redlands, CA; Attn: Gregg Schneider; Tel: 909 799-8550; email: gregg@caseworx.com
3. JHC Fabrications, Inc., 595 Berrimain Street, Brooklyn, NY 11208 Tel: 718 649 1661.
4. Nulab, Monroe Township, NJ; Attn: Tony DiTringo; Tel: 732 792-0050; email: tony@nulab.com
5. Precision Innovations, Germantown, WI; Attn: Kelly Marx; Tel: 262 255-6116; email: kelly@permarltd.com
6. Spec Rite, St Louis, MO; Attn: Jen Clark; Tel: 314 633-4978; email: jclark@specritedesigns.com
7. Approved substitution.

C. Compliance: Comply with the recommended practices of SEFA-PH-2010.
D. Material: Trespa TopLab Vertical, or equal.

E. Color: As selected by the Architect from manufacturer’s standard colors.

F. Material Performance Requirements

1. Thickness: Solid phenolic material shall have uniform thickness (+0.03 inch) and flatness (maximum difference of 0.03 inch) for 10 foot span.
2. Listing: Panels shall be U.L. registered and labeled for quality consistency.
3. Chemical Resistance: Evaluation of chemical resistance is based on SEFA’s (Scientific Equipment and Fixture Association) standard list of 49 chemicals/concentrations, their required methods of testing and their minimum acceptable results as a means of establishing a minimum acceptable level of performance for all exposed and semi-exposed surfaces.
4. Panels to have screw pull-out strength minimums per following chart (lbs.):

<table>
<thead>
<tr>
<th>Screw Depth</th>
<th>#6</th>
<th>#8</th>
<th>#10</th>
<th>#12</th>
<th>1/4”</th>
<th>5/16”</th>
<th>3/8”</th>
<th>7/16”</th>
<th>1/2”</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/4” panels</td>
<td>120</td>
<td>150</td>
<td>170</td>
<td>200</td>
<td>230</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5/16” panels</td>
<td>160</td>
<td>190</td>
<td>210</td>
<td>240</td>
<td>280</td>
<td>350</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3/8” panels</td>
<td>190</td>
<td>220</td>
<td>260</td>
<td>290</td>
<td>340</td>
<td>420</td>
<td>510</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1/2” panels</td>
<td>250</td>
<td>300</td>
<td>340</td>
<td>390</td>
<td>450</td>
<td>560</td>
<td>680</td>
<td>790</td>
<td>900</td>
</tr>
<tr>
<td>5/8” panels</td>
<td>310</td>
<td>370</td>
<td>430</td>
<td>490</td>
<td>560</td>
<td>710</td>
<td>850</td>
<td>990</td>
<td>100</td>
</tr>
<tr>
<td>3/4” panels</td>
<td>510</td>
<td>590</td>
<td>680</td>
<td>850</td>
<td>1000</td>
<td>2001</td>
<td>400</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

5. Uniform load to cause no more than ¼ inch deflection at center of the span:

<table>
<thead>
<tr>
<th>Thickness</th>
<th>12” x 24”</th>
<th>12” x 36”</th>
<th>12” x 48”</th>
<th>24” x 36”</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/4” panels</td>
<td>35</td>
<td>10</td>
<td>5</td>
<td>20</td>
</tr>
<tr>
<td>5/16” panels</td>
<td>85</td>
<td>25</td>
<td>10</td>
<td>50</td>
</tr>
<tr>
<td>3/8” panels</td>
<td>170</td>
<td>50</td>
<td>20</td>
<td>100</td>
</tr>
<tr>
<td>1/2” panels</td>
<td>370</td>
<td>110</td>
<td>45</td>
<td>220</td>
</tr>
<tr>
<td>5/8” panels</td>
<td>690</td>
<td>210</td>
<td>85</td>
<td>410</td>
</tr>
<tr>
<td>3/4” panels</td>
<td>1400</td>
<td>400</td>
<td>170</td>
<td>800</td>
</tr>
<tr>
<td>1” panels</td>
<td>2600</td>
<td>780</td>
<td>330</td>
<td>1500</td>
</tr>
</tbody>
</table>

6. Performance Requirements:

a. Modulus of elasticity: 1,500,000 psi minimum.
b. Shear strength: 2000 psi minimum.
c. Compressive strength: 24,000 psi minimum.
d. Weight: 93 lbs. per cubic foot maximum.
e. Flame spread (ASTM E-84): Class 1A (25).
f. Non-porous surface and edges.
g. Will not support micro-organic growth.
G. Construction

1. General:
   a. Construction and design shall develop maximum strength and rigidity in each sectional unit. Each sectional unit to be completely fabricated ready for placement in the laboratory casework and equipment assembly. Each cabinet to be a complete integral rigid unit within itself to permit relocation at any subsequent time.
   b. The cabinet shall incorporate full overlay design in which posts and rails are concealed behind the doors and drawer heads. The door and drawer heads shall create a 1/8 inch (3 mm) horizontal reveal. There shall be a 1/16 inch (1.5 mm) inch vertical reveal at the edge of each cabinet creating a 1/8 inch (3 mm) vertical reveal at the end of each cabinet when two cabinets are set in place next to each other.
   c. Each cabinet shall be assembled incorporating mortise and tendon construction or 32mm dowel construction. Vertical and horizontal members shall be keyed and then phenol seal bonded and mechanically fastened. Exposed edges on cabinet components, doors and drawer heads to be sanded and polished to a satin smooth finish. Underside of toe space shall be enclosed.

2. Base, Wall, Upper, and Tall Cabinets:
   a. Component Thickness Schedule
      1). Cabinet sides and bottoms: ½ inch (13 mm)
      2). Door and drawer heads: ½ inch (13 mm)
      3). Horizontal rail supports: ½ inch (13 mm)
      4). Cabinet backs: ¼ inch (6 mm)
      5). Wall cabinet backs: ½ inch (13 mm)
      6). Cabinet shelves: ½ inch (13 mm)

   b. Cabinet Backs: All base cabinets shall have removable back panels from the inside of the cabinet for access to the pipe spaces to the rear of the cabinet. If cabinet is located in the corner of an assembly and access to the pipe space is required to the side of the cabinet, removable panels shall be provided in the side of the cabinet also. All removable panels shall be easily removed without the use of tools or the removal of screws.
      1). Sink cabinets shall be provided with a fixed half-height back panel to allow plumbing lines to enter and exit the cabinet through the open area.

   c. Cabinet Base:
      1). Sectional units, cabinets and cases shall be located on the laboratory floor shall be equipped with leveling devices that are easily adjustable, to compensate for unevenness in the floor.
      2). Sectional units shall have 4 inches (100 mm) high by 3 inches (75 mm) deep toe space members, unless otherwise noted on Laboratory Furnishings drawings.

   d. Shelves: All shelves shall be adjustable on 32 mm centers.
e. Drawers shall have full box construction and be fabricated of ½ inch (13 mm) thick solid composite phenolic resin material. Drawer bottoms shall be matching ¼ inch (6 mm) material. Drawer fronts shall be attached to drawer box using dual directional adjustment hardware. Sides shall be full height with ½ inch (13 mm) clearance to frame opening. Drawers shall be a minimum of 18 inches front to back.

3. Wall and Tall Storage Cabinets: Wall and floor storage cabinets and cases shall match in design and construction the base cabinets.

4. Filler Panels: Provide filler panels where required between cabinets, at corner intersections of cabinets, between cabinets and walls and wherever else required for a complete finished installation. For tall cabinets, filler panels shall be provided for vertical face and top. For wall cabinets, filler panels shall be provided for vertical face, top and bottom. Filler panels shall follow the profile of toe kicks.

H. Hardware: As specified elsewhere in this Section.

2.6 CABINET HARDWARE

A. General: Special cabinets, such as corrosives storage, flammable liquid and solvent storage, rock storage, map storage, museum storage, radioisotope storage, and narcotics lockers, may be provided with the manufacturer’s standard hardware.

1. All door and drawer pulls shall match, regardless of type of casework, except for:

   a. Polypropylene casework. Refer to the pull requirements as specified above.
   
   b. Flammable liquid/ solvent storage cabinets, which should use manufacturer’s standard latch handles as required to satisfy requirements of regulatory approvals.

2. All hardware shall be compliant with the ADA Standards for Accessible Design (28 CFR Part 36).

B. Drawer and Hinged Door Pulls:

1. Drawer and door pulls shall attach to door or drawer with machine screws. Two (2) pulls shall be furnished on drawers wider than 28 inches (711 mm). Plastic pulls or other types subject to breakage are not acceptable.

2. Type: Pulls shall be round “wire” type pulls.

   a. Material and Finish:

      1). Stainless steel with BHMA 630 Satin (Previously US32D) finish.

   b. Size:

      1). Length: 4 inches (100 mm) center to center of screw holes.
      2). Diameter: ¼ inch (6 mm).

C. Sliding Door Pulls:

1. Style: Rectangular flush design stainless steel pulls with recessed finger pull.

D. Hinges:

1. General: Hinges shall be attached to both door and case with three screws through each leaf. Provide two hinges for doors up to 48 inches (1219 mm) high; three hinges for doors over 48 inches (1219 mm) high.

2. Type: Institutional with a five-knuckle bullet-type barrel. Characteristics:
   
   a. Height: 2½ inches (63 mm), nominal.
   b. Material: Stainless steel with stainless steel screws.

   2). Manufacturers:

      a). Rockford Process Control, Inc. 202 Seventh St., Rockford, IL 61104
         Tel: 815 966-2000.
      b). Approved substitution.

E. Shelf Hardware:

1. Shelf Supports:

   a. Adjustable shelf supports: 13 gauge (2.4 mm thick) steel angle with 5 mm diameter by 3/8 inch (10 mm) long pin, bright zinc-plated finish, and all edges rounded.

2. Manufacturers:

   a. Bainbridge Manufacturing, Inc., P. O. Box 487, 237 W 3rd, Waterville, WA 98858
      Tel: 800 255-4702.
   b. The Engineered Products Company (Epco), P. O. Box 108, Flint, MI 48501 Tel: 313
      767-2050.
   c. Knape & Vogt Manufacturing CO., 2700 Oak Industrial Dr. NE, Grand Rapids, MI
      49505 Tel: 616 459-7620.
   d. Sugatsune America, Inc. 221 East Selandia Lane, Carson, CA 90746 Tel: 310 329-
      6373.
   e. Approved substitution.

F. Catches:

1. Roller Catches:

   a. Types and Materials: Roller catches shall be one of the following types. All-plastic or knuckle-type catches are not acceptable, except at corrosive storage cabinets.

      1). Tension ball catches consisting of a case with an adjustable-tension ball catch and a matching strike. Components shall be either stainless steel, chrome plated zinc alloy, or chrome-plated brass.
      2). Nylon roller housed in a steel case, which catches on a steel strike plate. Steel components shall be zinc finished.
      3). At metal casework base cupboard, catches may consist of a two-piece heavy-duty cam action positive catch positioned near the pivoting edge of door which provides a clean unobstructed opening. Main body of the catch shall
be confined within an integral cabinet divider rail, while latching post shall be mounted on the hinge side of door.

4). At corrosive storage cabinets, catches shall be non-metallic.

b. Application: Provide roller catches at top of all non-locked cabinet doors.

c. Manufacturers:

1). The Engineered Products Company (Epco), P. O. Box 108, Flint, MI 48501 Tel: 313 767-2050.
2). Sugatsune America, Inc. 221 East Selendia Lane, Carson, CA 90746 Tel: 310 329-6373.
3). Approved substitution.

2. Elbow catches: Heavy-duty, adjustable, spring-type elbow catch and strike plate.

a. Material: Brass or steel with bright chromium plated finish.

b. Application: Elbow catches shall be used on left hand doors of locked double door cabinets, including tall cabinets.

1). At tall cabinets, elbow catch shall latch to fixed center shelf. Latching devices using chains or strings are not acceptable.

c. Manufacturers:

1). The Engineered Products Company (Epco), P. O. Box 108, Flint, MI 48501 Tel: 313 767-2050.
2). Approved substitution.

G. Drawer slides:

1. Typical: Nylon roller slides:


b. Typical drawers shall be equipped with 3/4 extension 75 lb./pr. (34 kg/pr.) dynamic and 100 lb./pr. (45 kg/pr.) static load capacity, self-closing slides: Blum 230M series, Fulterer FR2021, or equal.

c. File drawers shall be equipped with full extension 75 lb./pr. (34 kg/pr.) dynamic and 100 lb./pr. (45 kg/pr.) static load capacity slides: Blum 430E series, Fulterer FR2021, or equal.

d. Provide matching slides at pull-out writing boards, pull-out keyboard trays, pull-out shelves, and other similar conditions.

e. Manufacturers:

1). Fulterer USA, 542 Townsend Ave., High Point, NC 27263 Tel: 800 395-4646.
2). Julius Blum, Inc. 7733 Old Plank Rd., Stanley, NC 28164 Tel: 800 438-6788.
3). Grass America Inc., P. O. Box 1019, 1202 Highway 66 South, Kernersville, NC 27284 Tel: 800 334-3512.
5). Approved substitution.
2. Typical: Ball bearing slides:
   b. Full extension, 100 lb/pr. (45 kg/pr.) capacity: Accuride 3832, Fulterer FR5000, or equal.
   c. File drawers shall be equipped with rail mounted with overtravel, 150 lb/pr. (68 kg/pr.) capacity: Accuride 4034, Fulterer 5755, or equal.
   d. Pull-out shelf suspension: 100 lb/pr. (45 kg/pr.) capacity pull-out shelf slide: Accuride 322, or equal.
   f. Manufacturers:
      1). Accuride, 12311 Shoemaker Ave., Santa Fe Springs, CA 90670 Tel: 562 903-0200.
      2). Hettich America LLP, 6225 Shiloh Road, Alpharetta, Georgia 30005 Tel: 770 887-3733.
      3). Fulterer USA, 542 Townsend Ave., High Point, NC 27263 Tel: 800 395-4646.
      4). Waterloo Furniture Components Inc., 501 Manitou Dr., Kitchener, Ontario, Canada N2C 1L2 Tel: 519 748-5060.
      5). Approved substitution.

3. Metal (and Stainless Steel) Drawers: Integral drawer suspension assembly: Three-quarter extension, 100 lb/pr. (45 kg/pr.) capacity, typical. 150 lb/pr (68 kg/pr.) for file drawers. Two epoxy-coated steel channel sections, with integral drawer stop, for case and drawer forming drawer suspension assembly. (Channel sections shall be stainless steel at stainless steel casework.) Assembly shall include nylon-tired ball bearing rollers, self-centering and self-closing when open to within 3 inches (76 mm) of the closed position. Case channels shall maintain alignment of drawer and provide an integral drawer stop to prevent the inadvertent removal of the drawer. Drawer shall be removable without the use of tools. Drawers shall rise when opened thus avoiding friction with lower drawers and/or doors. Provide matching slides at all pull-out writing boards, pull-out keyboard trays, pull-out shelves, and other similar conditions.

H. Special Hardware Requirements for Mobile Cabinets:
   1. Mobile cabinets shall be engineered by the manufacturer to avoid overturning (tipping) when drawers are loaded to their design load, and opened to the specified glide opening.
   2. The top drawer of mobile cabinets shall have an opening restricted to ¾ full open.
   3. Mobile cabinets shall be provided with a rod-based drawer interlock glide system to prevent multiple drawers from being opened simultaneously. Accuride 3641 with companion slides Accuride 3642, Fulterer FR5218 with companion slides FR5019, or similar.
   4. Mobile cabinets may additionally be provided with a counter weight system, consisting of galvanized steel plates securely attached to the cabinet bottom or inside the cabinet back. The weights shall not be visible when the cabinet is in the normal, upright position.

I. Drawer Stops: All regular drawers shall be equipped with integral stops to prevent drawer head impact with cabinet body.
J. Door Stops: Provide door stops for any cabinet door, which will strike an obstruction when opened between 90 and 135 degrees.

1. Stop to be either:
   a. Sash chain, No. 30 zinc-plated steel.
      1). Terminations: Zinc chromate wire screw eyes. Open eye as required to attach stop with screws. Through-bolting not allowed.
   b. Coated cable.
      1). Seven-strand, 7-wire-per-strand, stainless steel cable with clear nylon coating.
      2). Wire diameter: 0.047 inches.
      3). Composite diameter with coating: 0.063 inches.
      4). Terminations: Number 10 stake eye on both ends. Attach to door/cabinet with screws. Through-bolting not allowed.
      5). McMaster Carr part number 30345T3 or equivalent.

2. Engineer stop to length to allow door to open 1 ½ inch (40 mm) from obstruction.

K. Hanging File Suspension System: Hangers shall be fastened and secured to drawer construction and shall not be freestanding units set inside the drawer. Provide in all file drawers.

1. Basis of Design: Blum Metafile Hanging File Frame Kit.
2. Manufacturers:
   a. Julius Blum, Inc. 7733 Old Plank Rd., Stanley, NC 28164 Tel: 800 438-6788.
   b. Hettich America L. P., 6225 Shiloh Rd., Alpharetta, GA 30005 Tel: 800 438-8424.
   c. Approved substitution.

L. Label holders: Provide label holders, pinned in place. Stick-on holders not acceptable. Label holders shall be provided at all drawers, and wood cabinets with solid doors. Label holders are not required at framed glass door cabinets.

1. Size:
   a. Minimum Size: 1 inch (25mm) by 2 inches (50mm)
   b. Maximum Size: 2 inches (50mm) by 3 ½ inches (90mm)

2. Material and finish: Steel with matt chrome finish.
3. Basis of Design Product:
   a. 704ANO Label Holder by Knape & Voght, 2700 Oak Industrial Drive NE, Grand Rapids, MI 49505 Tel: 800 253-1561.
   b. Approved substitution.

M. Number Plates: Provide 5/8 inch (16 mm) by 1 ¼ inches (32 mm) aluminum number plates with black numbers, pinned in place. Stick-on holders not acceptable. Number plates shall be provided at all drawers where indicated on the plans. Number drawers sequentially in each laboratory.
N. Sliding Door Hardware:

1. Framed Glass and Solid Doors: Sliding framed glazed doors shall have extruded aluminum track with top hung nylon rollers. Hardware shall be designed so doors cannot ‘jump’ track. Rocker arm carriers shall insure constant track contact.
   a. Basis of Design: Hettich (Grant) 73-034.
   b. Manufacturers:
      1). Hettich America L. P., 6225 Shiloh Rd., Alpharetta, GA 30005 Tel: 800 438-8424.
      2). Approved substitution.

2. Unframed Glass: Provide double channel track for top, bottom and sides of opening. Top and bottom shoes required to receive glass. Bottom shoes shall be provided with steel ball bearing rollers. Rubber bumpers shall be provided in jambs to cushion glass. Provide clear anodized aluminum or pre-coated steel, as recommended by manufacturer for size of opening.
   a. Manufacturers:
      1). Knape & Vogt Manufacturing CO., 2700 Oak Industrial Dr. NE, Grand Rapids, MI 49505 Tel: 616 459-7620.
      2). The Engineered Products Company (Epco), P. O. Box 108, Flint, MI 48501 Tel: 313 767-2050.
      3). Approved substitution.

O. Locks:

1. General: Provide locks on all file cabinet drawers. Provide locks at other locations as indicated on the drawings.
2. Lock type: Deadbolt-type lock.
   a. Disc-tumbler-type locks and/or cam-type locks will not be accepted.
   b. Framed sliding door locks shall be plunger type.
   c. Refer to Elbow Catches section, above, for requirements at two-swinging-door cabinets.
3. Testing requirements:
   a. Locks shall comply with ANSI/BHMA standard E07121.
   b. Lock shall be cycle tested per ANSI/BHMA A156.11 Grade 1.
4. Include spacers, adapters, fasteners, and strikes.
   a. All locks shall strike into metal material. Striking directly into wood is not acceptable.
5. Barrel length shall be coordinated with specific conditions.
6. Finish: Locks shall have satin nickel or satin chrome finish.
7. Keying:
a. Key schedule: Coordinate key schedule with Owner.
   1). Unless otherwise indicated, provide the following for all lockable tall storage cabinets:
      a). Four keys per cabinet.
      b). Master key each room independently, with a building master key.

b. Key quantities: Unless otherwise indicated, provide two keys per lock. Provide four copies of any master/ grand master keys.

c. Key system:
   1). Key system shall support a minimum of 2000 different keys.
   2). Key system shall support up to three levels of master keys (grand-master keys, master keys, and sub-master keys) in addition to individual keys.

d. Key cylinder type: Small-Pin Tumbler.

8. Key engraving:

   a. Keys to be engraved with an identification number corresponding to the layout of unique keys on the project. All identical keys shall be engraved with the same number.
   b. At laboratories with multiple, individually-locked drawers where number plates are indicated, engrave each key with number to match the number plate on each drawer.

9. Manufacturers:

   a. Swinging Doors and Drawers:
      1). Illinois Lock Company, 301 West Hintz Rd., Wheeling, IL 60090 Tel: 847 537-1800.
      2). National Cabinet Lock, 200 Old Mill Rd., P. O. Box 200, Mauldin, South Carolina 29662 Tel: 864 297-6655.
      4). Approved substitution.

   b. Sliding Doors:
      1). National Cabinet Lock, 200 Old Mill Rd., P. O. Box 200, Mauldin, South Carolina 29662 Tel: 864 297-6655.
      3). Sugatsune America, Inc. 221 East Selandia Lane, Carson, CA 90746 Tel: 310 329-6373.
      4). The Engineered Products Company (Epco), P. O. Box 108, Flint, MI 48501 Tel: 313 767-2050.
      5). Approved substitution.

P. Padlock Hasps: Provide one of the following:
1. Stainless steel padlock-eye cam-type locking device and strike plate at cabinet locations as indicated on the drawings. Strike plate, or protection plate, shall be large enough to prevent padlock from damaging door or drawer front.

2. Barrel-style cam-type padlock hasp sized to fit standard lock cylinder hole with finish to match drawer pulls, and strike plate at cabinet locations as indicated on the drawings. Strike plate, or protection plate, shall be large enough to prevent padlock from damaging door or drawer front.

3. Cam-lock shall engage or strike into a metal casting.

4. Manufacturers:
   
   a. Northeast Lock Corporation, 48 Oak St., Clifton, NJ 07014 Tel: 800 524-2575.
   d. Approved substitution.

Q. Glides: Non-marring material, 1 inch (25 mm) diameter, minimum, with a minimum of 5/8 inch (16 mm) vertical adjustment. Provide on movable tables and mobile cabinets, unless otherwise indicated.

R. Leveling devices: Where indicated, provide a 3/8 inch (10 mm) minimum diameter leveling bolt and floor clip.

S. Leg shoes: Leg shoes shall be provided on all legs and table legs to conceal leveling devices, except for tables with casters. Shoes shall be 2 ½ (63 mm) inch high and of black rubber or pliable black vinyl material. Use of a leg shoe which does not conceal leveling device is not acceptable.

T. Floor clips: Provide fixed leg assemblies and fixed table legs with floor clips securely fastened to the floor after shimming.

U. Casters: Where indicated, provide sets of 3 ½ inch (89 mm) diameter wheels with self-lubricating bearing, rated to carry 250 pounds (113 kg) minimum each. Each caster must swivel and have a locking brake. Wheel shall be of molded polyurethane tread mechanically locked to a polyolefin core.

1. Material: Caster shall be heavy gauge cold rolled steel with bright zinc plating.

V. Support Struts and Service Ledging: Refer to specifications for slotted channel framing in this Section.

2.7 NARCOTICS WALL CABINET

A. Manufacturers: Products complying with this specification may be provided by the following manufacturers. All products specified in this section shall be the provided by a single manufacturer.

1. Viking Medical, P. O. Box 2142, Medford Lakes, NJ 08055 Tel: 800 920-1033.
2. Inter Dyne Systems, Inc., 676 Ellis Road, Norton Shores, MI 49441 Tel: 231 799-8760.
3. Carr Corporation, 1547 11th St., Santa Monica, CA 90401 Tel: 800 952-2398.
4. Approved substitution.
B. Description: Wall-mounted cabinet with double door arrangement, one behind the other.

C. Construction:

1. Material: Type 304 stainless steel with No. 4 finish. All welds shall be heliarc and be ground smooth. Cabinet shall be constructed of 18 gauge (1.3 mm) double wall construction throughout.

2. Doors:
   a. Doors shall be 20 gauge (1.0 mm thick), double wall construction.
   b. Doors shall be furnished with full-length, institutional-type piano hinges.
   c. Doors shall latch with nylon roller latches.
   d. Provide stainless steel wire pulls.
   e. Provide individually keyed cylinder locks for each door. Key shall be removable in locked position, only.

3. Shelves:
   a. Shelves shall be 18 gauge (1.3 mm) and adjustable in ½ inch (16.7 mm) increments. Cabinet sides shall be provided with flush perforations for shelf attachment.

4. Provide red jeweled warning light on underside of cabinet. If cabinet is to be installed inside another item of casework, light shall be provided for remote mounting. Light shall illuminate whenever either door is unlocked. Cabinet shall be provided with 7/8 inch (30 mm) diameter knock-out for electrical connection.

2.8 LABORATORY WORK SURFACES

A. Epoxy Resin:

1. Manufacturers: Products complying with this specification may be provided by the following manufacturers.

   b. Durcon Laboratory Tops, Inc., 206 Allison Drive, Taylor, TX 76574 Tel: 512 595-8000.
   c. Kewaunee Scientific Corporation, P O Box 1842, Statesville, NC 28687 Tel: 704 873-7202.
   d. Approved substitution.

2. Thickness:

   a. Typical work surface: 1 inch (25 mm).
   b. Fume hood work surfaces: Tops shall be 1¼ (32 mm) inches thick at outer edge, indented minimum ¼ inch (6 mm) to provide a raised rim around all exposed edges 1 inch (25 mm) wide, minimum, or as to allow for the fume hood sash. The front top edge of the raised rim and exposed vertical corners of the top shall be rounded or chamfered to a 1/8 inch (3 mm) radius. The juncture between the raised rim and the top surface shall be coved or chamfered to a ¼ inch (6 mm) radius.
   c. Curbs and Splashes: ¾ inch (19 mm).
3. Color:
   a. Typical: Dark gray ("Graphite" as supplied by Durcon; "Slate" as supplied by Kewaunee Scientific; or similar).
   c. Color sample to be approved by Architect before work is put in hand.

4. Description:
   a. Monolithic filled epoxy resin work surface consisting of a polymerized cast resin material oven-cured in molds.
   b. Edge profile: For all exposed upper edges and corners:
      1). Radius eased: ¼ inch (6 mm) machined radius with blended radius corners.
   c. Marine edges: Where indicated on the Laboratory Furnishing Drawings, shall be 1 inch (25 mm) wide and ¼ inch (6 mm) high with chamfered or radiused transition to and be an integral part of the work surface.
   d. Indented areas: Where indicated on the Laboratory Furnishing Drawings, shall be ¼ inch (6 mm) deep with chamfered or radiused sides. Internal and external corners shall have ¼ inch to ½ inch (6 to 13 mm) radius. Marine edges formed around indented areas shall not be less than 1 inch (25 mm) wide.
   e. Drain grooves: Where indicated on the Laboratory Furnishing Drawings, shall be 3/8 inch (9mm) wide, 2 inches (50mm) on-center, and shall slope at 1/8 inch (3mm) per foot towards the sink.
   f. Raised rib drain board: Where indicated on the Laboratory Furnishing Drawings, provide ¼ inch (6mm) high, ¼ inch (6mm) wide raised radiused ribs at ¾ inch (18mm) on center. Slope worksurface to sink at 1/8 inch (3mm) per foot.
   g. Sink Mounting:
      1). Drop-in Sink Cutouts: Cutouts shall be profiled to provide support for the sink, and to ensure that the rim of the installed sink is 1/8 inch (3 mm) below the surrounding work surface level or bottom of drain grooves, if present. The top edge of the cutout shall have 1/8 inch (3 mm) bevel. Ensure that there shall be no gaps between the installed sink rim and work surface.
   h. Curbs and Splashes:
      1). Height: 4 inches (100 mm), unless noted otherwise on Laboratory Furnishing Drawings.
      2). Bonded to the surface of the top to form a square joint.
   i. Provide all holes and cutouts as required for built-in equipment and mechanical and electrical service fixtures. Verify size of opening with actual size of equipment to be used prior to making openings. Form inside corners to a radius of not less than 1/8 inch (3 mm). After sawing, rout and file cutouts to ensure smooth, crack-free edges. Seal exposed edges after cutting with a waterproofing material recommended by the manufacturer.
   j. Provide full-length, one-piece tops and backsplashes wherever possible, and keep field joints to an absolute minimum.
5. Physical Properties:

a. Chemical resistance:

1) Organic solvents: A cotton ball, saturated with the test chemical, is placed in a one ounce bottle with a reservoir of liquid above the ball. The container is inverted on the test material surface for a period of 24 hours. Test temperature: 23°C ±2°C.

2) Other test chemicals: Five drops (1/4 cc) of the test chemical are placed on the test material surface. The chemical is covered with a 1 inch diameter watch glass for a period of 24 hours. Test temperature: 23°C ±2°C.

3) Evaluation: After 24 hours exposure, exposed areas are washed with water, then a detergent solution, finally with naphtha, then rinsed with distilled water, dried with a cloth, and rated as follows:

<table>
<thead>
<tr>
<th>Test chemical</th>
<th>Concentration</th>
<th>Black</th>
<th>Dark grey</th>
<th>Light grey</th>
<th>Beige</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black</td>
<td>40% Chromic acid</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>White</td>
<td>10% Hydrochloric acid</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>White</td>
<td>37% Hydrochloric acid (conc.)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>White</td>
<td>40% Nitric acid</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>White</td>
<td>70% Nitric acid (conc.)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>White</td>
<td>60% Sulfuric acid</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>White</td>
<td>96% Sulfuric acid (conc.)</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>White</td>
<td>5% Acetic acid</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>White</td>
<td>5% Acetic acid (glacial)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>White</td>
<td>1% Citric acid</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>White</td>
<td>5% Oleic acid</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>White</td>
<td>5% Phenol solution</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>White</td>
<td>10% Ammonium hydroxide</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>White</td>
<td>20% Sodium carbonate sol.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>White</td>
<td>60% Sodium hydroxide sol.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

4) Test results:
b. Heat resistance:

1). High temperature test: A porcelain crucible is heated to a dull red color, placed on the test material, and allowed to cool to ambient temperature. Result: No observable surface deformation.

2). Flame test: A 3/8 inch (10 mm) Bunsen burner is adjusted to a quiet flame with a 1 1/2 inch (38 mm) inner cone, overturned on the test material, and allowed to stay for 5 minutes. Result: no observable surface deformation.

c. Physical properties:

<table>
<thead>
<tr>
<th>Property</th>
<th>ASTM Standard</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compressive strength</td>
<td>ASTM D695</td>
<td>31,400 psi (216 MPa)</td>
</tr>
<tr>
<td>Tensile strength</td>
<td>ASTM D638</td>
<td>8,000 psi (55 MPa)</td>
</tr>
<tr>
<td>Flexural strength</td>
<td>ASTM D790</td>
<td>11,700 psi (81 MPa)</td>
</tr>
<tr>
<td>Rockwell hardness “M”</td>
<td>ASTM D785</td>
<td>105-110</td>
</tr>
<tr>
<td>Specific density</td>
<td>ASTM D792</td>
<td>122.4 lb/ft³ (1960 kg/m³)</td>
</tr>
<tr>
<td>Water absorption</td>
<td>ASTM D570</td>
<td>0.01%</td>
</tr>
<tr>
<td>Fire Resistance</td>
<td>ASTM D635</td>
<td>ATB (sec)=0</td>
</tr>
<tr>
<td>Heat deflection @ 264 psi</td>
<td>ASTM D648</td>
<td>205°F (172°C)</td>
</tr>
<tr>
<td>(1.82 MPa)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

B. Solid Phenolic Resin
1. Manufacturers: Products complying with this specification may be provided by the following manufacturers.
   a. Durcon Laboratory Tops, Inc., 206 Allison Drive, Taylor, TX 76574 Tel: 512 595-8000.
   b. Fundermax NA, Inc. 2015 Ayrssley Town Boulevard, Charlotte, NC 28273 Tel: 980 505-4030.
   c. Trespa North America, Ltd., Greene Street Ground Floor, New York, NY 10012 Tel: 800 487-3772.
   d. Approved substitution.

2. Basis of design: Standard Grade - Trespa TOPLAB Base, Durcon SOC, or equivalent. Panels shall be of material specifically designed for laboratory work surfaces.

3. Thickness: Material shall have uniform thickness (+0.03 inch (0.76 mm)) and flatness (maximum difference of 0.03 inch (0.76 mm)) for 10 foot (3 m) span.
   a. Low-level shelf: 1 inch (25 mm).

4. Color: As selected by the Architect from the full range of manufacturer’s available colors.
   a. Color sample to be approved by Architect prior to fabrication.

5. Description:
   a. Drip Grooves: Provided under all work surface exposed edges, unless noted otherwise on the Laboratory Furnishing Drawings. Drip grooves shall be ½ inch (13 mm) from the front edge where the top overhangs 1 inch (25 mm) and ¼ inch (6 mm) from the edge where the edge overhangs ½ inch (13 mm).
   b. Edge Profile: All exposed edges shall be sanded to a smooth finish and rounded to a ¼ inch (6 mm) radius at front top edge and at vertical corners, except as indicated.
   c. Marine edges: Where indicated on the Laboratory Furnishing Drawings, shall be formed by adding ¼ inch thick by 1 inch by 1 inch (6 by 25 by 25 mm) solid phenolic angle strips to the top of the work surface perimeter using an epoxy or clear silicone sealant, unless otherwise indicated on the Laboratory Furnishing drawings. Edges adjoining the open work surface area shall be splayed at an angle of 45°.
   d. Provide all holes and cutouts as required for built-in equipment and mechanical and electrical service fixtures. Verify size of opening with actual size of equipment to be used prior to making openings. Form inside corners to a radius of not less than 1/8 inch (3 mm). After sawing, rout and file cutouts to ensure smooth, crack-free edges.
   e. Provide full-length, one-piece tops and backsplashes wherever possible, and keep field joints to an absolute minimum.
   f. Fix work surface panels with blind fastenings into the back or underside of the panel. Use No.10, type A sheet metal screws sized to stop at least 1/8 inch (3 mm) short of the finished face. Pre-drill panel with an 11/64 inch (4.4 mm) diameter high-speed drill bit aligned with 7/32 inch (5.6 mm) clearance holes in the supporting structure.
   g. Form tight-fitting butt joints in the work surface using mechanical fasteners positioned to be concealed after installation.

6. Physical Properties:
a. Modulus of elasticity: \(1.5 \times 10^6 \text{ psi} \) (10.3 GPa) minimum.
b. Shear strength: 2000 psi (14 MPa) minimum.
c. Compressive strength: 24000 psi (165 MPa) minimum.
d. Weight: 93 lb/ft\(^3\) (1490 kg/m\(^3\)) maximum.
e. Flame spread (ASTM E-84): Class I/A (25).
f. Water absorption: 3 percent maximum.
g. Service temperature: 350 degrees Fahrenheit (177°C) maximum.
h. Non-porous surface and edges.
i. Will not support micro-organic growth.
j. Chemical resistance: The work surface shall sustain contact with the following chemical concentrations for 24 hours with no detectable stain, loss of gloss or change.

1). Test Procedure: Cover five drops of each reagent with a 25 mm watch glass convex side up to duplicate the trapping of a reagent under a dispensing container. Test all volatiles by using a one ounce (30 mL) bottle stuffed with saturated cotton. After a 24 hour exposure, flush reagents off with water, clean with naphtha and detergent, rinse and wipe dry.

2). Evaluation Ratings:

<table>
<thead>
<tr>
<th>Rating</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No effect</td>
</tr>
<tr>
<td>1</td>
<td>Excellent</td>
</tr>
<tr>
<td>2</td>
<td>Good</td>
</tr>
<tr>
<td>3</td>
<td>Fair</td>
</tr>
<tr>
<td>4</td>
<td>Failure</td>
</tr>
</tbody>
</table>

1) No detectable change.
2) Slight detectable change in color or gloss.
3) A clearly discernable change in color or gloss but no significant impairment of surface life or function.
4) Slight surface etching or severe staining.

2). Pitting, cratering, or erosion of coating. Obvious and significant deterioration.

3). Test results shall not be lower than the following on black material:

<table>
<thead>
<tr>
<th>Reagent</th>
<th>Concentration</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amyl acetate</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Ethyl acetate</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Acetic acid</td>
<td>98%</td>
<td>1</td>
</tr>
<tr>
<td>Acetone</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Acid dichromate</td>
<td>5%</td>
<td>0</td>
</tr>
<tr>
<td>Butyl alcohol</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Ethyl alcohol</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Methyl alcohol</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Ammonium hydroxide</td>
<td>28%</td>
<td>1</td>
</tr>
<tr>
<td>Benzene</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Carbon tetrachloride</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Chloroform</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Reagent</td>
<td>Concentration</td>
<td>Rating</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>---------------</td>
<td>--------</td>
</tr>
<tr>
<td>Chromic acid</td>
<td>60%</td>
<td>1</td>
</tr>
<tr>
<td>Cresol</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Dichloroacetic acid</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Dimethylformamide</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Dioxane</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Ethyl ether</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Formaldehyde</td>
<td>37%</td>
<td>1</td>
</tr>
<tr>
<td>Formic acid</td>
<td>90%</td>
<td>3</td>
</tr>
<tr>
<td>Furfural</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Gasoline</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Hydrochloric acid</td>
<td>37%</td>
<td>3</td>
</tr>
<tr>
<td>Hydrofluoric acid</td>
<td>48%</td>
<td>3</td>
</tr>
<tr>
<td>Hydrogen peroxide</td>
<td>3%</td>
<td>3</td>
</tr>
<tr>
<td>Tincture of iodine</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Methyl ethyl ketone</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Methylene chloride</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Mono chlorobenzene</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Naphthalene</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Nitric acid</td>
<td>20%</td>
<td>1</td>
</tr>
<tr>
<td>Nitric acid</td>
<td>30%</td>
<td>1</td>
</tr>
<tr>
<td>Nitric acid</td>
<td>70%</td>
<td>3</td>
</tr>
<tr>
<td>Phenol</td>
<td>90%</td>
<td>0</td>
</tr>
<tr>
<td>Phosphoric acid</td>
<td>85%</td>
<td>3</td>
</tr>
<tr>
<td>Silver nitrate</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Sodium hydroxide</td>
<td>10%</td>
<td>0</td>
</tr>
<tr>
<td>Sodium hydroxide</td>
<td>20%</td>
<td>0</td>
</tr>
<tr>
<td>Sodium hydroxide, flake</td>
<td>40%</td>
<td>0</td>
</tr>
<tr>
<td>Sodium hydroxide, flake,</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Sodium sulfide, saturated</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Sulfuric acid</td>
<td>33%</td>
<td>1</td>
</tr>
<tr>
<td>Sulfuric acid</td>
<td>77%</td>
<td>1</td>
</tr>
<tr>
<td>Sulfuric acid</td>
<td>96%</td>
<td>3</td>
</tr>
<tr>
<td>50% Sulfuric acid/50% Nitric acid</td>
<td>77%/7</td>
<td>3</td>
</tr>
<tr>
<td>Toluene</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Trichloroethylene</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Xylene</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Saturated Zinc chloride</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Aqua regia</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Betadine (Providone iodine)</td>
<td>10%</td>
<td>0</td>
</tr>
</tbody>
</table>

C. Stainless Steel: Refer to Stainless Steel Fabrications section of this specification.
2.9 SHELVING ASSEMBLIES

A. High-Pressure Decorative (Plastic) Laminate Shelving:

1. Manufacturers/Facing material: Products complying with this specification may be provided by the following manufacturers.
   a. Nevamar Decorative Surfaces, One Nevamar Place, Hampton, SC 29924 Tel: 800 638-4380.
   b. Pionite Decorative Surfaces, One Pionite Road, P.O. Box 1014, Auburn, ME 04211 Tel: 800 746-6483.
   c. Wilsonart International, 2400 Wilson Place, P. O. Box 6110, Temple, TX 76503 Tel: 800 433-3222.
   d. Approved substitution (no known equal).

2. Approved Products:
   b. Pionite ChemGuard.
   c. Wilsonart ChemSurf

3. Color: To be selected by Architect.

4. Description:
   a. High-pressure decorative laminate, meeting or exceeding NEMA Standard LD3 2005 Grade HGP, HGL, or HGS requirements, consisting of a resin formulation applied over the decorative surface paper to achieve chemical resistance. The decorative paper shall be treated with melamine resin, and the core shall consist of kraft papers impregnated with phenolic resin. Sheets shall be bonded under high temperature and pressure. Product shall be developed for casework, work surface, and shelving surfaces in laboratories.
   b. Laminate shall be applied to top and bottom surfaces.
   c. Finish: Fine pebble-grained “crystal” texture or matte texture with slight sheen to minimize smudges and finger marks, and to provide optimum scratch resistance.
      1). Gloss: 15-16 +/- 3 gloss units.
   d. Physical Properties:
      2). Minimum Thickness: 0.038 inches ± 0.005 inches (0.97 mm ± 0.13 mm).
      3). Cleanability: 10 cycles (NEMA LD3 test method 3.4).
      4). Boiling Water Resistance: No effect (NEMA LD3 test method 3.5).
      7). Ball Impact Resistance: 60 inches (1524 mm) (NEMA LD3 test method 3.8).
      9). Dimensional change:
      10). Machine direction: 0.50% (NEMA LD3 test method 3.11).
11). Cross direction: 0.80% (NEMA LD3 test method 3.11).
12). Wear resistance: 1,500 cycles, min. (black); 700 cycles, min. (other colors) (NEMA LD3 test method 3.13).
14). Stain Resistance Performance Test Results: The surface shall show essentially no effect on Black (Lab grade) plastic laminate when left in contact for 16 hours either when reagents were kept covered or allowed to evaporate.

<table>
<thead>
<tr>
<th>Rating</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No effect (No detectable change in the material surface.)</td>
</tr>
<tr>
<td>1</td>
<td>Excellent (Slight detectable change in color or gloss but no change in function or life of the surface.)</td>
</tr>
<tr>
<td>2</td>
<td>Good (A clearly discernable change in color or gloss but no significant impairment of surface life or function.)</td>
</tr>
<tr>
<td>3</td>
<td>Fair (Objectionable change in appearance due to discoloration or etch, possibly resulting in deterioration of function over an extended period of time.)</td>
</tr>
<tr>
<td>4</td>
<td>Failure (Pitting, cratering, or erosion of the surface. Obvious and significant deterioration.)</td>
</tr>
</tbody>
</table>

### Acids

<table>
<thead>
<tr>
<th>Concentration</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetic acid</td>
<td>All 0</td>
</tr>
<tr>
<td>Aqua regia</td>
<td>0</td>
</tr>
<tr>
<td>Chromic trioxide (Chromic acid cleaning solution)</td>
<td>1</td>
</tr>
<tr>
<td>Glacial acetic acid</td>
<td>99% 0</td>
</tr>
<tr>
<td>Hydrochloric acid</td>
<td>All 0</td>
</tr>
<tr>
<td>Hydrofluoric acid</td>
<td>48% 0</td>
</tr>
<tr>
<td>Formic acid</td>
<td>All 0</td>
</tr>
<tr>
<td>Nitric acid</td>
<td>All 3</td>
</tr>
<tr>
<td>Sulfuric acid</td>
<td>All 0</td>
</tr>
<tr>
<td>Perchloric acid (concentrated)</td>
<td>0</td>
</tr>
<tr>
<td>Phosphoric acid</td>
<td>All 0</td>
</tr>
<tr>
<td>Picric acid</td>
<td>1.2% 0</td>
</tr>
<tr>
<td>Tannic acid (saturated)</td>
<td>0</td>
</tr>
<tr>
<td>Uric acid (saturated)</td>
<td>0</td>
</tr>
</tbody>
</table>

### Alkalis

<table>
<thead>
<tr>
<th>Concentration</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ammonium hydroxide</td>
<td>All 0</td>
</tr>
<tr>
<td>Sodium hydroxide</td>
<td>All 3</td>
</tr>
<tr>
<td>Sodium sulfide</td>
<td>15% 0</td>
</tr>
</tbody>
</table>
### Solvents

<table>
<thead>
<tr>
<th>Chemical</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetone</td>
<td>0</td>
</tr>
<tr>
<td>Amyl acetate</td>
<td>0</td>
</tr>
<tr>
<td>Amyl alcohol</td>
<td>0</td>
</tr>
<tr>
<td>Butyl alcohol</td>
<td>0</td>
</tr>
<tr>
<td>Carbon disulfide</td>
<td>0</td>
</tr>
<tr>
<td>Carbon tetrachloride</td>
<td>0</td>
</tr>
<tr>
<td>Chlorobenzene</td>
<td>0</td>
</tr>
<tr>
<td>Chloroform</td>
<td>0</td>
</tr>
<tr>
<td>Cresol</td>
<td>0</td>
</tr>
<tr>
<td>Dimethylformamide</td>
<td>0</td>
</tr>
<tr>
<td>Dioxane</td>
<td>0</td>
</tr>
<tr>
<td>EDTA</td>
<td>0</td>
</tr>
<tr>
<td>Ethyl acetate</td>
<td>0</td>
</tr>
<tr>
<td>Ethyl alcohol</td>
<td>0</td>
</tr>
<tr>
<td>Formaldehyde</td>
<td>0</td>
</tr>
<tr>
<td>Methanol</td>
<td>0</td>
</tr>
<tr>
<td>Methyl ethyl ketone</td>
<td>0</td>
</tr>
<tr>
<td>Methylene chloride</td>
<td>0</td>
</tr>
<tr>
<td>n-Hexane</td>
<td>0</td>
</tr>
<tr>
<td>Naphthalene</td>
<td>0</td>
</tr>
<tr>
<td>Phenol</td>
<td>0</td>
</tr>
<tr>
<td>Tetrahydrofuran</td>
<td>0</td>
</tr>
<tr>
<td>Toluene</td>
<td>0</td>
</tr>
<tr>
<td>Trichlorethane</td>
<td>0</td>
</tr>
<tr>
<td>Xylene</td>
<td>0</td>
</tr>
</tbody>
</table>

### General Reagents

<table>
<thead>
<tr>
<th>Chemical</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alconox (lab detergent)</td>
<td>0</td>
</tr>
<tr>
<td>Aluminon</td>
<td>0</td>
</tr>
<tr>
<td>Ammonium phosphate</td>
<td>0</td>
</tr>
<tr>
<td>Aromatic ammonia</td>
<td>0</td>
</tr>
<tr>
<td>Benedicts solution</td>
<td>0</td>
</tr>
<tr>
<td>Calcium hypochlorite (concentrated)</td>
<td>0</td>
</tr>
<tr>
<td>Camphorated parachlorophenol</td>
<td>1</td>
</tr>
<tr>
<td>Cellosolve</td>
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5. Plastic laminate adhesive: High-pressure decorative laminate shall be bonded to core with thermosetting resorcinol or phenol-resorcinol adhesive, or as recommended by the manufacturer for the application, at temperature above 65°F (18.3°C) at a pressure no less than 15 pounds per square inch. Laminate core is not to exceed 10% moisture content and is to be laminated and cured in a controlled environment between 45% and 60% RH.
6. Core material: Hardwood Veneer Plywood.
   a. Description: A one step calibrated core +/- .5mm (to avoid voids) with type 1 waterproof nauf glue. Grade 2 face, and back of mill choice plywood veneer.
   b. Thickness/Plies:
      1). 1 inch (25 mm): minimum 9-ply.
   c. Physical Properties:
      1). Average modulus of rupture: 7346 psi (50.65 N/mm$^2$).
      2). Face Screw Holding Strength: 355 lbf (1579 N).

7. Edging:
   a. Unless otherwise indicated, all edges shall be edgebanded with 3 mm PVC edge banding set in hot melt adhesive. Adhesive shall have a minimum softening point of 150°F (65.6°C). Apply primer to substrate when recommended by adhesive manufacturer. Contact cement is not acceptable. Color of edgebanding to be selected by the Architect.

B. Safety Edges:
   1. Type: Retainer Rail: ¼ inch (6 mm) diameter stainless steel retainer rail, as indicated on the drawings.
   2. Refer to the description of each system below for locations of each type.

C. Reagent Shelves with Fixed Tubular Supports.
   1. Shelving: High-Pressure Decorative Laminate shelving as specified above.
   2. Shelf supports shall be Type 304 stainless steel tubing, ASTM A312, 1 inch (25 mm) outside diameter, 0.133 inch (3.4 mm) wall thickness, with 1/4 inch (6 mm) thick welded steel threaded inserts as shown on drawings.
   3. Fasteners shall be slotted, flat head, zinc screws with bolts as shown on drawings.
   4. Electrical raceway supports shall be 1/4 inch (6 mm) diameter stainless steel “U” bolt, provide one at each shelf support as indicated on drawings.
   5. Safety edging:
      a. Provide safety edging at all four edges of overall installation. Do not provide safety edging at intermediate butt joints.
   6. Load capacity: System shall support a minimum of 25 pounds per square foot. Maximum deflection shall be 0.35 inches (9mm) under load.

D. Reagent Shelves on adjustable shelf standards with a steel tube support system.
   1. Shelving: High-Pressure Decorative Laminate shelving as specified above.
   2. Steel Frame Support System: Provide cold rolled steel tube vertical and horizontal support members with radiused edges. All members shall be welded together. Grind all welds smooth and polish to produce clean smooth appearance with no visual evidence of welds after paint is applied. All vertical members shall be one piece continuous from floor to
underside of structure above or to top horizontal member as indicated on the drawings. Horizontal top and intermediate members shall be one piece between vertical members. Provide welded caps at all open ends of tube sections. Secure vertical members to floor slab, underside of benchtop, if indicated on the drawings, and to underside of structure above.

a. Tube steel dimensions: 2 inches x 2 inches, 12 gauge (50 x 50 x 2.8 mm).

3. Shelf standards:

a. Steel tubes shall be punched to receive adjustable shelf brackets. Pattern shall match Knape & Vogt 85 ANO series uprights, length in accordance with drawings.

4. Shelf Brackets: 16 gauge (1.6 mm thick) bookend type, as detailed on drawings.
5. Safety edging: Front and rear edges.
6. Load capacity: System shall support a minimum of 35 pounds per square foot applied at all shelves simultaneously. Maximum deflection shall be 0.35 inches (9mm) under load.
7. Finish: Factory-finish steel tube support system, shelf standards, and brackets with epoxy powder coating. Color to be selected by the Architect.

E. Adjustable Wall Shelves:

1. Shelving: High-Pressure Decorative Laminate shelving as specified above.
2. Double Slot Shelf Standards:

a. Manufacturers: Products complying with this specification may be provided by the following manufacturers. All products specified in this section shall be the provided by a single manufacturer.

   1). Knape & Vogt Manufacturing Company, 2700 Oak Industrial Drive NE, Grand Rapids, MI 49505 Tel: 616 459-3311.

   2). Approved substitution.

b. Basis of Design: Knape & Vogt 85 ANO series uprights, or equal. Length as indicated on the drawings.

3. Shelf Brackets: 16 gauge (1.6 mm) bookend type, as detailed on drawings.
4. Shelf standards and brackets shall be slotted channel framing as specified elsewhere in this Section.
5. Safety edging: Front edge only.
6. Load capacity: System shall support a minimum of 35 pounds per square foot applied at all shelves simultaneously. Maximum deflection shall be 0.35 inches (9mm) under load.
7. Finish: Factory finish standards and brackets with epoxy powder coating. Color to be selected by the Architect.

F. Heavy Duty Wall Shelves:

1. Shelving: High-Pressure Decorative Laminate shelving as specified above. All shelves to be one piece continuous full length of assembly.
2. Heavy duty shelf standards: Slotted channel framing type. Refer to slotted channel framing specifications elsewhere in this Section.
3. Heavy duty shelf brackets:
   a. Shelf Brackets: Cold-formed steel, slotted channel framing type. Refer to slotted channel framing specifications elsewhere in this Section.

4. Other components, hardware, and fasteners, as required for a complete assembly and as indicated on the drawings.

5. Safety edging, provide at all four edges of each shelf.

6. Load capacity: System shall support a minimum of 50 pounds per square foot applied at all shelves simultaneously. Maximum deflection shall be 0.35 inches (9mm) under load.

G. Heavy Duty Freestanding Shelves:

1. Shelving: High-Pressure Decorative Laminate shelving as specified above. All shelves to be one piece continuous full length of assembly.

2. Heavy duty shelf standards: Slotted channel framing type. Refer to slotted channel framing specifications elsewhere in this Section.
   a. Shelf Brackets: Cold-formed steel, slotted channel framing type. Refer to slotted channel framing specifications elsewhere in this Section.

3. Provide 16 gauge (1.6 mm thick) ceiling escutcheon when vertical channel penetrates finished ceiling. Finish: Provide epoxy powder coating for all cold-formed framing components and trim.

4. Other components, hardware, and fasteners, as required for a complete assembly and as indicated on the drawings.

H. Stainless Steel (Wire) Shelving System

1. Manufacturers: Products complying with this specification may be provided by the following manufacturers. All products specified in this section shall be the provided by a single manufacturer.
   a. InterMetro Industries Corporation, 651 North Washington St., Wilkes-Barre, PA 18705 Tel: 800 992-1776. Manufacturer of Metro product range.
   b. Eagle Group, 100 Industrial Blvd., Clayton, DE 19938 Tel: 302 653-3000.
   d. Approved substitution.

2. Floor Mounted Stainless Steel Shelving Systems
   a. Basis of Design: Metro Super-Erecta stainless steel shelf system, floor mounted post supported, or equivalent.
   b. Posts: floor mounted stainless steel posts, grooved at 1 inch (25 mm) increments and numbered at 2 inch (50 mm) increments for shelf adjustment, length as shown on drawings, Metro PS series or equal.
c. Shelves: Drop Mat Style: stainless steel wire with 1 inch (25 mm) high open wire ledges all sides.
d. Provide diagonal bracing for lateral stability at freestanding applications.
e. Accessories:
   1). Foot Plate: stainless steel with adjustable leveling bolt, Metro No. 9993S or equal.
   2). Post Clamps: Zinc-plated, to join adjacent posts, Metro No. 9994Z or equal.

3. Wall Mounted Stainless Steel Shelving Systems
   a. Basis of Design: Metro Super Erecta stainless steel shelf system, wall mounted post supported, or equivalent.
   b. Post-Type Wall Mount:
      1). Posts: wall mounted stainless steel posts, grooved at 1 inch (25 mm) increments for shelf adjustment, length as shown on drawings, Metro PDF series or equal.
      2). Wall Mounting Brackets: Provide two end brackets, Metro No. BES, and one intermediate bracket, stainless steel, Metro No. BCS, per post.
      3). Shelf Supports: single supports at end posts, and double supports at intermediate posts, stainless steel wire.
   c. Shelves: Drop Mat Style: stainless steel wire with 1 inch (25 mm) high open wire ledges all sides.
   d. Accessories:
      1). Hole plugs: Provide chrome-plated hole plugs for all open holes.
   e. For controlled environment room applications: Secure to concealed blocking in prefabricated wall with stainless steel fasteners to support a 100 lb. load (1.5 kN) for each linear foot (meter) of shelf.

I. Open Industrial Metal Shelf Units:
   1. Manufacturers: Products complying with this specification may be provided by the following manufacturers. All products specified in this section shall be the provided by a single manufacturer.
      a. Lyon Metal Products, P. O. Box 671, Aurora, IL 60507 Tel: 800 323-0096.
      b. Penco Products, Inc., P. O. Box 378, 99 Brower Ave., Oaks, PA 19456 Tel: 800 562-1000.
      c. Hallowell, Division of List Industries Inc., 5711 Distribution Dr., Memphis, TN 38141 Tel: 901 375-0022.
      d. Approved substitution.
   2. Type: Premium grade 18 gauge (1.0 mm thick) steel shelf units comprised of 5 shelves adjustable on 1 ½ inch (38 mm), maximum, increments, and 85 inches (2159 mm) high 14 gauge (2.0 mm thick) angle post supports. Size in accordance with Laboratory Furnishings plans.
   3. Provide side and rear cross bracing for lateral stability at freestanding applications.
2.10 CYLINDER RACKS AND RESTRAINT ASSEMBLIES

A. Cylinder Rack Assembly:

1. Manufacturers: Products complying with this specification may be provided by the following manufacturers. All products specified in this section shall be the provided by a single manufacturer.

   b. Kumar Industries, 4775 Chino Avenue, Chino, CA 91710 Tel: 909 591-0722.
   a. Matheson Tri-Gas, 166 Keystone Drive, Montgomeryville, PA 18936 Tel: 215 648-4000.
   a. Scott Specialty Gases, Inc., 6141 Easton Road Box 310, Plumsteadville, PA 18949 Tel: 215 766-8861.
   b. Approved substitution.

2. Frame members: 2 inches x 2 inches x 1/8 inch (50 x 50 x 3 mm) square steel tube.
3. Construction: Refer to the Laboratory Furnishings drawings for details. Construction to be fully welded. Weld cover plates to close exposed tube ends. Grind and polish all welds to produce smooth surface with no visible evidence of welding when painted. Sizing:

   a. Size typical units to accommodate standard-size laboratory gas cylinders.
   b. Where shown on drawings, size units to accommodate liquefied gas dewars.

4. Chain: Provide restrainers of 5/16 inch diameter, Type 304 stainless steel welded chain fitted with stainless steel snap shackle with swivel clevis and split ring for each bracket; McMaster-Carr Supply Company, Suncor Marine & Industrial, Inc., or approved substitution.
5. Cylinder rack steel components shall be factory-finished to match the casework metal color as selected for the project.

B. Cylinder Restraint Assembly:

1. Framing channel, Fittings, Swivel Hangers, and End Caps: Slotted channel framing as specified elsewhere on this Section.
2. Provide two swivel hangers per cylinder or dewar per wall bracket
3. Sizing:

   a. Size typical units to accommodate standard-size laboratory gas cylinders.
   b. Where shown on drawings, size units to accommodate liquefied gas dewars.

4. Chain: Provide restrainers of 5/16 inch diameter, Type 304 stainless steel welded chain fitted with stainless steel snap shackle with swivel clevis and split ring for each bracket; McMaster-Carr Supply Company, Suncor Marine & Industrial, Inc., or approved substitution.
5. Cylinder restraint steel components shall be factory-finished to match the casework metal color as selected for the project.
2.11 OVERHEAD SERVICE CARRIERS

A. Materials:

1. Support Framing: Slotted channel framing as specified elsewhere on this Section.
2. Brake-formed metal: 16 gauge (1.6 mm) galvanized steel with epoxy powder-coated finish.

B. Fabrication: Fabricate and assemble components as detailed on the drawings.

C. Coordination: Carefully coordinate location of supports with the work of other Sections.

D. Finish: As specified for slotted channel framing. Color shall be selected by the Architect.

2.12 CABLE TRAY SYSTEM

A. Manufacturers: Products complying with this specification may be provided by the following manufacturers. All products specified in this section shall be the provided by a single manufacturer.

1. P-W Industries Inc., 801 W. Street Road, Suite 4, Feasterville, PA 19053 Tel: 215 364-3807.
2. Chalfant Cable Trays, 11525 Madison Avenue, Cleveland, OH 44102 Tel: 216 521-7922.
3. Cooper B-Line, Division of Cooper Industries., 509 West Monroe Street, Highland, IL 62249 Tel: 800 280-7994.
4. Approved substitution.

B. Provide a Cable Tray system, complete with straight and curved sections, fittings, connectors, hardware and miscellaneous devices required for a complete installation.

C. Cable Tray shall be suspended from Overhead Service Carrier specified above and located in laboratories as shown on the Laboratory Furnishings Drawings.

D. Construction shall be Trough Type extruded aluminum 6063-T6 alloy. Maximum spacing between transverse members shall be 4 inches (102 mm) measured parallel to side members. Cable bearing members shall be a minimum of 1 inch (25 mm) and shall be welded to side rail to insure integrity of the ground fault path.

E. Material shall be extruded Anodized Aluminum Alloy Type 6063-T6, NEMA VE-1 Class 12B.

F. Cable Tray shall be 12 inches (305 mm) wide except as otherwise noted. Side rails shall be 4 inches (102 mm) high. Curved section radius shall be 12 inches (305 mm).

G. Connectors: High pressure, rigid type connectors attached by ribbed neck hardened steel screws and locking type nut which does not require a washer. Hardware shall be cadmium plated. Ribbed neck portion of screw shall prevent screw from rotating during tightening of nut.

H. Grounding Continuity: Cable tray systems and all components shall be provided and installed per their listings and per manufacturer’s instructions so that the completed system is electrically continuous and provides an approved equipment grounding path in accordance with NEC Article 392. Where cable tray components are not mechanically and electrically continuous, the system shall be provided with approved bonding jumpers and connections in accordance with NEC.
Article 392 and Article 250.96. Where bonding jumpers are utilized they shall be a minimum of No. 2 AWG copper with suitable, listed fittings. All system testing shall be in accordance with NEMA requirements.

I. Install all cable tray and support systems components in accordance with NEMA VE-1, applicable code requirements and with manufacturer's written instructions.

J. Vertically support at each end of run, at all turns, branches and connection point, and at intervals not to exceed ten feet maximum.

K. Use expansion fittings and connectors at all locations requiring movement.

L. Install warning signs at nominal intervals at 20 feet (6 m), visible from below.

M. Warning Signs: Provide engraved nameplates, using 1/2 inch (12.7 mm) high black letters on yellow background with the following warning label:

   WARNING --- MECHANICAL SUPPORT FOR CABLES & RACEWAY ONLY. DO NOT USE AS A WALKWAY, LADDER OR SUPPORT.

N. Listings:

   1. National Electrical Code, currently enforced edition, including all State and local amendments applicable to this project.
   2. ASTM A123 and ASTM A525.
   3. NEMA VE-1: Metallic Cable Tray Systems.
   4. Underwriters Laboratories: All tray systems shall be UL listed as an assembly.

O. Refer to Laboratory Furnishings Drawings for locations and details.

2.13 CEILING UTILITY TILES

A. Ceiling utility tiles providing a means to mount and connect electrical outlets, data outlets and quick connect service fixtures.

B. Provide services at each panel as shown on the drawings.

C. Cut-outs for utilities shall be made in the factory using laser-cutting or other method to produce accurate and clean edges.

D. Provide tiles with electrical and data junction boxes factory attached.

E. Electrical outlets, data outlets, and cover plates shall be by Divisions 26 and 27.

F. Piped service quick-connect fittings shall be as specified in section 115343.

G. Material:

   1. Utility panel shall be minimum 16-gauge cold rolled steel with finish as specified for metal fabrications.

      a. Color: To be selected by architect from manufacturer’s full color line.
H. Nominal Dimensions:
   1. Size: 24 inches x 24 inches. Exact size of tile shall be coordinated with architectural reflected ceiling plan and the ceiling grid system profile as specified in Division 09 and as submitted.
   2. Height (including junction boxes): 3 inches.

I. Hold-Down Clips: Coordinate with Division 09 contractor to provide a minimum of six hold-down clips at each utility ceiling tile.

J. Provide service identification as shown on drawings.
   1. Service identification to be silk-screened onto painted metal panel. Stick-on labels are not compliant with this requirement.

2.14 LASER SHELF
A. Framing System: Slotted channel framing as specified elsewhere in this Section and as detailed on the drawings.

B. Shelf:
   1. 1 inch thick plastic laminate shelving as specified above for adjustable wall shelving.
   2. Safety Edging: 2 inches high by 3 mm thick PVC band applied to all sides with hot melt glue. Contact cement is not acceptable.

2.15 PIPE DROP ENCLOSURE
A. Fabricate pipe drop enclosures from minimum 18 gauge (1.3 mm thick) galvanized steel, per details shown on the Laboratory Furnishing drawings, except as noted.
   1. Pipe drop enclosures at the following locations shall be fabricated of 18 gauge, Type 304 stainless steel with a No. 4 finish:
      a. At scullery sinks.
      b. At stainless steel counters.

B. Seal all joints between dissimilar metals and at all panel seams with clear silicone sealant.

C. Materials and finish shall be as specified under Metals Fabrications in this Section.

2.16 DRYING RACK
A. Epoxy Drying Rack:
   1. Comply with requirements for molded epoxy resin specified under Laboratory Tops in this Section and as described herein.
   2. Drying rack bodies shall be of one inch (25 mm) thick black epoxy with a 3/16 inch to ¼ inch (5 to 6 mm) radius on all edges and corners. Each rack shall be of the size and with the peg arrangement shown on the Laboratory Furnishing drawings.
3. Pegs shall be of injection molded white polypropylene. Pegs shall not be bonded into the body, but shall be held in position by mechanical design.

4. Provide a drip trough of Type 304 stainless steel with a 16 gauge (1.6 mm thick), Type 304 stainless steel screen of 14 x 14 (1.8 x 1.8 mm) mesh, .02 (0.05 mm) wire.

5. Provide stainless steel fixing screws of appropriate type for attachment to support structure.

6. Provide clear, tight-fitting hose to drain from drip tray into sink.

B. Clear Acrylic Drying Rack:

1. Drying rack bodies shall be of ¾ inch (18 mm) thick clear acrylic with eased corners and edges. Bottom edge shall be cut to form 45 degree drip edge with 1/8 inch (3mm) flat edge at bottom to prevent damage. Each rack shall be of the size and with the peg arrangement shown on the Laboratory Furnishing drawings. Edges shall be polished.

2. Pegs shall be of injection molded white polypropylene. Pegs shall not be bonded into the body, but shall be held in position by mechanical design.

3. Provide ½ inch (13 mm) diameter x ½ inch (13 mm) thick clear acrylic rod spacers and stainless steel fixing screws of appropriate type for attachment to support structure.

4. Engineer rack and supports to accommodate installation of owner-furnished owner-installed water purification unit on the portion of the rack without pegs. Allow for up to 50 pounds of load capacity.

C. Stainless Steel Drying Rack with White Polypropylene Pegs:

1. Manufacturers: Products complying with this specification may be provided by the following manufacturers. All products specified in this section shall be the provided by a single manufacturer.

   a. Inter Dyne Systems, Inc., 676 Ellis Road, Norton Shores, MI 49441 Tel: 231 799-8760.

   b. Approved substitution (no known equal).


   a. Drying rack bodies shall be of one-piece design and of not less than 20 gauge (1.0 mm thick) Type 304 stainless steel with a No. 4 finish. The top shall have two 90-degree bends, and sides to have one 90 degree bend.

   b. Each rack shall have an integral full-width 20 gauge (1.0 mm thick), Type 304 stainless steel drip trough with stainless steel drain tube. Drip trough shall be continuously welded.

   c. The trough shall have a full-length, Type 304 stainless steel wire mesh screen insert. Screen insert shall be turned down on all four sides to provide a clean and finished appearance.

   d. Each rack front shall be dimensioned and punched with T-shaped holes to accommodate the peg arrangement shown on the drawings.

3. Pegs shall fit into the punched holes in the rack front. A T-shaped protrusion on the base of the pegs shall allow easy removal and replacement without the need for tools. The T-shaped holes shall be designed to fit the protrusion on support pegs for holding single or
multiple utensil drip trays, drain shelves, funnel racks or pipette holders. Pegs shall be of injection-molded white polypropylene.
4. Provide wall hangers for each rack, designed to enable the removal and replacement of the entire rack for cleaning without the need for tools.
5. Provide stainless steel fixing screws of appropriate type for attachment to support structure.
6. Provide clear, tight-fitting hose to drain from drip trough drain tube into sink.
7. Provide finished stainless steel back panel when any portion of the back of drying rack is exposed.

2.17 LATTICE ROD AND APPARATUS SUPPORT ROD ASSEMBLIES

A. Manufacturers: Products complying with this specification may be provided by the following manufacturers. All products specified in this section shall be the provided by a single manufacturer.

1. Water Saver Faucet Co., 701 West Erie Street, Chicago, IL 60610 Tel: 312 666-5500.
2. Chicago Faucets, 2100 South Clearwater Dr., Des Plaines, IL 60018 Tel: 847 803-5000.
3. Delta Faucet Company, 55 East 11th St., Indianapolis, IN 46280 Tel: 317 848-1812.
4. Manufacturer of fume hoods specified in Section 115313.
5. Approved substitution.

B. Fume Hood-Mounted ½ inch (12.7 mm) Diameter Stainless Steel Lattice Rod Assembly:

1. Rack assembly:
   a. Rods: ½ inch (12.7 mm) diameter polished Type 304 stainless steel rods, 12 inches (305 mm) on center, horizontally and vertically. Lengths as required such that vertical rods are 4 inches (100 mm) from the rear baffle of the fume hood.
   b. Rod clamps, closed style, stainless steel, adjusted with Allen set screws. Provide at each rod intersection.
   c. Flange: Stainless steel adjustable flange, adjusted with Allen wrench, side wall mounted.

2.18 CABLE / VACUUM LINE THROUGH PORT

A. Provide 3 inch (75 mm) diameter wire or cable access through ports of Type 304 stainless steel with No. 4 finish at bench tops as located and detailed on the Laboratory Furnishings drawings.

2.19 GROMMETS AND ACCESSORIES

A. Round Grommets:

1. Size: 2 3/8 inch (60 mm) O.D.
2. Material: Plastic
3. Accessories: Removable slotted plastic cover
4. Color: To be selected by Architect.
6. Refer to plans for location.
7. Manufacturers: Products complying with this specification may be provided by the following manufacturers.
a. Doug Mockett & Company, Inc., Box 3333, Manhattan Beach, CA 90266 Tel: 800 523-1269.
b. Häfele America Inc., 3901 Cheyenne Dr., P. O. Box 4000, Archdale, NC 27263 Tel: 336 889-2322.
c. Approved equal.

B. Ventilation and Cord Slot Grommet

1. Dimensions: 17 inches wide, 1 ¾ inches deep.
2. Color: Black.
4. Manufacturer: Doug Mockett & Co., Inc. P.O. Box 3333, Manhattan Beach, CA 90266 Tel: 800 523-1269, or approved equal.

C. Utility Management Hook

1. Type 303 stainless steel hook with polished finish.
2. Size: 4 23/32 inch tall, 2 43/64 inch wide.
3. Load capacity: 22 pounds.
5. Manufacturer: McMaster Carr, P.O. Box 54960, Los Angeles, CA 90054-0960 Tel: 562 692-5911, or approved equal.

D. Grilles

1. Air intake grilles: Perforated metal mesh in a metal frame.
2. Sizes: As shown on drawings.
6. Manufacturer: Doug Mockett & Co., Inc. P.O. Box 3333, Manhattan Beach, CA 90266 Tel 800 523-1269 or approved equal.

2.20 PEGBOARD

A. Pegboard: ¼ inch (6 mm) thick tempered hardboard, with 9/32 inch (7 mm) diameter holes on 1 inch (25 mm) straight centers.

B. Perimeter Frame: Select white maple, clean and free of defects. All lumber kiln-dried to uniform moisture content of six percent, with clear polyurethane finish.

2.21 FINISH FOR MISCELLANEOUS WOOD ITEMS

A. Applicability: This section applies to wood fabrications, including, but not limited to, wood laboratory tables, wood-framed balance tables, wood-framed pegboards, and wood filler panels.

B. Finish:

1. Manufacturer may use either of the following finish systems:
a. Customized, high-solids, cross-linked, ultraviolet light (UV)-cured coating developed for durability, including abrasion, chemical, impact, and scratch resistance, for flat-line applications. Coatings shall have little or no VOCs. Chemical-resistant modified acrylic urethane finish with built-in UV blocker, or equal, applied over permanent wood stain.

2. Stain Color: Stain color to match Architect’s sample.
3. Application:
   a. Finish application and sequence shall be as recommended and designed by the manufacturer for a high quality, laboratory-grade wood casework finish.
   b. Preparation: Sand exposed surfaces smooth, free from dirt and defects.
   c. Stain application: Apply stain of color selected to all exposed casework surfaces. Apply in a manner to achieve a match with the selected color sample upon completion of application of the finish.
   d. Finish application: Apply top finish to all stained surfaces. Finished surfaces shall be even, water-clear and bright. Cloudy or muddy finishes carrying tinting pigments will not be acceptable.

C. Wood Finish Chemical Resistance Performance Requirements: as specified elsewhere in this section.

2.22 METAL FABRICATIONS

A. Applicability: This section applies to metal fabrications, including, but not limited to, pipe drop enclosures, shelving support systems, metal-framed laboratory tables, cylinder racks, utility ceiling tiles, and other miscellaneous brake-formed and shop fabricated components and trim, such as required for overhead service carriers.

B. Manufacturers: Products complying with this specification may be provided by the following manufacturers, and/or other manufacturers that may be listed under individual products within this specification.
   1. Kumar Industries, 4775 Chino Avenue, Chino, CA 91710 Tel: 909 591-0722.
   3. Approved substitution.

C. Materials:
   1. Steel: Cold-rolled furniture stock sheet steel, prime grade, roller leveled.
      a. Steel shall be treated at the mill to be free of scale, ragged edges, deep scratches, or other injurious effects.
      b. All gauges indicated are to be U.S. standard.

D. Finish Requirements:
   1. Paint finish for steel laboratory products shall utilize a dry coating process with minimal waste generation. Liquid-applied coatings shall not be acceptable. Manufacturer shall
supply documentation that waste generated during the painting process, is a solid, non-hazardous material.

a. Pretreatment: Finish process shall incorporate a phosphate conversion coating during the pretreatment/cleaning operation.
b. Operator Protection: The painting process shall be cleanly contained, have no solvent odor and be performed in an air-conditioned room.
c. VOC (Volatile Organic Compounds) emissions shall not exceed 0.29 pounds per gallon (35 g/L).
d. Offgasing: No further emissions or “Offgasing/Decomposition” vapors shall occur at room temperature from installed finished parts.

2. Preparation: After the units have been completely welded together and before finishing, they shall be given a pre-paint treatment to provide excellent adhesion of the finish to the metal and to aid in the prevention of corrosion. Physical and chemical cleaning of the metal shall be accomplished by washing with an alkaline cleaner, followed by a spray treatment with a heated cleaner/phosphate solution and pretreated with iron phosphate spray followed by a neutral final seal prior to application of final finish. The strength of each solution shall be monitored by filtration to insure consistent quality. All treated parts shall be immediately dried in heated ovens and gradually cooled before application of the finish. Treated metal parts shall be clean and properly prepared to provide optimum adhesion of finish and resistance to corrosion.

3. Application: Electrostatically apply powder coat of selected color and bake in controlled high temperature oven to assure a smooth, hard satin finish. Surfaces shall have a chemical resistant, high grade laboratory furniture quality finish of the following thicknesses:

a. All surfaces, exterior or interior, exposed to view, shall receive sufficient powder coat to achieve an average 1.5 mil (38 µm) film thickness with a minimum 1.2 mil (30 µm) film thickness and shall have smooth satin luster.
b. Backs of cabinets and other surfaces not exposed to view shall have sufficient powder coat to achieve an average 1.0 mil (25 µm) film thickness.

4. All drawer bodies to be finished in matching color.
5. Concealed interior parts shall receive corrosion-resistant treatment.
6. Finish must be UV stable.
7. Color: As selected by the Architect.

E. Metal Finish Performance Requirements: as specified elsewhere in this section.

2.23 STAINLESS STEEL FABRICATIONS

A. Applicability: This section applies to stainless steel fabrications, including, but not limited to, work surfaces, canopy hoods, drying racks, shelves, autoclave/equipment enclosure walls and panels, utility ceiling tiles, sinks and scullery sinks, stainless steel pipe drop enclosures, and other miscellaneous brake-formed and shop fabricated stainless steel components and trim as shown on the drawings.

B. Manufacturers:
C. Materials and Finishes:

1. Unless otherwise noted stainless steel shall be Type 304 and shall be of gauge indicated on Laboratory Furnishing drawings or this specification.
2. All fabrications shall have exposed surfaces ground and polished to a No. 4 satin finish.
3. All stainless steel nuts, screws, bolts, and rivets, etc., shall be of the same type stainless as in the sheet material and shall have a tumbled finish closely resembling that of a No. 4 finish.
4. All stainless steel welding material shall be of type similar to the sheet material or a richer quality. All welds shall be made without discoloration and shall be ground, polished, and passivated to blend harmoniously with a No. 4 satin finish. All joints in stainless steel tops and work surfaces shall be welded.

D. Work Surfaces:

1. Thickness: 16 gauge (1.6 mm).
2. Fabrication:
   a. Edges: Flanged down the same dimension as the adjacent non-stainless top, with 1 inch (25 mm) being a minimum and returned over a perimeter metal frame to simplify securing top material to cabinet or structural frame.
   b. Reinforcement: Under-surface shall be reinforced with full length 16 gauge (1.6 mm) structural metal channels as required to insure rigidity and prevent buckling, warping, or oil canning. Where bench-mounted fittings are indicated on the drawings, provide top reinforcement to allow for rigid, secure mounting of fittings.
   c. Undercoating: Underside of top shall have a heavy mastic agent coating providing sound deadening.
   d. Stainless steel sides and backsplashes, where indicated, shall be integrally welded to top and finish as indicated above. The back side of exposed backsplashes shall be finished to match front and sides.
   e. Provide all holes and cutouts as required for built-in equipment and mechanical and electrical service fixtures. Verify size of opening with actual size of equipment to be used prior to making openings. Form inside corners to a radius of not less than 1/8 inch (3 mm). After sawing, rout and file cutouts to ensure smooth, crack-free edges with no burrs.

3. Work surfaces with sinks: Work surfaces and sinks shall be integral, fabricated with a marine edge and shall be pitched to sink bowl for proper drainage. Marine edges shall be seamless die-formed.
4. Flat work surfaces: (Without marine edge or sink) Shall have an integrally coved backsplash and squared front edge of work surface to align with adjacent work surfaces.
5. Wall-Supported Benchtop
a. Benchtops shall be fabricated as per construction section of this specification with stainless steel wall support and bracket angles all as per Laboratory Furnishings Drawings.

b. Unit shall be designed to support 200 pounds per square foot, completely wall supported with no legs or support members extending to the floor.

6. Joints: Fabricate work surfaces in the largest sections practical for delivery to the job site. All joints shall be field-welded, ground smooth, and polished on-site to create a continuous work surface.

E. Cup Sink: All cup sinks in stainless steel work surfaces and fume hoods shall be integral one piece construction with top. Cup sinks at fume hoods shall have ¼ inch (6 mm) high lip.

F. Laboratory Sink: Integral one piece construction with stainless steel work surface.

1. Thickness: 18 gauge (1.3 mm thick), unless otherwise noted.
2. Construction: Sink units shall be designed and fabricated with sufficient reinforcement to prevent oil canning. All sink joints shall be butt-welded, ground smooth by the heliarc welding process. Inside radii shall be 1 inch (25 mm). Bottoms shall be pitched to the drain indent. No soldering will be permitted in connection with sink construction. Sink bowl dimensions given are inside dimensions. Underside shall have a heavy mastic agent coating providing sound deadening.

G. Scullery Sink: Stainless steel top with integral sink bowls in sizes as shown. The requirements for stainless steel tops and sinks described above shall govern in its entirety. Backsplash, marine edge and drain boards shall be provided as indicated in Laboratory Furnishings plans.

1. Thickness: 14 gauge.
2. Construction: Front, bottom and back of sink compartments shall be formed of one sheet of material with integral 1 ½ inch (40 mm) roll rim, extending full length at front and ends of compartments and drainboards. Compartment ends and partitions shall be electrically welded into place. Drainboards shall pitch from 2 inches at rolled rim and ends to 2 ½ inches (65 mm) below rim at compartments. Bottoms shall be pitched to the drain indent. Sink units shall be designed and fabricated with sufficient reinforcement to prevent oil canning. All sink joints shall be butt-welded, ground smooth by the heliarc welding process. Inside radii shall be 1 inch (25 mm). No soldering will be permitted in connection with sink construction. Sink bowl dimensions on drawings are inside dimensions. Underside shall have a heavy mastic agent coating providing sound deadening.
3. Legs: Sinks shall be supported on stainless steel square tube legs with stainless steel leveling guides.
4. Accessories: Provide Elkay LK-86-RT, or approved, waste fitting at each compartment of stainless steel construction with strainer, overflow and lever handle. Provide tailpiece compatible with laboratory waste piping system. Refer to Division 22 for piping requirements.
5. Coordination: Coordinate scullery sink design with the requirements of any undercounter equipment (such as dishwashers and glassware washers), as shown on the Laboratory Furnishings drawings. Provide intermediate, end, and trim panels to enclose the undercounter portions of the scullery sink at equipment locations.

H. Autoclave/Equipment Enclosure Panels:
1. Description: System of custom-designed, engineered, rigid, self-supporting pre-fabricated wall panels installed around equipment locations, creating closure to surrounding construction. Refer to drawings for locations and configurations.

2. Configuration: Unless otherwise shown, enclosure panels shall be full-height (from floor to the ceiling) and full-width (wall to wall), including panels at locations above pieces of equipment, to create a full and complete wall area.
   a. System overall thickness to be 1 inch to 3 inches.
   b. Where both sides of the enclosure panel walls are exposed to working rooms, the system shall be a double-sided system with both sides finished as required for an exposed condition.
   c. Joints between panels to be tight (approximately 1/16 inch) and uniform.
   d. Construction: Sheet gauges and reinforcing details should be engineered as necessary to prevent "oil-canning" or deflection of panels between supports.
   e. Panels shall be assembled with rivets located on the non-visible edges of the panel.
   f. Exposed Side of Panel System: There shall be no visible fastening methods on the exposed face(s) of the panel system. This requirement does not apply to faces within areas intended solely for equipment maintenance.
   g. Insulation: Fire-retardant expanding polyurethane foam shall be used within the panel construction. Insulation shall fill all dead spaces within each panel, increasing panel rigidity. It shall be classed with an R Value between 6.2 and 7.4 per inch.

I. Canopy Hood: Provide stainless steel canopy with all hangers and miscellaneous hardware at locations and sizes as indicated on the Laboratory Furnishing drawings.
   1. Thickness: 18 gauge.
   2. Construction: Provide reinforcing necessary to prevent oil canning or deflection of panel between supports. All corners and joints shall be welded, ground smooth and free of all defects. Welded joints with visible burn marks will not be accepted.
   3. Accessories: Provide stainless steel hangers and miscellaneous support hardware as required for a complete installation.
   4. Provide exhaust duct transition piece for mechanical connection above the ceiling under Division 23.Refer to the Exhaust Schedule on the drawings for required exhaust flow rate and connection diameter.

2.24 MOP HOLDER

A. Manufacturers: Products complying with this specification may be provided by the following manufacturers.
   4. Approved substitution.

B. Basis of Design: Model B-223-24 or equal.
C. Description: 20 gauge (1.0 mm thick), minimum, Type 304 stainless steel mop and broom holder with satin finish formed into channel shape. Three ribbed rubber cam holders shall be provided for grasping. Holder shall project 3 ¼ inches (80 mm) to 3 ½ inches (90 mm) from the wall.

2.25 FOLD-DOWN WRITE UP STATION

A. Manufacturers:

1. Life Science Products, Inc., 105 Dixon Drive, Chestertown, MD 21620 Tel: 800 638-9874.
2. Approved substitution.

B. Basis of Design: File station.

C. Description:

1. Shell: 15.0” x 24.0” x 2.75” deep; 5052-H32 Aluminum Alloy, .062” thick, Federal Specification #QQA-250-8.
4. Drop Table Hinge: 1/2” x 1/2” Guden Continuous Hinge #60504, Reverse Offset.
5. All Aluminum: Clear Iridited per Military Specification #C-5541 Type 1 Class 3.
7. Magnetic Catch: Two each #1676A12
8. Hardware: All stainless steel hardware with press fit studs and nylon insert lock nuts.
9. Table Support Hinges: Stainless steel #13 bead chain with stainless steel end couplings - 115 lbs. tensile strength.
10. Cabinet Fabrication: All outside perimeter edges of cabinet hemmed and corners lapped and riveted with .0625 aluminum truss head rivets.

2.26 SLOTTED CHANNEL FRAMING

A. Manufacturers: Products complying with this specification may be provided by the following manufacturers. All products specified in this section shall be the provided by a single manufacturer.

1. Unistrut, 35660 Clinton Street, Wayne, MI 48184 Tel: 800 521-7730.
2. Cooper B-Line Inc. (B-Line), 509 West Monroe St., Highland, IL 62249 Tel: 618 654-2184.
3. Kumar Industries (Nu-Strut), 4881 Chino Ave., Chino, CA 91710 Tel: 909 591-0722.
5. Wesanco, Inc. (Westrut), 14870 Desman Road, La Mirada, CA 90638 Tel: (714)-739-4989.
6. Approved substitution.

B. Materials: Channel and framing members shall be fabricated from steel conforming to the following requirements:

1. Framing Members:
b. Exposed Framing Members and Fittings: ASTM A446 GR A with zinc coating conforming to ASTM A525.
c. Stainless Steel Framing Members and Fittings: ASTM A240 (Type 304), where indicated.

2. Fittings:
   a. Concealed Fittings: Fabricate from steel satisfying the requirements of ASTM A570 GR 33, and conform to the following ASTM specifications: A575, A576, A36, or A635. Nuts shall conform to ASTM A576 GR 1015 and screws shall conform to SAE J429 GR 2 and ASTM A307.
   b. Exposed Fittings: Fabricate from steel satisfying the requirements of ASTM A570 GR 33, and conform to the following ASTM specifications: A575, A576, A36, or A635. Nuts shall conform to ASTM A576 GR 1015 and screws shall conform to SAE J429 GR 2 and ASTM A307. Exposed fittings shall receive zinc coating conforming to ASTM A525.
   c. Stainless Steel Fittings and Hardware: Sintered Nuts shall be of ASTM B783 (Type 316N2-33) stainless steel and fittings shall be of ASTM A240 (Type 304) stainless steel. Stainless steel fittings and hardware shall be used with stainless steel framing members, or where indicated.

3. Thickness: 12 gauge, unless noted otherwise.
4. Size: 1 5/8 inch x 1 5/8 inch cross-section, unless noted otherwise.

C. Components:

1. The following components shall be provided, unless otherwise noted:
   b. Suspended Framing Channel, 3 ¼ inch x 1 5/8 inch x 12 gauge: Unistrut P5000, Powerstrut PS 100, Kumar Industries N-150, B-Line Systems, Inc. B11, or equal.
   c. 90° Angle Fitting: 4 1/8 inch x 3 ½ inch x ½ inch with two holes, each leg: Unistrut P1325, Powerstrut PS 607, Kumar Industries N-1123, B-Line Systems, Inc. B104, or equal.
   d. 135° Angle Fitting: 3 inch x 2 5/16 inch x ½ inch with one hole, each leg: Unistrut P1546, Powerstrut PS 633-45°, Kumar Industries N-1425, B-Line Systems, Inc. B154, or equal.
   e. T-Shaped Flat Plate Fitting: 5 3/8 inch x 3 ½ inch x ¼ inch plate, T-shaped, with four holes: Unistrut P1031, Powerstrut PS 714, Kumar Industries N-1022, B-Line Systems, Inc. B133, or equal.
   f. Wing Shape Fitting, 9 5/32 inch x 3 7/8 inch ten holes, two holes in each wing section and two holes in each of three channel section sides: Unistrut P2347, Powerstrut PS 913, B-Line Systems, Inc. B273.
   h. Horizontal Support Members: 1 5/8 inch x 1 5/8 inch x 12 gauge framing channel with 13/32 inch x 3 inch slotted holes, 4 inches on center: Unistrut P1000 SL,

i. Slotted Hole Framing Channel, 1 5/8 inch x 1 5/8 inch x 12 gauge framing channel with 13/32 inch x 3 inch slotted holes, 4 inches on center: Unistrut P1000 SL, Powerstrut P 200 S, Kumar Industries N-200-SL, B-Line Systems, Inc. B22S.

j. Slotted Framing Channel for installation in Chemical Fume Hoods, 1 5/8 inch x 13/16 inch x 16 gauge Type 316 stainless steel framing channel: Unistrut P4000 SS, Powerstrut PS 560 SS, Kumar Industries, B-Line Systems, Inc.

1). Attach channel to side of fume hood with 2 5/8 inch x 1 7/8 inch x 1/8 inch, 4 hole, stainless steel 90° fitting: Unistrut P6325 SS, Powerstrut, Kumar Industries, B-Line Systems, Inc.


m. End Caps: 0.06 inches thick for framing channel: Unistrut P1280, Powerstrut PS 707, Kumar Industries N-2500, B-Line Systems, Inc. B205, or equal. Provide end caps for all exposed horizontal framing channels.

n. Ceiling Escutcheon: Provide 18 gauge steel, finished to match framing members, as indicated on the Laboratory Furnishing drawings, at ceiling penetrations.

o. Other components, hardware, and fasteners, as required for a complete assembly and as indicated on the drawings.

2. Service Struts and Ledging:

a. 16 gauge, 13/16 inch x 1 5/8 inch cold-formed framing uprights: Unistrut P4000, Powerstrut PS 560, Kumar Industries N-400, B-Line Systems, Inc. B56, or equal. Uprights shall be provided at 48 inches, maximum, and fastened top and bottom by two adjustable U-shaped spreaders.

b. U-shaped spreaders: 12 gauge by 1½ inch (45 mm) wide by length required, galvanized steel.

c. Locations:

1). Provide to support tops at pipe service chase space, support drain troughs, under fume hood superstructures, and other abnormal loads.

2). Support struts with U-shaped spreaders shall be provided at 48 inches (1220 mm) on center below island and peninsula benches, as indicated on drawings. Support struts shall be provided along wall 48 inches (1220 mm) on center below island and peninsula benches. Struts will be used to support piped and electrical services installed under Divisions 22, 26, and 27. Provide all bolts, expansion sleeves, and fastening devices for a complete assembly. Pipe and conduit hangers shall be provided by Division 22, 26, and 27 installers.

3. Heavy Duty Shelving:
a. Shelf Standards: Framing channel, spaced equally, 36 inches on center, maximum. Secure to wall. Provide all bolts and fastening devices for a complete assembly.
b. Brackets: Cold-formed framing channel brackets, as required for maximum cover of shelf depth:
   2). Shelves at least than 11 inches and less than 13 inches deep: Unistrut P1771, Powerstrut PS 732-10, B-Line Systems, Inc. B541, or equal. Secure to steel uprights and underside of shelf with removable bolt fasteners.
   3). Shelves at least 13 inches and less than 15 inches deep: Unistrut P1773, Powerstrut PS 732-12, B-Line Systems, Inc. B289-12, or equal. Secure to steel uprights and underside of shelf with removable bolt fasteners.

4. Suspended Adjustable Shelf:
   a. Vertical members: Telescoping 12 gauge tube or strut, 1 5/8 inch x 1 5/8 inch and 1 7/8 inch x 1 7/8 inch, with 9/16 inch diameter pre-punched holes at 1 7/8 inch on center: Unistrut “Telestrut System”, Allied Tube & Conduit “Square-Fit” telescoping channel, or approved substitution.
   b. Provide fittings designed to connect and attach telescoping tubing.
   c. Gravity pins shall be used to connect telescoping members.

5. Cylinder and Dewar Restraint:
   a. Swivel Hanger: 1 ¾ inch long by 3/8 inch diameter link welded to threaded stud; provide two per cylinder: Unistrut M2350, Powerstrut PS205, Kumar N-2911, B-Line 446B.

6. Laser Shelf:
   a. Vertical members: Telescoping 12 gauge tube or strut, 1 5/8 inch x 1 5/8 inch and 1 7/8 inch x 1 7/8 inch, with 9/16 inch diameter pre-punched holes at 1 7/8 inch on center: Unistrut “Telestrut System”, Allied Tube & Conduit “Square-Fit” telescoping channel, or approved substitution.
   b. Provide fittings designed to connect and attach telescoping tubing.
   c. Gravity pins shall be used to connect telescoping members.

7. Finish:
   a. Provide finish coating for all cold-formed framing components, except for stainless steel components.
b. Concealed Framing Members and Fittings: Rust inhibiting acrylic enamel paint applied by electrostatic deposition, after cleaning and phosphating, and thoroughly baked. Finish shall withstand a minimum of 400 hours salt spray when tested in accordance with ASTM B117. Color: Green.

c. Exposed Framing Members and Fittings: Factory applied epoxy powder coat. Color: To be selected by the Architect.

2.27 SEALANT

A. Manufacturers: Products complying with this specification may be provided by the following manufacturers.

1. Dow Corning Corporation, P.O. Box 994, Midland, MI 48686 Tel: 989 496-7881.
3. C.R. Laurence Company, Inc., 600 Wharton Drive, Atlanta, GA 30336 Tel: 404 696-3445
4. Approved substitution.

B. Basis of Design: Dow Corning 732 Multi-Purpose Sealant, GE Silicones RTV 100 Series, C.R. Laurence CRL 33S Silicone, or equal.

C. Characteristics:

1. Type: One-part silicone rubber, MIL-A-46106.
3. Cure: Cures at room temperature on exposure to water vapor in the air.
4. Authorizations:
   a. FDA Regulation No. 21 CFR 177.2600.
   b. USDA Rating P1.
   c. NSF Rating C2.
   d. UL 150 C Rating, File No. E40195 (N).

5. Properties:
   a. Tack Free Time, ASTM C-679: 45 minutes, maximum.
   c. Tensile Strength, ASTM D-412: 220 pounds per square inch, minimum.
   e. UV Resistance, ASTM C-793: Excellent.

PART 3 - EXECUTION

3.1 SITE CONDITIONS

A. Inspection:

1. Prior to installation of the work of this Section, carefully inspect the installed work specified in other Sections and verify that all such work is complete to the point where this installation may properly commence.
2. Verify that all work may be installed in complete accordance with the original design, reviewed submittals, and the manufacturer's recommendations.
3. Where floor conditions require shimming or leveling of more than ¾ inch at any point, do not install casework in those locations. Notify the contractor and design team that remedial measures will be required to bring the floors closer to a level situation.

B. Discrepancy: In the event of discrepancy, immediately notify the Architect.

C. Flooring: Casework shall be installed on top of finished flooring. Coordinate sequencing, protection, and installation requirements with the contractor to prevent damage of flooring.

3.2 INSTALLATION

A. Coordinate work with any Owner furnished and/or installed components indicated on drawings.

B. General: Assemble units into one integral unit with joints flush, tight, and uniform. Align similar adjoining units to a tolerance of 1/16 inch (1.5 mm).

C. Cabinets:

1. Install cabinets to create a plumb, level, true and straight installation.
2. Installation of metal and stainless steel casework fixed cabinets shall utilize the internal leveling devices. Do not use shims.
3. Installation of wood casework shall be performed using shims. Shimming shall be minimized as much as possible, yet be sufficient to achieve a level and plumb condition.
4. Installation shall maintain the required height of countertops, but in all cases must stay within the range required by the ADA regulations.
5. Securely fasten wall units to solid supporting material, not plaster, lath, or wallboard. Anchor, adjust, and align wall cabinets as specified for base cabinets. Verify that all required backing and reinforcement necessary to support wall-mounted units is in place, secure, and accurately located.

D. Installation materials:

1. Installation of wood, plastic laminate, and solid phenolic casework may involve the use of shims, spacers, cleats, straps and other such items of either metal or wood composition.
2. Installation of metal casework shall use spacers, cleats, and straps of galvanized steel, epoxy-coated steel, or stainless steel. No wood materials of any sort shall be part of the permanent installation of metal casework.
3. Installation of stainless steel casework, counters, and scullery sinks shall use spacers, cleats, and straps of stainless steel of the stainless steel type specified for the casework construction. No wood or carbon steel materials of any sort shall be part of the permanent installation of stainless steel casework.
4. Installation of polypropylene casework shall use shims, spacers, cleats, straps, and other such items of polypropylene construction only. No wood or metal materials shall be part of the permanent installation of polypropylene casework.

E. Laboratory Tops:
1. Scribe tops as necessary for close and accurate fit. Joints between worksurfaces, backsplashes, and adjacent items, penetrations, or similar shall be hairline joints, with a maximum width of 1/16 inch.

2. Field Joints: Factory-prepared and identical to factory joints, locate only where indicated on approved Shop Drawings. Field processing of top and edge surfaces is not acceptable, except as described by manufacturer in approved Submittal Data. Provide full length, one-piece tops and backsplashes wherever possible, and keep field joints to an absolute minimum.

3. Abut top and edge surface in one true plane, with internal supports placed to prevent any deflection. Joints in top units shall be flush and the narrowest for the respective materials of construction. Cement top joints and laboratory sinks in accordance with the manufacturers’ specifications.

4. All joints in stainless steel work surfaces shall be field-welded, ground smooth, and polished on site to create a continuous work surface.

F. Sealant:

1. Caulk edges of tops, backsplashes and side splashes to adjacent wall surface with silicone sealant.

2. At animal facility rooms, caulk perimeter of all casework furnishings and fixtures mounted to the wall or ceiling surfaces, including but not limited to wall mounted shelving brackets, fixed casework, service fittings and fixtures, autoclave/equipment enclosure panels, mop holders, and exam lights.

G. Flexible Metal Casework Support System:

1. Support system locations shall be established from approved shop drawings so that mechanical and electrical work can be installed without interfering with installation.

2. Installation of support system shall be coordinated with the trades to maintain the integrity of the installed system.

3. Support system assemblies, ancillary components and accessories shall be installed with the supervision of the manufacturer's authorized representative and according to manufacturer's recommendations.

3.3 DESTRUCTIVE TESTING

A. The Owner, Architect, and/or Contractor may, at their own cost, elect to perform destructive testing on casework cabinet components (such as fronts, sides, etc.) to confirm compliance with the requirements of this specification. The casework manufacturer/installer should account for the de-installation, repair, and reinstallation, or replacement of one cabinet that may be selected for destructive testing.

3.4 CLEANING AND PROTECTION

A. Repair or remove and replace defective work as approved by the Architect at no additional cost to the Owner.

B. Clean finished units, touch up as required, and remove and refinish damaged or soiled areas.
C. Cover tops with kraft paper or polyethylene sheeting after installation for protection against scratching, soiling, and deterioration during remainder of construction period. Remove protection prior to final cleaning.

D. Clean counter tops with diluted dishwashing liquid and water leaving tops free of all grease and streaks. Use no wax or oils.

END OF SECTION 115310
U. Exhaust valve sound data shall be equal to or less than the sound data in the schedules below:

<table>
<thead>
<tr>
<th>Octave Band</th>
<th>0.25 - 0.35 Hz (62Hz)</th>
<th>0.35 - 0.45 Hz (125Hz)</th>
<th>0.45 - 0.55 Hz (250Hz)</th>
<th>0.55 - 0.65 Hz (500Hz)</th>
<th>0.65 - 0.85 Hz (1KHz)</th>
<th>0.85 - 1.05 Hz (2KHz)</th>
<th>1.05 - 1.25 Hz (4KHz)</th>
<th>1.25 - 1.55 Hz (8KHz)</th>
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Notes:
- Measurements shown in tabular form are less than 6dB above background.
- Data obtained from tests conducted in accordance with the specified standards.
- Measurements shown in tabular form are less than 6dB above background.
- Data obtained from tests conducted in accordance with the specified standards.
### Octave Band Exhaust Sound Power Level (dB re. 10⁻¹² Watts)

<table>
<thead>
<tr>
<th>Valve Size (in)</th>
<th>CPM</th>
<th>Ls</th>
<th>CMH</th>
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<tr>
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<tr>
<td>0.25° △P = 6 (2Pa)</td>
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<td>0.5° △P = 1 (5Pa)</td>
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<tr>
<td>1.0° △P = 2 (25Pa)</td>
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<td>2.0° △P = 5 (50Pa)</td>
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<tr>
<td>3.0° △P = 7 (75Pa)</td>
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</table>

|          | 125 | 250 | 500 | 1K  | 2K  | 4K  | 125 | 250 | 500 | 1K  | 2K  | 4K  | 125 | 250 | 500 | 1K  | 2K  | 4K  | 125 | 250 | 500 | 1K  | 2K  | 4K  |
|----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 200      | 95  | 340 |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 12x18"   |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 12x24"   |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 12x36"   |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 12x48"   |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |

**Notes:**
- Measurements shown in *italic* were less than 60dB above background noise.
- Exhaust sound is the noise emitted from the valve and transmitted through the exhaust duct into the room; exhaust sound travels against the direction of airflow.
- △Ps = difference in pressure across the valve.

**Data:**
- Data was obtained from tests conducted in accordance with ANSI/ASHRAE Standard 130.
- For sound Power Level performance data at different flow rates or pressures, contact Accuvent.

**dB Levels:**
- dB levels based on maximum airflow for 12" valve of 1333 CPM (265 L/s; 22.65 CMH) at 0.25"
- dB levels based on maximum airflow for 14" valve of 2090 CPM (416 L/s; 350.1 CMH) at 0.25"
SECTION 235123 - GAS VENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Listed double-wall Special Gas Vents.

B. Related Requirements:

1. Section 235113.11 "Draft Control Fans" for draft inducer fans, venturi-draft inducer fans, mechanical-draft vent fans, vent exhaust fans, and combustion-air fans.
2. Section 235113.16 "Vent Dampers" for motorized and barometric dampers.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for product.

B. Shop Drawings: For vents.

1. Include plans, elevations, sections, and attachment details.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1.4 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Sample Warranty: For special warranty.

1.5 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:

B. Certified Sizing Calculations: Manufacturer shall certify venting system sizing calculations.

PART 2 - PRODUCTS

2.1 LISTED SPECIAL GAS VENTS

A. Manufacturers:
   1. Duravent
   2. Schebler “eVent”
   3. Selkirk Metalbestos

B. Description: Double-wall metal vents tested according to UL 1738 and rated for 480 deg F continuously, with positive or negative flue pressure complying with NFPA 211.

C. Construction: Inner shell and outer jacket separated by at least a 1-inch airspace.

D. Joints and connections shall be sealed with gasket and mechanically coupled together.

E. Inner Shell: ASTM A 959, Type 29-4C stainless steel.

F. Outer Jacket: Stainless steel

G. Accessories: Tees, elbows, increasers, draft-hood connectors, terminations, adjustable roof flashings, storm collars, support assemblies, thimbles, firestop spacers, and fasteners; fabricated from similar materials and designs as vent-pipe straight sections; all listed for same assembly.
   1. Termination: Round chimney top designed to exclude minimum 98 percent of rainfall.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of work.

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

3.2 APPLICATION

A. Listed Special Gas Vent: Condensing gas appliances.
3.3 INSTALLATION OF LISTED VENTS

A. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Section 077200 "Roof Accessories."

B. Comply with minimum clearances from combustibles and minimum termination heights according to product listing or NFPA 211, whichever is most stringent.

C. Seal between sections of positive-pressure vents according to manufacturer's written installation instructions, using sealants recommended by manufacturer.

D. Support vents at intervals recommended by manufacturer to support weight of vents and all accessories, without exceeding appliance loading.

E. Lap joints in direction of flow.

3.4 CLEANING

A. After completing system installation, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, and construction debris, and repair damaged finishes.

END OF SECTION 235123
TYPICAL UNSCHEDULED SLAB REINFORCEMENT

TYPICAL SCHEDULED SLAB REINFORCEMENT

ONE-WAY SLAB SCHEDULE

ONE-WAY SLAB SCHEDULE NOTES

ONE-WAY SLAB REINFORCEMENT SCHEDULE FOR SLAB

1. TYPICAL FLOOR/ROOF DRAIN 4

2. TYPICAL FALL PROTECTION STANCHION ATTACHMENT DETAIL

3. TYPICAL SLAB REINFORCEMENT DETAIL AT UTILITY FLOOR BOXES

DETAIL

S-350
TYPICAL ANCHOR ROD DETAILS

BASE PLATE 1

BASE PLATE 2

PLATE WASHER DETAIL

TYPICAL COLUMN BASE DETAIL

TYPICAL ROOF DECK EDGE DETAIL

TYPICAL ROOF DECK OPENING

TYPICAL ROOF-FLOOR SLAB TRANSITION DETAIL

TYPICAL FALL PROTECTION ANCHOR ATTACHMENT

SECTION

CANOPY PIPING OPENING DETAIL

CHASE GRATING SUPPORT DETAIL

ELEVATOR DIVIDER BEAM DETAIL

ELEVATOR RAIL SUPPORT DETAIL

NOTES:

- STIFFENERS (TYPICAL)
  - 3/8" PLATE FULL DEPTH C10x20

AS THE STRUCTURAL STEEL LAYOUT WILL PERMIT.

DECK UNITS SHALL BE CONTINUOUS OVER AS MANY SPANS

END LAPS SHALL OCCUR ONLY AT SUPPORT POINTS.

ANCHOR RODS WITH DOUBLE FINISHED COLUMN END LEVELING. SEE BASE DETAILS FOR

ANCHOR ROD AR1

A563 NUT

F1554(A36)

CONCRETE

TOP OF SLAB

FLANGES LESS THAN PIPE OVERHANGS

OMIT WELD WHERE

SCALE:   3/8" = 1'-0"

SCALE:   1" = 1'-0"

SCALE:   1" = 1'-0"

SCALE:   1" = 1'-0"
SCALE: 1/8" = 1'-0"
Note: The text in the image appears to be extracted from architectural drawings but does not contain any legible content for transcription.
### DOOR SCHEDULE

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<th>No.</th>
<th>Location</th>
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### GENERAL DOOR SCHEDULE NOTES
- **DOOR PANEL LEGEND**
- **DOOR FRAME LEGEND**
- **CARD READER**
- **OVERHEAD DOOR VIEWER**
- **EXIT ONLY**
- **CAUTION**
- **PAINT DOOR AND FRAME TO MATCH ADJ. WALL**
- **DOOR VIEWER**

### STOREFRONT FRAME PERIMETERS AND SURROUNDING WALL CONSTRUCTION UNLESS OTHERWISE INDICATED.
- **B UNDERCUT DOORS AS REQUIRED BY FINAL FLOOR FINISH.**
- **C PROVIDE SEALANT BETWEEN HOLLOW METAL FRAME.**

### PROJECT MANUAL DIVISION 8 FOR GLAZING.
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<td>HDWR. FIRE</td>
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COPYRIGHT NOTICE: THIS ARCHITECTURAL AND ENGINEERING DRAWING IS GIVEN IN CONFIDENCE.
FACTORY ADHERED SUBSTRATE AS REQUIRED FOR FRENCH CLEAT INSTALLATION TO WALL. DO NOT EXTEND TO EXPOSED EDGES OF ACRYLIC PANELS.

METAL CORNER

GYPSUM FINISHING

REVEAL METAL TRIM UP TO MATCH FACE LINE OF WALL

1/2" SOLID MAPLE WOOD WRAP

3/4"

WOOD FRAMING MEMBER

1/8"

WOOD CEILING BEYOND INTERIOR PARTITION TYPE

1 1/2"

3/4" MDF PANEL MOUNTED TO WALL WITH FRY REGLET GRAPH SYSTEM PRIOR TO FINISHING

ANCHOR STUD LOCATIONS ON COORDINATE STUD LOCATIONS AND REFER TO ELEVATION

CONCRETE FLOOR TO TOP OF WALL CONSTRUCTION

PANEL CLIP, TYP.

CARPET TO CONCRETE

CARPET TO TERRAZZO

CARPET TO RESILIENT

RESILIENT TO TERRAZZO

MDF WALL DETAIL
20. WHERE FUME HOOD OCCURS ADJACENT TO UNDER COUNTER CORROSIVE STORAGE CABINETS, ROUTE VENT PIPE (IN PIPE CHASE) TO FUME HOOD AND EXTEND 4" ABOVE FUME HOOD WORK SURFACE BEHIND BAFFLE.

21. INTERNAL EXHAUST EQUIPMENT BLOWED ON THESE DRAWINGS SHALL BE PROVIDED UNDER DIVISION 11, DIVISION 22 SHALL PROVIDE ELECTRICAL SERVICE PANELS AND CONTAINERS TO PROPERLY SERVE EQUIPMENT.

22. LOCATION OF EQUIPMENT, SUCH AS FUME HOODS, CORROSION STORAGE CABINETS, BRACKETS OR ANY OTHER ITEMS THAT MAY INTERFERE WITH DUCTWORK, STRUCTURAL, OR MECHANICAL SYSTEMS, SHALL BE CORRECTLY SEATED TO ACCOMMODATE建築件組件的安裝。

23. UNLESS OTHERWISE INDICATED, ALL MEASUREMENTS OF CHIMNEYS, DRUMS AND FITTINGS ARE INDICATED ON ALL LABORATORY FURNISHING DRAWINGS SHALL BE SUPPLIED, INSTALLED AND PAINTED UNDER DIVISION 11.

24. CONTRACTOR SHALL COORDINATE ALL LABORATORY FURNISHING PLANS AND COORDINATES WITH REFLECTED CEILING PLANS FOR PROPER COMPLIANCE WITH THE MOBILIZED BY SHEET.

25. ALL BULLETIN BOARDS, MARKER BOARDS, CHALKBOARDS, PROJECTION SCREENS, COAT RACKS AND FIRE EXTINGUISHERS ARE INDICATED ON THE "LF" PLAN DRAWINGS, SHEET TITLE: LABORATORYFURNISHINGS KEYSHEET.

26. ALL CABINETS, SHELVES AND SUPPORTS ARE SHOWN IN ROUGH PROJECTIONS AND COORDINATING DRAWINGS ARE SHOWN IN COLD-ROLL STEEL HANDRAILED UNLESS OTHERWISE NOTED.

27. SERVICE FITTINGS SHOWN ON THE "LF" PLAN DRAWINGS ARE FOR LOCATION ONLY. REFER TO DETAILS AND SPECIFICATIONS FOR ACTUAL LOCATION AND ENGINEERING DRAWING IS GIVEN IN DISSEMINATION OR DUPLICATION MAY BE INFRINGED.
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<th>HOOD SIZE</th>
<th>HOOD TYPE</th>
<th>HORIZONTAL ANGLE</th>
<th>CUTOFF VELOCITY</th>
<th>MOMENTUM</th>
<th>SASH NUMBER</th>
<th>AIRFLOW</th>
<th>AIRFLOW</th>
<th>WATER</th>
<th>CFM</th>
<th>INCH FPM</th>
<th>CONFIGURATION</th>
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**NOTES:**
1. Minimally variable air volume (CAV) exhaust airflows correspond to 0.5 to deep work surface for extended depths, apply ample correction to manufacturer's recommendations.
2. Provide exhaust duct transition piece to transition from fume hood collar size to scheduled exhaust connection size.
COORDINATE LOCATION OF ALL UPRIGHTS AND DIAGONAL BRACING WITH ALL PIPING, DUCTWORK AND LIGHTING, ETC...

FOR TABLE CONSTRUCTION REFER TO:

BUILDING LF-504

1" UNISTRUT P1325 90° ANGLE FITTING AT EACH VERTICAL UNISTRUT. SECURE TO HORIZONTAL STRUCTURE MOUNTED UNISTRUT.

4" Ø SWIVEL CASTERS W/ LOCKING BRAKES

SELECT PIPING STYLE, COORDINATE WITH PM

(2) UNISTRUT P-1325 90° ANGLE FITTING AT EACH VERTICAL UNISTRUT-SECURE TO HORIZONTAL STRUCTURE MOUNTED UNISTRUT.

LOCKING CASTERS

UNISTRUT P2458-18 TUBULAR KNEE BRACE SUPPORTS

FINISHED CEILING BY DIVISION 9

UNISTRUT P2458-24 TUBULAR KNEE BRACE SUPPORTS

FINISHED ENDS AT U-SHAPED CHANNEL TO MATCH ELECTRICAL SERVICES BY DIVISION 26

5" A.F.F. TO SHELF 0" A.F.F.

18 GAUGE SHEET METAL PAINTED TO MATCH UNISTRUT

ELEVATION VIEW

LABORATORY FURNISHINGS DETAILS

NOTES:

1. FIXTURE SPACING REPRESENT TYPICAL CONFIGURATIONS. REFER TO FLOOR PLANS FOR ACTUAL SERVICES REQUIRED.

2. CONTRACTOR TO VERIFY CLEARANCES FOR ALL SERVICE CUT-OUTS.

3. REFER TO FLOOR PLANS FOR ACTUAL SERVICES REQUIRED.

4. REFER TO PLANS AND SINK SCHEDULE FOR SINK TYPES AND SIZES.

5. APPLY TYPICAL FIXTURE SPACING @ OHSC & WALL CONDITIONS WHERE OCCURS ON LF PLANS.

6. MAX. 34" TOP OF WORK SURFACE FROM FINISHED FLOOR.

7. ADDITIONAL INFORMATION: 1.6" THICK FOR E-AH DORMER WALL. SEE ARCHITECTURAL AND ENGINEERING DRAWINGS. 2. TYPICALnox WALLS AND CEILINGS.

SCALE: 2"=1'-0"
GENERAL NOTES:

1. All information contained herein is subject to change and should only be used in conjunction with the latest revision of the contract documents.

2. Conflicts between the plans and specifications shall be resolved in favor of the most recent document prepared by Ratio Architects, Inc.

3. TheOwner's designated representative to witness testing and provide test reports to the Contractor shall follow all of the Owner's safety protocols and guidelines.

4. All work shall be constructed in accordance with the plans and specifications, and shall be completed in a manner that is aesthetically pleasing, functional, and safe.

5. The Contractor shall coordinate with all disciplines to maintain proper clearances and access of all services.

6. The Contractor shall verify conditions prior to fabricating and installing sheet metal.

7. All sheet metal shall be made from 24 gauge stainless steel single wall.

8. All sheetmetal shall be made from type 304 stainless steel single wall AL29.

9. All sheet metal shall be made from galvannealed steel.

10. All sheet metal shall be made from galvanized steel.

11. All sheet metal shall be made from 304 stainless steel single wall AL29.

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41. All sheet metal shall be made from galvannealed steel.

42. All sheet metal shall be made from galvanized steel.

43. All sheet metal shall be made from 304 stainless steel single wall AL29.

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45. All sheet metal shall be made from galvannealed steel.

46. All sheet metal shall be made from galvanized steel.

47. All sheet metal shall be made from 304 stainless steel single wall AL29.

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49. All sheet metal shall be made from galvannealed steel.

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PLAN NOTES:

1. All ductwork shall be made from galvanized steel.

2. All ductwork shall be made from galvannealed steel.

3. All ductwork shall be made from 304 stainless steel single wall AL29.

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LOWER FLOOR HVAC PLAN - WEST
COORDINATE OPENINGS THROUGH STRUCTURAL MEMBERS WITH ALL TRADES DURING THE SUBMITTAL PHASE FOR REVIEW BY THE DESIGN TEAM.
### AHU VESTIBULE

<table>
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<tr>
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### AHU CASINGS

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### AHU COOLING COIL SCHEDULE

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### AHU HEATING COIL SCHEDULE

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### BRIEF

- **AHU**
  - **Cooling Coil Schedule**
  - **Heating Coil Schedule**

- **AHU Casings**
  - **Rating**
  - **Starters**
  - **N+1**

- **AHU Vestibule**
  - **Effectiveness**
  - **Starters**
  - **N+1**
  - **Notes**

### Exhaust Fan Schedule

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### Gas Fired Steam Furnace Schedules

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### Entropy Heat Recovery Wheel Schedules

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### Miscellaneous Equipment Schedules

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### Fan Schedule

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### Lighting Schedule

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### Expansion Tank and Air Control System Schedules

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### Notes

- **AHU Vestibule**: Effectiveness, Starters, N+1, Notes
- **AHU Casings**: Rating, Starters, N+1
- **AHU Cooling Coil Schedule**: Description, Quantity, Supplier
- **AHU Heating Coil Schedule**: Description, Quantity, Supplier
- **Gas Fired Steam Furnace Schedules**: Description, Quantity, Supplier
- **Entropy Heat Recovery Wheel Schedules**: Description, Quantity, Supplier
- **Miscellaneous Equipment Schedules**: Description, Quantity, Supplier
- **Fan Schedule**: Description, Quantity, Supplier
- **Lighting Schedule**: Description, Quantity, Supplier
- **Expansion Tank and Air Control System Schedules**: Description, Quantity, Supplier

### Housekeeping

- **N/A**

### Specialties

- **CONSTRUCTION SPECIALTIES**
  - **Notes**: Yes, No
  - **Connection**: Yes, No
  - **Control Type**: Yes, No
  - **Connection**: Yes, No
  - **Control Type**: Yes, No
  - **Connection**: Yes, No
  - **Control Type**: Yes, No

### Model Numbers

- **M501**
  - **Rating**: 13
  - **Mfg.**
  - **Model #**
  - **Schedule**: Specific
  - **Notes**: Reserved

### Production

- **TWIN CITY**
  - **Model**: 14
  - **Mfg.**
  - **Model #**
  - **Schedule**: Specific
  - **Notes**: Reserved

### Ductwork and Air Handling

- **Direct**: 120 / 1
  - **Mfg.**
  - **Model #**
  - **Schedule**: Specific
  - **Notes**: Reserved

### Electrical

- **Electrical Basis of Design**
  - **Input (MBH)**
  - **Mfr.**
  - **Model #**
  - **Schedule**: Specific
  - **Notes**: Reserved

### Mechanical Schedules

- **RATIO**
  - **1600 Ashland Muncie, IN 47306**
  - **Civil Engineer**
  - **Architect**
  - **Structural Engineer**
  - **Electrical Engineer**
  - **Plumbing Engineer**
  - **Mechanical Engineer**
  - **Construction Specialties**
  - **BSU**
  - **Civil Engineer**
  - **Architect**
  - **Structural Engineer**
  - **Electrical Engineer**
  - **Plumbing Engineer**
  - **Mechanical Engineer**
**Terminal Box Schedule (HW) Lower Level**

| TB-1-2-117 AHU-2 | Office 117 DDC | 6" | 150 CFM | 45 CFM | 0.060 in-wg | 1.000 |
| TB-1-4-133 AHU-4 | Field Storage |   |         |        |            |       |

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### Laboratory Air Control Valves (Designated SAV, LAV, HAV)

- **HAV-4-458-1 LEF-2 Synthetic**
  - HOOD EXHAUST 8
  - 640 CFM
  - 30 0 CFM
  - 0.000 in-wg
  - 0.000 in-wg
  - 20 35
  - DDC 20.00 lb
  - ACCUTROL H -AVC5000-10
  - 1,3

- **HAV-4-458-2 LEF-2 Synthetic**
  - HOOD EXHAUST 8
  - 640 CFM
  - 30 0 CFM
  - 0.000 in-wg
  - 0.000 in-wg
  - 20 35
  - DDC 20.00 lb
  - ACCUTROL H -AVC5000-10
  - 1,3

- **HAV-4-458-3 LEF-2 Synthetic**
  - HOOD EXHAUST 8
  - 640 CFM
  - 30 0 CFM
  - 0.000 in-wg
  - 0.000 in-wg
  - 20 35
  - DDC 20.00 lb
  - ACCUTROL H -AVC5000-10
  - 1,3

- **HAV-4-458-5 LEF-2 Synthetic**
  - HOOD EXHAUST 8
  - 640 CFM
  - 30 0 CFM
  - 0.000 in-wg
  - 0.000 in-wg
  - 20 35
  - DDC 20.00 lb
  - ACCUTROL H -AVC5000-10
  - 1,3

---

### Temperature Specifications

- **55.0 °F**
- **85.0 °F**
- **140.0 °F**
- **120.0 °F**
- **0.87 GPM**
- **0.03 psi**
- **3/4"**
- 27 20 20 27 29 40 51 53 39
- **DDC 20.00 lb**
- **PRICE SDV-06**
- **1,2**

- **55.0 °F**
- **85.0 °F**
- **140.0 °F**
- **120.0 °F**
- **1.3 GPM**
- **0.03 psi**
- **3/4"**
- 40 0 CFM
- 12960 20 20 27 29 40 51 53 39 23.00 lb
- **PRICE SDV-07**
- **notes**

- **55.0 °F**
- **85.0 °F**
- **140.0 °F**
- **120.0 °F**
- **0.73 GPM**
- **0.03 psi**
- **3/4"**
- 25 CFM
- 7290 20 20 27 29 40 51 53 39
- **DDC 20.00 lb**
- **PRICE SDV-06**
- **1,2**

- **55.0 °F**
- **85.0 °F**
- **140.0 °F**
- **120.0 °F**
- **1.94 GPM**
- **0.03 psi**
- **3/4"**
- 00 CFM
- 19440 20 20 27 29 40 51 53 39
- **DDC 30.00 lb**
- **PRICE SDV-10**
- **1, 2**

- **55.0 °F**
- **85.0 °F**
- **140.0 °F**
- **120.0 °F**
- **2.53 GPM**
- **0.03 psi**
- **3/4"**
- 80 CFM
- 25272 20 20 27 29 40 51 53 39
- **DDC 30.00 lb**
- **PRICE SDV-09**
- **1, 2**

---

**CHEM 449 CHEM 449**

- **HOOD EXHAUST 10**
- 480 CFM
- 150 CFM
- 0.000 in-wg
- 0.000 in-wg
- 2 0 35
- DDC 16.00 lb
- ACCUTROL H -AVC5000-8
- 1,3

- **HOOD EXHAUST 8**
- 700 CFM
- 360 CFM
- 0.000 in-wg
- 1.000 in-wg
- 20 35
- DDC 20.00 lb
- ACCUTROL H -AVC5000-10
- 1,3

---

**BSU FOUNDOURAL FOUNDATIONAL SCHEDULES**
### TERMINAL BOX SCHEDULE (HW) FOURTH FLOOR

<table>
<thead>
<tr>
<th>TB-4-2-449A</th>
<th>AHU-2 Write Up</th>
<th>3, 4, 5</th>
<th>DDC 6&quot;</th>
<th>380 CFM</th>
<th>65 CFM</th>
<th>0.3</th>
<th>80 in-wg</th>
<th>1.000</th>
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</thead>
<tbody>
<tr>
<td>TB-4-1-417B</td>
<td>AHU-1 Chairs Office</td>
<td>417B</td>
<td>DDC 6&quot;</td>
<td>300 CFM</td>
<td>65 CFM</td>
<td>0.38</td>
<td>80 in-wg</td>
<td>1.000</td>
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<tr>
<td>TB-4-1-417A</td>
<td>AHU-1 Break Room</td>
<td>417A</td>
<td>DDC 6&quot;</td>
<td>300 CFM</td>
<td>65 CFM</td>
<td>0.38</td>
<td>80 in-wg</td>
<td>1.000</td>
</tr>
<tr>
<td>TB-4-3-458A</td>
<td>AHU-3 Write Up</td>
<td>458A</td>
<td>DDC 6&quot;</td>
<td>185 CFM</td>
<td>60 CFM</td>
<td>0.12</td>
<td>0 in-wg</td>
<td>1.000</td>
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<tr>
<td>TB-5-3-500E</td>
<td>AHU-3 Corridor</td>
<td>500</td>
<td>DDC 6&quot;</td>
<td>240 CFM</td>
<td>95 CFM</td>
<td>0.37</td>
<td>0 in-wg</td>
<td>1.000</td>
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<tr>
<td>TB-5-2-519A</td>
<td>AHU-2 Write Up</td>
<td>519A</td>
<td>DDC 6&quot;</td>
<td>190 CFM</td>
<td>60 CFM</td>
<td>0.12</td>
<td>0 in-wg</td>
<td>1.000</td>
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<tr>
<td>TB-5-4-555A</td>
<td>AHU-4 Write Up</td>
<td>555A</td>
<td>DDC 6&quot;</td>
<td>100 CFM</td>
<td>45 CFM</td>
<td>0.06</td>
<td>0 in-wg</td>
<td>1.200</td>
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<tr>
<td>TB-5-4-548</td>
<td>AHU-4 Stock RM Office</td>
<td>548</td>
<td>DDC 6&quot;</td>
<td>100 CFM</td>
<td>45 CFM</td>
<td>0.06</td>
<td>0 in-wg</td>
<td>1.200</td>
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<tr>
<td>TB-4-3-443</td>
<td>AHU-3 ELEC</td>
<td>443</td>
<td>DDC 6&quot;</td>
<td>400 CFM</td>
<td>0 CFM</td>
<td>0.38</td>
<td>0 in-wg</td>
<td>1.000</td>
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<tr>
<td>TB-4-3-441</td>
<td>AHU-3 IDF</td>
<td>441</td>
<td>DDC 6&quot;</td>
<td>200 CFM</td>
<td>65 CFM</td>
<td>0.38</td>
<td>0 in-wg</td>
<td>1.000</td>
</tr>
<tr>
<td>TB-4-1-445</td>
<td>AHU-1 Open Study/CORRIDOR</td>
<td>445</td>
<td>DDC 6&quot;</td>
<td>440 CFM</td>
<td>300 CFM</td>
<td>0.38</td>
<td>80 in-wg</td>
<td>1.000</td>
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<tr>
<td>TB-4-1-419</td>
<td>AHU-1 Faculty Office</td>
<td>419</td>
<td>DDC 6&quot;</td>
<td>200 CFM</td>
<td>95 CFM</td>
<td>0.37</td>
<td>0 in-wg</td>
<td>1.000</td>
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<tr>
<td>TB-4-1-418</td>
<td>AHU-1 Conference Room</td>
<td>418</td>
<td>DDC 8&quot;</td>
<td>500 CFM</td>
<td>95 CFM</td>
<td>0.37</td>
<td>0 in-wg</td>
<td>1.000</td>
</tr>
<tr>
<td>TB-4-1-417</td>
<td>AHU-1 Front Office</td>
<td>417</td>
<td>DDC 8&quot;</td>
<td>500 CFM</td>
<td>95 CFM</td>
<td>0.37</td>
<td>0 in-wg</td>
<td>1.000</td>
</tr>
<tr>
<td>TB-4-1-416</td>
<td>AHU-1 Faculty Office</td>
<td>414, 415, 416</td>
<td>DDC 8&quot;</td>
<td>450 CFM</td>
<td>95 CFM</td>
<td>0.37</td>
<td>0 in-wg</td>
<td>1.000</td>
</tr>
<tr>
<td>TB-4-1-407</td>
<td>AHU-1 GA</td>
<td>407</td>
<td>DDC 10&quot;</td>
<td>800 CFM</td>
<td>160 CFM</td>
<td>0.38</td>
<td>0 in-wg</td>
<td>1.000</td>
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<tr>
<td>TB-4-1-406</td>
<td>AHU-1 Faculty Office</td>
<td>405, 406</td>
<td>DDC 6&quot;</td>
<td>300 CFM</td>
<td>65 CFM</td>
<td>0.38</td>
<td>80 in-wg</td>
<td>1.000</td>
</tr>
<tr>
<td>TB-5-1-512</td>
<td>AHU-1 IDF-2</td>
<td>512</td>
<td>DDC 8&quot;</td>
<td>350 CFM</td>
<td>0 CFM</td>
<td>0.38</td>
<td>0 in-wg</td>
<td>1.000</td>
</tr>
</tbody>
</table>

### TERMINAL BOX SCHEDULE (HW) FIFTH FLOOR

| TB-5-1-525A | AHU-3 Write Up | 525A | DDC 6" | 200 CFM | 60 CFM | 0.12 | 0 in-wg | 1.000 |
| TB-5-1-500E | AHU-3 Corridor | 500 | DDC 6" | 240 CFM | 95 CFM | 0.37 | 0 in-wg | 1.000 |
| TB-5-3-507 | AHU-3 Corridor | 507 | DDC 6" | 240 CFM | 95 CFM | 0.37 | 0 in-wg | 1.000 |
| TB-5-3-500A | AHU-3 Corridor | 500A | DDC 6" | 240 CFM | 95 CFM | 0.37 | 0 in-wg | 1.000 |
| TB-5-3-500G | AHU-3 Corridor | 500G | DDC 6" | 240 CFM | 95 CFM | 0.37 | 0 in-wg | 1.000 |
| TB-5-1-506 | AHU-1 IDF-2 | 506 | DDC 8" | 350 CFM | 0 CFM | 0.38 | 0 in-wg | 1.000 |

### TERMINAL BOX SCHEDULE (HW) PENTHOUSE

| TB-6-1-610 | AHU-4 Stock RM Office | 610 | DDC 6" | 100 CFM | 45 CFM | 0.06 | 0 in-wg | 1.200 |
| TB-6-1-608 | AHU-4 Stock RM Office | 608 | DDC 6" | 100 CFM | 45 CFM | 0.06 | 0 in-wg | 1.200 |
| TB-6-1-606 | AHU-4 Stock RM Office | 606 | DDC 6" | 100 CFM | 45 CFM | 0.06 | 0 in-wg | 1.200 |
| TB-6-1-604 | AHU-4 Stock RM Office | 604 | DDC 6" | 100 CFM | 45 CFM | 0.06 | 0 in-wg | 1.200 |
| TB-6-1-602 | AHU-4 Stock RM Office | 602 | DDC 6" | 100 CFM | 45 CFM | 0.06 | 0 in-wg | 1.200 |
| TB-6-1-600 | AHU-4 Stock RM Office | 600 | DDC 6" | 100 CFM | 45 CFM | 0.06 | 0 in-wg | 1.200 |

**Notes:**
- TERMINAL BOX SCHEDULE (HW) FIFTH FLOOR
- NOTES:
  - TERMINAL BOX SCHEDULE (HW) FIFTH FLOOR
- **TAG NO. SYSTEM AREA SERVED TYPE**
  - SIZE TO UNIT MAX. CFM
  - DUCT SIZE TO COIL MIN. CFM UNIT MAX. S.P.
  - MBH AT HTG.
  - INLET NC LEVEL AT INLET S.P.
  - MAX. DISCHARGE SOUND POWER OCTAVE BAND CENTER BASIS OF DESIGN
HEATING WATER SEQUENCE OF OPERATIONS:

1. The Building Automatic Control System (BAS) is capable of automatically controlling the operation of the geothermal heating/cooling system.
2. The BAS shall start the heating/cooling process in response to the following conditions:
   a. The building load exceeds the furnace or chiller capacity
   b. The temperature difference between the building supply and return water is less than 10°F

3. The BAS shall automatically control the operation of the geothermal heating/cooling system to maintain the building temperature setpoint. The BAS shall continuously monitor the building temperature and adjust the heating/cooling system as necessary to maintain the setpoint.

4. The BAS shall also automatically control the operation of the geothermal heating/cooling system in response to the following conditions:
   a. The building load exceeds the furnace or chiller capacity
   b. The temperature difference between the building supply and return water is less than 10°F

5. The BAS shall also automatically control the operation of the geothermal heating/cooling system in response to the following conditions:
   a. The building load exceeds the furnace or chiller capacity
   b. The temperature difference between the building supply and return water is less than 10°F

CHILLED WATER SEQUENCE OF OPERATIONS:

1. The Building Automatic Control System (BAS) is capable of automatically controlling the operation of the geothermal heating/cooling system.
2. The BAS shall start the heating/cooling process in response to the following conditions:
   a. The building load exceeds the furnace or chiller capacity
   b. The temperature difference between the building supply and return water is less than 10°F

3. The BAS shall automatically control the operation of the geothermal heating/cooling system to maintain the building temperature setpoint. The BAS shall continuously monitor the building temperature and adjust the heating/cooling system as necessary to maintain the setpoint.

4. The BAS shall also automatically control the operation of the geothermal heating/cooling system in response to the following conditions:
   a. The building load exceeds the furnace or chiller capacity
   b. The temperature difference between the building supply and return water is less than 10°F

5. The BAS shall also automatically control the operation of the geothermal heating/cooling system in response to the following conditions:
   a. The building load exceeds the furnace or chiller capacity
   b. The temperature difference between the building supply and return water is less than 10°F

6. The BAS shall also automatically control the operation of the geothermal heating/cooling system in response to the following conditions:
   a. The building load exceeds the furnace or chiller capacity
   b. The temperature difference between the building supply and return water is less than 10°F

7. The BAS shall also automatically control the operation of the geothermal heating/cooling system in response to the following conditions:
   a. The building load exceeds the furnace or chiller capacity
   b. The temperature difference between the building supply and return water is less than 10°F
PLAN NOTES:

1. Comply with manufacturer's requirements for supply and return.
2. Manual high point vent at all locations in the piping system where air can be trapped.
3. Campus chilled water lines.
4. Full line size by-pass.
5. Automatic air vent with 1/2" drain line. Route to nearest floor drain in mechanical room.
7. High pressure switch to stop pumps if discharge pressure is too high (hardwired manual reset) nearest floor drain in mechanical room.
8. Schedule relief valve.
9. Building differential pressure station at most hydraulically remote location.
10. Refer to two way-valve AHU multiple water coil.
11. Pete's P/T plug. Install 1/2" thread-o-let on coil.
12. Check valve.

SUPPLY AND RETURN.

PIPING DETAIL ON M-903.

PIPING SYSTEM WHERE AIR CAN BE TRAPPED.

STRAIGHT PIPE DISTANCED UP STREAM AND DOWN FLUSH TO PREVENT AIR TRAPPING.

CONNECT TO EMS.
ARCHITECTURAL DRAWINGS FOR POLE BASE SPECIFICATIONS.

REFER TO LIGHT POLE BASE DETAIL 7 ON E-503 AND BASE DETAIL IN SPECIFICALLY NOTED TO BE DEEPER.

BY THE OWNER.

PLAN BELOW GRADE CONDUITS. PULLING OF THE MANDREL SHALL BE WITNESSED

CONTRACTOR SHALL PULL APPROPRIATELY SIZED MANDREL THROUGH ALL

SURFACES, GRADING, AND LIGHT FIXTURE POLE BASE DETAIL.

SEE LANDSCAPING AND CIVIL PLANS FOR ADDITIONAL INFORMATION ON FINISH 10.

DISCREPANCIES ARE FOUND IN THESE PLANS FROM THE ACTUAL FIELD

CONDITIONS, THE CONTRACTOR SHALL NOTIFY THE ENGINEER IMMEDIATELY.

FIELD VERIFY ALL INTERFERENCE WITH BURIED UTILITIES.

CONTRACTOR SHALL VERIFY ALL DIMENSIONS (VERTICAL AND

THAT MAY INTERFERE WITH THE INSTALLATION OF NEW WORK.

RECEPTACLE IN CALL BOX BASE.

PROVIDE 20A, 120V BRANCH CIRCUIT TO EMERGENCY CALL BOX IN SCHEDULE 40

SCIENCE BUILDING WHEN AVAILABLE - PANELBOARD LNL1.

EXISTING PUMP WELL

PROVIDE BELOW GRADE SCHEDULE 40 PVC CONDUIT FROM EXISTING PUMP WELL

HEAD TO PUMP CONTROLLER IN AQUATICS 024. SEE SHEET E-402 FOR LOCATION.

TEMPORARILY WIRE RECEPTACLE FOR SUMP PUMP IN MANHOLE E-AE TO EXISTING

80x70

5" CONDUIT

DUMP

DUMP

NEW MANHOLE

NEW DUCT BANK

SYSTEM

TO MSB1B

EMPTY CONDUIT TO MSB1A

APPROXIMATE CONDUIT ROUTING

APPROXIMATE CONDUIT ROUTING

POLES - 1WNH1#13

BSU FOUNDATIONAL SCIENCES BUILDING

1600 Ashland
Muncie, IN 47306
SEE SHEET E

MOUNT RECEPTACLE FOR GLYCOL FILL UNIT ON UNISTRUT. COORDINATE EXACT LIGHTING IS FACTORY WIRED FOR SINGLE POINT OF CONNECTION AND SHIPPED INSTALL MOTOR COMBINATION STARTER IN MAINTENANCE VESTIBULE OF AHU WIRE MOTOR BRANCH CIRCUIT THROUGH ASSOCIATED COMBINATION STARTER MAKE FINAL CONNECTION TO FAN MOTOR THROUGH ASSOCIATED LOCAL MECHANICAL EQUIPMENT PROVIDED WITH FACTORY INSTALLED DISCONNECT MAINTENANCE VESTIBULE WITH TCC SYSTEM INSTALLER. INSTALL VFD IN MAINTENANCE VESTIBULE OF AHU RUNNING. ASSOCIATED VFD TO SHUT DOWN VFD IF DISCONNECT IS OPEN WHILE FAN IS MOUNTED ON UNISTRUT FRAME.
PLAN NOTES:

1. DRAWING AT 100% SCALE. DRAWING DOES NOT SHOW POSITION OF ENCLOSURES RELATIVE TO WALLS. POSITION SHALL BE DETERMINED THROUGH EXAMINATION OF ARCHITECTURAL SHEETS A. ENCLOSURES ARE TO BE CEILING MOUNTED

2. COORDINATE MOUNTING HEIGHT OF RECEPTACLE WITH SINK BACKSPLASH TO FINISHED FLOOR.

3. PROVIDE #12 AWG GROUND WIRE IN CONDUIT FROM BACK BOX TO GROUND BUS IN ELECTRICAL PANEL SERVING THIS SPACE.

4. PROVIDE FLUSH MOUNTED JUNCTION BOX AT 96" ABOVE FINISHED FLOOR.

5. MAKE FINAL CONNECTION TO ELECTRIC PROJECTOR SCREEN. COORDINATE PENDANT MOUNTED RECEPTACLES AT 6’ INSTALLER PRIOR TO ROUGH IN.

6. COORDINATE LOCATION OF CEILING MOUNTED RECEPTACLE WITH PROJECTOR UNLESS SPECIFICALLY NOTED OTHERWISE IN THESE DRAWINGS.

7. ELEVATIONS ON DRAWING REFER TO ARCHITECTURAL SHEET A.

8. CIRCUIT NUMBER SHOWN TO INDICATE PANELBOARD AND QUANTITY. OTHER DEVICES ON THE CIRCUIT ARE INDICATED BY CIRCUIT NUMBER ONLY.

9. HOME RUN DOES NOT DESIGNATE FIRST DEVICE IN THE BRANCH CIRCUIT. ALL INDICATED BRANCH CIRCUIT HOME RUNS ARE SHOWN FOR WIRE COUNT AND SIZE.

10. COORDINATE ALL DEVICE ELEVATIONS WITH ARCHITECTURAL AND LAB DRAWINGS SEE SHEET E.

11. DRAWING FOR SCREEN SWITCH ROUGH IN REQUIREMENTS AND LOCATION.

12. MAKE FINAL CONNECTION TO EVAPORATOR CONTROL PANEL USING SAME SIZE.

13. PROVIDE 60A/3P, 240V NON-PUMP ROOM 023B AND THEN INTO BACK OF DISCONNECT SWITCH. FINAL STUB BRANCH CIRCUIT CONDUIT UP FROM BELOW FLOOR INTO CHILLER/VAC INSTALLED PRIOR TO ROUGH IN.

14. COORDINATE MOUNTING HEIGHT OF RECEPTACLE WITH SINK BACKSPLASH TO FINISHED FLOOR.

15. PROVIDE FLUSH MOUNTED JUNCTION BOX AT 96" ABOVE FINISHED FLOOR.

16. MAKE FINAL CONNECTION TO ELECTRIC PROJECTOR SCREEN. COORDINATE PENDANT MOUNTED RECEPTACLES AT 6’ INSTALLER PRIOR TO ROUGH IN.

17. COORDINATE LOCATION OF CEILING MOUNTED RECEPTACLE WITH PROJECTOR UNLESS SPECIFICALLY NOTED OTHERWISE IN THESE DRAWINGS.

18. ELEVATIONS ON DRAWING REFER TO ARCHITECTURAL SHEET A.

19. CIRCUIT NUMBER SHOWN TO INDICATE PANELBOARD AND QUANTITY. OTHER DEVICES ON THE CIRCUIT ARE INDICATED BY CIRCUIT NUMBER ONLY.

20. HOME RUN DOES NOT DESIGNATE FIRST DEVICE IN THE BRANCH CIRCUIT. ALL INDICATED BRANCH CIRCUIT HOME RUNS ARE SHOWN FOR WIRE COUNT AND SIZE.

21. COORDINATE ALL DEVICE ELEVATIONS WITH ARCHITECTURAL AND LAB DRAWINGS SEE SHEET E.

22. DRAWING FOR SCREEN SWITCH ROUGH IN REQUIREMENTS AND LOCATION.

23. MAKE FINAL CONNECTION TO EVAPORATOR CONTROL PANEL USING SAME SIZE.

24. PROVIDE 60A/3P, 240V NON-PUMP ROOM 023B AND THEN INTO BACK OF DISCONNECT SWITCH. FINAL STUB BRANCH CIRCUIT CONDUIT UP FROM BELOW FLOOR INTO CHILLER/VAC INSTALLED PRIOR TO ROUGH IN.
GENERAL NOTES:
1. REFER TO ARCHITECTURAL SHEET A OTHER DEVICES ON THE CIRCUIT ARE INDICATED BY CIRCUIT NUMBER ONLY.
2. PRIOR TO ROUGH IN.

PLAN NOTES:
1. REFER TO ISLAND BENCH DETAIL IN "LF" SERIES OF DRAWINGS FOR CONDUIT FROM ISLAND BENCH END WALL DOWN INTO CEILING AND SHALL BE USED ONLY PURSUANT TO THE AGREEMENT WITH RATIO ARCHITECTS, INC.  NO OTHER COPYGHT NOTICE: THIS ARCHITECTURAL AND ENGINEERING DRAWING IS GIVEN IN CONFIDENCE TO HOOD USING FLEXIBLE WHIP.
2. PROVIDE FLUSH MOUNTED JUNCTION BOX AT 96" ABOVE FINISHED FLOOR.
3. INSTALL RECEPTACLE IN WALL OF ISLAND BENCH.  RECEPTACLE CUTOUT FURNISHED WITH RECEPTACLE CUTOUT.
4. PROVIDE GFIC RECEPTACLE IN APRON OF BASE CABINET.  BASE CABINET LOCATION WITH SCREEN INSTALLER PRIOR TO ROUGH IN.  SEE TECHNOLOGY DRAWINGS.
5. INSTALL RECEPTACLE IN KNEE OPENING OF BASE CABINETS. LENGTH OF WIRE TO MAKE FINAL CONNECTION TO STORAGE CABINET WITH OUT FINISHED FLOOR.  PROVIDE #12 AWG GROUND WIRE IN CONDUIT FROM BACK BOX TO SPACE.  PROVIDE #12 AWG GROUND WIRE IN CONDUIT FROM BACK BOX TO CONNECTION FOR CHEMICAL FUME HOODS LOCATED ON TOP OF HOOD.  MAKE PROVIDE JUNCTION BOX IN ACCESSIBLE CEILING SPACE.
6. INSTALL RECEPTACLE IN WALL OF ISLAND BENCH.  RECEPTACLE CUTOUT FURNISHED WITH RECEPTACLE CUTOUT.
7. PROVIDE GFIC RECEPTACLE IN APRON OF BASE CABINET.  BASE CABINET LOCATION WITH SCREEN INSTALLER PRIOR TO ROUGH IN.  SEE TECHNOLOGY DRAWINGS.
8. INSTALL RECEPTACLE IN KNEE OPENING OF BASE CABINETS. LENGTH OF WIRE TO MAKE FINAL CONNECTION TO STORAGE CABINET WITH OUT FINISHED FLOOR.  PROVIDE #12 AWG GROUND WIRE IN CONDUIT FROM BACK BOX TO SPACE.  PROVIDE #12 AWG GROUND WIRE IN CONDUIT FROM BACK BOX TO CONNECTION FOR CHEMICAL FUME HOODS LOCATED ON TOP OF HOOD.  MAKE PROVIDE JUNCTION BOX IN ACCESSIBLE CEILING SPACE.
9. INSTALL RECEPTACLE IN WALL OF ISLAND BENCH.  RECEPTACLE CUTOUT FURNISHED WITH RECEPTACLE CUTOUT.
10. PROVIDE GFIC RECEPTACLE IN APRON OF BASE CABINET.  BASE CABINET LOCATION WITH SCREEN INSTALLER PRIOR TO ROUGH IN.  SEE TECHNOLOGY DRAWINGS.
11. INSTALL RECEPTACLE IN KNEE OPENING OF BASE CABINETS. LENGTH OF WIRE TO MAKE FINAL CONNECTION TO STORAGE CABINET WITH OUT FINISHED FLOOR.  PROVIDE #12 AWG GROUND WIRE IN CONDUIT FROM BACK BOX TO SPACE.  PROVIDE #12 AWG GROUND WIRE IN CONDUIT FROM BACK BOX TO CONNECTION FOR CHEMICAL FUME HOODS LOCATED ON TOP OF HOOD.  MAKE PROVIDE JUNCTION BOX IN ACCESSIBLE CEILING SPACE.  

F.7
OPENINGS FOR AV DEVICE, CABLING AND DRAWINGS FOR REQUIREMENTS.

2" CONDUIT FOR AV CABLES. ROUTE TO ACCESSIBLE CEILING SPACE IN ROOM WHERE FLOOR BOX IS INSTALLED.

AFTER CONDUIT INSTALLATION LAB BENCH TOP

NOTES:

Scale: NOT TO SCALE

TYPICAL AV FLOOR BOX

BETWEEN PEDESTALS IS 64" CONSTRUCTION DETAILS. SPACE BELOW. REFER TO "LF" SERIES OF DRAWINGS FOR CABINET ROUTE CONDUIT DOWN INTO ISLAND OR BENCH PIPE CHASE TO CEILING

ELECTRONICS CHASSIS UP ABOVE LAB BENCH TOP 1" RIGID STEEL CONDUIT STUBBED ALUMINUM SINGLE SERVICE PEDESTAL SIMILAR TO INDICATED ON THE FLOOR PLANS PROVIDE DEVICES AS CHASSIS IS 21' - 0"

1" CONDUIT - MAX LENGTH BETWEEN FLOOR BOX IS INSTALLED. CORRIDOR OF FLOOR OF ROOM WHERE 1/4" CONDUIT FOR TELCOM CABLES.

CIRCUIT DESIGNATION.

BACKBOCK WITH PROJECTOR SCREEN WALL DRY CONTACT PADDLE SWITCH. INSTALL IN ABOUT 45° ABOVE HORIZON. MOUNTED TO WALL IN ELECTRICAL ROOM.

- #12AWG CONDUCTORS IN 3/4" CONDUIT TO ABOVE CEILING IN ACCESSIBLE LOCATION.

MOTORIZED WINDOW SHADE CONTROLLER INSTALLED BY CONTRACTOR.

COORDINATE ACTUAL WIRING REQUIREMENTS WITH MOTORIZED SHADE PROVIDED TO ASSIST WITH BIDDING.

DETAIL NOTES:

NOTE:

2. ENCLOSURE SHALL NOT BE LOCATED INSIDE ROOM 135 AND 136.

1. FINAL CONNECTION TO EXISTING WELLHEAD BY WELL CONTRACTOR PRIOR TO ROUGH IN.

2. COORDINATE DISCONNECT SWITCH RATINGS WITH WELL PUMP CONTRACTOR PRIOR TO ROUGH IN.

NOTE:

24V REMOTE SHUTDOWN CIRCUIT.

PROVIDE 2-#12 IN 3/4" CONDUIT.

GAS VALVE PANEL WIRING DIAGRAM

WINDOW SHADE MOTOR CONTROL DIAGRAM

GAS VALVE SHUTDOWN PANEL WIRING DIAGRAM

NOTE:

1. FULL CONNECTIONS FOR DESIGNER TO MONITOR IN DESIGN PHASE.

2. FUNCTIONAL TESTING TO BE CONDUCTED FOR ALL MOTOR CONTROLLERS PRIOR TO INSTALLATION.

3. HANDING OVER TO CONSTRUCTION TO BE CONDUCTED FOR ALL MOTOR CONTROLLERS PRIOR TO INSTALLATION.

4. TOUCH-UP PAINT ON ELECTRICAL ROOM WALLS AND CEILING.

NOTES:

Scale: NOT TO SCALE

TYPICAL LIGHTING CONTACTOR

WELL PUMP SCHEMATIC
<table>
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<tr>
<th>Type</th>
<th>Description</th>
<th>Mounting</th>
<th>Lumen/Ft</th>
<th>Color</th>
<th>Energy</th>
<th>Notes</th>
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<td>F19</td>
<td>4&quot; LED X 10&quot; HIGH PENDANT MOUNTED ROUND CYLINDER</td>
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<td>3500</td>
<td>3000K</td>
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<td>F4</td>
<td>2 X 4 LED TYPE LIGHT FIXTURE, COLD-ROLLED STEEL</td>
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<td>SAME AS F40A BUT 26'-0&quot; LONG. COVE</td>
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<td>4'-7&quot; LONG X 2&quot;WIDE DIRECT WALL MOUNTED LED</td>
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<td>EXTERIOR WALL, 6&quot; SQUARE, UP AND DOWNLIGHT, AND MEDIUM DISTRIBUTION. ACRYLIC CLEAR LENS, AND EXTRUDED ALUMINUM REFLECTORS, SINGLE CIRCUIT, AND DIMMABLE LED DRIVER. FACTORY POWDER COAT FINISH RAL 7016.</td>
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**ELECTRICAL SCHEDULES**

- **Addendum #1 05.02.19**
- **Addendum #4 05.16.19**

- **Research Facilities Design**
  - Muncie, Indiana 47306
  - Ball State University
  - (317) 287-6333

- **BSU FOUNDATIONAL SCIENCES BUILDING**
  - 1600 Ashland
  - Muncie, IN 47306

- **MCGRAW-EDISON**
  - TLM-F02-LED-E1-XX-730/POLE:...
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### BSU Foundational Sciences Building

#### 5th Floor - West Telecom Schedule

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#### Muncie, IN 47306

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#### Indianapolis, Indiana 46240

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#### Telecommunications and Security

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#### Security Schedules - IDF 243

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## Footnotes

- BSU: Ball State University
- Founded: 1899
- Location: Muncie, IN 47306
- Website: https://www.bsu.edu
- Phone: 765-285-2000

### Project Details

- **Project No.**: 633
- **Location Label**: BSU Foundational Sciences Building
- **Architect / Landscape Architect**: Muncie, IN 47306
- **Mechanical / Electrical / Plumbing Engineer**: Indianapolis, Indiana 46240
- **Civil Engineer**: Indianapolis, Indiana 46240
- **Electrical Engineer**: Indianapolis, Indiana 46240
- **Mechanical / Electrical / Plumbing Engineer**: Indianapolis, Indiana 46240

### Contact Information

- **Address**: 1500 Block Ashland Muncie, IN 47306
- **Website**: https://www.bsu.edu
- **Phone**: 765-285-2000
- **Fax**: 765-283-5121

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**Sheet Title**: T502

**Sheet Number**: 1

**Checked By**: [Signature]

**Approved By**: [Signature]

**BICSI ID #**: 212593

---

**Project No.**: 633

**Location Label**:

BSU Foundational Sciences Building

1500 Block Ashland Muncie, IN 47306

- ARCHITECTS, INC.
- BICSI ID # 212593
- CHECKED BY
- APPROVED BY

---

**Not for Construction**

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**Key Plan**

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**Telecom & Security Schedules**

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**REV 01/20**