



## CAMPUS PLANNING, DESIGN & CONSTRUCTION

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### ADDENDUM NO. 1 - OUTLINE AND SUMMARY INFORMATION

Project Name: Linfield Hall 120 Lab Renovation PPA No.: 17-0034  
Location: Linfield Hall Meat Lab - MSU Date: 5/8/2018  
Owner: Montana State University - CPDC  
PO Box 172760  
Bozeman, MT

To: *All Plan Holders of Record*

*The Plans and Specification prepared by DSA Architects & GPD Engineers dated April 11, 2018, shall be clarified and added as follow. The bidder proposes to perform all the following clarifications or changes. It is understood that the Base Bid shall include any modification of Work or Additional Work that may be required by reason of the following change or clarifications.*

*The Bidders are to acknowledge the receipt of this Addendum by inserting its number and date into their Bid Forms. Failure to acknowledge may subject the Bidder to disqualification and rejection of the bid. This Addendum forms part of the Contract Documents as if bound therein and modifies them as follows:*

#### I. PRIOR APPROVALS

- A. Prior Approvals - 26 51 00: Lithonia, Williams, Columbia. Note that all light fixtures shall be 3500K color temperature rather than 4000K.

#### II. AMENDMENTS TO THE PROJECT MANUAL

- A. The following reports identifying materials to be encountered during construction are on file with MSU Facilities.
- 2008-12-26 South Linfield Building Inspection Asbestos NESHAP
  - Linfield Lewis Lead Inspection Report
  - Linfield – Lewis – Cobleigh Asbestos Inspection Add

#### III. AMENDMENTS TO THE DRAWINGS

- A. AV scope narrative by MSU IT Dept – Not in Contract
- Two wide screen displays. One 65” diagonal display mounted on east wall just above tile over office window. Second 50” diagonal display mounted on south wall of observation level.
  - Two HD cameras mounted on poles from ceiling. One over southern most meat cutting table and one over the “equipment” wall location. Exact location and height tbd.

- Wall mounted equipment rack located in office space. Shallow rack cabinet similar to Middle Atlantic\* SWR SERIES RACK, SWR-12-12. Need at least 6U.

- Touch panel controller to control TVs and cameras and to select source from either camera or office computer to display on TVs. Touch panel controller can be located in equipment rack if rack is located where user can easily reach. Otherwise controller will need to be located at tbd wall location. (wall mount box option\*\*)

B. Doors:

1. Change doors and notes as indicated on the attached floor plans.

C. Fall rail as shown on the roof plan and elevations adjacent to the HVAC unit to be installed shall be powder coated a WHITE color. Powder coat process shall be submitted for approval. New roof ladder shall be powder coated IN SAME COLOR.

D. Add roof ladder. (see attached plans)

E. A3-1.... the existing flue on the balcony plan indicated as a part of the Alternate No 2 description on the Balcony demolition plan shall be placed in the base bid of the project.

F. B, **Drawing E1.0 - ADD:** Change existing duplex receptacle on south wall of 120I to quad receptacle (two duplex receptacles). Add double gang box extension as required.

G. **Drawing E1.0 - CLARIFICATION:** AV equipment and connectivity to MSU infrastructure will be contracted through MSU IT department.

IV. GENERAL INFORMATION

A. ...NA

V. ATTACHMENTS

B. 23 0000 – General Provisions for HVAC Work

C. 23 0719 – HVAC Insulation

D. 23 0900 – Building Management and Controls System

E. 23 3113 – Ducts

F. Architectural drawing sheets 34/A0-1, 34/A0-2, 34/A3-1, 34/A3-4, 34A5-1.

**SECTION 23 0000  
GENERAL PROVISIONS FOR HVAC WORK**

**PART 1 GENERAL**

**1.1 ALTERNATES**

- A. Take cognizance of any change required in this work which may be a direct result of any alternate bid item listed and include the price deemed necessary to meet the requirements of the respective alternate.

**1.2 BIDDING**

- A. The Contractor shall provide labor, materials, equipment, items, articles, operations and methods listed, shown, scheduled, or mentioned on the drawings, and/or specified, including all incidentals required for their completion.
- B. The Contractor shall refer to the General part of these specifications, such as Instructions to Bidders, Special Conditions and DIVISION 01 for restrictions covering time that work can be performed in certain areas, noisy and dusty operations, sequence of work, access to restricted areas and similar types of work and operations.

**1.3 SUBSTITUTIONS**

- A. Most items in this Division are eligible for substitution in accordance with the General Conditions and Supplements thereto. Where a proprietary specification is written for a particular item, then only that item may be used.
- B. When the Engineer deems it necessary, to assure satisfactory installation and compatibility with other equipment, piping, ductwork, electrical provisions and other appurtenances, the Contractor shall prepare scale drawings of the substitute item showing proposed location, connections, relation to other equipment and other pertinent data such as maintenance space requirements, electrical requirements, height and weight. Drawings must receive Engineer's approval before the substitution is made.
- C. It is the Contractor's responsibility that the substitute item shall fit into the space allocated and that the item can be installed and function as intended. Should changes in the work of any Contractor become necessary as a result of any substitute item under this Division, such changes shall be arranged and paid for by this Contractor.
- D. Capacities of substitute items shall not be less than that of the specified item.
- E. The performance of the factory representative and supplier on past work will be a consideration in the approval process of substitute items.
- F. The final decision as to acceptability rests with the Engineer.

**1.4 CODES, REGULATIONS AND PERMITS**

- A. All materials and equipment shall be new, approved by the governing authority, and be in new, undamaged condition when installed.
- B. Comply with the International Mechanical Code, National Fire Protection Association Fire Codes, State of Montana Plumbing Code, International Building Code, and all other applicable Federal, State, County and City codes, regulations and ordinances. Comply with DIVISION 26 and all codes referenced therein for any and all electrical work accomplished under this Division or by this Contractor.
- C. Arrange for and obtain all permits and approvals required for the execution of the work.

**1.5 INTENT OF DRAWINGS**

- A. Pipe or duct risers and other diagrams are schematic only and not to scale. They are intended only to indicate sizes or relative arrangement of pipe and equipment shown elsewhere in plan view.

**1.6 WORKMANSHIP**

- A. Work shall be accomplished by workmen skilled in the particular trade, in conformance with best practices and to meet all applicable codes.

- B. This Contractor shall replace materials or equipment not properly installed or finished, without increase in payment received.

#### **1.7 RESPONSIBILITY**

- A. The Contractor is responsible for installation of a satisfactory and complete piece of work in accordance with true intent of the drawings and specifications.
- B. Consult all drawings for the project to predetermine that the work and equipment will fit as planned.
- C. The location of piping, ducts, equipment, etc., shall be checked to ensure clearance from openings, structural members, cabinets, lights, outlets, and equipment having fixed locations. This shall be accomplished prior to fabrication of pipe or ducts.
- D. If, at any time, and in any case, changes in location of piping, ducts, equipment, etc., becomes necessary due to existing obstacles or installation of other trades shown on any of the project drawings and such conflict could have been avoided by proper coordination between trades or proper pre-planning of work, such required changes shall be made by the Contractor at no extra cost. These changes are to be recorded on the record drawings.
- E. This Contractor is responsible to provide all incidental electrical interconnections, control wiring, etc., which are necessary for system completion and which are not specifically shown or otherwise indicated on the electrical drawings or specified in DIVISION 26.
- F. All electrical work incidental to or accomplished under this Division shall comply with all requirements of DIVISION 26.

#### **1.8 DELIVERY AND STORAGE OF MATERIALS**

- A. Make provisions which are acceptable to the Owner and Engineer for delivery and storage of materials.
- B. Make provisions for introduction into the building of equipment furnished under this Division. Refer to DIVISION 01 for additional provisions to allow equipment passage into the building.
- C. All materials shall be protected from damage and from weather. Cover, enclose and protect all stored materials and preserve in new, clean condition. Keep all openings in pipe, ductwork and equipment closed with caps and covers. All materials shall be elevated above the ground or floor during storage.
- D. All materials and products installed shall be new and shall be in new and undamaged condition. Materials which are rusted, weathered or otherwise depleted in condition shall not be installed.

#### **1.9 MANUFACTURER'S DIRECTIONS**

- A. Manufactured materials and equipment shall be applied, installed, connected, erected, used, cleaned and conditioned as directed by the manufacturer unless noted otherwise herein or on the drawings.
- B. Certain items of equipment, as noted herein, shall be checked out, started and put into service by factory representatives.

#### **1.10 CUTTING, PATCHING, REPAIRING**

- A. Cutting, patching and repairing required by the work of this Division shall be the responsibility of this Contractor.
- B. Work shall be performed in accordance with DIVISION 01 of these specifications.
- C. The performance of this work shall not weaken the structural integrity of the building.
- D. Any abrasion or disfigurement of the finished work or any portion of the building where any such abrasion or disfigurement is caused by the activities of the Contractor shall be repaired and neatly refinished to match the adjacent work.

#### **1.11 OPENINGS IN PIPES AND DUCTS**

- A. Openings in pipes and ducts shall be kept closed during progress of work.

- B. The Contractor is required to clean new systems found dirty to the satisfaction of the Engineer at no additional cost.

#### 1.12 CLEANUP

- A. Upon completion of work, remove materials, scraps, etc., relative to this work and leave the premises in a clean and orderly condition. This applies equally to finished, unfinished and concealed spaces.
- B. Clean equipment of dirt and debris.

#### 1.13 SAMPLES

- A. The Contractor shall submit actual production samples on any material or equipment requested if, in the Engineer's opinion, it is necessary in order to determine the quality, workmanship, operation, etc. of the item.
- B. Samples will be returned to the Contractor. Approved samples may be used on the job.
- C. Costs incurred in providing and returning samples will be the responsibility of the Contractor.

#### 1.14 TEMPORARY SERVICES

- A. See DIVISION 01 - GENERAL REQUIREMENTS for Temporary Facilities.

#### 1.15 FIRE PROTECTION

- A. Metallic pipe, duct and other penetrations of all fire partitions, walls and floors shall be effectively fire-stopped to equal the fire rating of the floor or partition using materials and methods UL approved and tested to meet all conditions of ASTM E119, UL 1479 and ASTM E 814 tests. One such material is Carborundum bulk "Fiberfrax" fiber packing for filling the annular space between pipe and sleeve or hole and Fiberfrax LDS moldable caulking for sealing in the fiber packing. Other acceptable materials are Dow Corning 3-6548 Silicon RTV foam firestop system, General Electric 'Pensil' 851 system or U.S.G. fire code compound and Thermafire.
- B. PVC pipe, duct penetrations to be fire stopped same as metallic penetrations with the addition of an intumescent wrap to effectively close the hole if PVC vaporizes.
- C. In lieu of using caulks or other field-placed filler materials as noted above, the fire stopping of pipe penetrations may be accomplished using a fire-rated intumescent mechanical seal system such as "Metraseal 120" as produced by the Metraflex Company. Where the use of such seal systems are specifically noted on plans, then only these systems shall be utilized.
- D. Construction of permanent bracing, framing, roof curbs and platforms or other structures which utilize wood construction shall be fabricated from fire resistant treated materials or shall be otherwise protected by approved fire resistant materials.

#### 1.16 ACCESS DOORS

- A. Where access to valves, dampers, equipment, etc. is required, provide Inryco/Milcor Type "K", "DW", or "M" doors. Access doors required in fire-rated walls or ceilings shall be U.L. approved, similar and equal to Ruskin #APW1. Size of door shall be sufficient to provide proper access to item, if size is not listed on the drawings.

#### 1.17 SYSTEM TESTS AND DEMONSTRATION

- A. **Test and demonstrate each system as specified in Section 017900.** Note that demonstration requirements are significant and failure may result in reimbursement to the Owner by the Contractor if demonstrations are incomplete.

#### 1.18 TRAINING AND OPERATING INSTRUCTIONS

- A. **The Contractor shall provide training and operating instructions for each new system and piece of equipment as specified in Section 017900.** Note that the

requirements for these functions are extensive.

### 1.19 RECORD DRAWINGS

- A. A separate set of mechanical drawings shall be maintained at the job site at all times and shall be used as record drawings. This set shall be kept up to date with all changes and/or additions in the construction and/or mechanical systems, and shall be delivered to the Engineer at the completion of this job. This set of drawings shall be kept clean and protected at all times. **Follow Section 017839.**

## PART 2 SUBMITTALS AND BROCHURES OF EQUIPMENT

### 2.1 GENERAL

- A. The literature required to be submitted and approved in order to fulfill the requirements of this Division falls into two general categories. These are the "Brochures of Equipment" and "Submittals."
- B. "Submittals" is a general term for informational literature which must be supplied to and approved by the Contractor and the Engineer prior to installing, receiving, or in some instances, even ordering equipment. The normal required types of submittals include shop drawings, manufacturer's literature, installation and operation instructions (from the manufacturer) and wiring diagrams. System reports, such as start-up reports or balancing reports, and the project completion checklist are two forms of submittals which are required after the equipment has been installed and is operational
- C. Brochures of Equipment are booklets assembled by the contractor which contain operation, maintenance and repair literature for all equipment installed under the requirements of the project. They will be used by the Owner's personnel as the primary source of information for operating and maintaining the installed systems. As such, they shall exhibit a professional quality, high degree of clarity and durability which will allow their use throughout the useful life of the installed system.

### 2.2 SUBMITTALS

- A. **Follow Section 013000 for all shop drawings and product data submittals.**
- B. The contractor shall procure all manufacturer's literature and produce or have produced, all drawings, calculations or other data as required by either the Submittal Schedule contained in this Section or as specifically called out in the individual Sections of this Division.
- C. Submittal materials shall be complete in every respect and shall clearly indicate equipment features, dimensions, weights, performance characteristics and capacities. Capacity and performance calculations shall be adjusted to indicate actual equipment performance at the project elevation. Literature or drawings which describe more than one model or size of equipment shall be marked with arrows or otherwise clearly inscribed to identify the actual equipment which will be furnished. All options and special parts of features shall also be clearly identified. All submitted materials must be clear, complete and legible. Copies or duplications of poor quality will not be reviewed or accepted.
- D. Approval of submittals by the Engineer shall not relieve the Contractor from responsibility for deviations from drawings or specifications, nor shall it relieve him from responsibility for errors in shop drawings or other submittal literature.

### 2.3 BROCHURES OF EQUIPMENT (AKA OPERATIONS AND MAINTENANCE MANUALS)

- A. The Contractor shall prepare complete Brochures of Equipment, each containing all required submittal data for the construction materials and each piece of equipment installed under this project. The literature required for submittal purposes shall be expanded to include operation and maintenance literature for each piece of equipment. Maintenance information shall be complete in every respect and shall include parts lists and assembly drawings wherever applicable. Manuals, catalogs, etc., shall be new, as supplied by the factory, and not photocopied.
- B. All literature shall clearly indicate the equipment it represents and shall be labeled with

the equipment identification abbreviation found on the drawings, e.g. EF-1, etc. All information which is not applicable to the particular model and size supplied shall be clearly and neatly crossed out with heavy black marker or other suitable means. This includes dimensional drawings, maintenance information, parts lists, wiring diagrams, etc. Only the information applicable to the particular equipment supplied shall remain and it shall be easy to follow. Booklets not meeting these requirements shall be returned for correction.

- C. **In addition to the requirements stated herein, follow Division 1 Section 017823 for format, material requirements, schedule and content.**
- D. Authorization for final payment shall not be made prior to final acceptance of the Brochures of Equipment.

**END OF SECTION 23 0000**

**SECTION 23 0719  
HVAC INSULATION**

**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 insulating the following duct services:
  - 1. Concealed supply and return/exhaust ductwork.
- B. Section includes insulating the following HVAC piping systems:
  - 1. Steam and condensate piping, indoors.

**1.3 ACTION SUBMITTALS**

- A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory- and field-applied if any).

**1.4 INFORMATIONAL SUBMITTALS**

- A. Qualification Data: For qualified Installer.

**1.5 QUALITY ASSURANCE**

- A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.
- B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
  - 1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
  - 2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

**1.6 DELIVERY, STORAGE, AND HANDLING**

- A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

**1.7 COORDINATION**

- A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Division 23 Section "Hangers and Supports for HVAC Piping and Equipment."
- B. Coordinate clearance requirements with duct Installer for duct insulation application. Before preparing ductwork Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

**1.8 SCHEDULING**

- A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.



- B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

**PART 2 PRODUCTS**

**2.1 ACCEPTABLE PRODUCTS**

- A. Equivalent products of Armstrong, Johns-Manville, Knauf, Certaineed, and Owens-Corning are acceptable.
- B. Owens-Corning catalog designations and descriptions are used herein.
- C. Substitute insulation shall provide same thermal and mechanical protection as the insulation specified.

**2.2 PIPE INSULATION**

- A. Pipe insulation for indoor piping shall be Owens-Corning Fiberglass 25 ASJ/SSL pipe insulation or equal, unless otherwise specifically noted herein. Wall thickness shall be as listed herein for each system and pipe size.
- B. Hot service pipe to be covered with insulation in thicknesses as listed herein.

<b>System/Pipe Size</b>	<b>≤1"</b>	<b>1-1/4"-1-1/2"</b>	<b>2" - 4"</b>
Steam Heating and Condensate	2-1/2"	2-1/2"	2-1/2"

- C. Valve Bodies, Flanges and Fittings

- 1. Fittings shall be insulated to the thickness of adjacent insulation and covered with pre-molded plastic jacket such as Zeston. Provide extra insulation at elbow head to prevent fitting cover oil canning.
- 2. Valve bodies up to 4" in size, flanges and appurtenances in pipe lines shall be insulated the same as pipe. Enlarge insulation as necessary to accommodate the size of the fittings, valves or equipment.

**2.3 DUCT INSULATION**

- A. Refer to the description published hereinafter for insulating materials to be used and the locations in which insulation is to be installed.
- B. Exterior Duct Insulation for Indoor/Outdoor Ductwork
  - 1. Exterior duct insulation (insulation applied to the exterior of a duct) of the type noted below shall be applied where noted.
    - a. Insulation for concealed and round ducts located above ceilings and within roof curbs shall be minimum R-8, Type 75 fiberglass duct wrap, 2" thick, with foil reinforced kraft jacket. The extent of the ductwork to be insulated is essentially that portion of the supply and return/exhaust ductwork serving RTU-2 that is located above the ceiling and that which is within the equipment roof curb. Sound attenuators and flex connectors, where concealed, shall be insulated the same as ductwork.

**2.4 METAL JACKETS**

- A. All new pipe insulation installed on this project shall be covered with metal jackets. Jacket material shall be as listed below.
  - 1. Stainless steel, smooth surface, .010" thick with stainless steel tie bands and all joints and seams sealed water tight with clear or silver mildew resistance 100% silicone wiped smooth.

- B. Fittings shall be covered with pre-formed metal jackets.

## **PART 3 EXECUTION**

### **3.1 GENERAL**

- A. Insulation shall only be installed by trained crews of the manufacturer.
- B. Materials, accessories, fasteners and installation methods shall be in strict accord with manufacturers recommendations and guide specifications.
- C. The appearance of the finished work will be of equal importance with its mechanical correctness for acceptance.

### **3.2 INSTALLATION**

- A. Termination of insulation at equipment, unions, etc., shall be neat without any raw edges. Insulation ends exposed in the meat lab Room 120 shall be covered with metal jacket and made water tight.
- B. Pipe Insulation
  - 1. Provide heavy density fiberglass insulation, cork or Kaylo block under pipe where insulation saddles are specified with pie hangers. (See Section 230529) Note: Wood blocking is not acceptable for this purpose.
- C. Duct Insulation
  - 1. Exterior insulation on exposed indoor ductwork
  - 2. Exterior insulation on concealed ducts
    - a. Duct wrap insulation shall be wrapped tightly on the ductwork with all circumferential joint butted and longitudinal joints overlapped a minimum of 2". Adhere insulation with insulation bonding adhesive. Additionally secure insulation to the bottom of rectangular ducts over 24" wide with suitable mechanical fasteners at not more than 18" O.C. On circumferential joints, the flange on the facing shall be stapled with flare door staples on 6" centers and taped with foil-reinforced Kraft tape. On longitudinal joints, the overlap shall be stapled on 6" centers and taped with foil-reinforced Kraft tape. All pin penetrations or punctures in facing shall also be taped.
- D. Metal Jacket
  - 1. Apply with minimum 1" overlap at seams. Sheet metal screws or stainless steel bands shall be spaced at max. 8" o.c. Seams shall lay at weather/water-protected side of surface, sealed with clear mildew resistant 100% silicone sealant in direction to sheet moisture. Final appearance of jacket to be neat without dents, twists, and with seams straight. Wipe all exposed joints of excess sealant to create a smooth clean surface that allows easy cleaning. Seal all ends of insulation with metal jacket and sealant so that there are no exposed insulation edges.

**END OF SECTION 23 0719**

**SECTION 23 0900**  
**BUILDING MANAGEMENT & CONTROL SYSTEM**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

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

**1.2 SUMMARY**

- A. This Section includes control equipment for rooftop air handling unit RTU-2. This unit will be provided with factory controls. Temperature Control work to be accomplished under this Section includes field wiring of control components provided with RTU-2, providing minimal space sensors and switches, monitoring and scheduling RTU-2 operation via BacNet and creation of a system graphic as described herein.
- B. This contractor is required to participate extensively in the startup and testing process and to field tune all factory controls to optimize the functional operation of the unit and the room pressure relationships.
- C. This project is will modify the HVAC systems in one portion of the existing building. The control system in the existing building is a Johnson Controls Incorporated system. The new work must either be an extension of the existing JCI system or the temperature controls contractor must replace all temperature controls within the building. That is to say, that when this project is complete, all systems in the entire building will be controlled by the same manufacturer's system and will be have an enterprise level server located in the Campus Heating Plant. If an alternate system manufacturer is proposed, that system must integrate with one of the existing campus level enterprise systems already in place.

**1.3 SYSTEM DESCRIPTION**

- A. The control system consists of sensors, indicators, actuators, final control elements, interface equipment, other apparatus, accessories, and software connected to distributed controllers operating in multitasking, multi-user environment on token-passing network and programmed to operate mechanical systems according to sequences of operation indicated or specified. All ancillary equipment, interconnecting wiring, wiring devices and any and all items and components required for complete and proper operation of this system shall be provided by this Contractor whether shown or specified or not. The system provided shall be complete and usable. Each of the prequalified vendors has provided controls under the current campus guidelines. This system will abide by the same configurations and protocols as previously mandated for other systems and as described hereinafter. Any upgrades required to the vendors' existing servers in the campus heating plant must be made as part of this project at no additional cost to the owner. The contractor shall address any questions regarding scope or system requirements prior to submitting his or her bid for this project.
- B. System protocol, network and interface requirements shall be as follows.
  - 1. The system shall be connected to, and must be compatible with, the campus local area network (LAN) and virtual private network (VPN) and shall use BacNet IP protocol. The system shall use a standard Web browser interface with both graphics and text/tabular format options. The system shall allow monitoring of any system parameter, changing of parameters, trending of data, data printing and shall be suitable for a minimum of ten users accessing the system at the same time. The system shall have multiple (at least three) levels of security through a password hierarchy to allow different levels of access. The system shall feature embedded operating systems that are not susceptible to security

problems or the vendor shall security problems. provide ten years of free software upgrades and patches to address any discovered

2. BACNet addressing for MSU HVAC Virtual Private Network:
  - a. All HVAC devices utilizing the MSU campus network must be connected to the HVAC VPN, unless specifically allowed to do otherwise.
  - b. All HVAC devices on the HVAC VPN using BACNet communication protocols must adhere to the following addressing standards for proper operation.
3. Bacnet Network Number: (Range 0 – 65535):
  - a. The Bacnet Standard requires that all devices on the same network segment, whether Ethernet, IP, or MS/TP must have the SAME network number. In the case of the HVAC VPN subnet at MSU, even though it serves multiple buildings across campus, it is currently configured as one network segment. Therefore, all Bacnet Ethernet and Bacnet IP devices, regardless of make/model/vendor, must utilize the SAME network number.
  - b. To re-iterate, there are three types of physical networks (IP, Ethernet, MS/TP) in the Bacnet architecture. Given the current configuration of the MSU HVAC subnet, the only networks capable of utilizing unique network numbers would be MS/TP trunks, because their physical network segment falls beneath their parent Ethernet or IP device, thereby isolating them.
  - c. Bacnet IP Network Number: 10001.
  - d. Bacnet Ethernet Network Number: 20001.
  - e. Bacnet MS/TP Network Numbers. Five Digit Network Number, with digits as follows:
    - 1) Digit 1:
      - a) 3 or higher for MS/TP network type.
    - 2) Digits 2, 3, and 4:
      - a) Three-digit building number. MSU will provide this number for each building.
    - 3) Digit 5:
      - a) Instance/trunk number. First MS/TP trunk could be 0, tenth trunk could be 9.
      - b) Note that if you exceed 10 MS/TP trunks, then you can start the 11th by increasing the digit 1 (mentioned above) from 3 to 4 in order to allow more MS/TP trunks.
    - 4) Bacnet Device Addressing: (Range 0 – 4194303):
      - a) Digit 1:
        - 1) Range 0 to 3, but always use 1.
      - b) Digits 2, 3, and 4:
        - 1) Three-digit building number. Always use three digits, even if building number is less than 100. (Range 0 - 999)
      - c) Digit 5:
        - 1) Building network instance number (Range 1 to 9). If there are more than 9 subnets, then you can increase the value of digit 1 by 1 and start over.
      - d) Digits 6 and 7:
        - 1) Device ID. This is actually an extension of Digit 5, so that the device ID is actually a three digit number 100-199, 200-299, etc...

C. Building Level Network.

1. Protocols: LON, BACnet MS/TP, and/or proprietary.
2. Functionality:
  - a. Control and coordination of all building control systems.
  - b. Monitoring and changing any system parameters.
  - c. Programming changes.
  - d. All systems to be arranged to operate effectively in stand-alone mode when network communications are lost.

- 1) Provide local outside air temperature sensor or other controls if required to provide appropriate control in stand-alone mode.
  - 2) Provide description of system operation in stand-alone mode. Typically, stand-alone mode should provide "occupied mode" control, and suitable operation under all conditions.
3. Operator interface at building
- a. Web browser access through campus network as indicated for external network operator interface.
    - 1) Graphics/text presentation similar to that for external network operator interface.
    - 2) Direct connection to building level controller (and/or other locations):
      - a) Access via proprietary "tool", and/or laptop computer.
      - b) Provide all hardware and software required for fully functional operator interface at building level and major system controllers.
      - c) Graphical/text access to entire system functionality.
- D. External Network Interface:
1. Campus Network: Connect to existing campus HVAC virtual private network (VPN). Coordinate location of network connections and IP addresses with Owner.
  2. Integrate new building systems with existing vendor hardware and software serving campus whenever possible. Provide new systems or upgrade existing systems where required for new systems to be integrated into existing systems.
  3. Protocols: BACnet IP.
  4. Functionality:
    - a Monitoring any system parameter.
    - b Changing parameters where required for trouble-shooting, maintenance, or operating functions (as defined??).
    - c Suitable for minimum of 10 users accessing system at one time.
    - d Trending set-up, access, and printing.
- E. External Operator Interface:
1. General:
    - a. Standard Web browser interface.
    - b. Text/tabular format option for system parameters.
    - c. Graphics option with presentation similar to that for internal network operator interface.
- F. The entire system, including all controllers and actuators, shall be connected to the building emergency power. All controllers shall be supplied and installed with uninterruptable power supplies having integral surge protection. The control system shall maintain full, uninterrupted service during a commercial power outage with no momentary or extended lapses. The controls system contractor shall wire all controls to provisional circuits in panelboards served by the emergency generator. The contractor shall provide appropriately sized uninterruptible power supplies (five minutes minimum ride-through at full draw) for all laboratory airflow controls systems and all controllers of air handlers, exhaust fans and all equipment responsible for space pressurization and conditioning to insure continued and uninterrupted operation of the controls during power outages. The contractor shall insure that all frequency drives and starters of all air handlers and exhaust fans for "on-the-fly" starting such that the fans immediately start and run upon transfer of commercial power to standby power and back. He shall further test, program and adjust drives and controls such that on-the-fly starting maintains the proper airflow orientation at the labs and that the pressure gradient remains less than 0.15" at all times.
- G. Full color graphics shall be provided for all control elements and systems, including the laboratory airflow controls systems and equipment specified in Section 15903. Graphics shall be custom designed for this application and shall feature real-time icons which change color or

simulate motion for active equipment. Real-time values for all control and sensing elements shall be continually displayed along with all set-point alarm settings for each element.

1. The system diagrams graphics shall include:
  - a. A summary page showing major system parameters and alarms,
  - b. Diagrams for all major systems including all air handling units, chillers and cooling towers, heating water loops, etc.,
  - c. Hyperlinks to specific information for individual pieces of equipment,
  - d. Information for all parameters including current value, setpoint, status and current alarms,
  - e. Interactive capability for appropriate parameters such as set-points, operating schedules, etc.,
  - f. An overall summary plan page with tabs featuring the plan for each floor of the building with room numbers from the construction documents and depicting all zone temperatures and alarms,
  - g. Line drawings with text and colors depicting general locations of equipment and areas served by the systems, zones of control, etc.,
  - h. Plans depicting locations of control sensors, stats, and elements,
  - i. Hyperlinks to Operations and Maintenance literature for all controllers and control systems components (essentially the same information included in the O&M manuals),
  - j. Approved as-built systems diagrams and sequences of operation. The controls contractor shall coordinate all graphics displays with the Owner and insure similar presentation to the Owner's other systems on campus.
2. The system building plans graphics shall include:
  - a. Summary page(s) depicting all current zone temperatures and alarms,
  - b. Floor plan representation of the building with final room numbers from the construction documents.
  - c. Line drawings, text and/or colors showing general locations of equipment, and areas served by systems, zones, etc.
  - d. Location of control elements outside of mechanical areas (e.g. duct pressure sensors, outdoor temperature sensors, room sensors, etc)
  - e. Space control points (temperature, humidity, or other as provided) with current value, set-points, and current alarms.
  - f. Interactive capability for appropriate parameters (set-points, schedules etc).
  - g. Hyperlinks on plans to access related system diagrams (e.g. hyperlink to proper VAV box and AHU serving a room).
3. Trending capabilities shall include:
  - a. Capability to trend all significant system parameters. Provide sufficient memory to trend all significant system parameters for the intervals and length of time noted below.
  - b. Trends shall be configured by the contractor for any and all system parameters as requested by the Owner.
  - c. Trends shall be configured for seven days for all main system parameters.
  - d. Sampling intervals for trending shall be appropriate for the value being trended so that typical events for each parameter can be captured. In general:
    - 1) Sample slow changing parameters every 30 minutes.
    - 2) Sample fast changing parameters every 5 minutes.
    - 3) Sample/record binary parameter values on change of value.
    - 4) Provide any intended alternative methods for determining appropriate trend intervals for Owner approval.
  - d. The contractor shall provide simple-to-use graphing and printing programming and shall configure programming such that multiple parameters can be included on a single graph.
  - e. Present and coordinate trending program configuration and capabilities with Owner during the pre-design and pre-installation meetings and again during start-up phase.

- f. Store and archive trend data so that it will not be lost during intermittent power outages.
- H. The system shall be provided with a web-server with access software to allow full system access, including complete graphics and text/tabular format option, via the internet. The system shall be capable of being accessed from any PC utilizing Microsoft Internet Explorer software or comparable internet browser. All data and graphics shall be displayed in real time. The system shall provide Owner definable access restrictions based upon IP address for remote access. See Paragraph 1.3 for vendor server requirements regarding use and the requirement to upgrade this equipment under the scope of this project.
- I. The Controls Systems as provided shall incorporate, at minimum, the following integral features, functions and services:
  - 1. All automated monitoring, supervision, control, information storage and presentation as required by these Specifications.
  - 2. The detection, annunciation and management of all alarm and non-expected conditions as required by the Specifications and control sequences.
  - 3. The diagnostic monitoring and reporting of system functions, Nodes and communication networks.
  - 4. Administrative functions necessary for the definition, back-up and restoration of all Controls Systems project specific and general databases.
  - 5. Interfaces between individual elements and the systems and networks provided by other trades as required by the Contract Documents.
  - 6. All other Controls Systems functions as required by the Contract Documents.

#### **1.4 QUALIFICATIONS OF CONTRACTOR**

- A. See Paragraph 1.2 C, above, for limitations regarding control systems manufacturer. The installing contractor shall be a franchised or direct representative of the controls manufacturer.
- B. System shall be that of a contractor who regularly designed, installs and services HVAC temperature control systems as their primary function and must have a history of at least six years in that field.
- C. Acceptable contractors as listed below or prior approved equal.
  - 1. Johnson Controls Incorporated
- D. Submittal must present history of the contractor, proof of successful system installations in similar size and usage buildings, qualifications of the installer, qualifications and experience history, setup and test personnel and proof of permanent maintenance personnel located within a 150-mile radius of the project.
- E. The ability of a particular company to install and service equipment and systems will be a consideration in the approval process of systems. This includes visibility of service in the immediate area and close proximity to provide four-hour response to service calls.

#### **1.5 SEQUENCE OF OPERATION**

- A. System operating sequences are described on the contract drawings.

#### **1.6 SUBMITTALS**

- A. General: Follow Section 013000. Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections. Due to the importance that timely completion of the controls will have on the success of the project, system drawings and information must be submitted and approved no more than 30 days following notice to proceed without exception.
- B. Product Data for each type of product specified. Include manufacturer's technical Product Data for each control device furnished, indicating dimensions, capacities, performance

characteristics, electrical characteristics, finishes of materials, installation instructions, and startup instructions.

- C. Shop Drawings containing the following information for each control system:
  - 1. Schematic flow diagram showing all equipment and control devices. All devices shall be identified by unique tag number.
  - 2. Each control device labeled with setting or adjustable range of control.
  - 3. Diagrams for all required electrical wiring. Clearly differentiate between factory-installed and field-installed wiring.
  - 4. Details of control panel faces, including controls, instruments, and labeling.
  - 5. Written description of sequence of operation.
  - 6. Trunk cable schematic showing programmable control unit locations and trunk data conductors.
  - 7. Listing of connected data points, including connected control unit and input device.
  - 8. Submit system graphics pages indicating all systems data, connected and calculated point addresses, and operator notations. Due to the importance of these items, submittal and approval of the graphics pages must occur along with the materials lists, diagrams and sequences submittals.
  - 9. System configuration showing peripheral devices, batteries, power supplies, diagrams, modems, and interconnections.
  - 10. Software description and sequence of operation.
  - 11. Valve schedules indicating all sizing, flows, calculated pressure drops and actuators to be used.
  - 12. Damper actuator schedules indicating damper torque requirements procured from damper manufacturer, actuator model numbers and actuator torque ratings and stroke speeds.
- D. Wiring diagrams detailing wiring for power, signal, and control systems and differentiating clearly between manufacturer-installed and field-installed wiring. These shall include all uninterrupted power supplies.
- E. Maintenance data for control systems equipment to include in the operation and maintenance manual. Include the following:
  - 1. Maintenance instructions and spare parts lists for each type of control device valve, actuator and compressed-air stations.
  - 2. Interconnection wiring diagrams with identified and numbered system components and devices.
  - 3. Keyboard illustrations and step-by-step procedures indexed for each operator function.
  - 4. Inspection period, cleaning methods, cleaning materials recommended, and calibration tolerances.
  - 5. Calibration records and list of set points.
  - 6. Instructions that explain how to design and install new points, panels and hardware, conduct preventive maintenance and calibration, how to debug and troubleshoot problems, and how to repair or replace hardware and software.
- F. Field Test Reports: Procedure and certification of pneumatic control piping system.
- G. Provide a listing and documentation of all programming developed and installed, including the set points, tuning parameters, and object database. Two sets of electronic media containing files of the software and database shall also be provided.
- H. Project Record Documents: Record actual locations of control components, including control units, thermostats, and sensors. Revise Shop Drawings to reflect actual installation and operating sequences.



### **1.7 QUALITY ASSURANCE**

- A. Installer Qualifications: Engage an experienced Installer specializing in control system installations.
- B. Manufacturer Qualifications: Engage a firm experienced in manufacturing control systems similar to those indicated for this Project and that have a record of successful in-service performance.
- C. Startup Personnel Qualifications: Engage specially trained personnel in direct employ of franchised contractor or manufacturer of primary temperature control system.
- D. Comply with NFPA 90A.
- E. Comply with NFPA 70.
- F. Coordinate equipment selection with Division 16 Section "Fire Alarm Systems" to achieve compatibility with equipment that interfaces with that system.

### **1.8 DELIVERY, STORAGE, AND HANDLING**

- A. Store equipment and materials inside and protected from weather.
- B. Factory-Mounted Components: Where control devices specified in this Section are indicated to be factory mounted on equipment, arrange for shipping control devices to unit manufacturer.

### **1.9 EXTRA MATERIALS**

- A. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels clearly describing contents.
- B. Replacement Materials: Provide one replacement diaphragm or relay mechanism for each unique pneumatic damper motor, valve motor, controller, thermostat, and positioning relay.

### **1.10 WIRING AND ELECTRICAL**

- A. Provide and install all required electrical provisions in accordance with Part 3 of this Section and Division 16.

### **1.11 COORDINATION**

- A. Pre-engineering Conference
  1. Prior to the preparation of submittals and within 21 days of award of the general construction contract, a pre-engineering conference will be conducted at the offices of the Owner. The purpose and scope of this conference is to have the Building Management and Control System contractor present his proposed systems, architecture and communications protocols such that the basic architecture/configuration, communications and individual and combined systems' capabilities can be determined and approved.
  2. Attendees at this conference, at a minimum, shall be the Building Management System contractor's application engineer/programmer, the Owner's representative(s) the Commissioning Authority (if any), and, at the option of the contractor, any other sub-contractor or general contractor's representative as they may deem appropriate.
  3. A minimum of two hours shall be allocated for this conference.
- B. Pre-installation Conference
  1. The final phase of the submittal and approval process of the engineering and programming process prior to the installation and testing phase of the system shall be the pre-installation conference. The purpose and scope of this conference is to have the Building Management System contractor present his systems, programs, graphics and basic methods of operation of the systems for review and approval. This conference shall include a "walk-through" of all of the graphical screens, the logic and programming, the final system architecture, the final review of the sequence of control and any other topic

that may arise. The contractor shall make the presentation using a laptop computer, an "in-focus" projector and present the actual programs, graphics and logic that is contained on the programming computer specific to this project.

2. This conference shall be scheduled approximately 7 days prior to the starting of any HVAC equipment or installation of any of the programming into the building controllers on-site.
  3. Attendees at this conference, at a minimum, shall be the Building Management System contractor's application engineer/programmer, the Owner's representative(s) the Commissioning Authority (if any), and, at the option of the contractor, any other sub-contractor or general contractor's representative as they may deem appropriate.
  4. A minimum of two hours shall be allocated for this conference.
- C. Pre-demonstration Conference
1. Prior to demonstration of the system to the Owner, the Building Management system contractor shall meet with the Owner to discuss how the system will be started, tested and demonstrated. Prior to or during this conference, the contractors shall provide the Owner with a schedule of all proposed demonstrations, training, starting, testing and commissioning activities.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS/VENDORS**

- A. See Paragraph 1.4 for allowable vendors and systems manufacturers.

### **2.2 SENSORS**

- A. Electronic Sensors: Vibration and corrosion resistant, for wall, immersion, or duct mounting as required.
1. Resistance Temperature Detectors: Platinum.
    - a. Accuracy: Plus or minus 0.2 percent at calibration point.
    - b. Wire: Twisted, shielded-pair cable.
    - c. Insertion Elements in Ducts: Use where not affected by temperature stratification or where ducts are smaller than 9 sq. ft..
    - d. Averaging Elements in Ducts: Use where ducts are larger than 9 sq. ft. or where prone to stratification, length as required.
    - e. Insertion Elements for Liquids: Brass socket with minimum insertion length of 2-1/2 inches.
    - f. Room Sensors: Wall sensor with offset adjustment dial or lever.
    - g. Outside Air Sensors: Watertight inlet fitting, shielded from direct sunlight.
  2. Humidity Sensors: Bulk polymer sensor element.
    - a. Accuracy:  $\pm$  3% scale.
    - b. Duct and Outside Air Sensors: With element guard and mounting plate, range of 10 to 90 percent relative humidity.
  3. Static-Pressure Transmitter: Non-directional sensor with suitable range for expected input, temperature compensated.
    - a. Accuracy: 2 percent of full scale with repeatability of 0.5 percent.
    - b. Output: 4 to 20 mA.
    - c. Building Static-Pressure Range: 0 to 0.25 inch wg.
    - d. Duct Static-Pressure Range: 0 to 5 inches wg.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Verify that conditioned commercial power supply and controls systems UPS is available to control all controls. Verify that field end devices, wiring, etc. are installed before proceeding with installation.

### **3.2 INSTALLATION**

- A. Install equipment as indicated to comply with manufacturer's written instructions.
- B. Install software in control units and operator workstation. Implement all features of programs to specified requirements and appropriate to sequence of operation.
- C. Connect and configure equipment and software to achieve the sequence of operation specified.
- D. Mount duct zone sensors in easily accessible locations. If unsure about suitability of proposed locations, check with owner's maintenance personnel.
- E. Verify location of thermostats, humidistats, and other exposed control sensors with plans and room details before installation. Locate 60 inches above floor unless otherwise indicated on drawings.
- F. Install labels and nameplates to identify control components according to Division 15 Sections specifying mechanical identification.

### **3.3 ELECTRICAL WIRING AND CONNECTIONS**

- A. Install raceways, boxes, and cabinets according to applicable Division 26 Sections
- B. Install building wire and cable according to applicable Division 26 Section.
  - 1. All control cable shall be in raceway.
  - 2. Fasten flexible conductors, bridging cabinets and doors, neatly along hinge side; protect against abrasion. Tie and support conductors neatly.
  - 3. Number-code or color-code conductors, except local individual room controls, for future identification and servicing of control system.
- C. Connect electrical components to wiring systems and to ground as indicated and instructed by manufacturer. Tighten connectors and terminals, including screws and bolts, according to equipment manufacturer's published torque-tightening values for equipment connectors. Where manufacturer's torque requirements are not indicated, tighten connectors and terminals according to tightening requirements specified in UL 486A.
- D. Connect manual reset limit controls independent of manual control switch positions. Automatic duct heater resets may be connected in interlock circuit of power controllers.
- E. Connect HAND-OFF-AUTO selector switches to override automatic interlock controls when switch is in HAND position.
- F. Temperature control contractor is responsible for providing power to all control devices and equipment provided within this specification section (230900).

### **3.4 FIELD QUALITY CONTROL**

- A. Pressure test control air piping at 30 psi or 1.5 times the operating pressure for 24 hours, with maximum 5-psi loss.
- B. The Contractor shall coordinate test schedule with the Commissioning Agent where applicable.

### **3.5 STARTUP**

- A. Manufacturer's Field Services: Provide the services of a factory-authorized service representative to start control systems. Cooperate and participate fully with test and balance contractor to achieve proper system balance for all operating scenarios.
- B. Test and adjust controls and safeties.
- C. Replace damaged or malfunctioning controls and equipment.
- D. Start, test, and adjust control systems.
- E. Demonstrate compliance with requirements.

- F. Adjust, calibrate and fine tune circuits and equipment to achieve sequence of operation specified.
  - 1. Field verify the accuracy of all temperature sensor readings with hand-held instrumentation to be within 2°F of readings indicated by control system. Submit complete report for all readings.
  - 2. Field verify the accuracy of all humidity sensor readings with hand-held instrumentation to be within ±3% RH of readings indicated by control system. Verify humidity readings twice; once at RH levels of 30% and once at RH levels of 60%. Submit complete report for all readings.
  - 3. Calibrate all sensors as required.
- G. The Contractor shall coordinate startup and tuning of systems with Section 230593.

### **3.6 DEMONSTRATION**

- A. Manufacturer's Field Services: Provide the services of a factory-authorized service representative to demonstrate and train Owner's maintenance personnel as specified below.
  - 1. Train Owner's maintenance personnel on procedures and schedules related to startup and shutdown, troubleshooting, servicing, and preventive maintenance. See Section 017900.
  - 2. Provide operator training on data display, alarm and status descriptors, requesting Data, execution of commands, data logging and trending.

**END OF SECTION**

**SECTION 23 3113  
DUCTS**

**PART 1 GENERAL**

**1.1 WORK INCLUDED**

- A. Furnish and install all sheet metal and flexible duct systems as indicated on the plans or herein described.
- B. Furnish and install all grilles, registers, diffusers, louvers, dampers and ductwork accessories as shown on the plan or herein described.

**1.2 QUALITY ASSURANCE**

- A. Duct construction shall be in accord with the requirements of the two following organizations and good industry practice.
  - 1. Various applicable manuals and standards of the Sheet Metal and Air Conditioning National Association (SMACNA) such as: HVAC Duct Construction Standards, Round and Rectangular Industrial Duct Construction Standards; Duct Liner Standards; Fibrous Glass Duct Construction Standards.
  - 2. Material and duct construction standards of the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE).

**1.3 EQUIPMENT SUBSTITUTION**

- A. Where equipment may be described by manufacturer, name, or model, such description is to set a standard of quality, size and arrangement. See Section 23 0000, para. 1.03 SUBSTITUTIONS.

**1.4 TESTING & APPROVING AGENCIES**

- A. Where items of equipment are required to be provided with compliance to U.L., A.G.A., or other testing and approving agencies, the contractor may submit a written certification from any nationally recognized testing agency, adequately equipped and competent to perform such services, that the item of equipment has been tested and conforms to the same method of test as the listed agency would conduct.

**1.5 CODES**

- A. Materials, methods and installation shall also be in accord with the applicable requirements of the National Fire Protection Association (NFPA) Standards 90A and 90B.

**1.6 SUBMITTAL DATA**

- A. See Section 15000 for general submittal requirements.
- B. Submit complete manufacturer's literature for all duct accessories, including flexible connectors.
- C. Submit manufacturer's literature and performance data for all grilles, diffusers and registers. Identify all materials of construction and the options and accessories which will be furnished with each unit. Performance data shall include throw, pressure drop and NC information. Performance data is not required for units supplied as specified.
- E. Submit complete manufacturer's literature, including installation instructions for all dampers. Submit AMCA leakage ratings for all mixing, balancing and shut-off dampers.
- F. Submit complete manufacturer's literature for all duct sealants, tapes and special joining or gasket joint systems.
- G. Submit duct leakage test report for the duct system where so indicated.

## PART 2 PRODUCTS

### 2.1 DUCTS

#### A. Metal Rectangular Ducts

1. Unless otherwise noted on drawing sheets, square or rectangular ducts installed in the mechanical room/closet for HVAC systems and similar uses shall be constructed of galvanized sheet steel: Comply with ASTM A 653/A 653M.
2. Unless otherwise indicated on plans, all ductwork shall be constructed to 2" water gauge pressure class standards and shall be fabricated with suitable gauge material for construction without external bracing using sheet metal angles or standing seams. Minimum wall thickness for all rectangular ducts shall be 24-gauge unless a heavier minimum gauge is required by the listed SMACNA standards due to duct dimensions or pressure class. Transverse joints shall be constructed, sized and spaced in accordance with SMACNA standards for the duct dimensions, wall thickness and pressure class of duct employed.

#### B. Metal Round Duct

1. Round duct shall be longitudinal seam G60 galvanized steel constructed to SMACNA 2" pressure class but not less than 24 gauge thickness.
2. Fittings shall have formed or fully welded joint construction. 90° elbows shall have minimum 5-gore construction with a centerline radius of 1.5 times the diameter. Centerline radius of 1.0 is acceptable where space is limited.
3. Joining and hanging of pipe and fittings over 18" diameter shall utilize flanged angle rings such as SMACNA fig. 3-2 style RT-2, United Sheet Metal Unwiring or Ductmate 'Spiralmate' for duct joints and beaded slip connections on fittings. Utilize SMACNA fig. 3-2 style RT-1 beaded slip joint on ducts size 18" diameter and smaller or Ductmate - METU gasketed connector on ducts 12" diameter and smaller.

#### C. Metal Duct Sealing

1. All joints and seams of ductwork and fittings shall be sealed air tight in accordance with SMACNA seal class "A". Joint sealing materials shall be specified herein or with an approved substitute product.
2. Sealant shall be water based vinyl acrylic such as "Iron-Grip 601" as manufactured by Hardcast, Inc., "Pro-Seal" by Ductmate, or approved equal. Sealant shall be rated for up to 10" w.g. pressure class for SMACNA seal classes A, B and C and shall have a service temperature range of -20°F to 200°F.
3. Exposed duct in the meatlab shall be wiped clean on the exterior after joining and sealing so that the exterior of the duct is free of sealant.

## PART 3 EXECUTION

### 3.1 INSTALLATION

- A. Install all ductwork and fittings generally in accord with the applicable SMACNA Manual or ASHRAE Guide. Adequately support with sheet metal strap, strap irons or rods as required, fastened securely to the duct and to building construction. **Utilize only hangers as noted on the drawing details and connectors specified herein for exposed duct installed in the Meat Lab Room 120. Installation of exposed duct shall be highly**

**uniform and presentable, shall be plumb, level and parallel to building lines, spaced uniformly between obstacles and well coordinated with lighting and other trades. Sealant on exposed duct in the Meat Lab Room 120 shall be wiped clean from the exterior of the joint so that it is not visible. Exposed ductwork and materials shall be free of oil, markings and sticker of any kind.**

- B. Joints shall be mechanically secure and essentially airtight.
  - 1. Joints, seams and other possible leakage areas shall be sealed with sealants specified above. It is the intent to have no air leakage out of the duct system, especially for duct concealed above finish ceilings and within roof curbs.
  - 2. Leakage testing shall be as specified elsewhere in this section.
- C. Turning vanes shall be installed at all 90 degree elbows and elsewhere as indicated. Set in tight with the back vane tangent to the sides of the duct.
- D. Connections to equipment shall be made with flexible connections with at least 4" metal-to-metal unless otherwise noted on drawings. Flexible connections shall be airtight.
- E. All dampers shall operate smoothly through their entire range. Provide locking mechanisms to secure volume dampers in position. Mark all damper axles permanently to indicated damper blade position on the visible end of the shaft using a file, scratch awl or similar tool.
- F. Provide air volume extractors or extended, tapered inlet connection where branch ducts are set into the side of trunk ducts as indicated on the plans.
- G. Spin-in connector for round duct connection shall be conical in design unless otherwise noted on plans. Connectors for branch ducts which attach to main duct runs shall be fitted with volume damper.
- H. Wall and Floor Penetrations
  - 1. Frame or sleeve all openings through stud walls.
  - 2. On non-fire rated walls, floors or partitions, for uninsulated duct, seal the space between ductwork and sleeves with mildew resistant silicone caulk.
  - 3. Provide finishing collars on all exposed sides of wall and ceiling surfaces at all penetrations.
- I. Access Doors
  - 1. Install access doors in the locations listed below, at all locations shown on the plans, and elsewhere as necessary for damper or service access or observation. Final locations and sizes of doors shall provide maximum access for service of the component being accessed.
    - a. At splitter dampers (use 8" X 8" door).
    - b. At volume dampers in main ducts (use 8" X 8" door).
- J. Instrument Test Holes
  - 1. Locate instrument test holes in full cooperation with the test and balance contractor. In general, test holes will be required on each side of all coils, fans, filters and other duct-mounted equipment (e.g. humidifiers, etc.), at all locations specifically identified on the drawings and elsewhere as necessary to properly balance the system.
  - 2. Where used for testing and balancing procedures, provide I.T.H. in a traverse pattern on two accessible adjacent sides of the duct so instrument readings can be taken at 90 degrees.
  - 3. Where an I.T.H. is located in insulated duct, a plug of insulation shall be cut out over the I.T.H. or inserted and held in place with duct tape and the area identified 'I.T.H.'

### **3.2 TESTING, BALANCING, CLEANING**

- A. Testing all ductwork for leakage as follows.
  - 1. The entire duct system (supply, return, fresh air, and exhaust, etc.) and its components shall be statically leak tested by visual methods. Testing procedures shall be performed before any external insulation is applied. Each joint and seam of ductwork shall be inspected. Unless otherwise specified, all duct shall be capped and inspected while being pressurized to 2" w.c. positive pressure. Leaks discovered shall be sealed. Schedule leak testing/observation with MSU project manager not less than seven days in advance.
  - 2. All dampers shall be checked for smoothness of operation. Repair unacceptable units to the satisfaction of MSU project manager.
  - 3. The Contractor shall operate all dampers after installation to ensure that operation is correct and that service access is adequate.
  - 4. Any portion of ductwork which indicates 'oil canning' or deformation duct to duct pressures shall be additionally reinforced.
  - 5. The Contractor shall schedule and coordinate all testing with the MSU project manager.
- B. Balancing
  - 1. See Section 23 05930: TESTING, ADJUSTING AND BALANCING FOR HVAC.
  - 2. The entire system, including all components, shall be balanced to the airflows indicated on the drawings and/or specified elsewhere.
  - 3. This contractor to work in full cooperation with the test and balance contractor to locate instrument test hole locations, installing balancing devices as recommended by T&B contractor, furnishing and installing sheave and belt changes required to achieve final balance and to make any duct modifications which are deemed necessary by the T&B contractor in order to achieve final air balance.
  - 4. Balancing is to include adjusting and/or replacing sheaves, pulleys, belts, motor speeds, etc., to deliver the listed airflows. Set all dampers and make all necessary adjustments.
- C. Cleaning
  - 1. All equipment, plenums, ducts, grilles and registers, hoods and component parts of all duct systems shall be clean and free of oil, dirt, stickers, marks, writing and all debris on both the inside and outside of all components. Cleaning methods shall consist of sweeping, vacuuming, washing, etc., as necessary to establish clean conditions.
- D. Test Reporting
  - 1. Provide a written report for the visual leak testing indicating the name of the tester, the conditions and findings of the test and a list of any repairs made or leaks sealed. The testing form shall be signed and dated by the individual conducting the testing.
  - 2. The test form shall be submitted to the engineer's for approval. Final connection of any duct to equipment shall not take place until the report receives the engineer's approval.

**END OF SECTION 23 3113**



**PROJECT TEAM**

**OWNER**

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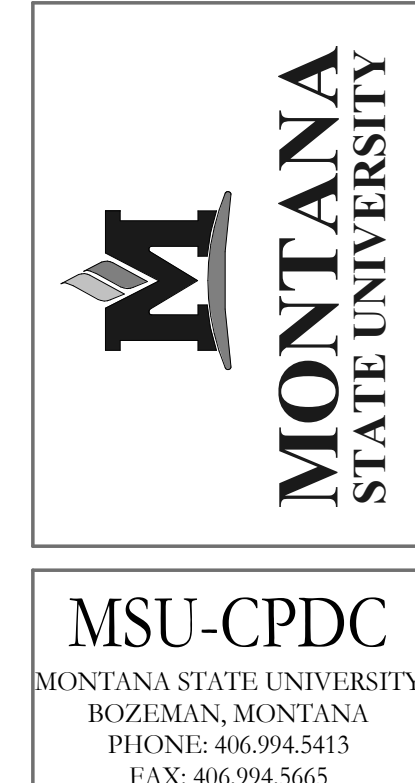
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**LINFIELD HALL 120 LAB  
RENOVATION  
MONTANA STATE UNIVERSITY  
PROJECT #17-0034  
BOZEMAN, MONTANA**

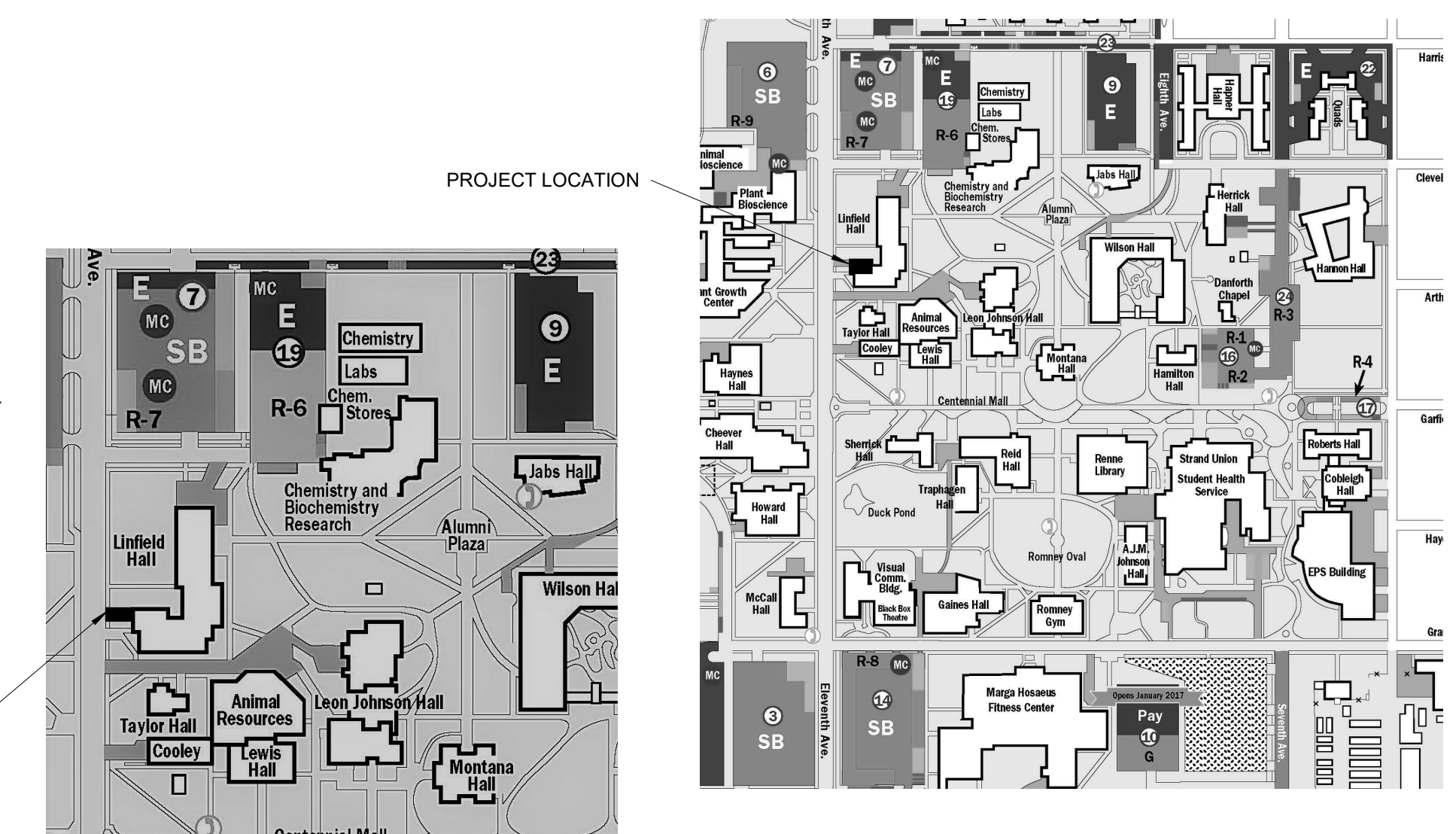


**LINFIELD HALL LAB 120  
RENOVATION  
MSU - BOZEMAN**

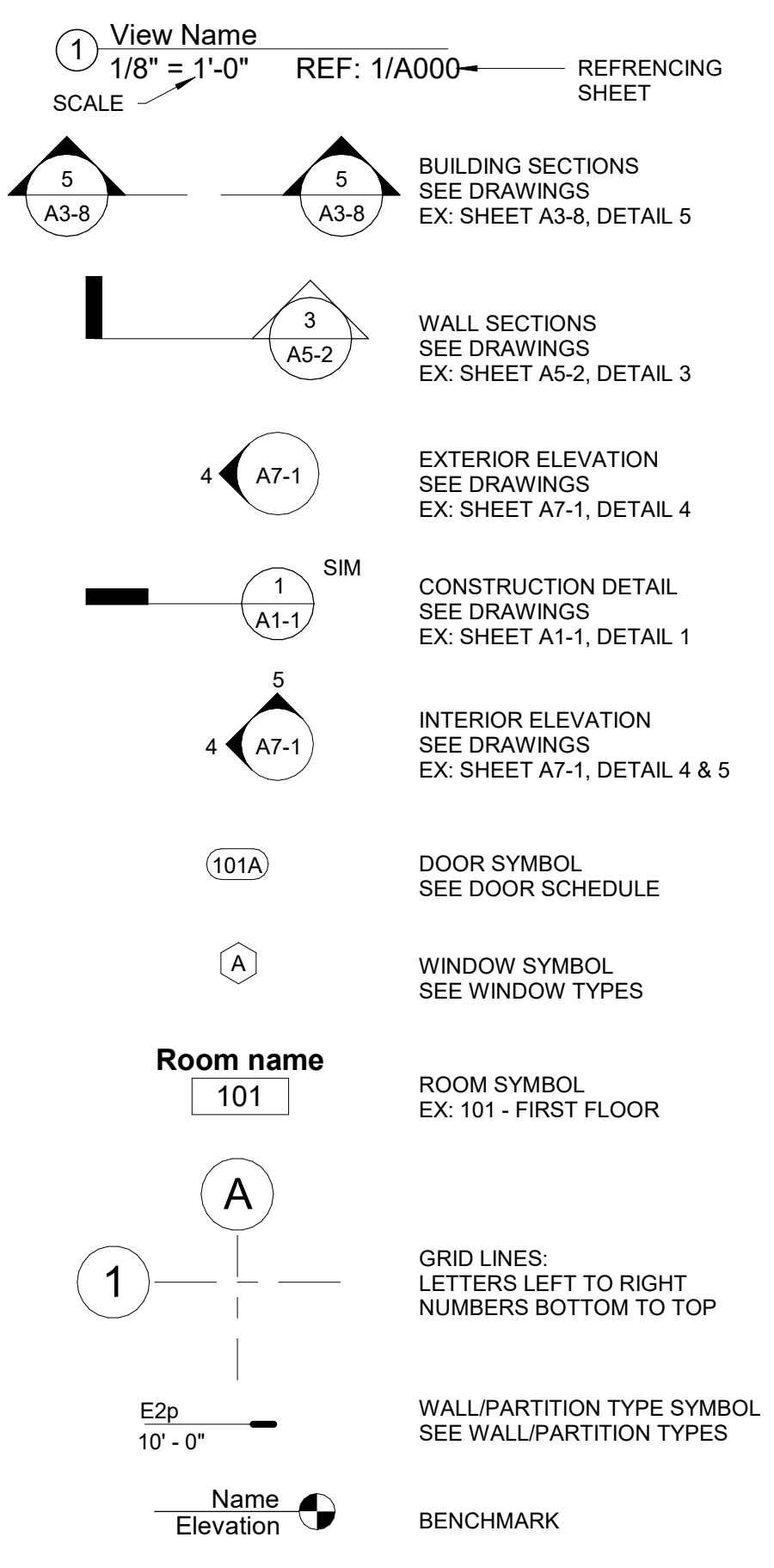
100% PERMIT SET

DO NOT BLOCK ANY ROADS OR SIDEWALKS.  
ALL AREAS USED FOR CONSTRUCTION OR AREAS DAMAGED DURING THE EXECUTION OF THE WORK OF THIS CONTRACT SHALL BE REPAIRED, AND IF NECESSARY, RESODDED WHEN CONSTRUCTION IS COMPLETED. EXISTING TREES AND SIDEWALKS SHALL BE PROTECTED FROM DAMAGE AND SHALL BE REPLACED BY THE CONTRACTOR IF DAMAGED. NO PARKING IN ANY ACCESS ROUTES. CONTRACTOR WILL BE RESPONSIBLE TO REPAIR OR REPLACE DAMAGED AREAS OF BUILDINGS AND/OR LANDSCAPING.

MSU LINFIELD CONTRACTOR ACCESS:  
JOB RELATED VEHICULAR TRAFFIC SHALL ENTER THE CONSTRUCTION SITE ONLY BY THIS ROUTE. ACCESS ONLY FOR SUPERINTENDENT PARKING, LOAD AND UNLOAD ONLY.  
CONTRACTOR PERSONNEL PARKING SHALL BE IN ACCORDANCE WITH THE MSU PARKING POLICIES.



**REFERENCE SYMBOLS**



**ABBREVIATIONS**

(1) & @ #	QUANTITY AND NUMBER	EA	EIF	EXTERIOR INSULATION FINISH SYSTEM	EACH	MAT	MATERIAL	SCHED	SCHEDULE
AB	ANCHOR BOLT	EA	EIF	EXTERIOR INSULATION FINISH SYSTEM	EACH	MAT	MATERIAL	SCHED	SCHEDULE
AC	AIR CONDITIONING	EA	EIF	EXTERIOR INSULATION FINISH SYSTEM	EACH	MAT	MATERIAL	SCHED	SCHEDULE
ACT	ACOUSTICAL CEILING TILE	EA	EIF	EXTERIOR INSULATION FINISH SYSTEM	EACH	MAT	MATERIAL	SCHED	SCHEDULE
ADDM	ADDENDUM	EA	EIF	EXTERIOR INSULATION FINISH SYSTEM	EACH	MAT	MATERIAL	SCHED	SCHEDULE
ADJ	ADJACENT	EA	EIF	EXTERIOR INSULATION FINISH SYSTEM	EACH	MAT	MATERIAL	SCHED	SCHEDULE
AFF	ABOVE FINISHED FLOOR	EA	EIF	EXTERIOR INSULATION FINISH SYSTEM	EACH	MAT	MATERIAL	SCHED	SCHEDULE
AHU	AIR HANDLING UNIT	EA	EIF	EXTERIOR INSULATION FINISH SYSTEM	EACH	MAT	MATERIAL	SCHED	SCHEDULE
ALT	ALTERNATE	EA	EIF	EXTERIOR INSULATION FINISH SYSTEM	EACH	MAT	MATERIAL	SCHED	SCHEDULE
ALUM	ALUMINUM	EA	EIF	EXTERIOR INSULATION FINISH SYSTEM	EACH	MAT	MATERIAL	SCHED	SCHEDULE
ARCH	ARCHITECTURAL	EA	EIF	EXTERIOR INSULATION FINISH SYSTEM	EACH	MAT	MATERIAL	SCHED	SCHEDULE
BC	BRICK COURSE	EA	EIF	EXTERIOR INSULATION FINISH SYSTEM	EACH	MAT	MATERIAL	SCHED	SCHEDULE
BO	BOTTOM OF	EA	EIF	EXTERIOR INSULATION FINISH SYSTEM	EACH	MAT	MATERIAL	SCHED	SCHEDULE
BLDG	BUILDING	EA	EIF	EXTERIOR INSULATION FINISH SYSTEM	EACH	MAT	MATERIAL	SCHED	SCHEDULE
BLKG	BLOCKING	EA	EIF	EXTERIOR INSULATION FINISH SYSTEM	EACH	MAT	MATERIAL	SCHED	SCHEDULE
BTWN	BETWEEN	EA	EIF	EXTERIOR INSULATION FINISH SYSTEM	EACH	MAT	MATERIAL	SCHED	SCHEDULE
BOW	BOTTOM OF WALL	EA	EIF	EXTERIOR INSULATION FINISH SYSTEM	EACH	MAT	MATERIAL	SCHED	SCHEDULE
BU	BUILT UP	EA	EIF	EXTERIOR INSULATION FINISH SYSTEM	EACH	MAT	MATERIAL	SCHED	SCHEDULE
CL	CENTERLINE	EA	EIF	EXTERIOR INSULATION FINISH SYSTEM	EACH	MAT	MATERIAL	SCHED	SCHEDULE
CB	CATCH BASIN	EA	EIF	EXTERIOR INSULATION FINISH SYSTEM	EACH	MAT	MATERIAL	SCHED	SCHEDULE
CC	CENTER TO CENTER	EA	EIF	EXTERIOR INSULATION FINISH SYSTEM	EACH	MAT	MATERIAL	SCHED	SCHEDULE
CDX	EXTERIOR GRADE PLYWOOD	EA	EIF	EXTERIOR INSULATION FINISH SYSTEM	EACH	MAT	MATERIAL	SCHED	SCHEDULE
CF	CUBIC FEET	EA	EIF	EXTERIOR INSULATION FINISH SYSTEM	EACH	MAT	MATERIAL	SCHED	SCHEDULE
CT	CERAMIC TILE	EA	EIF	EXTERIOR INSULATION FINISH SYSTEM	EACH	MAT	MATERIAL	SCHED	SCHEDULE
CH	CHANNEL	EA	EIF	EXTERIOR INSULATION FINISH SYSTEM	EACH	MAT	MATERIAL	SCHED	SCHEDULE
CJ	CONTROL JOINT	EA	EIF	EXTERIOR INSULATION FINISH SYSTEM	EACH	MAT	MATERIAL	SCHED	SCHEDULE
CLG	CEILING	EA	EIF	EXTERIOR INSULATION FINISH SYSTEM	EACH	MAT	MATERIAL	SCHED	SCHEDULE
CLR	CLEAR	EA	EIF	EXTERIOR INSULATION FINISH SYSTEM	EACH	MAT	MATERIAL	SCHED	SCHEDULE
CMU	CONCRETE MASONRY UNIT	EA	EIF	EXTERIOR INSULATION FINISH SYSTEM	EACH	MAT	MATERIAL	SCHED	SCHEDULE
COL/COLS	COLUMN/COLUMNS	EA	EIF	EXTERIOR INSULATION FINISH SYSTEM	EACH	MAT	MATERIAL	SCHED	SCHEDULE
CONC	CONCRETE	EA	EIF	EXTERIOR INSULATION FINISH SYSTEM	EACH	MAT	MATERIAL	SCHED	SCHEDULE
CONST	CONSTRUCTION	EA	EIF	EXTERIOR INSULATION FINISH SYSTEM	EACH	MAT	MATERIAL	SCHED	SCHEDULE
CONT	CONTINUOUS	EA	EIF	EXTERIOR INSULATION FINISH SYSTEM	EACH	MAT	MATERIAL	SCHED	SCHEDULE
COORD	COORDINATE	EA	EIF	EXTERIOR INSULATION FINISH SYSTEM	EACH	MAT	MATERIAL	SCHED	SCHEDULE
CTR	CENTER	EA	EIF	EXTERIOR INSULATION FINISH SYSTEM	EACH	MAT	MATERIAL	SCHED	SCHEDULE
CTRD	CENTERED	EA	EIF	EXTERIOR INSULATION FINISH SYSTEM	EACH	MAT	MATERIAL	SCHED	SCHEDULE
DBL	DOUBLE	EA	EIF	EXTERIOR INSULATION FINISH SYSTEM	EACH	MAT	MATERIAL	SCHED	SCHEDULE
DF	DRINKING FOUNTAIN	EA	EIF	EXTERIOR INSULATION FINISH SYSTEM	EACH	MAT	MATERIAL	SCHED	SCHEDULE
DIA	DIAMETER	EA	EIF	EXTERIOR INSULATION FINISH SYSTEM	EACH	MAT	MATERIAL	SCHED	SCHEDULE
DIM	DIMENSION	EA	EIF	EXTERIOR INSULATION FINISH SYSTEM	EACH	MAT	MATERIAL	SCHED	SCHEDULE
DN	DOWN	EA	EIF	EXTERIOR INSULATION FINISH SYSTEM	EACH	MAT	MATERIAL	SCHED	SCHEDULE
DR	DOOR	EA	EIF	EXTERIOR INSULATION FINISH SYSTEM	EACH	MAT	MATERIAL	SCHED	SCHEDULE
DS	DOWNSPOUT	EA	EIF	EXTERIOR INSULATION FINISH SYSTEM	EACH	MAT	MATERIAL	SCHED	SCHEDULE
DTL/DET	DETAIL	EA	EIF	EXTERIOR INSULATION FINISH SYSTEM	EACH	MAT	MATERIAL	SCHED	SCHEDULE
DWG	DRAWING	EA	EIF	EXTERIOR INSULATION FINISH SYSTEM	EACH	MAT	MATERIAL	SCHED	SCHEDULE

**GENERAL DEMOLITION NOTES:**

- PRIOR TO BIDDING, THE CONTRACTOR SHALL VISIT THE FACILITY & THOROUGHLY FAMILIARIZE HIMSELF WITH EXISTING CONDITIONS.
- SCHEDULE DEMOLITION WORK WITH THE OWNER TO MINIMIZE DISRUPTION OF SERVICES & PROVIDE FOR THE UNINTERRUPTED FUNCTIONING OF THE FACILITY.
- THE CONTRACTOR SHALL PROVIDE ALL DEMOLITION INCIDENTAL TO OR REQUIRED FOR NEW & RENOVATION CONSTRUCTION WHETHER OR NOT IT IS SPECIFICALLY NOTED, INCLUDING, BUT NOT LIMITED TO, ALL OTHER WORK THAT MIGHT REASONABLY BE REQUIRED TO BE REMOVED IN PREPARATION FOR SPECIFIED FINISHES. DEMOLITION SHALL BE PERFORMED IN A MANNER THAT WILL NOT DAMAGE ANY SERVICES INDICATED TO REMAIN. SERVICES SHALL BE PATCHED IF NECESSARY TO PROVIDE A SUITABLE SUB-STRATA FOR NEW FINISHES.
- REMOVE ALL ITEMS SHOWN DASHED OR INDICATED AS SUCH BY NOTE.
- THE CONTRACTOR SHALL CONSTRUCT DUST BARRIER PARTITIONS AS REQUIRED TO SEPARATE CONSTRUCTION AREAS FROM OCCUPIED AREAS. EXIT PATHS SHALL BE MAINTAINED CLEAR OF EQUIPMENT, MATERIAL & DEBRIS-SEE PHASING PLANS.
- DEBRIS SHALL BE PROMPTLY REMOVED FROM THE BUILDING & THE SITE & DISPOSED OF IN A LEGAL MANNER. SURFACES IN THE CONSTRUCTION AREA SHALL BE MAINTAINED IN A BROOM CLEAN CONDITION AT THE END OF EACH WORK DAY.
- PORTIONS OF OCCUPIED AREAS WILL REMAIN IN OPERATION AT ALL TIMES. SECURITY MUST BE MAINTAINED AT ALL TIMES. REVIEW SECURITY PROCEDURES WITH THE OWNER PRIOR TO THE START OF WORK.
- THE CONTRACTOR SHALL MAINTAIN & ADHERE TO ALL CURRENT LIFE-SAFETY & INTERIM LIFE-SAFETY RULES & REGULATIONS THROUGHOUT THE CONSTRUCTION OF THIS PROJECT.
- THE CONTRACTOR SHALL PATCH &/OR REPAIR ANY & ALL SURFACES DAMAGED OR REMOVED DURING DEMOLITION TO MATCH EXISTING SURFACES UNLESS SURFACES ARE TO RECEIVE NEW FINISHES OR UNLESS NOTED OTHERWISE. REFER TO 8 & COORDINATE WITH STRUCTURAL.
- ALL BUILDING SERVICES, INCLUDING MECHANICAL, PLUMBING & ELECTRICAL SHALL NOT BE DISRUPTED FOR ANY LENGTH OF TIME NO MATTER HOW MINIMAL, UNLESS COORDINATED & APPROVED BY THE GENERAL CONTRACTOR & THE OWNER. LIFE SAFETY SIGNAGE SHALL BE MAINTAINED AT ALL TIMES
- CONTRACTOR SHALL INSPECT EXISTING CONDITIONS PRIOR TO WORK. PRIOR TO SUBSTANTIAL COMPLETION THE CONTRACTOR WILL REPAIR OR CLEAN DAMAGED OR DIRTY SURFACES ADJACENT TO PROJECT WORK AREAS (CAUSED BY CONSTRUCTION ACTIVITIES) TO MATCH ORIGINAL CONDITION.

**GENERAL NOTES:**

- DIMENSIONS ARE TO GRID, FACE OF STUD, MASONRY, OR DOOR/WINDOW OPENINGS. DIMENSIONS TO OPENINGS ARE NOMINAL. VERIFY ALL OPENINGS WITH ROUGH OPENING REQUIREMENTS.
- ALL DOOR OPENINGS PERPENDICULAR TO A WALL ARE 4" TO THE WALL FRAMING UNO.
- ALL EGRESS DOORS SHALL BE READILY OPENABLE FROM THE EGRESS SIDE WITHOUT THE USE OF A KEY OR SPECIAL KNOWLEDGE OR EFFORT.
- ALL SIGNAGE TO COMPLY WITH IBC SECTION 1110 AND APPLICABLE ICC/ANSI PROVISIONS. SEE SPECIFICATIONS.

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**TITLE OF CONTENTS**

34/A0-1	LINFIELD COVER SHEET
34/A0-2	LINFIELD CODE PLAN
34/A3-1	LINFIELD WORK PLAN
34/A3-2	MEAT LOCKER PLAN AND ELEVATION
34/A3-3	FFE
34/A3-4	ROOF PLAN
34/A3-5	SECTIONS & DETAILS
S0.1	GENERAL STRUCTURAL NOTES
S1.1	AHU SUPPORT
M0.0	SCHEDULES AND LEGENDS
M1.0	PARTIAL 1ST FLOOR MECHANICAL PLANS
M2.0	BALCONY AND ROOF MECHANICAL PLANS
M3.0	SECTIONS AND DETAILS
M4.0	TEMPERATURE CONTROLS
E1.0	PARTIAL 1ST FLOOR ELECTRICAL PLANS
E2.0	BALCONY LEVEL ELECTRICAL PLANS

- ALTERNATE LEGEND - LINFIELD**
- ALT 1 - REMOVE & REPLACE DOORS IN BALCONY, 120KA, INFILL 120KB
  - ALT 2 - ADD WALL WITH WINDOWS IN BALCONY (MEZZANINE).
  - ALT 3 - CEILING PAINTING AND TOUCH UP.
  - ALT 4 - JIB CRANE ON LOADING DOCK.

DRAWN BY: matt  
REVIEWED BY:  
REV. DESCRIPTION DATE  
1



PPA#17-0031  
A/E#00-00-00  
DSA 17-521

**SHEET TITLE  
LINFIELD COVER  
SHEET**

**SHEET  
A0-1**

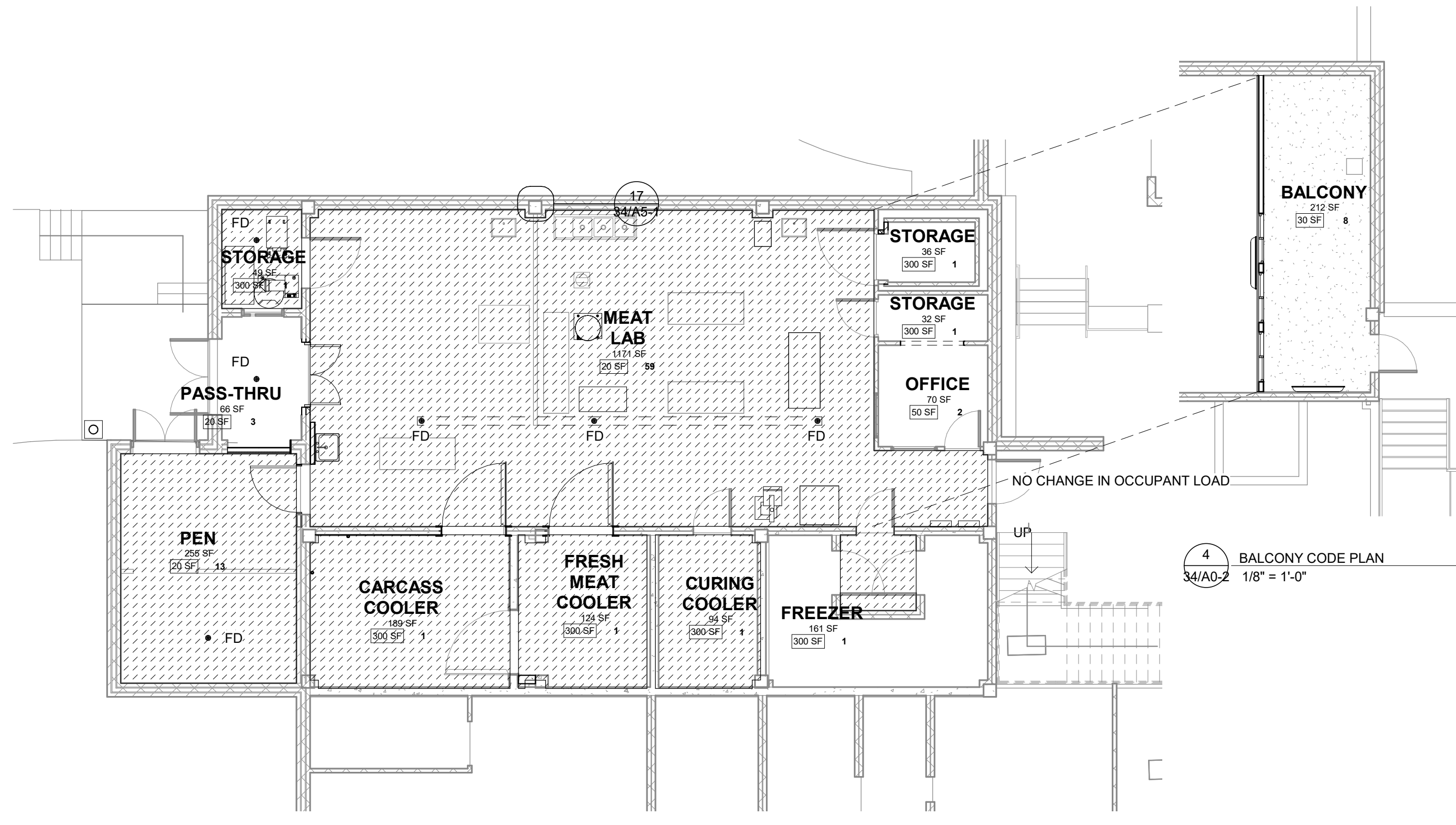
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**BUILDING CODE INFORMATION**

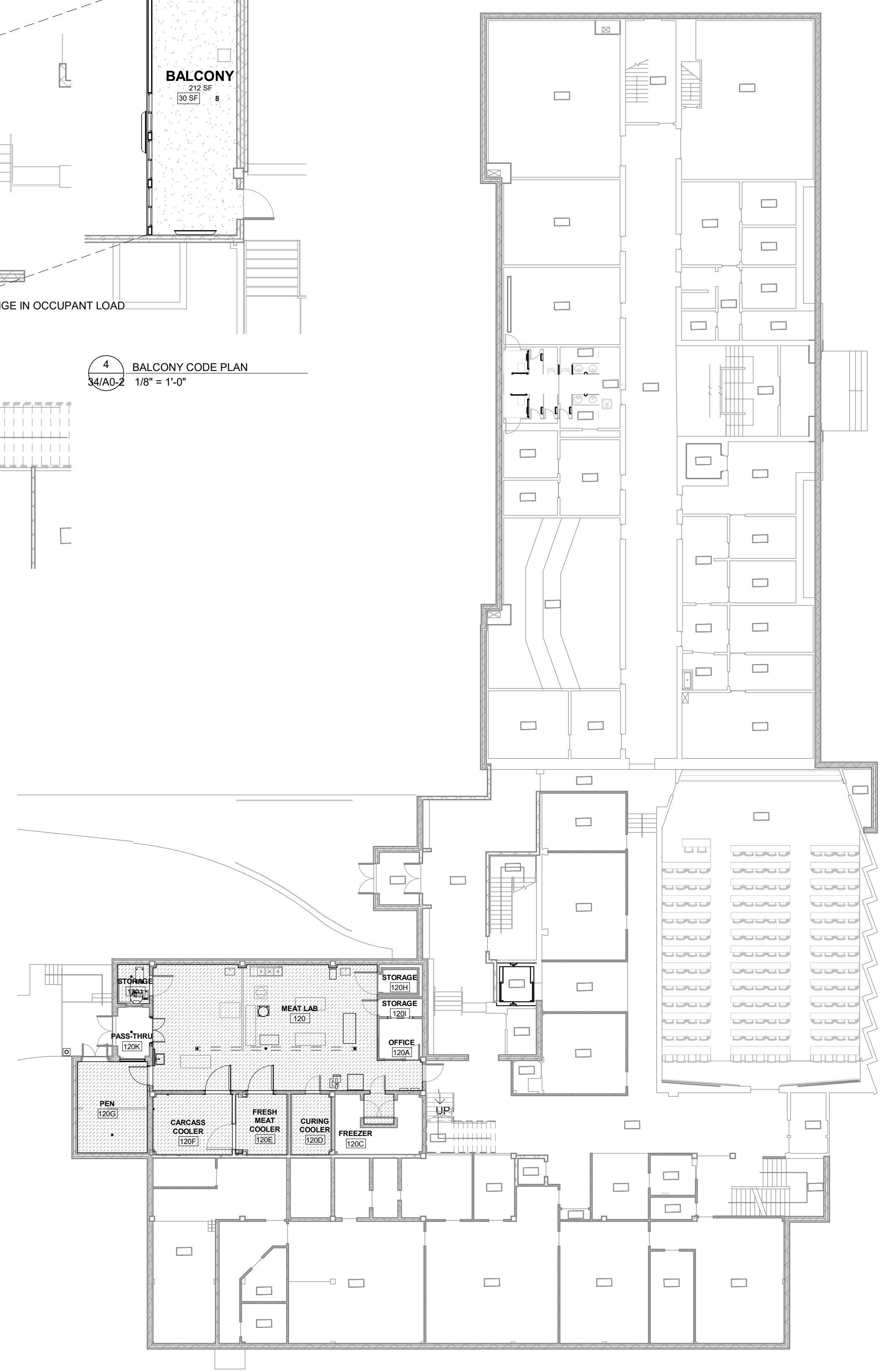
APPLICABLE BUILDING CODE: 2012 INTERNATIONAL BUILDING CODE  
BUILDING AGENCY / JURISDICTION: CITY OF BOZEMAN, MONTANA

**LEGEND**

- OCCUPANCY GROUP A-4 AREA
- OCCUPANCY GROUP B AREA
- (IU: 1) INCIDENTAL USE (W/ OCCUPANT LOAD) W/ REQUIRED SEPARATION PER TABLE 509. CALCULATED AS PART OF MAJOR USE FOR AREA CALCULATION PURPOSES.
- (AO: 1) ACCESSORY OCCUPANCY AREA: (W/ OCCUPANT LOAD) W/ NO SEPARATION REQUIRED AND CALCULATED AS PART OF MAJOR USE FOR ALLOWABLE AREA CALCULATION IF TOTAL ACCESSORY OCCUPANCIES OCCUPY LESS THAN 10% OF MAJOR OCCUPANCY CLASSIFICATION AREA PER FLOOR PER SECTION 508.2.
- FIRE RESISTIVE CORRIDOR: WITH OPENING, DUCT, PENETRATION, AND JOINT PROTECTION. SEE WALL TYPES AND JOINT DETAILS, DOOR AND WINDOW SCHEDULES, PENETRATION DETAILS, AND MECHANICAL DRAWINGS. (PART OF ADJACENT OCCUPANCY DESIGNATION AND CALCULATED AS PART OF IT FOR BUILDING AREA CALCULATION PURPOSES.)
- 2-HOUR FIRE WALL OR FIRE BARRIER, OR COMBINATION OF (WHERE OCCURS) CONFORMING TO THE MOST STRINGENT REQUIREMENTS OF EACH. SEE CODE ANALYSIS PLANS FOR SPECIFIC NAMES OF IBC WALL DESIGNATIONS. ALL WITH FIRE-RESISTIVE OPENING PROTECTION AT DOORS, WINDOWS, DUCTS (WITH EXCEPTIONS), PENETRATIONS, AND PROTECTION AT JOINTS. SEE WALL TYPES, DOOR AND WINDOW SCHEDULES, MECHANICAL DRAWINGS, PENETRATION DETAILS, AND JOINT DETAILS WHERE APPLICABLE.
- 1-HOUR FIRE WALL, FIRE BARRIER, FIRE PARTITION, OR SMOKE BARRIER WALL: OR COMBINATION OF (WHERE OCCURS) CONFORMING TO THE MOST STRINGENT REQUIREMENTS OF EACH. SEE CODE ANALYSIS PLANS FOR SPECIFIC NAMES OF IBC WALL DESIGNATIONS. ALL WITH FIRE-RESISTIVE OPENING PROTECTION AT DOORS, WINDOWS, DUCTS (WITH EXCEPTIONS), PENETRATIONS, AND PROTECTION AT JOINTS. SEE WALL TYPES, DOOR AND WINDOW SCHEDULES, MECHANICAL DRAWINGS, PENETRATION DETAILS, AND JOINT DETAILS WHERE APPLICABLE.
- NONRATED WALL: WITH NO OPENING PROTECTION REQUIRED AT DOORS, WINDOWS, DUCTS, PENETRATIONS, AND JOINTS UN. SEE WALL TYPES.
- (2) ROOM OCCUPANT LOAD (OR TOTAL FLOOR OCCUPANT LOAD) PER SECTION 1004.
- MOER:2 MEANS OF EGRESS REQUIRED (QUANTITY) (ONLY DESIGNATED WHERE (2) OR MORE MEANS OF EGRESS ARE REQUIRED PER TABLE 1015.1.).
- EXIT SIGN W/ INTEGRATED DIRECTIONAL ARROW WHERE OCCURS AT ALL EXITS, EVERY 100' IN CORRIDORS, AND IN SPACES WHERE 2 MOE ARE REQUIRED PER SECTION 1015. SEE ELECTRICAL DRAWINGS. (W/ POE IN QUADRANT INDICATING "EXIT" TEXT SIDE OF SIGN.) SIGNS SHOWN IN CORRIDORS ARE CEILING HUNG. SIGNS SHOWN ON WALLS ARE WALL HUNG.
- 53 REQUIRED EXIT AND EXIT EGRESS DIRECTION AND ACCUMULATIVE NUMBER OF OCCUPANTS SERVED WITH EGRESS DIRECTION AT ARROW LOCATION.
- Wmin MINIMUM EGRESS WIDTH (INCHES) BASED ON ACCUMULATIVE NUMBER OF OCCUPANTS SERVED AT INDICATED EGRESS COMPONENT, USING FACTORS FROM TABLE 1005.1: 2 INCHES/OCC FOR STAIRWAYS (FULLY SPRINKLERED BLDG); 2 INCHES/OCC FOR OTHER EGRESS COMPONENTS.
- EXIT ACCESS TRAVEL DISTANCE - MAXIMUM 250' FOR 'A'; 300' FOR 'B' OCCUPANCIES W/ SPRINKLER SYSTEM PER TABLE 1016.2. MOST RESTRICTIVE REQUIREMENT GOVERNS. MAXIMUM DISTANCE FOR EACH STORY SHOWN.
- COMMON PATH OF EGRESS TRAVEL DISTANCE - MAXIMUM 75' FOR 'A'; 100' FOR 'B' OCCUPANCIES W/ SPRINKLER SYSTEM; PER TABLE 1014.3.
- FE PORTABLE FIRE EXTINGUISHER



**3** FIRST FLOOR CODE PLAN (LINFIELD) PARTIAL  
34/A0-2 1/8" = 1'-0"



**2** FIRST FLOOR OVERALL PLAN (LINFIELD)  
34/A0-2 1/16" = 1'-0"

### LINWORK LEGEND

- NEW ELEMENTS
- EXISTING ELEMENTS TO REMAIN
- - - EXISTING ELEMENTS TO BE DEMOLISHED

EXISTING DOOR SCHEDULE									
Mark	From Room Name	Comments	Type	Width	Height	Door Material	Thickness	Frame Type	HARDWARE
120A	LAB	NO CHANGE	3' 6" x 80"	3' - 6"	6' - 8"		1 3/4"		
120A	LAB	NO CHANGE	34" x 80"	2' - 10"	6' - 8"		1 3/4"		
120AI	STORAGE	REMOVE	60" x 84"	5' - 0"	7' - 0"		1 3/4"		
120B	FREEZER	NO CHANGE	3' 6" x 80"	3' - 6"	6' - 8"		1 3/4"		
120C	FREEZER	NO CHANGE	3' 6" x 80"	3' - 6"	6' - 8"		1 3/4"		
120CB	FREEZER	NO CHANGE	36" x 80"	3' - 0"	6' - 8"		1 3/4"		
120D	COOLER	NO CHANGE	36" x 80"	3' - 0"	6' - 8"		1 3/4"		
120F	COOLER	REPLACEMENT	5'-0" X 10'-4"	5' - 0"	10' - 4"	ALUM	4"	HM	NO CLOSER
120FE	COOLER	REPLACEMENT	5'-0" X 10'-4"	5' - 0"	10' - 4"	ALUM	4"	HM	NO CLOSER
120G	LAB	REPLACEMENT	4' x 80"	4' - 0"	7' - 0"		1 3/4"		
120GE	LAB	NO CHANGE	60" x 82"	5' - 0"	6' - 10"		1 3/4"		
120H	STORAGE	REPAIR	4' 6" x 84"	4' - 6"	7' - 0"		1 3/4"		RE-FINISH HARDWARE & REPLACE WEATHERSTRIPPING W/ RUBBER SILENCERS; SCRAPE & REPAINT DOOR AND FRAME
120I	STORAGE	NO CHANGE	36" x 84"	3' - 0"	7' - 0"		1 3/4"		REMOVE EXIST. CLOSER
120JA	STORAGE	NO CHANGE	4' x 80"	4' - 0"	7' - 0"		1 3/4"		
120JB	LAB	NO CHANGE	36" x 86"	3' - 0"	7' - 2"		1 3/4"		
120KA	LAB	REPLACEMENT	72" x 84"	6' - 0"	7' - 0"		1 3/4"		PROVIDE NEW HARDWARE
120KB	LAB	REMOVE	60" x 84"	5' - 0"	7' - 0"		1 3/4"		
120KE	LAB	NO CHANGE	72" x 84"	6' - 0"	7' - 0"		1 3/4"		
120L	BALCONY	NO CHANGE	36" x 80"	3' - 0"	6' - 8"		1 3/4"		

REPLACEMENT DOOR SCHEDULE									
DOOR NO.	ROOM NAME	COMMENTS	DOOR TYPE	WIDTH	HEIGHT	THICKNESS	HARDWARE	DETAIL(S)	
120E-R	FRESH MEAT COOLER	REMOVE & REPLACE W/ INSULATED COOLER DOOR	A	5' - 0"	10' - 4"	4"	MFG	SEE NOTE 8	
120F-R	CARCASS COOLER	REMOVE & REPLACE W/ INSULATED COOLER DOOR	A	5' - 0"	10' - 4"	4"	MFG	SEE NOTE 8	
120G-R	PEN	REMOVE & REPLACE W/ HMMF & VIEW LITE	C	3' - 8"	7' - 0"	1 3/4"	TYPE 1	5/A5-1, 6/A5-1	
120KA-R	PASS-THRU	REMOVE & REPLACE W/ HMMF	D	4' - 9"	6' - 10"	1 3/4"	TYPE 2	5/A5-1, 6/A5-1	
Grand total: 4									

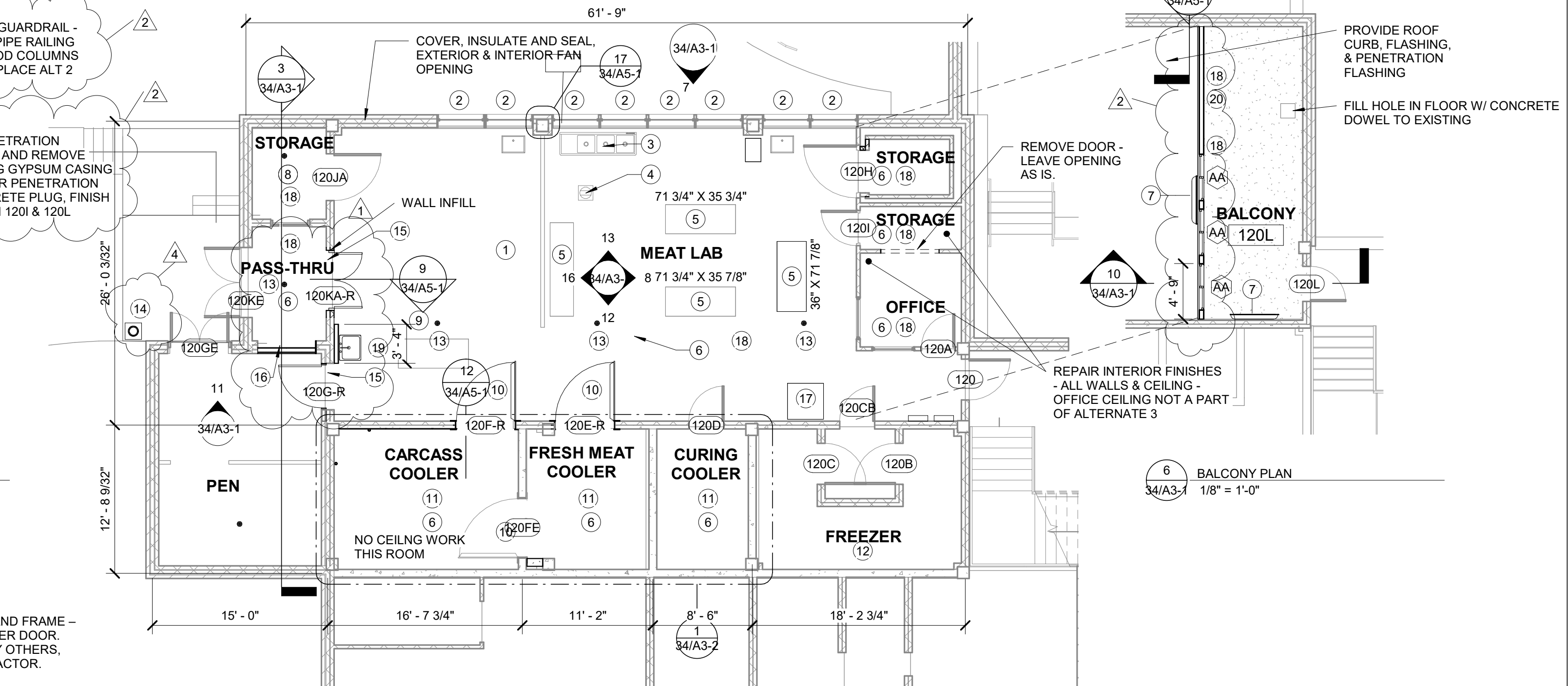
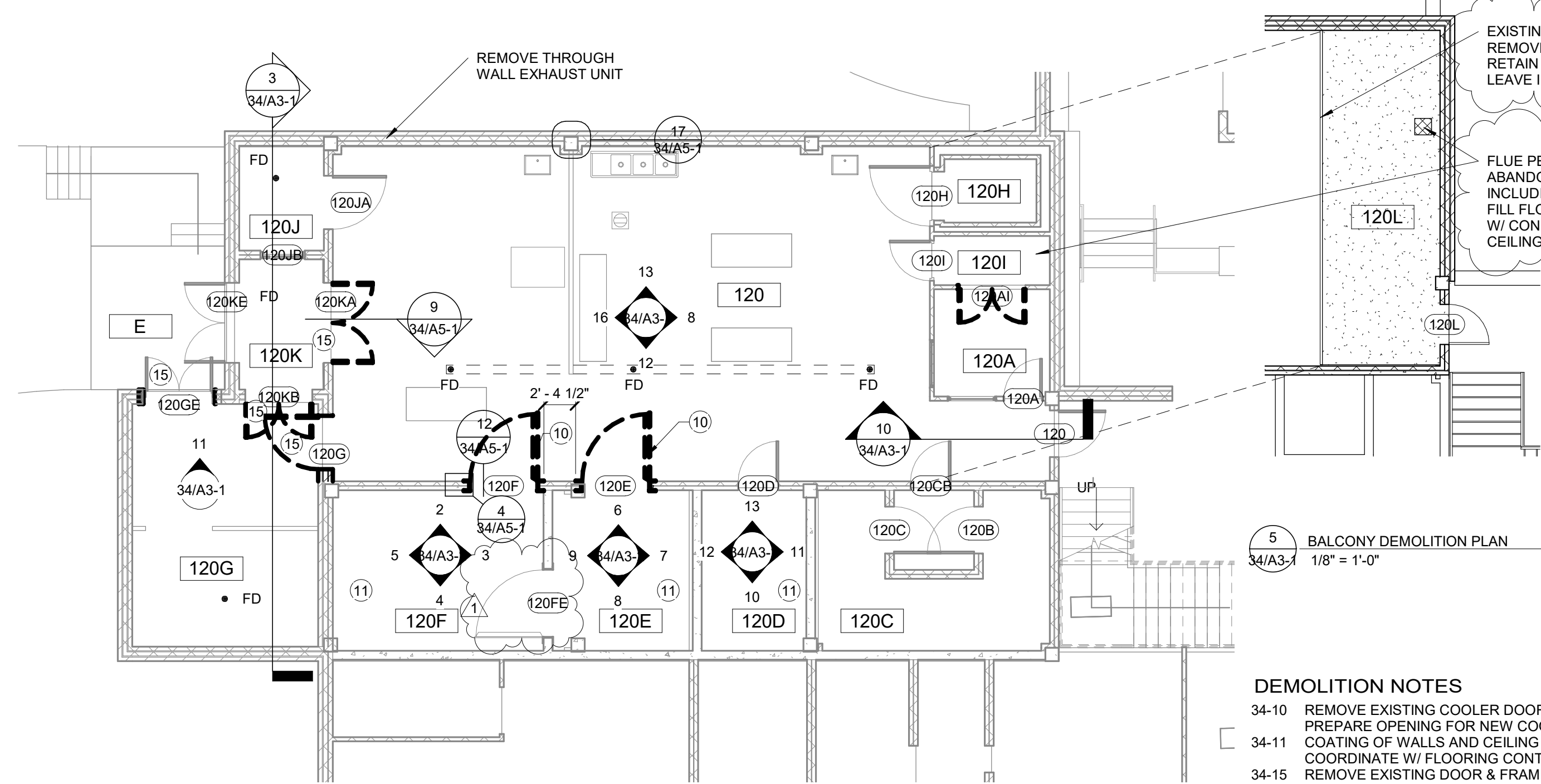
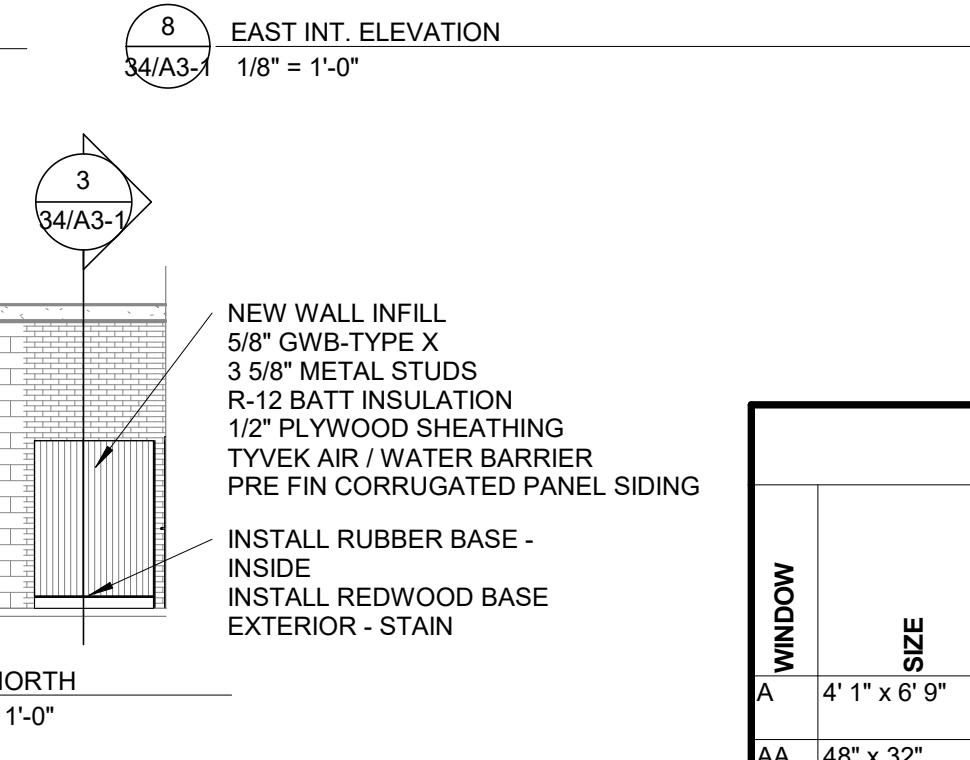
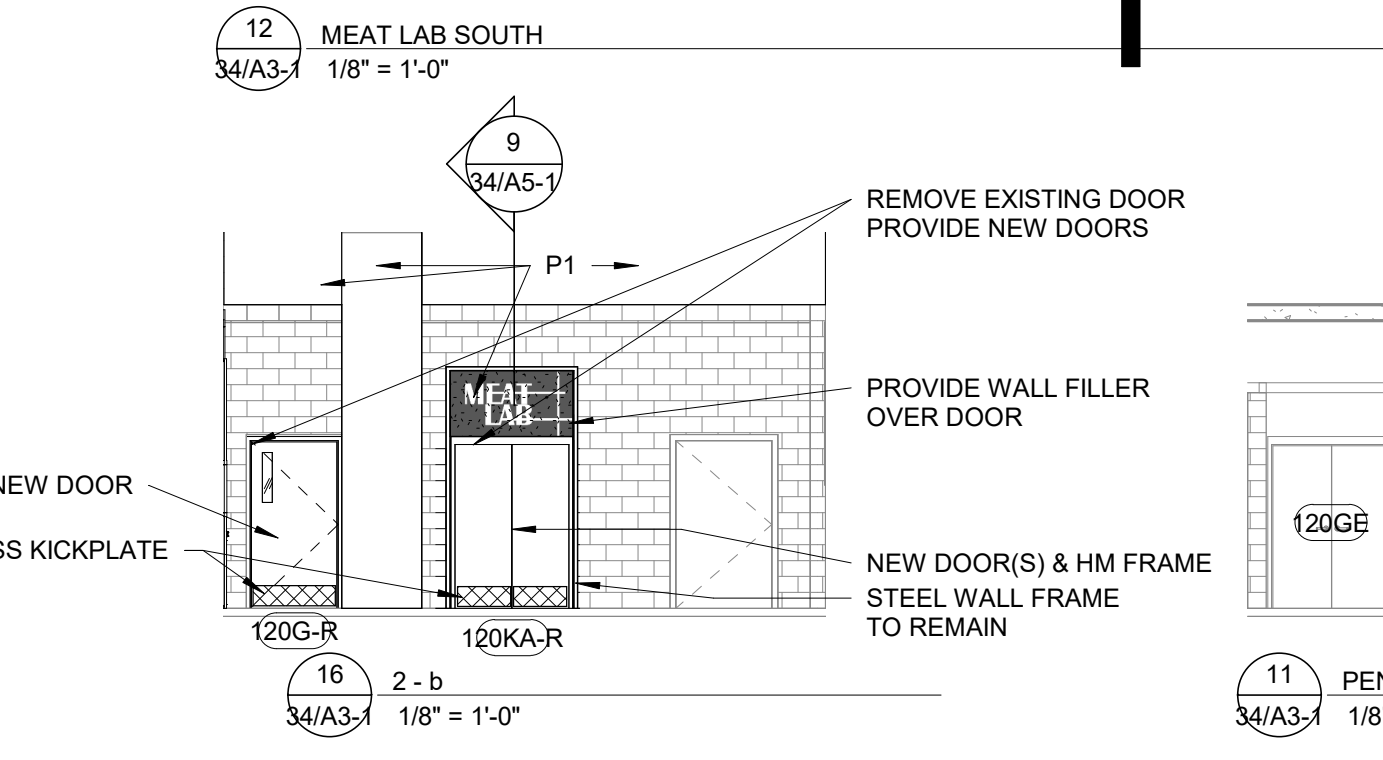
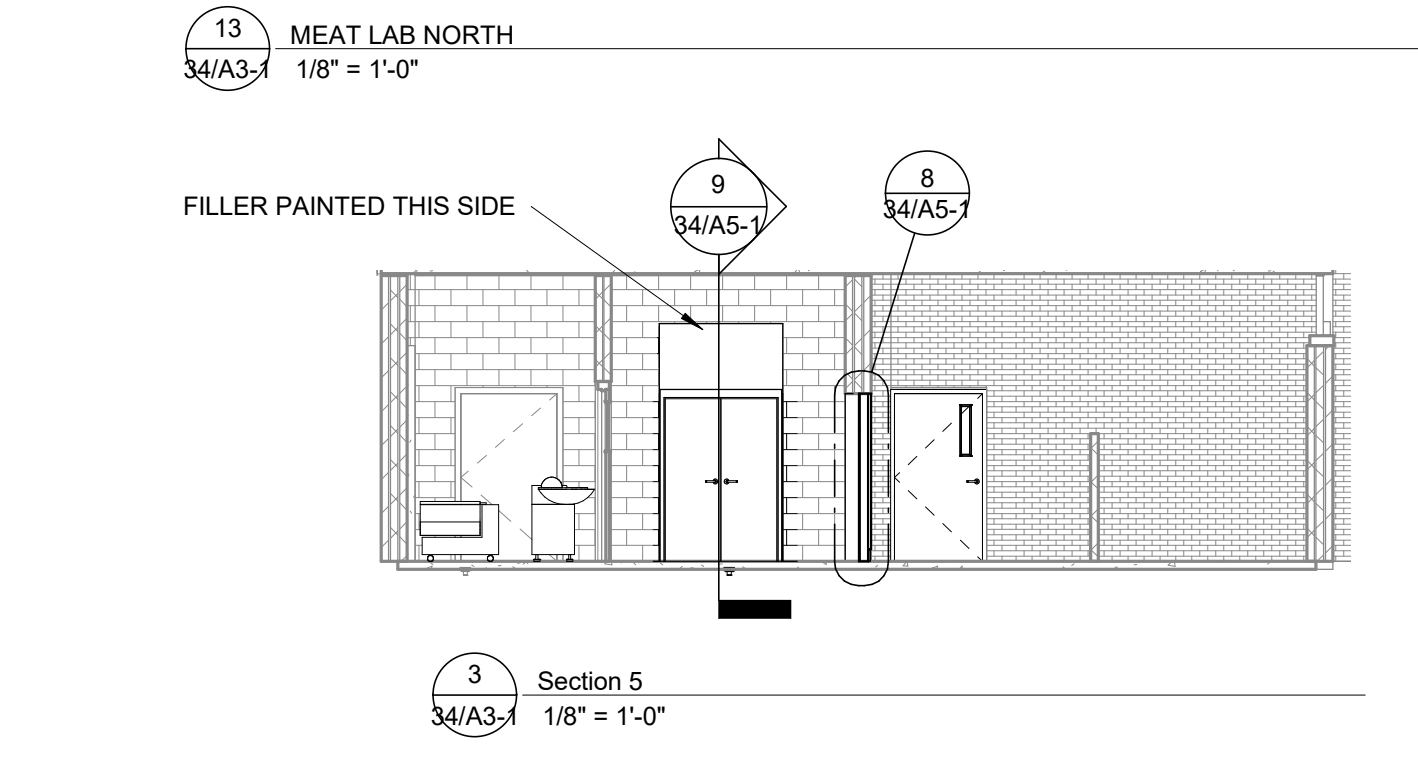
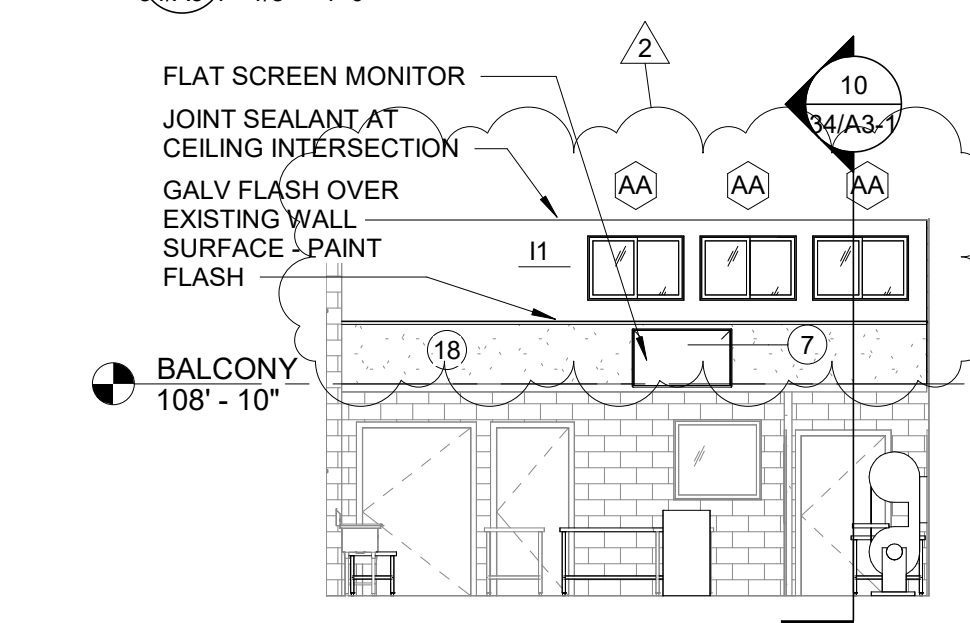
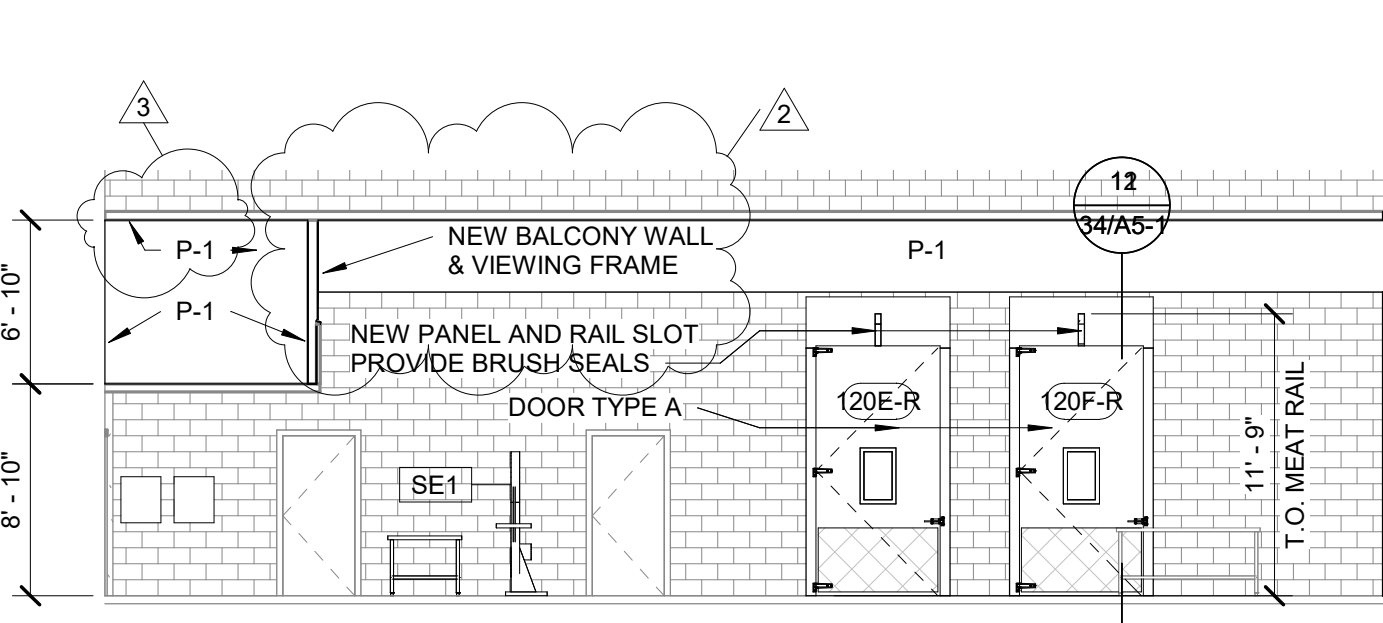
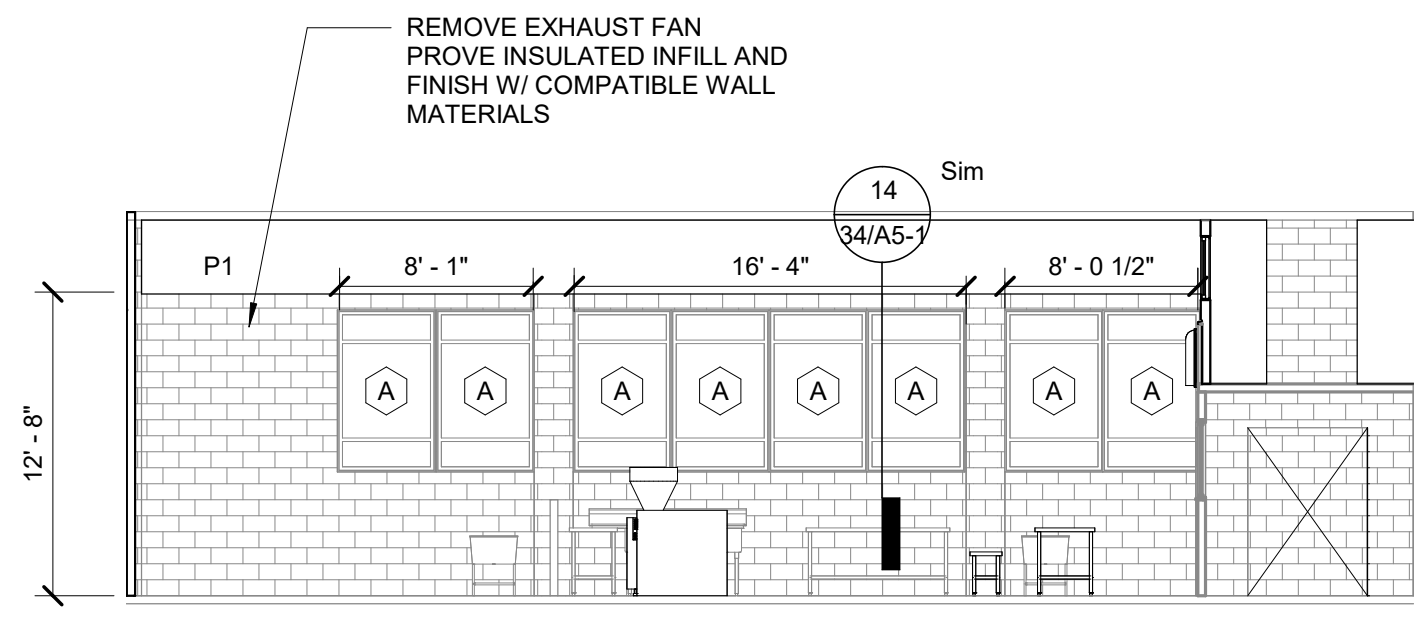
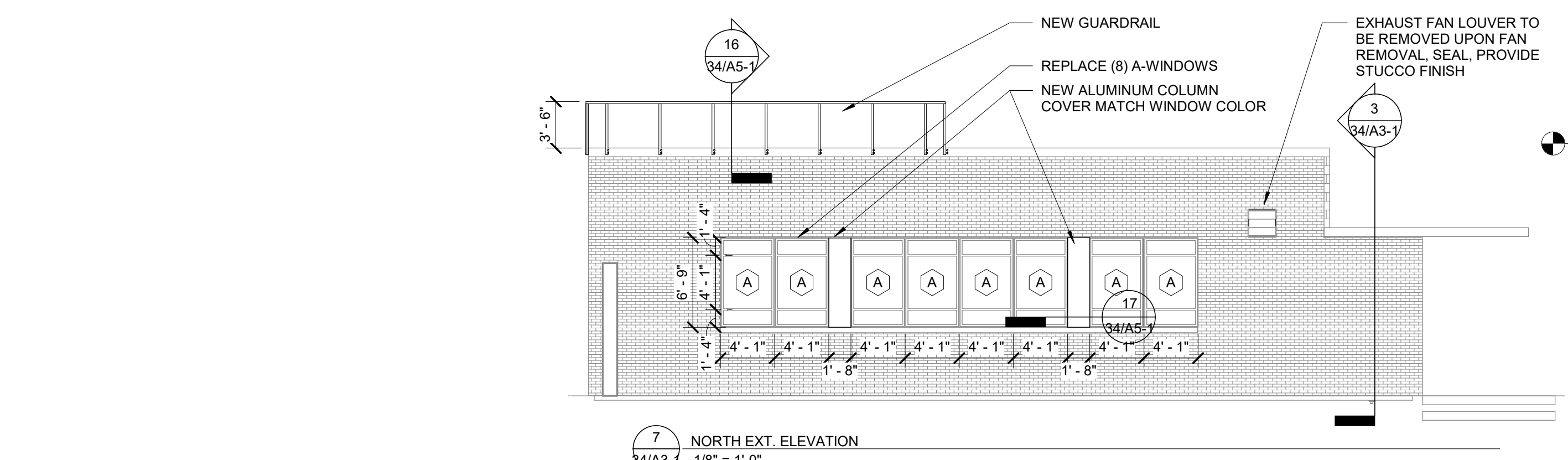
**DOOR SCHEDULE NOTES**

- THE FOLLOWING DOORS SHALL REMAIN AS IS: 120JA, 120H, 120I, 120A, 120, 120CB, 120C, 120D, 120B, 120GE, 120JB, 120KE.
- THE FOLLOWING DOORS SHALL BE REPLACED: 120E, 120F, 120FE, 120G, 120KA, 120KB.
- THE FOLLOWING DOORS SHALL BE REMOVED: 120KB, 4, R SIGNIFIES A REPLACEMENT.
- 120G-R & 120KA-R ARE CONSIDERED EXTERIOR DOORS AND SHALL BE INSULATED.
- RE-FINISH HARDWARE & REPLACE WEATHERSTRIPPING W/ RUBBER SILENCERS; SCRAPE & REPAINT DOOR AND FRAME AT DOOR 120H & 120I.
- REMOVE INTACT, TESTING BY MSU ENVIRONMENTAL SERVICES PRIOR TO DISPOSAL.

### WORK ITEMS

- SMOKER TO REMAIN W/ SMOKE GENERATOR
- REPLACE WINDOWS
- REPLACE TWO COMPARTMENT SINK WITH THREE COMPARTMENT SINK
- DEMO FLOOR OUTLET - REPLACE WITH CORD REEL. SEE E.101.2
- REPLACE ALL 3/4" WORKBENCH TOPS - BY OWNER
- PREPARE EXISTING SLAB AND COATINGS FOR NEW SURFACE COATING - REMOVE EXISTING EPOXY FLOOR COVERING AND FLOOR BASE RM 120E (EPOXY TYPE W/ FIBERGLASS MAT - PULLING LOOSE). PROVIDE & INSTALL NEW EPOXY FLOOR COVERING: RMS 120, 120A, 120H, 120D, 120E, 120F, 120I, 120K, 120L (WORK BY OTHERS, COORDINATE W/ FLOORING CONTRACTOR).
- INSTALL TWO WALL MOUNT TV'S. TV MOUNTS PROVIDED BY MSU, MOUNTED BY CONTRACTOR. COORDINATE W/ OWNER AND MSU IT/AV. CONNECT CONDUITS TO CONTROLLER IN OFFICE 120A.
- LEVEL FLOOR AND CAP DRAIN (WORK BY OTHERS, COORDINATE W/ FLOORING CONTRACTOR)
- ADD 30 X 72 FOOD GRADE WORK TABLE WITH LOCKING CASTORS (BY OWNER)
- REPLACE COOLER DOORS WITH METAL INSULATED DOORS AND HARDWARE
- NEW COOLER ROOM WALL AND CEILING COVERINGS (WORK BY OTHERS, COORDINATE W/ FLOORING CONTRACTOR).
- MAINTAIN 120B & 120C FREEZER ROOMS
- PROVIDE & INSTALL NEW FLOOR DRAIN BASKETS - BY MSU
- PROVIDE & INSTALL JIB CRANE (ALTERNATE 4)
- REMOVE & REPLACE DOOR AS SHOWN
- REMOVE DOOR AND PROVIDE WALL INFILL
- EXISTING WOOD TOP TABLE TO REMAIN - NO CHANGE
- PAINT CEILING & WALLS - PREP CEILING PATCH & REPAIR - RENDER SMOOTH SURFACES - PAINT W/ EPOXY PAINT. PAINT ALL CONDUITS ON CEILING - LEAVE GALVANIZED ON TILE WALL - DO NOT PAINT TERRA COTTA / TILE WALLS. DOORS 120 H - REMOVE EXISTING WEATHER STRIP. CEILING PREP AND PAINT ALTERNATE 4.
- PROVIDE & INSTALL NEW HAND SINK - ADD PLUMBING WALL
- INSTALL NEW WALL & WINDOWS AT BALCONY - ALTERNATE ITEM 2
- MECHANICAL SYSTEMS UPGRADE

WINDOW SCHEDULE			
WINDOW	SIZE	GLAZING TYPE	COMMENTS
A	4' 1" x 6' 9"	INSULATED	ALUMINUM EXTERIOR FIXED
AA	48" x 32"	SINGLE SAFETY GLAZING	ALUMINUM SLIDER



**DEMOLITION NOTES**

- REMOVE EXISTING COOLER DOOR AND FRAME - PREPARE OPENING FOR NEW COOLER DOOR.
- COATING OF WALLS AND CEILING BY OTHERS. COORDINATE W/ FLOORING CONTRACTOR.
- REMOVE EXISTING DOOR & FRAME.



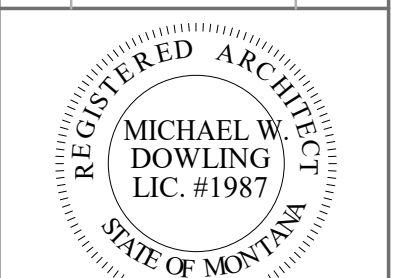
MSU-CPDC  
MONTANA STATE UNIVERSITY  
BOZEMAN, MONTANA  
PHONE: 406.994.5413  
FAX: 406.994.5665

LINFIELD HALL LAB 120  
RENOVATION  
MSU - BOZEMAN

100% PERMIT SET

DSArchitects  
55 WEST 14TH STREET  
SUITE 103  
HELENA, MT 59601

DRAWN BY:	MJF	
REVIEWED BY:		
REV.	DESCRIPTION	DATE
4		



PPA#17-0031  
A/E#00-00-00  
DSA 17-521  
SHEET TITLE  
LINFIELD WORK  
PLAN

SHEET  
**A3-1**

DATE  
04/11/18

100% PERMIT SET

DRAWN BY: Author  
REVIEWED BY:

REV.	DESCRIPTION	DATE
4		



PPA#17-0031  
A/E#00-00-00  
DSA 17-521

SHEET TITLE  
SECTIONS &  
DETAILS

SHEET  
A5-1

DATE  
04/11/18

