

BuildingName
The Description of the Project
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SPECIFICATION DIVISION 13

NUMBER SECTION DESCRIPTION

DIVISION 13 SPECIAL CONSTRUCTION

SECTION 132100 - CONTROLLED ENVIRONMENT ROOMS

END OF CONTENTS TABLE

DIVISION 13 SPECIAL CONSTRUCTION
SECTION 132100 - CONTROLLED ENVIRONMENT ROOMS

SPECIAL ATTENTION SHOULD BE GIVEN TO COORDINATING WORK OF THIS SECTION WITH SECTION 123553 LABORATORY CASEWORK AND MECHANICAL AND ELECTRICAL WORK. SECTION 055000 "METAL FABRICATIONS" MAY BE REQUIRED TO SUPPORT EXTERIOR MOUNTED CONDENSER UNITS.

PART 1 - GENERAL

1.1 SUMMARY

- A. Extent and type of controlled environment room are indicated on Drawings and by provisions of this Section.
- B. Work included in this Section:
 - 1. Plumbing and wiring related to lighting, alarm, control and refrigeration systems, ready for hook-up to building services are included in this Section.

DELETE BELOW IF HUMIDITY CONTROL SYSTEM NOT INCLUDED.

- 2. Plumbing and wiring related to humidity control system, complete and ready for hook-up to building services, are included in this Section.

USUALLY RETAIN BELOW. REVISE IN COORDINATION WITH ELECTRICAL ENGINEER IF THIS WORK WILL BE PERFORMED UNDER DIVISION 26.

- 3. An electrical panel, receptacles and related conduit, surface raceways, wiring, boxes, and connections are included in this Section.
 - 4. Cutting and patching of penetrations in insulated sandwich panels for connection of plumbing and electrical services work of Divisions 22 and 26, is included in this Section.

DELETE BELOW IF SHELVING NOT INCLUDED IN THIS SECTION

- 5. Floor and wall mounted wire shelving are included in this Section.

- C. Related Sections: The following Sections contain requirements that relate to this Section:

INCLUDE BELOW IF ROOM WILL BE INCLUDED AS AN ALTERNATE.

- 1. Division 01 Section "Alternates" for additional requirements related to this Section.

DELETE BELOW IF NONE. IF PARA RETAINED, MODIFY TO SUIT PROJECT.

- 2. Division 12 Section "Laboratory Casework" for laboratory furniture, tops, sinks, faucets and service fittings.

COORD. BELOW WITH ARTICLE "MECHANICAL AND ELECTRICAL SYSTEMS AND ACCESSORIES."

- 3. Division 22 for plumbing services and connections to sink and service fittings within controlled environment room.

COORDINATE BELOW WITH ELECTRICAL ENGINEER. REVISE BELOW AND COORDINATE WITH PLUMBING AND WIRING ARTICLE ABOVE IF OUTLETS ARE REQUIRED TO BE RECESSED IN WALLS.

4. Division 26 for connection of equipment to building electrical service.

1.2 QUALITY ASSURANCE

- A. Fire-Rating: Panel construction shall meet UL flame spread rating of 25.
- B. Sanitary Construction: Provide unit with National Sanitation Foundation (NSF) seal on door.
- C. Personnel Safety: Comply with Occupational safety and Health Administration regulations regarding personnel alarms and equipment location.
- D. Plumbing Systems: Comply with the requirements of the "Michigan Plumbing Code 20033.
- E. Ventilation Systems: Comply with the requirements of the Michigan Building Code 2003 and Michigan Mechanical Code 2003 with respect to minimum ventilation requirements.
- F. Electrical Equipment and Wiring:
 1. Comply with requirements of the "National Electrical Code" of the National Fire Protection Association (NFPA).
 2. Provide electrical components, including, but not limited to refrigeration equipment, lighting, receptacles, and heated door section listed and labeled by Underwriter's Laboratories, Inc. (UL) for electrical safety.
 3. Provide control panels and electrical panels listed and labeled by UL, ETL, MET, or CSA.

1.3 SUBMITTALS

- A. Product Data: Submit Manufacturer's literature indicating compliance with requirements, and the following:
 1. Installation instructions.
 2. Operating and maintenance instructions for each item of equipment.
- B. Shop Drawings: Showing construction of box and ancillary equipment, including component data sheets, control diagrams, and operating sequence information.
 1. Provide a detailed power riser diagram specific to the controlled environmental room to be supplied.
- C. Pre-Training Submittals: Submit start-up, functional test, and performance test reports not less than 2 weeks prior to conducting training session.
- D. Product Warranties: Submit manufacturer's standard written warranty for each environmental room covering, at minimum, one year, parts and labor.

1.4 DESIGN REQUIREMENTS

*DELETE BELOW IF UNIT WILL NOT BE USED FOR CRYSTALLIZATION
(WHICH REQUIRE VIBRATION RESTRICTIONS).*

- A. Crystallization Room: In environmental rooms designated "crystallization room", provide units with the following special features:
1. Provide quiet switches in lieu of standard mechanical relays and solenoids.
 2. Provide self-closing, self-sealing doors.
 3. Provide remote mounted compressor and condenser units.
 4. Provide refrigeration system piping mounted on vibration isolators and not mounted along walls.

*DELETE BELOW IF UNIT WILL NOT BE USED FOR ANIMAL HOLDING
(WHICH REQUIRE NOISE RESTICTIONS).*

- B. Animal Room: In environmental rooms designated "animal room", provide the following special feature:
1. Provide quiet switches and relays in lieu of standard mechanical relays and solenoids.

1.5 PROJECT CONDITIONS

- A. Existing Clearances: Clear headroom above the unit is restricted by piping and ductwork. Maximum clear dimension from the finished floor to underside of the lowest obstruction is as follows:

MODIFY EXMPLE BELOW TO SUIT ACTUAL PROJECT CONDITIONS.

1. feet, 9 inches.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Manufacturer: Subject to compliance with requirements, provide products of one of the following:

Bahnson Environmental Specialties
Environmental Growth Chambers
Harris Environmental Systems, Inc.
Insulated-Structure, Ltd.
Nor-Lake, Inc.

2.2 ENVIRONMENTAL ROOM ENCLOSURE

- A. Size: Environmental room dimensions are indicated on Drawings. Provide rooms of manufacturer's standard sizes, but within 12-inches of dimensions indicated on drawings.

*IF HEIGHT NOT INDICATED ON DRAWINGS, INCLUDE ONE OF THE
FOLLOWING. NOTE THAT IT WILL BE DIFFICULT OR IMPOSSIBLE TO
INSTALL A GRID CEILING IN ROOMS LOWER THAN 8'-7".*

1. Room Height: 7 feet, 7 inches outside dimension.

2. Room Height: 8 feet, 1 inch outside dimension.
3. Room Height: 8 feet, 7 inches outside dimension.
4. Room Height: 9 feet, 7 inches outside dimension.

B. Wall and Ceiling Panels: Manufacturer's standard rigid, foamed-in-place urethane insulation core with metal panel skins adhered to exterior and interior sides. Provide all mechanical latching devices, gasketing and trim required for positive seal between panels and neat finished appearance.

1. Panel Thickness: 4-inches
2. Thermal Performance: U-value of assembled panels not less than 0.29.
3. Panel Skins: Provide metal panel skins of indicated materials. Paint metal panels in areas exposed to view in finished construction.
 - a. Exterior Floor and Ceiling: 14 gage galvanized steel.

BELOW IS TYPICAL, BUT OPTIONS INCLUDE STAINLESS STEEL AND GALVANIZED STEEL - CONSULT MFR'S LITERATURE.

- b. Exterior Wall Panels: 0.040-inch thick, stucco embossed, aluminum.
- c. Interior Wall Panels: 0.040-inch thick, stucco embossed, aluminum.
- d. Colors: Provide white interior and white exterior.

DELETE BELOW IF WALL-MOUNTED SHELVING, OR IF FLOOR-TO-CEILING UNISTRUT SUPPORTS WILL BE PROVIDED. COORDINATE BELOW WITH DRAWINGS.

4. Reinforcing: Provide reinforcing in the form of wood blocking or heavy-gage steel stripping, concealed within walls at locations indicated to receive wall mounted casework, shelving or equipment.

DELETE BELOW IF NO ELEVATED CO2 ROOMS

5. Panel Sealants for Elevated CO2 Room: In addition to requirement of mechanical latching device (cam-lock panels), provide silicone sealant at all panel joints for redundantly sealed, air-tight construction.

C. Doors: Provide units with the following characteristics:

1. Size: 36-inches by 78-inches.

USUALLY SELECT SWINGING TYPE BELOW.

2. Type: Flush mounted, swinging type.
3. Type: Sliding type.

SELECT SELF-SEALING FOR CRYSTALLIZATION ROOMS.

4. Operation: Self-closing hinges.
5. Operation: Self-closing, self-sealing.

MODIFY BELOW TO SUIT PROJECT REQUIREMENTS.

6. Observation Window: 12-inches by 12-inches (approximate dimension) triple pane observation window.

MODIFY BELOW TO SUIT PROJECT REQUIREMENTS.

- a. Electrically heat windows in freezer doors.

MODIFY BELOW TO SUIT PROJECT REQUIREMENTS.

7. Latching Hardware: Positive latching hardware with door handle and inside safety release. Provide cylinder locks in door handles, except in freezer unit (if applicable).

LIMIT KEYING INFORMATION TO BELOW. DO NOT INCLUDE SPECIFIC DEPARTMENTAL KEYING INFORMATION IN THIS SECTION.

- a. Manufacturer/Model of Cylinders: Best Co., only. Contact University of Michigan Key Office at (734) 764-3481 for cylinder and keying requirements.

RETAIN ALL BELOW.

8. Gaskets and Seals: Replaceable magnetic gaskets on sides and top, and adjustable sweep seals on bottom. Provide openings with stainless steel threshold.
9. Heat opening perimeter as required to prevent condensation.

INSULATED FLOORS BELOW MAY BE OMITTED IN WARM ROOMS AND COLD ROOMS WHERE NECESSARY FOR BARRIER-FREE APPLICATION OR HEIGHT RESTRICTIONS. IN COLD ROOMS, THIS CAN RESULT IN CONDENSATION ON UNDERSIDE OF THE SLAB, SO IT IS BEST TO CONSIDER ELIMINATING INSULATED FLOORS ONLY IN SLAB-ON-GRADE CONSTRUCTION.

- D. Floors: Insulated panels of construction similar to wall panels, except able to withstand floor loads of 600 psf.

1. Panel Thickness: 3-1/2 inches, minimum.
2. Floor Finish: 14 gage galvanized steel.
3. Floor Covering: 1/8-inch thick diamond tread PVC mat in manufacturer's standard color.

INSULATED FLOORS REQUIRE RAMPS (UNLESS A DEPRESSED SLAB CAN BE PROVIDED). RAMPS CREATE BARRIERS TO ACCESS THAT MUST BE DEALT WITH - SEE NOTES BELOW.

- E. Ramps: Provide ramp of type indicated, fabricated of minimum 1/8-inch thick Type 6061-T6 aluminum tread plate with diamond-check pattern, or flat aluminum plate with durable, non-skid coating. Provide fire-retardant-treated wood substructure designed to support structural loads equal to, or greater than, those specified for the insulated floor structure. Provide ramp of width indicated on Drawings, or if not indicated, 48 inches wide; and of indicated length or slope.

1. Fixed Exterior Ramp: Provide where indicated on Drawings, or if not indicated, one unit at each door where a transition from insulated floor to building floor occurs.

SELECT ABOVE OR BELOW.

2. Portable Exterior Ramp: Provide where indicated on Drawings, or if not indicated, one unit at each door where a transition from insulated floor to building floor occurs.

INCLUDE ONE LENGTH OPTION BELOW FOR EITHER OF THE ABOVE TYPES. ALL DISCUSSIONS ASSUME A 4-INCH TOTAL RISE.

OPTION BELOW WILL NOT COMPLY WITH STATE ACCESSIBIITY CODES OR ADA. 36 INCHES IS MFR STANDARD, BUT UM HAS HAD SUCCESS OBTIANING VARIANCES WITH THE 42-INCH EXTERIOR RAMP OPTION BELOW. THE STATE PREFERS THE 42-INCH LENGTH, WHICH GIVES THE CODE-REQUIRED 1:10 SLOPE FOR MAX. 6-INCH RISE (EXCEPTION MUST BE REQUESTED FOR THE MISSING LANDING AT DOOR).

- a. Length: 42 inches.

OPTION BELOW DOES NOT NEED LANDING, ACCORDING TO MICHIGAN BUILDING CODE (LESS THAN 1:12), AND DOES NOT REQUIRE VARIANCE. USE THIS IF SPACE IS AVAILABLE.

- b. Length: 50 inches.

USUALLY DELETE BELOW AND RETAIN ABOVE - MOST USERS DO NOT WANT AN INTERIOR RAMP SINCE IT CREATES A TRIPPING HAZARD. USE ONLY WHERE EXTERIOR RAMP CANNOT BE PROVIDED BECAUSE OF SPACE CONSIDERATIONS. AN EXCEPTION FOR RAMP LENGTH AND MISSING LANDING IS REQUIRED.

- 3. Fixed Interior Ramp: Maximum 20-inches long, provided at door. Include non-skid PVC mat.

F. Trim Strips and Closure Panels: Provide closure and trim pieces as indicated. Use materials and finishes matching exterior panel skins.

G. Ceiling Plenum: No plenum within room.

SELECT EITHER ABOVE OR BELOW. NOTE THAT GRID CEILING MATERIAL WILL REDUCE AVAILABLE HEADROOM TO BELOW THE BOTTOM OF THE LOWEST MECHANICAL ELEMENT (USUALLY THE CONDENSATE DRAIN LINE OUT OF THE FAN COIL UNIT IN ROOM). DO NOT SELECT PLENUM OPTION WITH ROOMS SHORTER THAN 8'-7" UNDER ANY CIRCUMSTANCES.

GRID IS PREFERRED BY MED. SCHOOL WHICH MAY REQUIRE VERY HIGH AIR VELOCITIES DUE TO ELECTRICAL LOAD REQUIREMENTS. BE SURE TO INVESTIGATE AND RESOLVE POTENTIAL CONFLICTS BETWEEN AVAILABLE HEADROOM AND GRID.

H. Ceiling Plenum: Provide white acrylic plastic, 1/2-inch square, "open cell" grid type ceiling supported by medium duty, painted steel suspension system to form plenum for distribution of air and light. Secure grid to T-bar supports to prevent rattling.

FOR PROJECTS WITH MULTIPLE ENVIRONMENTAL ROOMS, CREATE SEPARATE "OPERATING REQUIREMENT" ARTICLES FOR EACH TYPE OF ROOM AND RE-TITLE ACCORDINGLY. EXAMPLE: "COLD ROOM OPERATING REQUIREMENTS" AND "WARM ROOM OPERATING REQUIREMENTS"; OR "ROOM TYPE NO. 1"/"ROOM TYPE NO. 2". ENSURE CONSISTANT NOMENCLATURE ON DRAWINGS.

2.3 ENVIRONMENTAL ROOM OPERATING REQUIREMENTS

- A. System Operation, General: Provide units that are capable of maintaining selected set point(s), within indicated temperature and humidity control and uniformity ranges, when operated under the indicated maximum and minimum thermal loading conditions. Provide units with compressor running continuously, and with evaporator unit fan operating on demand. Size compressor and related components to operate under both minimum and maximum loading conditions without "short cycling," excessive wear on the compressor, or throttling of the hot gas bypass valve. Design units to operate without excessive compressor noise, and without high air velocities within the occupiable space of the room.

REVIEW THE FOLLOWING VALUE WITH ELECTRICAL ENGINEER.

1. Available Building Power Supply: 208V, 3 phase, 4 wire plus ground.

- B. Environmental Control: Provide environmental rooms complying with the following temperature and humidity control requirements:

TEMPERATURE SET POINT OR RANGE MUST BE DETERMINED BY CLIENT.

BELOW DESCRIBES STANDARD COLDROOM WITH A FIXED SET POINT.

1. Temperature Set Point: 4 degrees C., constant.

BELOW DESCRIBES A ROOM CAPABLE OF A RANGE OF TEMPERATURES FROM WARM TO COLD.

2. Temperature Range: 0 to 60 degrees C., constant.

BELOW IS NOT RECOMMENDED PRACTICE. ELEVATED CO2 POSES HEALTH RISK.

3. to 60 degree C., elevated CO2 environment.
4. Temperature Control Range: Provide units capable of maintaining temperature within the following range, when measured at a single point within the room over time:

RETAIN ONE OF THE FOLLOWING VALUES IN CONSULTATION WITH CLIENT - USUALLY +/- 0.5 DEG C. IS ACCEPTABLE. NOISE ASSOCIATED WITH THE OPERATION OF THE VALVE TYPE REQUIRED FOR +/- 0.2 DEG. C. ABOVE HAS PROVED ANNOYING TO OCCUPANTS.

- a. +/- 0.2 deg. C.
 - b. +/- 0.5 deg. C.
5. Uniformity Range: +/- 0.5 degree C, or better, when measured between a variety of points anywhere within the room, excluding areas of the room within 12 inches of walls, floor, and ceiling.
 6. Humidity Range: As follows:

BELOW IS MOST COMMON. HUMIDITY CONTROL SYSTEMS ADD CONSIDERABLE COST AND COMPLICATIONS TO UNITS.

- a. Uncontrolled, except that room supplier is responsible for providing system which ensures that condensation will not form on horizontal or vertical surfaces within the room.

BELOW WILL KEEP CONDENSATION FROM FORMING ON COLD SURFACES OF TYPICAL 4 DEG. C. ROOM.

- b. Less than 20 grains/lb.

RETAIN BELOW OR MODIFY FOR SPECIFIC REQUIREMENT OF RESEARCH BEING CONDUCTED.

- c. Ambient to 90 percent RH.

USUALLY DELETE BELOW - ELEVATED CO2 ROOMS ARE RARE.

- 7. CO2 Range: 0 to 10 percent.

- C. Thermal Loads: Provide environmental rooms capable of maintaining indicated controlled temperature and humidity conditions when operating under the following thermal loads:

CLIENT MUST DETERMINE DOOR OPENINGS BELOW. 8 PER HOUR IS A FAIRLY HIGH FREQUENCY OF USE.

- 1. Door Openings: Maximum of 8 per hour, for 8 working hours per day.
 - a. Temperature and humidity range recovery time for a 5-second door open condition: Not more than 5 minutes.

CLIENT MUST DETERMINE OCCUPANTS BELOW. 2 IS USUALLY THE MAXIMUM.

- 2. Number of Occupants: Maximum of 2, for 8 working hours per day.
- 3. Lighting: As indicated in "Electrical Systems and Accessories" Article of this Section.

CONSULT WITH CLIENT TO DETERMINE APPROPRIATE HEAT LOAD FROM EQUIPMENT EXPECTED TO OPERATE WITHIN THE ROOM, AND DURATION.

- 4. Owner's Equipment: Minimum thermal load from Owner's movable equipment within the room is a continuous zero-load condition. Maximum thermal load from Owner's movable equipment within the room is as follows:

SELECT VALUES BELOW IN COORDINATION WITH OWNER. NOTE THAT 1 KW IS FREQUENTLY ACCEPTABLE. NOTE THAT POSSIBLE THERMAL LOAD CANNOT EXCEED AVAILABLE ELECTRICAL POWER, AND IS FREQUENTLY MUCH LESS THAN THAT VALUE. CONSULT WITH MECHANICAL ENGINEER IF IN DOUBT.

- a. kilowatts, operating for 24 hours per day.
- b. kilowatts, operating for 8 hours per day.
- c. kilowatts, operating for 8 hours per day.

IF HUMIDITY CONTROL IS REQUIRED, ADD HUMIDITY-AFFECTING EQUIPMENT SUCH AS WATER BATHS HERE.

- 5. Ambient Conditions Exterior to Room: 60 to 80 deg. F.

DELETE BELOW IF NO FREEZER UNIT

2.4 FREEZER ROOM OPERATING REQUIREMENTS

- A. System Operation, General: Provide units that are capable of maintaining selected set point, within the indicated temperature control and uniformity ranges, when operated under the indicated maximum and minimum thermal loading conditions.

- B. Environmental Control: Provide freezer rooms complying with the following temperature control requirements:
1. Temperature Set Point: Minus 20 degrees C., constant.
 2. Temperature Control Range: +/- 0.5 deg. C., when measured at a single point within the room over time.
 - a. +/- 0.5 deg. C.
 3. Uniformity Range: +/- 0.5 deg. C, or better, when measured between a variety of points anywhere within the room, excluding areas of the room within 12 inches of walls, floor, and ceiling.
 4. Humidity: Uncontrolled.
- C. Thermal Loads: Provide freezer rooms capable of maintaining indicated controlled temperature when operating under the following thermal loads:
1. Door Openings: 4 per hour, during 8 working hours per day.
 2. Number of People: Maximum of 1, for a duration of 5 minutes or less.
 3. Lighting: As indicated in "Electrical Systems and Accessories" Article of this Section.

BELOW IS AN EXAMPLE ONLY. VERIFY WITH CLIENT AND EDIT TO SUIT ACTUAL CONDITIONS.

4. Product Load: Approximately 1 gallon of room temperature liquid introduced at 24 hour intervals.
5. Ambient Conditions Exterior to Room: 60 to 80 deg. F.

2.5 PLUMBING AND REFRIGERATION SYSTEMS AND ACCESSORIES

- A. Refrigeration, General: Provide units with factory installed refrigeration systems, complying with indicated requirements of "Operating Requirements" Article of this Section, and as follows:
1. Plumbing: Provide factory-and-field installed equipment, including piping, fittings and connections required to provide a complete, ready-to-operate refrigeration system.
 - a. Use pre-charged coolant lines where possible.
 2. Electrical: Provide factory-and-field installed conduit, wiring, fittings and connections (including compressor disconnect switch) required to provide a complete, ready-to-operate refrigeration system. Terminate wiring in power panel as indicated in "Electrical Systems and Accessories" Article of this Section.
- B. Condensing Unit: Factory assemble compressor/condenser units using UL listed or recognized components. Compressor shall be of semi-hermetic type. Use manufacturer's standard non-CFC refrigerant for condition of use. Pre-wire and factory pipe units.

CONSULT WITH MECHANICAL ENGINEER WHEN SELECTING SYSTEM TYPE. CURRENT PREFERENCE IS FOR WATER-COOLED SYSTEMS.

RETAIN BELOW FOR WATER-COOLED SYSTEMS. THESE SYSTEMS REQUIRE EITHER A BUILDING DOMESTIC WATER OR CHILLED WATER SUPPLY. BELOW IS FOR CHILLED WATER SUPPLY WITH DOMESTIC WATER BACK-UP.

1. System Type: Provide controlled environment room with water-cooled refrigeration system, for connection to building chilled water supply with domestic water back-up system. Include a control valve to throttle chilled water based on demand, and designed for a 10 deg. F. temperature rise.

MODIFY BELOW IN CONSULTATION WITH MECHANICAL ENGINEER.

- a. Chilled Water Temperature: Approximately 45 deg. F.
- b. Domestic Water Temperature: Approximately 65 deg. F.

SELECT ONE MOUNTING LOCATION FROM THREE CHOICES BELOW - CRYSTALLIZATION ROOMS MUST HAVE REMOTE MOUNTED EQUIPMENT. INSTALLATIONS ON COLDROOM ROOF MAY BE NOISY. A CLEAR, WRITTEN DESCRIPTION OF THE LOCATION MAY BE SUBSTITUTED HERE FOR A LOCATION DRAWING.

- c. Mounting Location: Mount unit on roof of cold room.
- d. Mounting Location: Building interior, as indicated on Drawings.
- e. Mounting Location: Building exterior, as indicated on Drawings.

USUALLY INCLUDE BELOW, EXCEPT FOR REMOTE INSTALLATIONS WHERE NOISE AND VIBRATION TRANSMISSION ARE NOT CRITICAL.

- f. Mounting Type: Mount system components on a single steel frame. Mount compressor on spring isolators sized for specific equipment provided.

RETAIN BELOW FOR AIR-COOLED SYSTEMS. THESE SYSTEMS REQUIRE MOUNTING THE CONDENSER UNIT OUTSIDE THE BUILDING AND SHOULD NOT BE RUN MORE THAN 50-75 FEET FROM THE ROOM.

2. System Type: Provide controlled environment room with an air-cooled refrigeration system.

SELECT ABOVE OR BELOW MOUNTING LOCATION - NOTE THAT CRYSTALLIZATION ROOMS SHOULD HAVE REMOTE MOUNTED REFRIGERATION EQUIPMENT

- a. Mount refrigeration system on building exterior as shown. Provide exterior mounted refrigeration units with all-weather hood and low-ambient controls, suitable for local climate.

USUALLY DELETE BELOW FOR EXTERIOR INSTALLATIONS, UNLESS NOISE AND VIBRATION CONTROL ARE IMPORTANT.

- b. Mounting Type: Mount system components on a single steel frame. Mount compressor on spring isolators sized for specific equipment provided.

BELOW MAKES DRAIN PIPE FROM CONDENSATION PAN A RESPONSIBILITY OF THE ROOM MANUFACTURER. SHOW OR NOTE ROUTE OF DRAIN PIPE (USUALLY TO A SINK OR OTHER WASTE WITHIN THE ROOM) ON DRAWINGS. IF NO SINKS ARE INCLUDED IN THE ROOM, CONSULT WITH MECHANICAL ENGINEER AND POSSIBLY INCLUDE SUBPARA BELOW TO LIMIT ROOM MANUFACTURER'S RESPONSIBILITY TO STUB-OUT ONLY.

C. Evaporator Unit: Provide forced-air type, designed for ceiling installation, complete with condensation collection pan, drain pipe, and, where necessary, condensate pump; and terminated with an air gap at location shown on Drawings, unless otherwise indicated. Provide evaporator units which are UL listed or recognized.

1. Provide units with defroster with automatic, programmable, timed operation.

USUALLY DELETE BELOW, UNLESS COORD. WITH MECHANICAL ENGINEER RESULTS IN DIVISION 15 BEING RESPONSIBLE FOR THE PLUMBING.

2. Stub out drain pipe from condensation collection pan for connection under Division 22.

PRIOR TO EDITING THE PARAGRAPH BELOW, DETERMINE WHETHER ROOM WILL BE OCCUPIED (DEFINED AS ONE OR MORE PERSONS SPENDING ONE HOUR OR MORE CONTINUOUSLY IN THE ROOM AT ANY GIVEN TIME). IF ROOM IS OCCUPIED, INCLUDE THE STANDARD BELOW. IF THE ROOM IS DETERMINED TO BE UNOCCUPIED, ELIMINATE PARAGRAPH BELOW.

D. Ventilation: Built-in fresh-air ventilation system. Comply with the standards below:

BELOW DESCRIBES A SYSTEM IN WHICH VENTILATION AIR IS SUPPLIED FROM THE ROOM IN WHICH THE ENVIRONMENTAL ROOM IS LOCATED. IT ASSUMES THAT THE AIR HANDLING UNIT IS PROVIDING 100% OUTSIDE AIR. IF THE AHU IS PROVIDING LESS THAN 100% O.A., THE MECHANICAL ENGINEER SHOULD MODIFY THE SPECIFICATIONS ACCORDINGLY.

1. Ventilation air supplied from the room within which the package environmental room is located and routed directly to the evaporator inlet. Return air shall be vented through a relief damper in the roof. System shall have an electrically driven centrifugal type ceiling fan. Blade type fans are not acceptable: Minimum 20 cfm per person.

SELECT OPTION BELOW IF ROOM WILL BE UNOCCUPIED OR WILL BE A FREEZER ROOM. IF THIS OPTION IS RETAINED BE SURE TO DESIGNATE ON DRAWINGS WHICH ROOMS MEET THE CRITERIA BELOW. IF NO VENTILATION IS TO BE PROVIDED, BE SURE TO NOTIFY THE CLIENTS THAT THE FOLLOWING SIGN MUST BE POSTED ON THE OUTSIDE OF THE ENVIRONMENTAL ROOM: "NOT FOR USE WITH FLAMMABLE SOLVENTS IN QUANTITIES GREATER THAN 1 L."

E. Omit ventilation in freezer rooms and in unoccupied storage rooms which are designated thus on the Drawings.

F. Humidification System: Manufacturer's standard, electrically powered steam generator, for direct injection of steam into room supply air stream ahead of cooling coils. Provide unit ready for connection to building purified water system, and capable of meeting humidity set point and control range indicated under "Operating Requirements" Article of this Section, and as follows:

A CLEAR, WRITTEN DESCRIPTION COULD BE SUBSTITUTED HERE FOR A LOCATION DRAWING.

1. Location: As shown on Drawing.

2. Duct the humidifier output through the evaporator unit mounted to the environmental room ceiling.
3. Interlock humidifier and cooling controls as required to provide stable interior temperature and humidity ranges.

DELETE BELOW IF NO DEHUMIDIFICATION SYSTEM REQUIRED. MODIFY TO INDICATE TITLE OF DIVISION 15 SECTION REFERENCED IN PARA.

- G. Dehumidification System: Manufacturer's standard desiccant-type air dryer system complete with required sheet metal ductwork between controlled environment room and dehumidifier unit. Connect unit to exhaust duct, specified in Division 23 Section ". Provide unit capable of meeting humidity range control indicated under "Operating Requirements" Article of this Section, and the following:

A CLEAR, WRITTEN DESCRIPTION COULD BE SUBSTITUTED HERE FOR A LOCATION DRAWING.

1. Location: As shown on Drawing.
2. Duct the dehumidifier output through evaporator unit mounted to the environmental room ceiling.
3. Interlock dehumidifier and cooling controls as required to provide stable interior temperature and humidity ranges.
4. Acceptable Models: Subject to compliance with requirements, provide units manufactured by one of the following:
 - a. Munters Cargocaire.
 - b. Brye-Aire.
 - c. Low-Humidity Systems.

USUALLY DELETE BELOW - MAY BE INCLUDED FOR FREEZER ROOMS TO PERMIT DEFROSTING.

- H. Floor Drain: Provide indicated floor drain and cover in environmental room.

DELETE BELOW IF NO ELEVATED CO2 ROOM.

- I. CO2 Sensor and Injection System: Provide CO2 Injection System with digital CO2 Controller with Thermistor Thermal Conductivity Cell and as follows:

1. Operation: Device measuring electrical conductivity of CO2, with factory installed sensors located for optimum performance. Interlock with control mechanism for release of CO2 into air supply of room. Release of CO2 shall be intermittent and only as required to maintain desired CO2 levels. Continuous flow devices are not permitted.
2. Controller Range: 0 to 20 percent.
3. Controller Sensitivity: +/- 0.1 percent.
4. Display: Digital readout of CO2 concentration in environmental room control panel.
5. Fabrication: Factory pre-assemble and test unit in presence of Owner's representative. Notify Owner at least 15 days before test.

2.6 ELECTRICAL SYSTEMS AND ACCESSORIES

- A. General: Provide factory installed conduit, wiring, switches, fittings and connections for each electrically powered accessory and item of equipment required by provisions of this Section. Terminate wiring in an electrical panel as indicated in this Article.

CONTROLLER BELOW IS ALWAYS REQUIRED.

- B. Controllers: Manufacturer's standard digital electronic control unit with lighted digital display and controls and as follows:

DELETE BELOW IF NO ANIMAL OR CRYSTALLIZATION ROOMS.

1. Mechanical relays are not permitted.

SELECT ONE OF THE FOLLOWING TO SUIT PROJECT.

2. Type: Temperature controller.
3. Type: Temperature and humidity controller.

RECORDER BELOW MAY BE OMITTED FOR SMALL SAVINGS IF APPROVED BY THE CLIENT.

- C. Recorders: Manufacturer's standard chart recorder with seven day movement and 10-inch diameter chart for recording conditions within the environmental room. Provide 100 additional papers for future use.

1. Type: Temperature recorder with single pen.

ABOVE IS FOR ENVIRONMENTAL ROOM WITHOUT HUMIDITY CONTROL. BELOW IS FOR HUMIDITY-CONTROLLED ROOMS.

2. Type: Temperature and humidity recorder with dry and wet bulb sensing for recording temperature and humidity, respectively. Provide a dual-pen unit for independent record of temperature and relative humidity conditions.

- D. Lighting: Fluorescent lighting with vapor proof fixtures and electrical components and cold weather ballasts capable of operation for indicated room condition without perceivable light flickering.

USUALLY RETAIN BELOW.

1. Cold Rooms and Combination Warm-and-Cold Rooms: Design lighting to provide light level of 70 foot-candles at 40 inches above finished floor at 4 deg. C.

DELETE BELOW IF NO FREEZER ROOMS.

2. Freezer: Design lighting to provide light level of 40 foot-candles at 40 inches above finished floor at minus 20 deg. C.

DELETE BELOW IF NO WARM-ONLY ROOMS.

3. Warm Rooms: Design lighting to provide light level of 70 foot-candles at 40 inches above finished floor at 30 deg. C.

- E. Switches for Light Fixtures and Outlets: Furnish single pole, double pole, or 3-way switches, as required, rated 120-277 volts AC and 20 amps, unless otherwise indicated. Locate light fixture switches as indicated on Drawings, or if not otherwise indicated, within room next to the latch side of the door.

DELETE BELOW IF NO SWITCHED OUTLETS. COORD. "PL" DESIGNATION ON DRAWINGS.

1. Furnish pilot light adjacent to toggle switch, where noted as "PL" adjacent to switch identification.

SELECT ONE OF THE FOLLOWING.

2. Color:
 - a. Brown.
 - b. Ivory.
 - c. White.
3. Products: Subject to compliance with requirements, provide products of one of the following:
 - Arrow Hart.
 - Bryant.
 - Eagle (industrial spec grade only).
 - Hubbell.
 - Leviton.
 - Pass and Seymour.

RETAIN OR DELETE BELOW IN CONJUNCTION WITH ELECTRICAL ENGINEER. THIS MASTER SPECIFICATION SECTION HAS BEEN PREPARED ASSUMING THAT BELOW WILL BE RETAINED.

- F. Electrical Power Wiring and Accessories: Factory install conduit, wiring, fittings, and connections for electrical receptacles indicated on Drawings and by provisions of this Section. Provide a sufficient number of 20 amp circuits to accommodate the maximum power requirements of Owner's movable equipment within the room indicated in the "Operating Requirements" Article of this Section. Recess conduit and wiring devices within environmental room walls. Provide a junction box to serve each surface-mounted raceway indicated on Drawings.

RETAIN OR DELETE BELOW IN CONJUNCTION WITH ELECTRICAL ENGINEER. THIS MASTER SPECIFICATION SECTION HAS BEEN PREPARED ASSUMING THAT BELOW WILL BE RETAINED.

- G. Surface Raceways: Provide 2-7/8-inch wide, 1-7/8-inch deep, single-channel, surface mounted, wire raceways complete with base, cover, and duplex receptacle covers.
1. Products: Provide 0.60-inch thick, 6063-T5 alloy aluminum extrusions with a clear satin anodized finish, and including base, cover, fittings, duplex receptacle cover, and other fittings as required for a complete installation.
 - a. ALA 3800 Series; The Wiremold Company.
 - b. SWA3200 Series ; Mono-Systems.

RETAIN OR DELETE BELOW IN CONJUNCTION WITH ELECTRICAL ENGINEER. THIS MASTER SPECIFICATION SECTION HAS BEEN PREPARED ASSUMING THAT BELOW WILL BE RETAINED.

H. Power Receptacles: Duplex receptacles shall be rated 125 volt, 20 amp, 2-pole, 3-wire, NEMA Type 5-20R, specification grade, extra-heavy duty, grounding type, with nylon or Lexan bodies and faces of indicated color.

1. Receptacle Spacing: 24-inches on center, unless otherwise indicated.
2. Circuiting: Feed receptacles from 2 dedicated 20 amp circuits, with adjacent receptacles wired to alternate circuits, unless otherwise indicated.
3. Provide GFCI (ground fault circuit interrupter) receptacles within 6 feet of sink units. GFCI receptacles shall be rated for 2000 amps interrupting capacity and trip in 25 milliseconds or less when ground currents exceed 5 milliamps.
4. Receptacle Face Color:

SELECT DESIRED COLOR BELOW.

- a. Brown.
 - b. Ivory.
 - c. White.
5. Products: Subject to compliance with requirements, provide products of one of the following:
Arrow Hart
Bryant.
Eagle (industrial spec grade only).
Hubbell.
Leviton.
Pass and Seymour.

I. Data Outlets: Where data outlets are indicated on the Drawings furnish and install "standard faceplate bracket" (similar to Panduit #T70DB-X) only. Jacks and final faceplate shall be provided by Owner (ITcom). "Hanging Boxes" are not acceptable.

1. Furnish and install one 1" conduit for data wiring from the surface raceway to a 4"x4" box outside the cold room. Furnish and install nylon pull cord. Box shall be accessible so the Owner (ITcom) so the 1" conduit can be extended to the existing cable tray. All conduits shall have plastic bushings.

PANEL BELOW IS ALWAYS REQUIRED

J. Control Panel: Provide a factory-installed control panel housing temperature and humidity controllers and recorders, as applicable; alarm controls; and other devices requiring periodic adjustment or access by the user. Multiple control panels may be provided where a single control panel is not large enough to accommodate all required devices. Control panel may be standard unit of the Manufacturer of the environmental room, but shall be provided with the following characteristics:

1. Panel Door: Secure, metal-framed unit, with clear, laminated safety-glass window permitting an unobstructed view of all displays, settings, charts, and condition lights when the door is in the closed position.

BELOW IS STANDARD WITH MEDICAL SCHOOL, BUT MAY NOT BE REQUIRED IN ALL CASES. DISCUSS WITH CLIENT.

2. Door Lock: The same keyable, 7-pin tumbler, Best Co. cylinder lock specified for the environmental room door in "Environmental Room Enclosure" Article of this Section.

DISCUSS BELOW WITH ELECTRICAL ENGINEER. THIS APPROACH WILL RESULT IN A CLEAN ELECTRICAL INSTALLATION.

- K. Electrical Panel: Provide a factory-installed electrical panel of single power drop design, rated 208/120V, 3-phase, 4-wire. The ampere ratings shall be suitably sized to meet the power requirements of the controlled environment room, but not less than 60A. Panel shall be of "load center" construction with main lugs only (MLO) and shall include all necessary circuit breakers of the appropriate size and pole number. Branch circuit breakers shall feed all loads including, but not necessarily limited to, receptacles, lighting, evaporator unit, compressor unit, and control panels.

1. Locate the electrical panel as indicated on the Drawings, or if not otherwise indicated, next to the control panel. Roof- or remote-mounted panels are not acceptable. The electrical panel may be incorporated into the control panel, as standard with the Manufacturer.
2. Products: Subject to compliance with requirements, provide products of one of the following:
Cutler-Hammer/Westinghouse.
General Electric.
Siemens.
Square D.

- L. Alarm Systems: Provide the following alarm systems:

BELOW IS STANDARD ALARM APPLICABLE TO BOTH WARM AND COLD ROOMS.

1. Temperature Set point Deviation Alarm: Audible and visible warning device mounted on exterior of environmental room indicating temperature rise or fall outside of design parameters.

DELETE BELOW IF NO COMBINATION COLD ROOM/FREEZER ROOMS.

- a. Provide a separate, distinctly marked alarm for the freezer.

BELOW IS ALARM APPLICABLE COLD ROOMS ONLY. SO FAR, IT HAS BEEN REQUESTED BY MED. SCHOOL ONLY. REVIEW WITH CLIENT FOR INCLUSION IN PROJECT.

2. High-Pressure Refrigeration System Failure Alarm: Audible and visible warning device mounted on exterior of environmental room, and actuating upon failure of the high-pressure refrigeration system. System failure is defined as a 25 percent or greater increase in refrigerant pressure beyond normal operating parameters.

BELOW IS ALARM APPLICABLE COLD ROOMS ONLY. REVIEW WITH CLIENT FOR INCLUSION IN PROJECT. BELOW COULD ALSO BE RE-WRITTEN FOR ELECTRICAL RESISTANCE HEAT IN WARM ROOMS.

3. Compressor Power Failure Alarm: Audible and visible warning device mounted on exterior of environmental room, and actuating upon failure of power supply to the compressor.

DELETE BELOW IF NO FREEZER ROOMS.

4. Manually Activated Personnel Alarm: Provide personnel alarm system in freezer, activated by "mushroom" type emergency push button on interior door jamb (latch side of door). Provide separate audible alarm with distinct tone mounted on exterior of environmental room.

DELETE 2 PARAGRAPHS BELOW IF NO ELEVATED CO2 ROOMS.

5. CO2 Set point Deviation Alarm: Provide audible and visible warning device mounted on exterior of environmental room indicating CO2 set point deviation outside of selected parameters.
6. Automatic CO2 Safety Alarm: Provide personnel safety alarm system in environmental room with time-delay feature. Alarm shall be activated by delay switch connected to pre-set timer. Include both audible and visual alarm indications on exterior of environmental room.

THE FOLLOWING IS AN OPTION. DISCUSS WITH THE OWNER BEFORE INCLUDING IN PROJECT.

7. Trouble Alarm Contact: Provide a general trouble alarm SPDT dry relay contact rated 125 VAC, 5 amps minimum, that actuates upon any of the above alarms for use with Owner's remote alarm system.

DELETE BELOW IF NO FURNISHINGS, OR MODIFY TO SUIT PROJECT.

2.7 FURNISHINGS AND EQUIPMENT

- A. Wall Mounted Shelving: Provide min. 18 gage, AISI Type 302/304 stainless steel wire shelves mounted on manufacturer's standard-and-bracket system with height adjustable in 1-inch increments. Manufacturer's standard units in configurations indicated on drawings.
 1. Size: 14 inches wide by lengths shown on drawings.
 2. Load Capacity: Not less than 50 pounds per lineal foot.
 3. Product: Super Erecta; Metro.
- B. Free-Standing Shelving: Provide free-standing, adjustable-height, wire post-and-shelf system of dimensions and in configuration indicated Drawings. Provide units with components fabricated of AISI Type 302/304 stainless steel. Include necessary fasteners and foot plates for each unit.
 1. Shelves: 14 inches wide by lengths shown on Drawings; position adjustable in 1-inch increments.
 2. Posts: 74-5/8 inches tall.
 3. Product: Super Erecta; Metro.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Field assemble environmental room components following manufacturer's printed instructions.
- B. Provide all required cutting and patching of openings required for mechanical and electrical penetrations of room.
- C. Field plumb and wire the various system components that cannot be factory plumbed and wired. Comply with referenced building codes and requirements of authorities having jurisdiction.

3.2 FIELD TESTING

- A. Perform start-up, functional test, and performance tests not less than 2 weeks prior to conducting training session. Perform tests in the presence, and to the satisfaction, of the Project Representative.
- B. Prepare a written report documenting satisfactory completion of start-up activities, and not less than 2 weeks of recorded data indicating compliance with requirements for maintaining temperature range, including tests of temperature recovery time.

3.3 TRAINING

- A. Provide not less than 8 hours of training, by a qualified manufacturer's technician, for Owner's personnel in the proper operation and maintenance of the controlled environmental room. Training shall include a general operation and maintenance course for the end users, and a detailed operation and maintenance course for the Owner's Plant Department Maintenance and Services group.

END OF SECTION 132100