GENERAL SPECIFICATION

LABORATORY CONTROLLED ENVIRONMENTAL ROOMS

SECTION 13060

1.01 PROVISIONS INCLUDED

A. Included Division _____ and applicable parts of Division _____ for conditions and requirements which may affect the work of this section.

I.02 DESCRIPTION

A. Work of this Section consists of furnishing all labor, materials, equipment and services necessary to complete the controlled environmental room work including, but not limited to the following:

1. Prefabricated, all metal clad construction, furnished and installed as a complete self-contained unit and system, with all essential plenums, controls, balanced air circulation and all other equipment necessary to reach the environmental conditions specified herein. Refer to schedule at end of this section.

2. Factory assembled and tested major components, including air handler, condensing unit and control panels, prior to delivery.

3. Delivery of room components to their final location, and complete assembly of rooms in place.

4. Refrigeration piping, electrical power wiring, control wiring and connections, which are an integral part of the rooms. Main electrical feeds for control panel and condensing unit shall be provided under the work of Division 16.

5. Installation of structures and fixtures supplied by room manufacturer.

6. Start-up and field testing of rooms.

B. Related Work Specified Elsewhere: The following work is not included in this Section and is to be performed under the designated Sections:

1. Section _____, Plumbing: city/DI water supply to boiler and sinks and open drain lines to within five (5) feet of room. Laboratory gases and water services shall be provided for under this referenced section. All penetrations through the environmental structure required by this Section will be provided for by this Section, including vapor seals. Coordinate with environmental room manufacturer.

2. Section _____, Mechanical: condenser water supply and return lines to water cooled condensing unit, including independent shut off valving. Ventilation air to air cooled condensing unit location adequate to maintain ambient conditions less than or equal to 90° F. Consult factory with ventilation concerns.

3. Section _____, Electrical: Electrical services to room control panel and condensing unit contactors. A fused service disconnect switch must be provided as part of the condensing unit service. All penetrations through environmental room structure required by this Section will be provided for by this Section, including vapor seals. Coordinate with environmental room manufacturer.

1.03 QUALITY ASSURANCE

Bidders' Qualifications:

A. Bidders shall have an established organization and factory with production facilities specializing in the type of equipment specified, have an experienced engineering department and an established history of similar installations of equal scope and complexity. A minimum of 200 rooms installed within the past five years is required to indicate competitiveness and familiarity with current state of the art methods and components. Each shall have the demonstrated ability to produce the specified equipment of the required quality and a proven capacity to complete an installation of this size and type within the required time limits.

B. Any deviations from the Specifications, including type of finishes as set forth herein, must be listed in detail, separate from the literature furnished with the bid such that the Architect does not have to expend inordinate time in evaluating competitive bids. In bidding, manufacturers should understand that the right is reserved to reject any and all bids. Any bid will rightfully be construed as being based on supplying the design, construction, and materials called for in this Section of the Specifications.

C. The bidder of rooms under this section is responsible for any alterations to the mechanical or electrical services as scheduled herein or as shown on plans which are necessary to accommodate the manufacturer's product requirement. The bidder shall include in his bid sufficient monies to cover such alterations. No extra charge will be allowed for service alterations after receipt of bid.

D. The environmental room design and installation shall conform to applicable codes, ordinances and regulations governing the use and safety of refrigerants including, but not be limited to, ASHRAE/ANSI standard 15-1992, ARI 420-77, ARI 520-78, NEMA-94.

E. The bidder shall be a manufacturer of environmental rooms which maintains factory parts and service. An extended warranty service contract shall be tendered at least one month prior to the end of the warranty period for consideration and acceptance by the owner.

1.04 SUBMITTALS

A. Shop Drawings: Submit in accordance with the provisions of Section _____, Submittals.

1. Indicate room design and construction features, power requirements, control range, uniformity limits, and all pertinent dimensions.

2. Include service connection information required by other trades.

B. Samples: Submit in accordance with the general requirement of the Specification.

Include instructions for sequential operation, start-up and shut-down, with pertinent control data and schematics, room arrangement, and recommended maintenance of equipment.

C. Operation & Maintenance Manual: Submit in accordance with the general requirements of the Specification. Include instructions for sequential operation, start-up and shut-down, with pertinent control data and schematics, room arrangement, and recommended maintenance of equipment.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Carefully pack and load environmental room components for shipment to project site using all reasonable and customary precautions against damage in transit.

B. Store products off ground, under cover, protected from elements and construction operations.

C. Protect products and exposed finishes during room erection against physical damage or stain.

D. Any room panels or equipment showing signs of damage will be rejected and replaced.

1.06 JOB CONDITIONS

A. Scheduling and Coordination: The room installer shall examine project conditions at the site with regard to access, dimensions, conditions as they exist and the general areas of work, and shall perform work in such a manner as required to deliver, install and connect the rooms in close coordination with work of other trades.

1.07 GUARANTEE/WARRANTY

A. Mechanical refrigeration equipment, parts and labor, shall be guaranteed for a period of one year from the date of room start-up and continuous operation.

B. Prominently place the name of installer/service agency to be contacted during warranty period.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. To establish a standard of quality and design desired, laboratory controlled temperature room drawings and specifications have been based on the products of Harris Environmental Systems, Inc., Andover, MA

2.02 INSTRUMENT AND CONTROL SYSTEMS

A. Main Temperature Control: Microprocessor based Proportional Integral and Derivative (PID) controller designed for environmental room applications with the following features:

1. Resistance Temperature Detector (RTD) 100 ohm platinum sensor for rapid response to temperature fluctuation, open tip for environmental rooms. Sensitivity shall be greater than or equal to ± 0.1° C.

2. The microprocessor PID controller shall continuously monitor room condition versus setpoint, providing an output which will modify the conditioning system capacity in response to any deviation.

3. Controller range shall be established to cover the required range of the room as scheduled.

4. Accuracy ± 0.5% of span typical, ± 1 digit for display at 25° C.

5. Ambient Temperature Error - 0.01% of span per degree C deviation from 25°C.

6. Resolution - 1 degree/unit.

7. Calibration Drift - Self-compensating for ambient temperature. All calibration values shall be stored in memory. No field calibration shall be required.

8. Noise Rejection - Normal mode, 60 dB minimum at 60 Hz.

   Common mode, 90 dB minimum.

9. Controller shall be Honeywell UDC 2000, or equal.

2.03 RELATIVE HUMIDITY

A. Main relative humidity Control: Microprocessor based Proportional Integral and Derivative (PID) controller designed for environmental room applications with the following features:

1. Thin Film or Bulk Capacitance Sensor: Sensitivity shall be greater than or equal to ± 2%.

2. The microprocessor PID controller shall continuously monitor room condition versus setpoint, providing an output which will modify the conditioning system capacity in response to any deviation.

3. Controller range shall be established to cover the required range of the room as scheduled.

4. Accuracy - ± 0.5% span or ± 1 digit for display.

5. Ambient Temperature Error - 0.01% of span per % R.H. deviation from 25° C.

6. Resolution - 1% R.H./unit.

7. Calibration Drift - Self-compensating for ambient temperature. All calibration values shall be stored in memory. No field calibration shall be required.

8. Noise rejection - Normal mode, 60 dB minimum at 60 Hz.

   Common mode, 90 dB minimum.

9. Controller shall be Honeywell UDC-2500 or Allen Bradley MicroLogix 1200 PLC.

C. Alarm and Safety Control System: Equip room with electronic high/low alarm and safety control.

1. Alarm system components:

   a. A PTC sensor electronic temperature control with dual setpoints. Device shall have exposed setpoints in the control panel and shall provide independent high and low alarm outputs.

   b. An alarm circuit board including control relays, solid state circuiting, an alarm buzzer, input/output termination and a "remote alarm" dry contact relay.

   c. Control panel mounted components including the high/low setpoints specified above, high-alarm lights, a "silence" switch which silences the alarm, and a control alarm override switch used to restart the system.

   d. Alarm setpoints shall be visible through an LED readout. No dials, set screws or switches shall be required.

2. Alarm System Functioning:

   a. Alarm circuitry is an "always alive" circuit. Upon deviation in room temperature or power failure to room, the remote alarm relay will close giving a remote signal.

   b. Alarm circuit cannot be shut off. It can be made inoperative by establishing the setpoints too wide and the control portion can be bypassed but it cannot be electrically shut off when room main power switch is on.

c. When room rises above high temperature setpoint, "high" pilot lights, buzzer sounds, and all heat-producing devices shut down including light, fans, and door heat. Remote alarm relay shifts giving a normal open or closed signal. System remains in this state until temperature drops, at which time system automatically resets.

d. The Alarm Buzzer can be silenced for a minimum of 15 minutes and a maximum of 60 by pushing the "silence" switch. When the alarm condition clears, this portion automatically resets ready for next alarm. Silencing alarm does not shut off remote alarm. At the conclusion of the timed sequence the buzzer will sound again unless the room is again within design parameters.

e. When room drops below setpoint, "low" pilot lights, buzzer sounds, and power to all cold-producing components including refrigeration solenoids is removed. Remote alarm relay shifts giving a normal open or closed signal. System operates as specified herein for override, silencing, etc.

f. The "override" switch on the alarm control is designed to temporarily bypass the alarm system in an effort to regain room control. In the event that an alarm condition is caused by a prolonged door opening or power failure, this function will allow power to all drives in an attempt to regain performance. If the room has not reached setpoint within (15) minutes, the alarm will sound and the system shall operate as described above under high/low alarm. During the 15 minute override, the audio/ visual alarm indicators will be off.

D. Control Panel:

1. Install all instruments, controls, and major electrical components in a surface mounted painted steel combination control enclosure adjacent to room door. Enclosure shall be of welded construction. Exposed screws or rivets will not be allowed. Control Panel must be tested and accepted per UL 508 standard

2. Provide control panel with easy access service door for front servicing of major electrical and instrument components.

3. Provide recessed control center at panel front protected with a hinged acrylic cover with lock to prevent unauthorized adjustments.

4. In addition to control instruments, panel shall contain all circuit fusing, timers, switches, pilot lights, main and safety controls, alarms, and all other devices required for system operation.

5. Label all control functions with descriptive nameplates or lenses on control panel face.

6. Mount a complete schematic of entire control system on inside face of control panel.

E. Temperature Recorder: Provide a 10" electronic chart recorder, having a seven day chart revolution in control panel. Recorder shall have a 100 ohm platinum RTD sensor. One recording pen shall be utilized, and pens shall be felt tip throw-away type. Add second pen for rooms with humidity control. Recorder shall be Honeywell DR-4300 GP or equal with accuracy of ±.5% of span with a maximum chart range of 55°C to allow for accurate temperature reading.

2.04 ROOM SHELL MATERIALS

A. Wall and roof panels shall be manufactured from the panel construction specified below:

1. Foam-In-Place Isocyanurate Panels:

a. Interior and exterior skin shall be a minimum of .032" thick white painted aluminum, prepainted with two coats of white polyester or modified epoxy enamel. Panel insulation shall be foamed-in-place isocyanurate insulation providing a "K" factor of 0.118 Btu/hour/square foot/degree Fahrenheit/inch of thickness. Insulation shall bond the panel and shall have a minimum compressive strength of 28 pounds per square inch. Sections shall match without distortion and shall be aligned by tongue and groove joint, fastened by cam lock devices, maximum 46" apart. All foam shall be Class I.

b. Walls shall be a minimum of 3" thick, and a maximum of 4" thick.

c. Roof panels shall be a minimum of 3" thick, and a maximum of 4" thick.

2. Flame-Resistance Characteristics: Not exceeding a rating of 25, when tested per ASTM E84 for standard time period (10 minutes)

B. Doors:

1. Construction: Identical to wall panels with baked epoxy finish.

2. Size: 80" high x 36" wide clear opening.

3. Heaters: Furnish on both door and door jambs of rooms operating below 10 degrees C. Heaters shall be replaceable without removing door or jamb.

4. Windows: Equip doors with 2-lite hermetically sealed windows either 14" x 14”" or standard manufactured size of equal area..

6. Door Hardware: Chrome-plated, die cast, self-closing hinges, magnetic latch assemblies, inside safety release.

C. Filler Panels: Where indicated, provide fillers on exposed faces of rooms from top of room to finished ceiling line, and elsewhere as required to present a neat, finished installation. Baked epoxy finish on filler and fascia panels shall match room panel finish.

D. Floors: Similar to wall construction, minimum 3" and a maximum of 4" thick, consisting of the following components:

1. 16 gauge galvinized steel bottom layer.

2. High Density Urethane insulation.

3. 16 gauge galvanized steel to allow an evenly distributed load of 500 lbs/sq. ft.

E. Alternate Floor Panels: Same as specified above for wall/roof panels, except use 14 ga. galvanized steel for exposed panel facings. Coordinate with other construction components of prefabricated rooms; include underlayment as required to prevent telegraphing of floor construction and excessive wear of floor finish. Fabricate to support the following loading.

- 600 lbs. per sq. ft., uniformly distributed.

- Provide ramps where located on the drawings.

F. Observation Windows: Excluding observation window in door, provide three lite hermetically sealed observation window panels as shown on drawings.

2.05 MECHANICAL SYSTEM : COLD ROOMS / WARM ROOMS

A. Design:

1. Refrigeration System: Complete integrated system consisting of an evaporator and condensing unit designed to operate continuously. Cooling output on demand proportioning basis in relation to the desired temperature control point. System capacity shall be sufficient to meet simultaneously:

   a) Performance test requirements included in the Execution Section of this specification.

   b) Additional internal heat gain generated by user equipment to a maximum of 10 watts per sq.ft. gross floor area with room lights on.

2. Defrost System: Shall be a hot gas system. Equip timer with fan delay switch. Design system to operate without defrost period when room is operated above 5°C to permit continuous operation. Room temperature rise shall not exceed 5°C above setpoint. The defrost period shall be adjustable but not to exceed fifteen minutes.

B. Components:

1. Environmental Room Evaporator Unit:

   a) Coil: Copper tube, aluminum fin design with aluminum housing; minimum 8 fins per inch, minimum four rows deep. Air velocity shall be less than 500 FPM.

   b) Evaporators shall be located within a pressurized supply plenum designed to uniformly distribute air throughout the room space for achieving specified uniformities. All fan motors shall be sealed type requiring no maintenance. Motors shall be sized with sufficient horsepower and static potential required to create a positive pressure supply plenum.

   c) Heating Coil (If Applicable): In order to operate at conditions above 20°C, the room shall be equipped with electric heaters integrated into the air flow system. The heaters shall be stainless steel sheathed with stainless steel fins and shall have thermal safeties attached to protect the heater. Heat shall be controlled at the control panel in a manner to give control to the desired level.

2. Condensing Unit: Water cooled or air cooled with semi-hermetic serviceable compressor, and spring mounted. Equip each condensing unit with:

    a) High /low pressure control.

    b) Vibration eliminating devices on suction and discharge lines.

    c) Fusible plug.

    d) Liquid line dryer.

    e) Moisture indicating sight glass.

    f) Suction line filter.

    g) Magnetic contactor on all three phase units.

    h) All other safety mechanical devices required.

    i) Select refrigerant to give optimum operation considering evaporating and condensing temperatures. Refrigerant shall conform to latest protocol concerning its use based on ozone depletion potential.

    j) Air cooled and/or water cooled condensers as indicated on the environmental room schedule furnished herein shall be manufactured and be properly matched to compressors determined by condensing unit manufacturer.

3. Refrigeration Piping: ACR type, hard drawn, cleaned and capped Type L copper tubing soldered with silver solder, except hot gas lines which shall be silver or silfos brazed. All lines shall be installed to allow for linear expansion of copper after start-up.

    a) Suction Lines: Size for velocity of 500-700 FPM on horizontal runs and show a slight pitch toward condensing unit. When condensing unit is located below evaporator, and there is no possibility of trapping oil, size vertical runs same as horizontal runs. When condensing unit is located above evaporator, size vertical runs for velocity of 1,000-1,500 FPM and install proper (shallow) "P" traps spaced not over 15' apart on all tubing risers.

b) Hot Gas Lines: When hot gas lines are field installed remote from compressor, size tubing at same velocities and with same "P" trap requirements as specified above for suction lines.

c) Liquid Lines: Size all liquid lines for maximum 2 PSIG pressure drop.

d) Hangers: F & M ring type or Unistrut assemblies with appropriate tubing clamps to support liquid, suction, and discharge lines individually. Space hangers or clamps 8' o.c. maximum.

e) Condensate Drain Piping: 7/8" O.D., or greater, Type L copper tubing piped from evaporators to open floor drain, rigidly supported at walls 3' o.c. maximum, installed in such a manner that leaves 1" clearance space between wall and drain, and equipped with cleanout tee near evaporator. Adequately pitch piping toward floor drain, carry through wall of refrigerated areas properly trapped and discharged within 2' of floor drain. Provide chrome plated escutcheons on both sides of wall penetrations.

f) Refrigerant Testing: Pressurize and leak test entire system at not less than 100 PSIG, clean and dehydrate by maintaining a vacuum of 500 microns or lower for a five hour period. Add required charge of refrigerant, and oil if necessary, and test entire system for performance. Mark each system clearly as to refrigerant type used.

4. Insulation: Fire retardant Armstrong "Armaflex Insulation" or equal for insulating refrigeration suction lines. Use minimum 1/2" thick wall; apply during tubing assembly wherever possible.

5. Humidifier: In the absence of a low pressure year round building steam system the following shall be provided.

a) Furnish an electric steam generator, depending on application. The heating elements shall be controlled by SCR with time proportioned signal from controller. Vapor shall be distributed directly to the manifold located at the fan unit.

b) Stainless Steel Construction: Vaporizing chamber, cover and fittings shall be constructed of stainless steel with heli-arc welded seams capable of continuous use with up to 18 Megohm deionized water.

c) Immersion Heater(s): Heater(s) shall be INCOLOY alloy sheathed resistance type heater(s) designed for up to 90 watts

per sq. in. They shall be threaded and screwed into the front face plate of the humidifier thus providing for convenient removal for inspection.

d) Mechanical/Electronic Water Level Control: Mechanical/electronic water level control system shall provide for automatic refill, low water cut off of humidifier. System shall consist of: A stainless steel float operated water make-up valve and a stainless steel float operated low water cut off switch. Both components shall be mounted on a gasketed plate which can be easily removed for inspection and servicing of same.

e) Optionally, steam boiler shall be designed to operate using a D.I. water feed. Water quality shall be 100% chloride free and available continuously at a minimum of 30 PSIG supply pressure.

6. Dehumidifier:

a) Latent refrigeration coils or desiccant dehumidifiers shall be installed for stripping make up air and controlling humidity levels. Equipment shall be sized and controlled to avoid excessive stripping causing the boiler to run excessively. For dewpoints below 45ºF, an industrial desiccant dehumidifier must be used.

b) The desiccant dehumidifier shall be of the non-cycling sorption type with a single desiccant rotary structure. The casing will be fabricated as a unitized body with aluminum construction for maximum strength and durability. Suitable access panels on both sides of the unit shall allow access for inspection or servicing without disconnecting ducting or electrical wiring. Air flow balancing dampers to be furnished. The dehumidifier shall be designed for continuous operation.

c) The desiccant wheel is a bacteriostatic inert structure impregnated with a desiccant that will not channel, break down, or emit a measurable carryover. Air seals between reactivation and process air circuits are a contact type, seal requiring no adjustment of process or reactivation air pressures to prevent leakage. The unit shall be factory assembled, complete with desiccant wheel, reactivation heaters, reactivation energy control system, blowers, contact seals and all wiring completed to NEC.

d) A supply and exhaust duct shall be provided by Division 15 for dehumidifier reactivation air.

2.06 ROOM INTERIORS

A. General: A complete aesthetic environment shall be achieved with design consideration given to items such as: minimum lighting levels, maximum working volume air movement rate, interior sound levels, light reflectance characteristics of finishes, and maintenance and ease of underfoot considerations for floor covering. As indicated on the equipment schedules the room shall be furnished with accessories such as shelving, counters, sinks, electrical outlets, etc.

B. Ceiling Plenum: Provide uniform air circulation and distribution system throughout the environmental room utilizing a plenum ceiling and a room perimeter slot diffuser, with return air to conditioning system through plenum return grille. Plenum to also house lighting troffers, make-up air fan, refrigeration devices, etc. Clearance below finish ceiling plenum within room work area shall be unobstructed.

1. Ceiling Materials: Anodized aluminum exposed tee ceiling grid with minimum 5/8" thick vinyl coated, white aluminum foil surfaced lay-in acoustical panels having a minimum noise reduction co-efficient (NRC) of 0.55 to 0.65 for perforated tiles (NRC is negligible for non perforated tiles).

2. Lighting: Interior 2' x 4' troffer fluorescent lighting fixtures with solid state ballasts in quantity to provide 70 footcandles evenly distributed at operating temperatures.

3. Warm Rooms: Shall utilize low return air walls for returning air to evaporator units where required to meet performance criteria.

C. Floor Covering: Armstrong Vinyl Corlon, inlaid type having temperature stability including dimensional stability including dimensional stability and flexibility from -40°C to +60°C. Flooring shall be smooth, free of ribs or patterns. Wear characteristics shall exceed rubber, and flooring shall require no maintenance except cleaning with detergent and water.

2.07 ROOM SERVICES

A. Electrical Power and Lighting Supply: As specified under Section _____, Electrical, fed to room control panel and condensing unit. The condensing unit contactors must be fed through a fusible disconnect switch (furnished by Div. 16). All feeds must be connected to condensing units and control panels by Div. 16.

B. Water Supply and Drain for Condensing Unit: As specified under Section _____, Plumbing, or Section Mechanical, shall be provided within 5' of unit. Supply and return lines shall be provided with shut off valves.

C. A D.I. water supply and waste for the steam generator shall be provided under the work of Div. 15. D.I. water shall be provided at a min. pressure of 30 PSIG. A flow of 4 G.P.H. shall be provided. D.I. supply and drain shall be supplied and connected to boiler by Div. 15.

PART 3 - EXECUTION

3.01 INSPECTION

A. Examine and verify areas and work of other trades for:

1. Correct dimensions.

2. Properly located electrical services.

B. Report any unsatisfactory conditions to Architect in writing.

C. Do not proceed with installations until unsatisfactory conditions have been corrected and conform to project requirements.

3.02 INSTALLATION

A. Install environmental rooms in accordance with the accepted manufacturer's recommendations, and approved shop drawings.

B. Install all components straight, plumb level and true. Install all service lines at right angles to walls and floors, except where required to pitch to drains.

C. Seal or otherwise insure that fastenings to rooms do not compromise vapor barriers or insulation. Seal between all piping and sleeves.

D. Provide and install filler panels to close off spaces between tops of rooms and ceiling of surrounding area. Fillers should extend to underside of construction above if necessary.

3.03 PERFORMANCE TEST

A. Provide all equipment for testing and perform all tests. Tests shall confirm that rooms conform to the following requirements:

1. Temperature control of ±0.5°C shall be the temperature at the sensing RTD and shall be the total variation in the temperature control of the room. It should not be confused with temperature uniformity as noted below.

2. Temperature uniformity of ± 0.5°C refers to the temperature as measured on a horizontal plane 40" above floor and within 12" of walls throughout the entire room. Uniformity shall be measured by a multipoint strip chart recorder utilizing a minimum of twelve (12) thermocouples during a continuous 24-hour test period. Gradient from floor to ceiling shall be 1°C.

3. Room shall recover preset operating temperature within five (5) minutes after door has been fully opened to 75° F ambient for a period of one full minute.

B. Owner's representatives shall be given the option of witnessing and confirming test results. Notify owners' representative in writing prior to test.

4.01 PART IV - ACCESSORIES

A. Shelving: Furnish and install where shown on drawings InterMetro Industries Corp. Metro Supererecta shelving. Utilize manufacturer's standard dimensions. All shelves shall be open wire 14" wide x designated lengths in the required finish. (Finishes available are coated steel, stainless steel, chrome, etc.)

1. Wall mounted type shelving shall include post type mounts with standard and mid unit, each composed of plated BES brackets and plated BSC intermediate brackets or posts as required for shelving quantities indicated. Brackets shall be mounted on 3-1/2" x 5/8" deep anodized aluminum channels mounted horizontally to vertical panel joints at appropriate heights and spacing to match Metro mounting brackets. Each horizontally mounted channel shall run continuously between vertical panel joint extrusions. Provide shelf supports for post mounting and utilize both single and double shelf supports where practical.

B. Electrical Outlets: Furnish and install where shown on drawings, wiremold, surface mounted metal raceways and fittings. Utilize manufacturer's G 3000 Series base and covers with gray painted finish. Outlets shall be duplex type receptacles spaced .24" o.c. Outlet circuits shall be 3-wire grounded, 15 amp, 115 volt rated.

Circuit protection shall be housed in room central panel utilizing proper fusing. Ground fault circuit breakers shall not be used. Installation shall be

done in a workmanlike manner and in accordance with National Electric Code.