

SECTION 13 21 26
COLD STORAGE ROOMS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Controlled, prefabricated, cold room including all metal clad construction, provided as a complete self-contained system, with plenums, controls, balanced air circulation, and other necessary equipment.
- B. Factory testing of major components including but not limited to air handler, condensing unit, and control panels.
- C. Refrigerant piping, electrical wiring, control wiring, and connections which are integral to rooms.
- D. Start-up and field-testing of rooms.

1.2 RELATED SECTIONS

- A. Division 23 - Mechanical: Final connections from room condensate lines to drains.
- B. Division 26 - Electrical: Coordination of conduit entry locations. Connection of power receptacles inside controlled temperature rooms. Wiring of room receptacles through each control console in case of an alarm so that if alarm goes off, then room receptacles will shut off. Provision of power to cold room control console and refrigeration condensing units. Plugmold.

1.3 PERFORMANCE REQUIREMENTS

- A. Cold Room Temperature:
 - 1. Temperature as measured uniformly using a multi-point strip chart using a minimum of 12 thermocouples during a continuous 24-hour test period: 4 degrees C with a uniformity of +/- 0.5 degrees C as measured on a horizontal plane 40" AFF and within 12" of walls throughout room.
 - 2. Maximum gradient of 1.0 degrees C (maximum variation between any 2 points in room).
- C. Provide unit with temperature control of plus or minus 0.2° C at sensing RTD.
- D. Room shall recover preset operating temperature with 5 minutes after door has been fully opened to 75 degrees F ambient for a period of one minute.

1.4 DEFINITIONS

- A. Temperature Gradient: Maximum temperature difference between any two points in room.

1.5 SUBMITTALS FOR REVIEW

- A. Submittals: Follow Section 01 33 23.
- B. Shop Drawings: Provide in large scale detail, drawings of fabricated equipment showing construction methods, type and gage of metal, hardware and fittings, with plan, front elevation and a minimum of one cross section. Show complicated parts of typical items in a cut away perspective. Show service connections, characteristics and wiring diagrams for control systems.
- C. Product Data: Submit brochures showing name and address of manufacturer, catalog or model number of each item incorporated into work.
- D. Samples: Submit one sample minimum size 3 x 6 inches in size illustrating color of each material.
- E. Operation & Maintenance Manual: Include instructions for sequential operation, start-up and shut-down, with pertinent control data and schematics, room arrangement, and recommended maintenance of equipment.

1.6 QUALITY ASSURANCE

- A. Manufacturer: Company specializing in manufacturing products of this Section with ten (10) years experience.
 - 1. Single Source Responsibility: Provide products of this Section from same manufacturer.
- B. Installer: Company specializing in installing products of this Section with three years experience approved by manufacturer.
 - 3. Installer shall have a permanent service organization maintained or trained by manufacturer that shall render satisfactory service within 24 hours of receipt of notification that service is needed.

1.7 REGULATORY REQUIREMENTS

- A. Meet standards of National Institutes of Health (NIH) Design Guidelines, National Sanitation Foundation (NSF), ASHRAE/ANSI standard 15-1992, ARI 420-77, ARI 520-78, and NEMA-94.
- B. Electrical Wiring and Components and Self-Contained Refrigeration Systems: Conform to Underwriter's Laboratories Standards.

1.8 PRE-INSTALLATION CONFERENCE

- A. Convene a pre-installation conference one week before commencing work of this Section according to Section 01 33 23.
- B. Require attendance of parties directly affecting work of this Section.
- C. Review conditions of installation, installation procedures and coordination with related work.

1.9 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store and protect products.

- B. Lay panels and flat sections, flat and blocked, clear of floor to prevent warping, twisting or sagging.
- C. Coordinate size of access and route to place of installation.

1.10 SPECIAL WARRANTY

- A. Provide manufacturer's warranty according to Section 01700.
 - 1. Mechanical Refrigeration Compressors: Five (5) years.
 - 2. Panels and Room Construction: Ten (10) years.
- B. Warranty: Include coverage of scheduled equipment, including disconnection of defective unit and connection of replacement unit.

PART 2 - PRODUCTS

2.1 GENERAL CONSTRUCTION

- A. Overall Dimensions:
 - 1. Outside Dimensions: 9'-2" x 12'-4"
 - 2. Overall Height: 9'-6"
 - 3. Inside Room Dimensions: 9'-0" wide x 14'-4" deep x 9'-0" high.
 - 4. Ceiling Height: Minimum 6'-10" ceiling height inside box.
- B. Shell Construction
 - 1. Fabricate double-wall, modular panel modules from precision die cut formed, 0.032" minimum stucco (or embossed) finish, tempered aluminum interior and exterior pans with interiors coated with adhesive which creates a stable bond with insulation when foamed in place. Factory-prepared, paint sprayed and baked finish with two coats of polyester or modified epoxy enamel. Structural metal, wood, or fiberglass is not permitted between interior and exterior skins.
 - 2. Wall Panels: Prefabricated aluminum panels assembled from standard size modules, 90 degree angle corner sections; insulated; 4" thick. Provide panels with gaskets to insure proper seal of tongue and groove panels. Provide blocking in walls as required for support of shelving and other wall-supported items.
 - 3. Roof Panels: Prefabricated aluminum panels assembled from standard size modules, 90 degree angle corner sections; insulated; 4" thick. Provide panels with gaskets to insure proper seal of tongue and groove panels. Reinforce roof panels to support a uniform load of 40 psf in addition to concentrated loads from equipment. Reinforcement shall not violate insulation value of panels.
 - 4. Floor: Galvanized steel plate; 14 gage; to support a uniformly distributed load of 600 psf minimum; insulated, 2" thick.
 - 5. Ramp: ADA compliant, aluminum diamond plate; 36" wide by 24" deep for transition back to regular floor.

6. Floor Covering: Neoprene or PVC, 3/16" minimum thick, gray, floor matting; dimensionally stable from 60° F to -20° F; seamless or welded seams; 3'-0" runner to cover aisle width; color as selected by Contracting Officer from manufacturer's standard range.
7. Fasteners: Assemble panels using linear tempered anodized aluminum extrusions, which grab and pull together; forming inherently tight seals. Fasteners shall provide a sheath type closure over full length of joined panel sections.
8. Seal junctures of wall panels and other wall panels and between wall panels and roof panels. Seal service line penetrations into rooms with silicon sealant.
9. Panels shall have a flame spread rating of 25 or less with a certifying Underwriter's Laboratory label on each panel.

C. Door:

1. Minimum 36" wide x 78" high x 4" thick; prefabricated aluminum, with a 3-lite, hermetically sealed, heated, insulated glass view window, 14" x 24" minimum size.
 2. Provide sections with in-fitting, flush mounted doors as required, with swing as shown. Door shall be constructed of same metal, interior and exterior, as section to which it is attached. Insulate door with foamed-in-place insulation with thermal resistance to within 10% of wall panels.
 3. Hardware: Each door shall have minimum two, adjustable hinges, cam-lift, self-closing type, equipped with stainless steel pins and cam type nylon bearings. Positive-type latch shall be furnished with an inside safety release. Door hardware shall be brass, forged, chrome plated.
 4. Mount a thermoplastic gasket, with a magnetic core, on inner edge of door, along both sides and top to assure a tight closure and positive seal. Equip bottom edge of door with an adjustable double wiper gasket. These gaskets shall be resistant to water, sunlight, oils and fats and shall be readily replaceable without use of tools.
 5. Provide U.L. approved anti-sweat heater wires behind metal edge around entire perimeter of door jamb, to prevent accumulation of condensation or formation of frost on units operating below 5 degrees C.
 6. Door panel shall carry approval of Underwriters Laboratory.
- D. Ceiling: Provide a removable plastic, ½" x ½", 2'-0" x 4'-0" "egg crate" drop ceiling including 15/16" anodized aluminum grid, all necessary hangers, connectors, and related items, required for a complete

installation. Provide seismic type clip system. Polystyrene materials will not be acceptable.

E. Filler Panels: Provide minimum 0.032" thick aluminum filler panels on exposed faces of rooms to adjacent finished surfaces, and elsewhere as required to present a neat, finished installation. Finish shall match room panel finish. Install with concealed fasteners.

F. Panel Locking Devices:

1. Cam-action locking devices shall be precisely positioned and firmly anchored in each molding fixture at edges, not to exceed 48" apart. This device shall consist of a cam-action rotating locking arm in tongue edge, to engage a steel rod receiving section in groove edge to draw sections together into a tight unit.
2. Each section of locking device shall have sufficient surface to assure permanent, rigid anchoring when bonded by urethane foam, without need of additional anchorage arrangements. Metal sides of each section shall flange out at end to provide additional anchorage and stability when locked in by foam.
3. Perform section locking from interior by means of a hex wrench furnished with walk-in. Provide press-fit 1/2" caps to conceal wrench holes.

G. Insulation:

1. Insulation shall be CFC-free, rigid, foamed-in-place polyurethane or polyisocyanurate; same thickness as room panels.
 - a. Overall density: 2.0 psf minimum
 - b. Compressive strength: 28 psi minimum
 - c. U-Factor: 0.032 max (R-32 minimum).
2. Foam insulation between metal pans of each module while they are held in precise position in a precision molding fixture of tool steel, providing uniformity in dimensions. Technique used in foaming insulation shall be such as shall insure uniform and complete filling of cavity, without voids.
3. A projecting tongue of insulation shall be extruded along one edge of each module, with a precisely conforming groove formed on matching edge of next module, to provide tight, continuing contact and seal of insulation along assembly areas of unit.

2.2 MECHANICAL SYSTEMS

A. General

1. Ventilation: Provide minimum 20 cfm, filtered ventilation make-up air to each cold room. Position air inlet so that air passes through air

- conditioning plenum before entering work area. Locate exhaust as far as practical from inlet.
2. All rooms shall be under positive pressure relative to adjacent spaces.
 3. Room mechanical equipment and building utilities shall be readily accessible with disruption of cold room internal functions. Motors shall be serviceable from inside room. Air-cooled condensing units and related equipment shall be located outdoors on the roof.
 4. Provide vent air outlet and collar for same.
- B. Refrigeration System: Provide a self-contained refrigeration system of capacity, air-delivery, dimensions and electrical characteristics as required to run continuously and to maintain specified environmental conditions. System shall be sealed and fully automatic in operation.
1. Coils: Copper tube, aluminum fin design with aluminum housing, air velocity 500 fpm maximum. Refrigeration coils to be low velocity and low profile. Include blowers, coils, refrigeration package, compressor, evaporation, heaters and necessary tubing and piping. Compressors are to be remote and mounted on commercial grade isolators at location shown on Drawings.
 2. Main temperature controller shall be a solid state pressure system. High limit controlling thermostat to project temperature overshoot is included. Provide both audible and visual high/low temperature alarms. Insure alarms sound locally and in Boiler Plant control room.
 3. Provide Time-Proportioning PID control for refrigeration.
 4. In addition to requirements indicated elsewhere, provide system that will accommodate an additional internal heat gain generated by user equipment to a maximum of 10 watts per square foot of room area with lights on.
 5. 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. Install lines to allow for linear expansion of copper after start-up. Size suction lines for 500 - 700 fpm velocity on horizontal runs and show a slight pitch toward condensing unit.
 6. Provide oil traps in vertical suction lines to insure oil return to compressor. If necessary, provide double suction risers to maintain oil flow.
 7. Insulation: Fire retardant Armstrong "Armaflex Insulation" or approved substitution for insulating refrigeration suction lines; minimum 1/2" thick wall; apply during tubing assembly wherever possible.

- C. Defrost System: Hot gas system with automatic blowers controlled by microprocessor temperature controller. Except for freezers, design systems 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 set point. Defrost period shall be adjustable but not to exceed 15 minutes. For freezers, provide electric defrost, drain pan heat, and drain line heat trace.
- D. Evaporator Coil Unit: 6 FPI, 13,500 BTUH, three 2,100 CFM fans, 1/15 HP, air-defrost type with shaded pole motor.
 - 1. Located in pressurized supply plenum designed to distribute air throughout room for achieving indicated uniformities. Provide sealed fan motors requiring no maintenance. Size motors with enough horsepower and static potential to create a positive pressure supply plenum.
- E. Condensing Unit System: Two-phase direct expansion type designed to operate continuously using a refrigeration bypass system control. System shall provide temperature control through continuous mixing of liquid and hot gas phase of refrigerant entering evaporator. Cycling compressor systems will not be acceptable.
 - 1. Air-cooled, spring mounted with 2 HP, 208V, 3-phase, semi-hermetic serviceable compressor; high/low pressure control; vibration eliminating devices on suction and discharge lines; fusible plug; liquid line dryer; moisture indicating sight glass; suction line filter; temperature, pressure, and current safety devices.
 - 2. Provide outdoor air-cooled self-contained condensing units with head pressure control.
 - 3. Where located outdoors, provide units with protective weather enclosures, cold weather enclosures, cold weather package, and disconnect.
- F. Condensate: Provide aluminum drain pan with drain line. Provide 7/8" o.d. minimum, Type L copper condensate lines routed out of each chamber and terminate at condensate drains located adjacent to each chamber. Equip condensate lines with clean out tee near evaporator. Pitch lines toward drain. Provide chrome-plated escutcheons on both sides of wall penetrations.
- G. Refrigerant: R-404A.

2.3 INSTRUMENTS AND CONTROL SYSTEMS

- A. Control Logic: All control relay type logic shall be accomplished with a microprocessor PLC module. Each on-off function shall be readily monitored by LCD indicators. PLC shall be programmed using a PC computer

interface or hand held programming module with friendly software language.

B. Control Panel:

1. All operating controls, instrumentation, functional switches, and control systems shall be located at a single control panel center next to door mounted at operator eye level.
2. All operating modes and functions shall be clearly indicated by pilot lights and legibly identified by silk screened legends.
3. Functional switches and all operational control settings shall be mounted in a recessed area of enclosure behind a lockable, hinged, transparent cover to protect against accidental mis-adjustment and unauthorized tampering.
4. Recessed control panel section shall be hinged for easy opening by authorized maintenance personnel. Once this panel is swung open and top section of control center is removed, all relays, contactors, and other enclosed control circuit devices shall be readily exposed for simple maintenance purposed.
5. Mount a complete schematic of entire control system on inside face of control panel.

C. Main Temperature Control: Microprocessor based, solid state, proportional, electronic controller, which uses a precision, 100 ohm, platinum resistance thermometer (RTD) for sensing; capable of both Celsius and Fahrenheit operation. Provide an RS-232 interface port for both time and computer (host) data logging.

1. Automatic reset and rate functions shall be incorporated to compensate for error due to load variations.
2. Operating temperatures shall be adjustable and set by up and down indicator buttons; value is displayed by a digital panel meter; actual temperature shall be displayed on a large, bright, digital read-out.
3. System shall have setting and reading temperature tolerance of plus or minus 0.1 degree C.
4. Profile Programmer control system shall include a microprocessor based set point vs. time profile programmer, providing an output which will modify conditioning system capacity in response to deviations.
5. Controller range shall be established to cover room's required range as indicated.
6. Accuracy: Plus or minus 0.5% of span typical; plus or minus 1 digit for display at 25° C.

7. Ambient Temperature Error: Minus 0.01% of span per degree C from 25° C.
 8. Resolution: 1 degree/unit.
 9. Calibration Drift: Self-compensating for ambient temperature.
Calibration values shall be stored in memory. No field calibration shall be required.
 10. Noise Rejection: Normal mode, 60 dB minimum at 60 Hz. Common mode, 90 dB minimum.
 11. Manufacturer: Honeywell "UDC 2000" or approved substitution.
- D. Temperature Safety Limit Alarms: Besides main temperature control system described above, provide over and under temperature alarm system on control panel. This alarm system shall be completely independent of main controller and shall activate if room temperature control point deviates out of tolerance in either direction.
1. System shall contain separate high and low alarm set-point and dials shall be calibrated directly in degrees Celsius with 1° divisions.
 2. Alarm system shall be adjustable over full range of room. If an alarm is activated, an audible alarm shall sound and a "High Temp" or "Low Temp" indicator shall be illuminated.
 3. Alarm shall sound until acknowledged by operator by depressing a reset button. Alarm buzzer can be silenced for a minimum of 15 minutes and a maximum of 60 by pushing the "silence" switch. When alarm system clears, this portion automatically resets for next alarm condition. Silencing alarm does not shut off remote alarm. At conclusion of timed sequence, buzzer sounds again unless room is again within design parameters.
 4. If high alarm is activated, power to room heaters and other heat-producing devices shall automatically be cut off from conditioned space. System remains in this state until temperature drops, at which time system automatically resets.
 5. Low Alarm shall deactivate cooling valves, lights "low" pilot, and sounds buzzer. Power to cold-producing components including refrigeration solenoids is removed. Remote alarm relay shifts giving a normal open or closed signal. System operates as indicated herein for override, silencing, and similar features.
 6. Remote Contacts: Alarm circuitry is an "always alive" circuit. Isolated contacts shall be available for connection to building alarm monitor equipment to give remote signal in event of either high or low alarm actuation.

7. Power Failure Alarm: A rechargeable battery operated power failure alarm shall be included that shall give both audible and visual signals if power is cut off from cold room.
 8. Inside "Panic" Alarm shall consist of a red "mushroom head" type push-button located inside room near door. When pressed, this button shall sound an alarm outside cold room.
 9. Provide override switch in alarm control designed to temporarily bypass alarm system in an effort to regain room control. If an alarm conditions caused by a prolonged door opening or power failure, this function will allow power to all drives in an attempt to regain performance. If room, has not reached set point with 15 minutes, then alarm will sound and system shall operate as described under high/low alarm. During 15 minute override, audio/visual alarm indicators will be off.
- E. Recorder: Provide a synchronous, motor-driven circular chart recorder to continuously indicate control conditions within room. Recorder shall be microprocessor-based and programmable to achieve proper parameter ranges and time bases; 10" diameter; seven-day chart; calibrated in Centigrade.
1. One recorder pen for temperature, felt tip throw-away type.
 2. Span: From -5 to 50 degrees C and an accuracy of plus/minus 1% of span.
 3. Manufacturer: Honeywell "DR 4301," "DR 4200 GP," "DR 4300," "DR-4300-1," or approved substitution.
- F. Leak Detector: Two sensor monitor with two level detection to monitor refrigerant; volt-free switching contact; 10A, 120V, green power LED, 90dB alarm, constant power on and fault monitoring; automatic reset on low level, manual on high level.
- G. Tie cold room into VA's wireless refrigeration system. The software used for the system is 'CheckPoint" by Medical Resources. The actual wireless device will be purchased by the VA. Provide port for VA's temperature monitoring devices.

2.4 ROOM SERVICES

- A. Electrical
1. Lighting: Rapid start T5 fluorescent; ambient illumination of 70 fc minimum at 40 inches above finished floor; two low-temperature fixtures, totally enclosed, fully-gasketed, rapid-start, UL-approved light fixtures with acrylic diffusers; each fixture to contain four 4'-0" long ballasted, cool-white lamps, operated from exterior by a pre-wired toggle switch with pilot light; suitable for ambient

- temperatures anticipated. Provide zero degree electronic ballasts with less than 10% THD.
2. Provide a power outlet box for 115/125 volt, 60 cycle, single phase AC service for connection; suitably weatherproof for ambient temperatures anticipated.
 3. Provide a recessed horizontal junction box for plugmold.
 4. Locate conduits in walls; do not surface mount conduits.
 5. Provide power to cold room control panel and remote condensers under provisions of Division 26.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Verify ventilation outlets, utility and electrical service connections and supports are correct and in required location.
- B. Ensure floors and walls are within tolerance for subsequent equipment installation. Correct out-of-tolerance conditions to suit equipment's installation requirements.
- C. Beginning of installation means acceptance of existing conditions.

3.2 INSTALLATION

- A. Provide inserts and anchors built into other work for support of this work. Ensure that these items are installed in their proper location. Include fastening devices required to attach work. Use proper anchoring devices for materials encountered and usage expected.
- B. Install items according to manufacturers' instructions. Insulate to prevent electrolysis between dissimilar metals.
- C. Weld joints in stainless steel work tight, without open seams, where necessary because of limitations of sheet size or installation requirements. Remove and replace equipment creating noise or vibration.
- D. Sequence installation and erection to ensure mechanical and electrical connections are affected in an orderly and expeditious manner. Cut, fit and patch where necessary. Coordinate work fully with other trades involved.
- E. Leak Detectors: Locate one sensor in cold room and the other in electrical communications closet.

3.3 ADJUSTING AND CLEANING

- A. Adjust equipment and apparatus to ensure proper working order and conditions. Remove masking/protection from stainless steel and other finished surfaces.
- B. Wash and clean equipment. Sand or scrape wood cutting or serving boards and tables if necessary. Polish glass, plastic, hardware and accessories, fixtures and fittings.

3.4 FIELD QUALITY CONTROL

- A. Provide equipment for and perform tests. Submit test results with close out documents. Tests shall confirm that rooms conform to indicated performance requirements.
- B. Pressurize and leak test system at 100 psig minimum. Clean and dehydrate system by maintaining a vacuum of 500 microns maximum for five hours, minimum. Add refrigerant as required and re-test. Mark system as to refrigerant used.

3.5 MANUFACTURER'S SERVICES

- A. Manufacturer's factory representative shall instruct Owner's staff in operation of room, including controls, after completion of room start-up.

3.6 PROTECTION

- A. Protect finished installation.

END OF SECTION