SECTION I – GENERAL

1.01 SECTION INCLUDES

A Furnish and install walk-in controlled environmental rooms (CER). Include all insulated walls, ceilings, floors, doors, hardware, refrigeration systems, mechanical systems, internal electrical systems, controls, gages, internal lighting, and other ancillary items required for a completely fabricated and operational CER.

1.02 RELATED DOCUMENTS

A Related work specified elsewhere: The following work is not included as part of this Section and is to be performed by the designated trades:

1. Roofing: Sleepers or curbs for remotely located equipment and all related roofing and flashing work.
2. Insulation: Sprayed-on under floor insulation applied to building deck below each CER (if insulated floor panels are not specified).
3. Laboratory Equipment: Such as fume hoods, workbenches and casework.
4. Flooring: Floor covering in each CER to be provided by the Flooring contractor.
5. Plumbing: Open drain lines to within two feet of each CER. Rough-ins for floor sinks, plumbing, drains and water piping for mechanical systems.
6. Mechanical: All ducting to and from the building system to each CER for proper ventilation. Water supply and return lines to each water cooled condenser (if water cooled units are specified), including isolation valves. Proper supply and return air to each air cooled condensing unit (if air cooled units are specified and located inside the building) to maintain ambient conditions of less than 90°F.
7. Fire Sprinklers: Dry sprinkler suppression system inside each CER.
8. Electrical: Electrical services as required to the control panel of each CER and condensing unit. A fused disconnect must be provided for each condensing unit.

1.03 REFERENCE STANDARDS

A Comply with all local building and trade standards, ordinances, building codes and regulations.

B Adhere to the following references:

1. American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE).
2. Air Conditioning and Refrigeration Institute (ARI).
3. American Society of Mechanical Engineers (ASME).
4. American Society for Testing and Materials (ASTM).
5. International Association of Plumbing and Mechanical Officials (IAPMO).
6. Uniform Plumbing Code (UPC) latest edition.
7. National Sanitation Foundation (NSF).
8. Underwriters Laboratory (UL).
9. National Electrical Manufacturers Association (NEMA).
10. National Electrical Code (NEC) latest edition.

1.04 SYSTEM DESCRIPTION

A Maintain cold room temperature set-point of +4°C ±0.5°C.
Temperature uniformity of ±1°C: Not less than 3°C, nor more than 5°C uniformly within CER.

B Maintain a temperature of +4°C to +37°C in variable temperature rooms. Temperature uniformity of ±1°C from set-point.

C Maintain freezer temperature of –20°C +2°C (no lower limit).

D Maintain RH level in cold rooms at 60%RH ±10% (no RH control in freezers). Ventilation: 35 CFM supply and exhaust (neutral pressure). For rooms larger than 100 SF, provide 50 CFM.

E Indicate if refrigeration redundancy is required. Delete line item "E" if not required.

1.05 SUBMITTALS

A Submit five (5) copies to be retained and distributed by the Owner, Architect and/or Owners Representative. Submit complete data and calculations, including, but not limited to:

1. Manufacturers technical data for CER components and systems.
2. Mechanical equipment showing dimensions and required clearances, weights, capacities and ratings.
3. Load capacities/calculations of refrigeration and dehumidification systems. Include typical load factors for ventilation loads, internal heat producing equipment (average of 5 watts PSF of room area), personnel, typical pull down of product, lighting, transmission and door infiltration losses. Obtain end user requirements to confirm these load requirements.
4. Data indicating that the dehumidification system is adequately sized to accommodate the additional air load from the building HVAC system.
5. Electrical requirements.

B Submit complete shop fabrication and installation drawings. Drawings shall be in the form of reproducible or photocopies and not to exceed 11 inches x 17 inches is size. The following shall be to be included, but not limited to:

1. Plans, elevations, sections and details depicting room layout and location of all CER components.
2. Refrigeration system piping drawings showing all refrigeration system components, air flows and system operation. Include pipe sizes and capacities.
3. Mechanical system drawings showing mechanical systems, air flows and duct sizes.
4. Electrical system schematic drawings showing all power connections to the equipment including, voltage, phase and full or rated load amperage for each electrical circuit.
5. Control panel wiring schematic, component layout and sequence of operation.

C Submit detailed anchorage and attachment drawings and calculations provided by a licensed engineer. Rooms shall be designed and constructed to meet the requirements for the seismic zone appropriate for the area in which construction is taking place.

D Submit record "As-Built" drawings.

E Certify in writing that each CER complies with this Specification and submit all test data indicating compliance. Include commission plan for testing systems in accordance with criteria listed in this Specification.

F Submit complete operating and maintenance manuals that describe proper operating procedures, maintenance and replacement parts.

1.06 QUALITY ASSURANCE

A CER supplier shall have a minimum of ten (10) years of documented experience and be an established organization and production facility specializing in this type of equipment. Supplier shall have the demonstrated ability to produce the specified equipment of the required quality and the proven capacity to complete an installation of this size and type within the required time limits.

B Use all means necessary to protect Work of this Section before, during and after installation.

C Installer shall be properly trained, experienced and familiar with the manufacturer's recommended methods.

1.07 COORDINATION

A Work in this Section requires close coordination with work in Electrical, Mechanical, Fire Sprinkler and Architectural Sections. Coordinate all work to assure an orderly progress in the project.

B Do not deliver finished components to project site until installation spaces are ready to receive the CER's. Schedule the installation of the CER in sequence with other trades.

C CER supplier has full responsibility to provide structural backing for all wall mounted shelving, furnishings and equipment as shown.

D CER supplier has full responsibility for the following:

1. Making openings for service penetrations to and from the walk-in.
2. Properly sealing all service penetrations into the CER.
3. Field check all dimensions and make any adjustments in the walk-in size for a proper fit.

E CER supplier has full responsibility to install all piping, tubing, wiring and associated components necessary from the walk-in location to any remotely located condensing units. Provide routing and layout drawings to coordinate with other trades.

1.08 EXTENDED GUARANTEE

A CER supplier shall provide a written guarantee of ten (10) years that the insulated structure shall be free of defects in material and workmanship and that it will not deteriorate excessively or otherwise fail to perform.

B CER supplier shall provide a written guarantee of five (5) years for each compressor.

SECTION II – PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A Cold Room Solutions, Inc. (925) 462-2500
1040 Serpentine Ln., Ste. 207
Pleasanton, CA 94566

B All products specified in this section shall be provided by a single manufacturer.

2.02 INSULATED ROOMS

A Wall and ceiling panels:

1. Insulated panels shall be minimum 4" thick, be of modular construction incorporating wall and ceiling panels and be of "woodless" type construction. Panels shall consist of insulation sandwiched between interior and exterior metal skin. Panel edges to have tongues and grooves that cam-lock together assuring an air tight vapor proof joint. Construction shall allow disassembly for possible relocation or expansion at a later date.
2. All panel insulation shall be HCFC Free Class I "foamed-in-place" 2.2 lb. density poly urethane foam insulation expanded with "Ozone Safe" 245 and UL certified as having a flame spread rating of ≤25 and smoke developed rating ≤450 in accordance with ASTM E84. Urethane insulation as herein specified shall be foamed in place and cured to a solid rigid state between metal panel skins at an average density of two (2) pounds per cubic foot, with a K factor of .125. Urethane insulation shall be both vermin-proof and odor-proof. This insulation shall have 97% closed cell structure and conform to international standards for ozone depletion contribution. FM 4880 compliant panels available upon request.
3. The sheet metal finish will be:
    a. Interior surface = 26 GA stucco embossed galvanized steel with a baked polyester white finish.
    b. Exposed exterior surfaces = 26 GA stucco embossed galvanized steel with a baked polyester white finish.
    c. Unexposed surfaces = 26 GA stucco embossed mill galvanized steel.
    d. *Other finishes available upon request. Delete line "d" if above finished are acceptable.*

B Door construction:

1 Door construction shall match the insulated panels. Each entrance to have a clear minimum opening of 36"W by 78"H. Doors shall be flush mounted, in-fitting and have a replaceable magnetic gasket on three sides and a neoprene adjustable gasket at the sill. The frame is to include an easily replaceable heater wire to prevent condensation and frost formation. Door hardware shall include three (3) Kason #1248 hinges, Kason #1094 door closer and a Kason #K-77C/487 latch/release. In addition, each door shall be equipped with a 14" x 14" heated viewing window.

C Insulated floors

1 CER's not located on a concrete slab-on-grade will require sprayed-on insulation applied to the underside of the deck below each CER or insulated floor panels. All low temperature CER freezers will require insulated floor panels (sprayed-on insulation will not be acceptable). If insulated floor panels are to be provided, the floor panels shall be capable of withstanding loads of up to 500 PSF. Wearing surface to be 18 GA type 304 #4 stainless steel over ½" non-wood underlayment. An ADA compliant transition ramp to be built into the insulated floor panel at each door.

D When insulated floor panels are not specified, the wall sections shall be built with cam-locks to secure to a 3" high seismic anchoring screed.

E If ceiling supports are required to support the insulated ceiling panels, steel support system is to be external to the room with no visible connections from the interior.

F Closure panel trim of the same material and finish as adjacent panels shall be provided to close openings between insulated panels and building walls.

G Seal all joints, openings, piping, electrical and ductwork penetrations (regardless of trade). Seal both sides of penetrations (if possible) and inside electrical conduit once wires have been pulled.

H All construction to be NSF labeled.

2.03 CONTROLS

A Each walk-in is to be provided with a control panel consisting of the following components:

1. Painted steel enclosure meeting NEMA 4 & 12 ratings.
2. Allen-Bradley Micrologix series programmable controller including analog temperature input, humidity input & Ethernet adapter.
3. CMore EA7-T8C 8" color touchscreen including room temperature/humidity display, temperature/humidity setting adjustment, alarm setting adjustment, alarm monitoring, alarm logging & temperature/humidity logging to a USB drive.
4. Honeywell eZtrend QXe series paperless chart recorder including temperature input, humidity input & trending software. Recorder is to include the extended security system meeting FDA 21 CFR part 11 requirements.
5. Alarm contacts for remote monitoring.
6. 100Ω RTD temperature sensor(s).
7. Humidity sensor with accuracy to ±2%RH.
8. *Note: To meet the FDA 21 CFR part 11 requirements a data logging system is required. Please contact the factory for information if this will be required.*

B Provide a personnel kick alarm mushroom type switch 12" AFF on the interior of each door leg (latch side). Each alarm shall be easily reset and be electrically powered through the control panel. The alarm shall consist of an actuator within the room and audible and visual alarm located above the CER door. Provide an extra set of dry contact for connection to the BMS. Clearly label the alarm "Personnel Alarm – Pull to Reset".

C If refrigeration redundancy is called for, include a lead-lag controller capable of automatically switching the refrigeration systems on a daily basis and should an alarm condition occur, the stand-by system should automatically come online to maintain a constant temperature.

2.04 LIGHTING

A Provide 4' 2-tube fluorescent light fixtures suitable for the environment in each cold room. Ballasts to be T5HO with low temperature rating. A minimum light level of 60 Fc as measured 40" AFF is to be provided. Each door section shall include an interior and exterior light switch. The interior light switch to have a constant burning pilot light and the exterior switch to have an indicating pilot light.

2.05 MECHANICAL SYSTEMS

A General – the refrigeration system shall use refrigerants acceptable to the Authority having jurisdiction. Utilize R-404A refrigerant, or approved equal. No CFC type refrigerants will be acceptable.

B All refrigeration piping required shall be furnished and installed by the CER manufacturer. All refrigeration piping to be ACR type, hard drawn, cleaned and capped Type L copper tubing. All refrigeration line joints shall be brazed with Stay-Silv 15 brazing alloy. All piping shall be pressure leak tested and witnessed by the Owners Representative.

C Condensing units and evaporator coils to be from the same manufacturer and be UL listed.

D Condensing units must be of adequate capacity to achieve and maintain the individual room operating temperature requirements and must be sized to handle additional loads appropriate for the application. Units to be complete in all respects including high/low pressure control, receiver, sight glass, liquid line dryer, suction line filter, crank case pressure regulator, accumulator, expansion valve and all other necessary components to achieve the cited performance. Units located outdoors shall be equipped with protective weather enclosures.

E Defrost cycle: System shall incorporate an automatic defrost system for any room operating under +4°C. Defrost system to include heaters to prevent condensate pan or drain line from freezing. A nominal temperature rise will be acceptable during each defrost cycle. Automatic defrost system shall be factory pre-wired to the control panel with all the necessary programming.

F Refrigeration piping:

1. All interconnecting piping between the evaporator coils and condensing units shall be installed under this Section.
2. Suction lines to be sized for minimal system pressure drop and effective oil return at all operating loads and conditions. When condensing unit is located below the evaporator, and there is no possibility of trapping oil, size vertical runs the same as horizontal runs. When the condensing unit is located above the evaporator coil, size vertical runs for velocity of 1,000-1,500 FPM and install proper “P” traps spaced not over 15’ apart on all risers.
3. Hot gas lines to be sized for a maximum of 3 psig pressure drop.
4. Liquid lines to be sized for a maximum of 2 psig pressure drop.
5. Condensate drain line to be run in copper tubing to nearest floor sink. To prevent condensation, drain line is to be insulated where it exits the CER insulated panels. Provide heated and insulated drain line inside freezers.
6. Pressurize and leak test the entire refrigeration system.
7. Where piping passes through floor slabs, core drill slab and install pipe sleeves. Provide firestopping at penetrations to achieve the specified fire rating.
8. All hangers to support tubing to meet local codes and conditions. Provide seismic bracing if required. Space hangers appropriately for the smallest diameter line.

G Piping insulation:

1. Suction lines, hot gas lines and condensate lines are to be insulated. Use minimum ½” thick wall insulation for drain lines. Use ¾” thick wall insulation for cold rooms and 1” thick wall insulation for freezers. Insulation exposed to the weather must have additional protection from the elements.

H Dehumidification:

1. Provide automatic, continuous duty type desiccant dehumidifier system to remove moisture, as required, from ventilation and other internal sources. Desiccant reactivation exhaust, room supply ventilation and room exhaust ventilation air flows shall be controlled with a self-contained volume dampering system and which is capable of maintaining the low CFM flow rates independent of the building system static pressure fluctuation. Design system for neutral pressure. Supply air duct, exhaust and regenerative heat exhaust to be ducted to the building system by others. Coordinate with building system design engineer that building system pressures will not adversely affect CER operation in any way. Air from the dehumidifier shall be introduced into the CER so as not to adversely affect the room temperature. Dampering system and controls shall have fail safe positions and safeties to avoid creating a negative room pressure. System to be self-contained only requiring manually dampered supply and exhaust duct hookups from the HVAC contractor.

2.06 INTERIOR

A Floor covering to be provided by others. Flooring material shall be crevice free, non-absorbent, slip resistant, abrasive sheet vinyl Type II, Grade A, .080 inch equal to Altro Safety Flooring. Material shall have temperature stability including dimensional stability and flexibility from -40°C to +60°C. Product to be smooth, free of ribs or patterns. Flooring shall require no maintenance except cleaning with detergent and water. If possible, flooring to be seamless. Floor covering shall be coved up the walls a minimum of 4" and capped with a vinyl trim piece. Color and style to be selected by the Owner or Architect.

B Shelving:
1. Provide 2-tier x 18" deep stainless steel solid cantilevered shelving as shown on the Plans. Maximum spacing of supports to be 48". Shelving to be adjustable in 1" increments.

C Worktables and casework within each CER to be provided by Laboratory Furnishing contractor.

2.06 ELECTRICAL

A All electrical components utilized within each walk-in shall be UL listed.

B Work performed under Division 16 shall provide the appropriate circuits to each condensing unit and CER control panel. All interconnecting and control wiring to be by CER supplier. A fused disconnect is to be provided at each condensing unit by DIV 16.

C Exposed conduit inside the CER shall be kept to a very minimum. Verify placement of all exposed piping and conduit with the Owner's Representative prior to installation.

D Wiring to be THHN or THWN conductors and EMT conduit.

E To minimize penetrations, all electrical circuits shall enter the room via a minimum number of conduits, preferably one. The conduit through the wall or roof and all conduit inside the walk-ins shall be PVC. A seal-off fitting Crouse-Hinds type or EZS or equal shall be placed immediately outside the room and properly sealed.

F Receptacles:

1. Where receptacles/data outlets are shown on Plans, provide Carlon PVC type junction boxes recessed in the insulated panels with ¾" PVC conduit stubbed up through the top of the insulated ceiling panels.
2. Provide wire and connection to GFCI receptacles. Coordinate height of receptacles with Architect.
3. There shall be no more than four (4) receptacles on any given circuit.
4. Data receptacles, cabling and wall plates to be provided by others.
5. Provide a recessed junction box as required for the building fire alarm system.

2.07 PLUMBING

A The CER supplier shall install condensate drain line from each evaporator coil to drain located outside the walk-in. Insulate drain lines on exterior side of CER to prevent the formation of condensate. Final connection of condensate drain line to waste system by DIV 15.

SECTION III – EXECUTION

3.01 SITE CONDITIONS

A Prior to installation of CER's, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

B Verify the work can be installed in strict accordance with all pertinent codes and regulations, the original design, approved submittals, and manufacturer's recommendations.

C In the event of a discrepancy, immediately notify the Architect in writing.

3.02 INSTALLATION

A Install all CER's in accordance with manufacturer's written instructions and reviewed shop drawings.

B Install sheet metal closure trim that matches insulated panel finish between all building walls and insulated panels.

C Install interconnecting accessories in accordance with the manufacturer's written recommendations and located for ease of servicing. Provide piping in accordance with good engineering practice.

D Suction line insulation shall be sized and installed to prevent condensation.

E Provide individual traps for condensate drains.

F CER supplier is responsible for the proper sealing of all penetrations of the insulated panels.

G Test all equipment operation and performance of each CER. Make all adjustments and repairs as required.

H Clean all rooms inside and out, including the roof of each CER. Remove all debris and marks.

3.03 TESTING

A Provide all the equipment and instrumentation necessary to successfully perform the testing.

B Control temperature set-point to be ±0.5°C. Maximum gradient from floor to ceiling within the room not to exceed ±1°C.

C Control humidity set-point to be 60%. Variation within the room not to exceed ±10%.

D Test and adjust equipment to ensure proper performance.

1. Operate each room and test full range of functions over a continuous 24 hour period, recording physical data on operating equipment and continuous readings of temperature and humidity (if humidity control is required).
2. There shall me a minimum of twelve (12) sensor points used in the testing.
3. Testing to include:
    a. Date and time of start of test.
    b. Printed name and signature of technician conducting the test.
    c. Confirmation that the data logger being used has been certified.
    d. Control point settings.
    e. Point where door is opened.
    f. Signature of Owners representative who witnessed the test.
4. Room shall recover pre-set operating temperature within five (5) minutes after door has been fully opened to ambient conditions for one (1) full minute.
5. Adjust and retest rooms not meeting the requirements.
6. Provide a written quality control test report on each room to the Owner

E Pressure test refrigeration piping with dry nitrogen to a minimum gauge pressure of 250 psi. When pressure test is completed and system is determined to be free of leaks, evacuate the system using a vacuum pump for a period of 24 hours. Before the vacuum is broken, use a micron gauge to determine the vacuum range is below a level of 350 microns for R-404A refrigerant (500 microns for R-22 refrigerant).

3.03 DEMONSTRATION

A At completion of work, provide a qualified and trained manufacturer's representative to provide a minimum of 2 hours of instruction to Owner's personnel in operating and maintenance of the CER's

B Demonstrate operation, function and maintenance of each room and associated equipment to the Owner's representative.

3.04 PROTECTION

A If Owner is not to occupy CER's, shut off equipment and controls and lock doors to prevent operation or access by unauthorized persons.