

SECTION 15600 - REFRIGERATION SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. Owner's Refrigeration equipment supplier will furnish refrigeration equipment as indicated on Drawings and defined Appendix A – Products and Work by Owner or Separate Contractor.
 - 1. Obtain services of a Walmart approved Refrigeration Contractor to perform all work in this Section, unless noted otherwise.

- B. Section Includes:
 - 1. Work and responsibilities associated with owner furnished refrigeration equipment for installation by the Contractor. Description of work and responsibilities includes, but is not limited to, installation, start-up, and commissioning of refrigeration systems and display cases, evaporator coils, condensers or condenser/compressor units, and interconnecting piping, condensate drains, and field installed refrigeration controls.
 - 2. Work and responsibilities for refrigeration equipment related items provided by the Contractor, including minor items necessary to the installation which may not specifically be mentioned in the Contract Documents. Such items include, but are not limited to, screws, shims, anchors, escutcheons, brackets, pipe sleeves, sealants, flux, glue, and changes due to unforeseen obstructions.

- C. Related Requirements:
 - 1. Section 07721 – Manufactured Curbs: Curbs for roof-mounted refrigeration equipment.
 - 2. Section 07900 – Joint Sealers: Products for use in sealing pipe penetrations
 - 3. Section 13810 – Energy Management Systems.
 - 4. Section 15050 – Basic Mechanical Materials and Methods: Hangers and supports for refrigeration system piping.
 - 5. Section 16050 – Basic Electrical Materials and Methods.
 - 6. Section 16100 – Wiring Methods
 - 7. Appendix A – Products and Work by Owner or Separate Contractor.
 - a. General procedures related to Owner furnished products and transport, handle, store and protect products.
 - b. Manufacturers, suppliers, and vendor contacts and product names and numbers related to Owner furnished products.
 - 8. Appendix B – Testing and Inspection by Owner.

1.2 DEFINITION OF TERMS

- A. Work shall mean complete installation of equipment and devices in accordance with applicable Specifications and as described in the Drawings, Application Sheets, Manufacturer's Legend Sheets and Instructions.

- B. Refrigeration Contractor shall mean the General Contractor's, Walmart approved, Subcontractor that is responsible for performing the refrigeration work as specified on the construction documents. Refrigeration Contractor shall be responsible for compliance with applicable codes, ordinances, and work permits.

- C. Refrigeration Equipment: Equipment shown or noted on the Drawings to include the following:
 - 1. Hot cases.
 - 2. Cold cases.
 - 3. Freezer/Cooler Panels and Doors.
 - 4. Evaporators.
 - 5. Mini-Racks.
 - 6. Rack-in Box (RIB).
 - 7. Separate Condensers.
 - 8. Refrigerated Case Protection (specified in Section 10260).

9. Floor Mounted Railings (Section 05500).
10. Other related equipment not specifically listed.

1.3 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. Publications are referenced within the text by the basic designation only.
- B. ASTM International (ASTM):
 1. ASTM A 536 – Ductile Iron Castings.
 2. ASTM B 75 – Seamless Copper Tube.
 3. ASTM B 280 – Seamless Copper Tube for Air Conditioning and Refrigeration Field Service.
 4. ASTM B 584 – Copper Alloy Sand Castings for General Applications.
 5. ASTM B 813 – Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube.
 6. ASTM C 1710 – Installation of Flexible Closed Cell Preformed Insulation in Tube and Sheet Form.
 7. ASTM D 2665 – Polyvinyl Chloride (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings.
 8. ASTM D 2564 – Solvent Cements for Polyvinyl Chloride (PVC) Plastic Pipe and Fittings.
 9. ASTM E 84 – Surface Burning Characteristics of Building Materials.
- C. American National Standards (ANSI):
 1. ANSI B 16.22 – Wrought Copper Alloy Solder Joint Pressure Fittings.
- D. American National Standards Institute/American Society of Heating, Refrigerating and Air-Conditioning Engineers (ANSI/ASHRAE):
 1. ANSI/ASHRAE Standard 15 – Safety Standard for Refrigeration Systems.
- E. American National Standards Institute/American Society of Mechanical Engineers (ANSI/ASME):
 1. ANSI/ASME B1.20.1 - Pipe Threads, General Purpose (Inch).
 2. ANSI/ASME B31.9 – Building Services Piping
- F. American Society of Mechanical Engineers (ASME):
 1. ASME A13.1 - Scheme for the Identification of Piping Systems
 2. ASME B 1.1 - Unified Inch Screw Threads (UN and UNR Thread Form).
 3. ASME B 31.5 - Refrigeration Piping Standard

1.4 CLOSEOUT SUBMITTALS

- A. Comply with the requirements of Section 01770.
- B. Refrigeration Installation Handover Document / Sign Off Sheet: Submit completed Refrigeration Installation Handover Document / Sign Off Sheet to Walmart Stores, Inc., 2001 SE 10th Street, Bentonville AR 72712-0550, Attention: Mechanical Construction Manager
- C. Record Documents: Provide laminated half-size refrigeration and energy management as-built drawings. Install on interior side of compressor room door or on interior side of door panel.
- D. Operation and Maintenance Data: Collect operation and maintenance manuals furnished by the case and rack OEMs and store them together at the refrigeration rack.
 1. Product Data, including rated capacities of selected models, weights (shipping, installed, and operating), furnished specialties and accessories, and installation instructions.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Transport, handle and store products in accordance with the requirements of Section 01600.
- B. Receive Owner furnished products in accordance with the requirements of Appendix A (Section 15600).

- C. Owner Furnished Equipment which is damaged, defective or unsuitable for intended service shall be received by the Contractor and damage noted on the Bill of Lading and signed by the Contractor and Carrier agent. Immediately report Owner Furnished Equipment damage to Walmart Mechanical Construction Manager and include photos of damage and signed Bill of Lading.
- D. Contractor shall furnish a suitable means of securing and protecting all tools, materials, and equipment associated with refrigeration installation during construction period.
- E. Store refrigeration pipe and fittings in a clean and dry location. Receive fittings and store in closed containers or cartons, and store copper piping with rubber end plugs in place. Do not install copper tubing left uncapped for more than one day as refrigeration piping.
- F. Deliver brazing materials, flux, solvents, glues, sealants, insulation materials, lubricants, oils, and refrigerants required to complete refrigeration installation and store on job site in manufacturer's original packaging or crating with labeling intact and fully legible.
- G. Ship insulation materials and accessories such as adhesive and coatings to job site in marked, unopened containers as received from manufacturer. Store materials at job site in a proper manner, which does not damage, deface, or otherwise reduce their serviceability. Store highly flammable solvents, adhesives, and coatings in compliance with OSHA requirements. Store materials, which are susceptible to weather damage in a weatherproof environment and store materials with manufacturer's identification attached.
- H. MSDSs for materials, compounds, and chemicals shall be maintained by the Contractor.

1.6 SEQUENCING, SCHEDULING, AND COORDINATION

- A. Sequence, schedule, and coordinate refrigeration installation and start-up activities with Walmart Mechanical Construction Manager to allow the overall project to be constructed in an orderly manner.
- B. Provide personnel as necessary to match schedule needs.
- C. Send a representative to project meetings as required by the General Contractor.
- D. Purchase materials and arrange deliveries in a timely manner to avoid delay of the project. This may include taking early deliveries and off-site storage of items which might be in short supply.
- E. Provide on-site storage container as required. Coordinate with General Contractor for location and availability of on-site storage space. Walk-in cooler and freezer boxes are not to be used for storage.
- F. Notify, coordinate, and correspond with legal authorities having jurisdiction for required inspections of the refrigeration system and piping during the installation process.
- G. Coordinate with Energy Management System Contractor for completion of check-out activities.
- H. Coordinate and confirm system start-up dates with Walmart Mechanical Construction Manager.
- I. Coordinate with the General Contractor and other sub-contractors the placement of refrigeration, electrical, mechanical, plumbing, and fire sprinkler systems to fit in the available clear space.
- J. Start-Up of the refrigeration systems shall consist of the following:
 1. Inspect delivered equipment upon arrival for inconsistencies with refrigeration design documents and damage. Coordinate with refrigeration equipment supplier to correct deficiencies.
 2. Verify that systems have been properly installed and are ready for start-up prior to soft start date.
 3. Assure systems are operational prior to onsite visit by manufacturer representative. Charge systems in accordance with specifications and begin start-up process. Schedule start-up so that systems are operational before equipment manufacturer representative site visit for Commissioning phase. Formally

- document start-up completion on Handover Documents and submit to Walmart Mechanical Construction Manager, within seven days after commissioning completion.
4. System performance is reviewed by equipment manufacturer representative with assistance from the Contractor.
 5. Owner will not consider start-up complete until all Handover Documents are accepted complete by Walmart Mechanical Construction Manager.
 6. Supply technicians, tools, testing instruments, and materials necessary to adjust refrigeration equipment as directed by refrigeration equipment representative.

1.7 CONTRACTOR RESPONSIBILITIES

- A. Obtain required permits and licenses for installation of refrigeration systems, piping, and equipment prior to start of project.
- B. Assign a competent Project Foreman with a minimum of five years' experience installing supermarket refrigeration systems. Foreman shall supervise daily activities associated with installation work including coordinating the activities of each trade as it relates to the refrigeration system installation in order to complete the work on the expected dates; serve as field contact representative and review installation documents for discrepancies. Foreman shall not be changed during the project without permission from the Walmart Mechanical Construction Manager, but may be changed by the Walmart Mechanical Construction Manager with just cause (competency, failure to communicate, or failure to execute direction from the Walmart Mechanical Construction Manager.)
- C. Project Foreman shall attend an OEM system installation training class.
- D. Use Owner's Contract Administration system for contracts, pay applications, potential change orders, change orders, contract documents, and requests for information.
- E. Installation of refrigeration systems involves multiple trades, skill sets, and activities including the following:
 1. Receiving, unloading, and setting grocery cases in their proper locations straight and level. This may include both refrigerated and non-refrigerated cases along with case wedges and cap displays supplied by case manufacturers. Align glass doors plumb and level to prevent saw-toothing of doors.
 2. Securing, bolting, buckling, sealing, and trimming out cases free of blemishes.
 3. Installing case condensate drains independently routed, concealed under cases, properly sloped, supported and trapped, in direction of flow to their designated hub drains or floor sinks.
 4. Setting air-cooled or evaporative condensers in their proper locations, level and anchoring them to building structure per structural detail.
 5. Provide crane service to hoist refrigeration equipment directly from truck to mounting position.
 6. Provide structural support for refrigeration equipment.
 7. Provide opening through the roof as applicable.
 8. Provide sheet metal refrigeration piping and conduit enclosure as shown on the drawings.
 9. Provide opening through outside building wall and provide weather hood as applicable.
 10. Setting condensing units in their proper locations level and anchoring them to building structure per structural detail.
 11. Setting condensing units and rooftop refrigeration racks in their proper locations, level and anchoring them to building structure per structural detail.
 12. Hanging evaporator coils level and tight to ceiling. Route condensate drains tight to walls properly trapped and slope in direction of flow to a hub drain or floor sink.
 13. Installing case and walk-in cooler and freezer valves.
 14. Installing interconnecting refrigeration piping between cases, condensers, evaporator coils, and racks; clean and free from leaks with proper slopes, traps, and sizes.
 15. Installing refrigeration piping supports as specified.
 16. Installing refrigeration piping insulation as specified.
 17. Sealing and restoring vapor barriers for penetrations into walk-in boxes and cases. (Including electrical, alarm, communication, and sprinklers).
 18. Correctly labeling and tagging refrigeration system equipment and piping as specified.

19. Removing and properly disposing of shipping materials, crating, skids, and other construction debris associated with refrigeration system installation.
 20. Submitting required regulatory forms in a timely manner, carefully and completely filled out. Verisae forms to be submitted at the end of commissioning week.
 21. Providing all equipment required for the unloading and installation of this scope of work.
 22. Systematically and thoroughly verifying refrigeration system control functions, sensor calibrations, and review construction activities for quality and completeness. Prepare refrigeration equipment for operation as part of Handover Document completion.
 23. Thoroughly and systematically pressure testing refrigeration systems. Evacuate and install oil and refrigerant charges. Maintain compliance with regulations governing handling of refrigerants.
 24. Verify performance of refrigeration systems as part of Handover Documents.
- Attach rooftop refrigeration equipment to structural support frame as shown on Drawings.

1.8 REQUEST FOR INFORMATION SUBMITTAL

- A. All Request for Information (RFIs) regarding Refrigeration shall follow the attached copy of the Request for Information Process Flow Chart.
- B. Refer to Specification Section 01255 for RFI Information Submittal Process.

1.9 WARRANTY

- A. Provide warranty and service on equipment and materials installed regardless of whether equipment or materials were furnished by Contractor.
- B. Provide supplemental warranty service for all new rack systems. This service will include failures during installation and for 90 days beyond store Re-Grand Opening date. The supplemental warranty shall include labor, parts, primary refrigerant and secondary coolant for repairs to installed refrigeration equipment and piping.
 1. Response time to emergency calls shall be within two hours.
- C. For all new rack systems, perform inspection of installation 90 days after store Re-Grand Opening date or when all punchlist items are corrected (whichever is longer). Make necessary corrections and adjustments. Complete refrigeration punch list. Send completed punch list to Walmart Stores, Inc., 2001 S.E. 10th St., Bentonville, AR 72716-0550, Attention: Mechanical Services Department, for verification of completion. Notify Walmart Mechanical Services Construction Manager (MSCM) prior to inspection.
- D. For all new rack systems, at 90 day inspection, include necessary lubrication, leak tests of all joints, flare nuts, and tightening of strapping as necessary. Perform leak test on small leak setting of refrigerant leak detector. Provide and change liquid line filter cores, oil system filter using Sporlan OF style filter, and replace suction filters. Place suction, liquid, and oil filters in a sealable plastic bag to prevent setting off any leak detection system. Perform oil acid test using either Virginia's TKO acid test kit (mineral or Alkylbenzene oil) or Virginia's ETK acid test kit (POE oil). For new rack house scenarios, oil test will be certified to meet OEM standards by Walmart Refrigeration Engineer of Record. If oil test results require an additional oil change, it will be performed by Walmart. Leave oil filters in motor room for inspection by Walmart Mechanical Services Construction Manager. Contractor to properly dispose of oil and components replaced.
- E. Owner's equipment manufacturer (OEM) supplier will furnish replacement parts for failures of OEM parts during installation period and for one year beyond store RE-Grand Opening date. Contractor shall obtain replacement parts from equipment manufacturer. Owner will not pay additional costs associated with repair or replacement of materials and parts during the warranty period.
- F. In the event the Contractor fails to respond to emergency calls or fails to perform required maintenance or repairs during warranty period, the Owner will have the right to have the repair or maintenance performed by another contractor. In this case, the Contractor agrees to pay the Owner the invoiced amount of the services performed plus 15 percent.

- G. If the service contractor discontinues or drops their service level because the Contractor has failed to make payment to subcontractor on completed warranty work, Walmart will remove that Contractor from New Stores Bid List until such time when all disputes or claims are settled.
- H. At the end of warranty period, certify in a letter to the Owner that equipment and materials installed or connected are functioning properly. Include certification that systems are free of leaks and are maintaining satisfactory temperatures at normal control adjustments.

PART 2 - PRODUCTS

2.1 OWNER FURNISHED PRODUCTS

- A. Owner will furnish refrigeration equipment as scheduled and shown on Drawings and as specified in Appendix A (Section 15600) for installation by the Contractor which includes, but not limited to, the following:
 1. Condensers.
 2. Condensing Units.
 3. Evaporators.
 4. Compressor Rack Systems.
 5. Refrigerated cases.
 6. Ice flakers.
 7. Produce misting system.

2.2 OWNER FURNISHED AND INSTALLED PRODUCTS

- A. Owner will furnish and install refrigeration equipment as scheduled and shown on Drawings which includes, but not limited to, the following:
 1. Walk-in Freezers and Coolers.

2.3 MATERIALS (CONTRACTOR FURNISHED AND INSTALLED)

- A. Refrigerant Systems: Furnish and Install piping for refrigeration systems as specified in Schedule I below and as indicated on Drawings.
 1. Refrigerant Copper Tubing and Fittings: ASTM B 280, type ACR, hard drawn tubing. Tubing shall be factory cleaned, ready for installation, and have ends capped to protect cleanliness of pipe interior prior to shipping. Provide wrought copper pressure fittings, ANSI B16.22.
 - a. Provide copper tubing from one of the following manufacturers:
 - 1) Cerro Flow Products
 - 2) Mueller Industries
 - b. Provide copper fittings from one of the following manufacturers:
 - 1) Mueller Industries
 - 2) Nibco
 - 3) NDL Industries, Inc.
 - c. ABS Piping and Fittings: BS 5391 and BS 5392, manufactured for class E pressure bearing service.
- B. Condensate Systems: Provide piping for condensate systems as specified in Schedule I below and as indicated on Drawings.
 1. Copper Tubing and Fittings: Type M, hard drawn tubing. PVC Piping and Fittings: ASTM D2665, schedule 40 drain, waste, and vent.
- C. Piping Insulation:
 1. Elastomeric Flexible Closed Cell Insulation: Maximum k factor at 75°F of 0.28 Btu-in/hr-ft²-°F, maximum flame spread and smoke development of 25 and 50, respectively per ASTM E84.
 2. Provide one of the following, thicknesses as specified in Schedule I below:
 - a. AP Armaflex by Armacell.
 - b. Aerocell by Aeroflex USA, Inc.
 - c. Insul-Tube by K-Flex USA.
 3. Cladded Insulation:

- a. Provide cladded insulation for insulated exterior refrigerant piping.
- b. Provide insulation from the approved list of manufacturers with factory or field installed PVC jacketing or cladding. PVC jacketing or cladding shall match the insulation color requirements.
- c. PVC jacketing and fitting covers shall be by one of the following:
 - 1) Proto PVC Fitting Cover System by Knauf Insulation
 - 2) Zeston PVC Fitting Cover System by Johns Manville,
4. Insulated tape, half lapped, triple reversed layered may be used to insulate valves, valve stations and factory installed piping components within cases.
5. Insulation color: black.

Schedule I			
Piping Service	Piping Size	Piping Material	Insulation Thickness
R404A/R407A/R22 - Suction	1-3/8 inches and smaller	Type L Hard Drawn Copper, Sealed ACR Tubing	1 inch
R404A/R407A/R22 - Suction	1-5/8 inches and larger	Type L Hard Drawn Copper, Sealed ACR Tubing	1-1/2 inch
R404A/R407A/R22 - Liquid	All	Type L Hard Drawn Copper, Sealed ACR Tubing	1/2 inch
R744 – Carbon Dioxide	1-3/8 inches and smaller	Type L Hard Drawn Copper, Sealed ACR Tubing	1-1/2 inch
R744 – Carbon Dioxide	1-5/8 inches and larger	Type K Hard Drawn Copper, Sealed ACR Tubing	1-1/2 inch
Propylene Glycol / Water	1-3/8 inches and smaller	Type L Hard Drawn Copper or Pressure Rated ABS	1 inch
Propylene Glycol / Water	1-5/8 inches and larger	Type L Hard Drawn Copper or Pressure Rated ABS	1-1/2 inch
Evaporator Condensate - Inside Refrigerated Walk-in Boxes Operating at 32°F or Below	All	Type L Hard Drawn Copper	1 inch
Evaporator Condensate - Outside Refrigerated Walk-in Boxes and Inside Boxes Operating Above 32°F	All	Schedule 40 PVC, Solid Core, DWV	N/A

D. Refrigerant Valves:

1. Isolation valves shall be full port ball type valves, with a minimum working pressure of 700 PSIG, a working temperature range of -40°F to 300°F, and specifically designed for use with the refrigerant that is contained within the system. The valve body shall be forged brass and hermetically sealed. Bolted body valves are not permitted.
2. Provide valves as manufactured by one of the following:
 - a. Henry Technologies.
 - b. Mueller Industries.
 - c. NDL Industries, Inc.

E. Pipe Freeze Protection:

1. Heating cable shall be self regulating, 120 volt, 5 watts per linear foot.
2. Provide one of the following:
 - a. Raychem XL-Trace by Tyco Thermal Controls, LLC.
 - b. CO Series by Delta-Therm Corporation.

F. Refrigerants and Oils:

1. Refrigerant: As specified on Refrigeration Equipment Schedules and certified to meet AHRI 700 standard for chemical purity. Deliver refrigerant in original containers.
 2. Refrigerant Oil: Approved for use by compressor manufacturer, with refrigerant and compressors for the application. Do not put oil in systems from containers that have been left uncapped for an extended period of time.
- G. Sheet Metal Piping Enclosure: Provide galvanized sheet metal refrigeration piping and conduit enclosure as shown on Drawings.
- H. Installation Accessories: Provide accessories required for piping installation as required and as specified in Part 3 hereinafter.
- I. Solder and Flux:
1. Solder: Min. 6% silver content lead-free solder, Stay-Brite #8 by Harris Products Group or similar.
 2. Flux: Water soluble flux conforming to ASTM B 813; Aqua-Brite Flux or similar.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General Installation Requirements:
1. Equipment:
 - a. Install refrigeration equipment in accordance with manufacturer's instructions.
 - b. Attach rooftop refrigeration equipment to structural support frame or roof curb as shown on Drawings.
 - c. Pipe routing, case, condenser, and compressor rack locations shall not deviate from Drawings without approval from Walmart Mechanical Construction Manager.
 2. All Piping:
 - a. Locations and Arrangements: Drawings (plans, schematics, and diagrams) indicate the general location and arrangement of piping systems. Locations and arrangements of piping take into consideration pipe sizing and friction loss, expansion, pump sizing, and other design considerations. So far as practical, install piping as indicated.
 - b. Install piping in a neat and workmanlike manner with pipe sizes as indicated on the drawings.
 - c. Inspect materials to verify they are free of defects, grease, and foreign particles; comply with the temperature and pressure rating of the system; and are compatible with the refrigerant in the system.
 - d. Suspend refrigeration piping as shown on Drawings, with supports spaced in accordance with the requirements of Section 15050.
 - e. Ream cut ends to full interior diameter and remove burrs created during cutting process.
 - f. Remove oxides and surface soil from pipe ends and fitting cups with abrasive cloth, abrasive pads, or properly sized fitting brush.
 - g. Install piping with sufficient flexibility to allow for expansion and contraction due to temperature fluctuations inherent in operation of these types of refrigeration systems. Install piping to prevent vibration and undue strain on pipe and fittings.
 - h. Maintain refrigerant piping clean and dry. Keep piping sealed when not working directly at a specific location or joint. Do not leave open refrigerant piping ends unattended during installation process. Fitted joints exposed to the exterior of the building shall be brazed the same day they are fitted. Visibly inspect pipe and fitting prior to assembly. Swab as necessary with cleaning solvent soaked cloth to remove dirt, filings, or visible moisture.
 - i. Prevent piping contact at pipe crossings by use of offset and/or insulation. Refrigerant piping shall not contact electrical conduit or other dissimilar grounded metals.
 - j. Provide branch supply and return line ball valves for isolation purposes as indicated on refrigeration piping plans. Install valves in a fully accessible location. Insulate isolation valves in accordance with refrigeration line insulation requirements.
 - k. Install exposed piping at right angles or parallel to building walls. Diagonal runs are not permitted unless expressly indicated.
 - l. Conceal all pipe installations in pipe chases, utility spaces, and above ceilings, unless indicated to be exposed to view.

- m. Install horizontal piping as high as possible allowing for specified slope and coordination with other components. Install vertical piping tight to columns or walls. Provide space to permit insulation applications where required, with one inch clearance outside the insulation. Allow sufficient space above removable ceiling panels to allow for panel removal.
 - n. Locate groups of pipes parallel to each other, spaced to permit applying insulation and servicing of valves.
 - o. Secure vertical refrigerant piping installed outside building walls to Unistrut fastening system with #022 Cush-a-Clamps. Fasten clamps directly to copper pipe, not to outside of insulation. Butt insulation against clamp and insulate uncovered.
 - p. In general, clamps are not required on horizontal piping. However, horizontal piping that is vertically supported without support directly under the piping shall be clamped.
 - q. Make copper piping soft solder joints with specified solder and flux. Clean joints before soldering.
 - r. Make brazed joints with use of brazing alloy containing minimum of 15% silver. Clean joints before brazing and have dry nitrogen at 1/2 psi pressure flowing through tubing during brazing.
 - s. Protect affected valves and control devices during brazing process by disassembling and removing heat sensitive parts or use of heat shields.
 - t. Install replacement parts (i.e. expansion valves, heat exchangers, sight glasses) using specified solder, excluding parts in hot gas lines. Use heat dams in all instances.
 - u. Walmart Mechanical Construction Manager shall visually inspect refrigerant piping and insulation prior to being covered.
 - v. Piping deemed by the Walmart Mechanical Construction Manager to be installed incorrectly shall be corrected at Contractor's expense.
3. Insulation:
- a. Install refrigeration piping insulation in accordance with ASTM C 1710, manufacturer's recommendations and per schedule I including glued and taped joints.
 - b. Ensure that temperature and other environmental conditions are favorable for installation of insulation materials.
 - c. Coordinate with other trades so that work is performed with minimum interference and conflict. Carefully note heat tracing and pressure testing procedures prior to installation of insulation materials. Do not apply insulation covering pipe or fitting joints until after pressure testing affecting those joints has been completed and approved by Walmart Mechanical Construction Manager and Authority Having Jurisdiction.
 - d. Do not apply insulation until surfaces are clean, dry, and free of dirt, grease, moisture or other impurities such as corrosive cleaners and dust. Seal refrigerant pipe openings while installing insulation to prevent foreign material from entering tubing.
 - e. Insulation work shall be performed by trained installers regularly engaged in insulation trade.
 - f. Cleanly and squarely cut insulation joints. Do not tear insulation.
 - g. Install piping insulation continuous through sleeves and penetrations (walls, partitions, roofs, ceilings, and floors).
 - h. Seal seams, butts, and ends to retard moisture vapor from entering system. Glue joints with approved products. Do not stretch insulation as it is being installed and glued.
 - i. Vapor stop exposed ends and every 12 feet by applying approved contact adhesive to outside surface of piping and inside surface of insulation and secure to piping.
 - j. Insulate fittings, flanges, and valves with same insulation thickness as adjacent piping.
 - k. Insulate valves to a point just below seal cap or packing gland. Seal insulation to valve body with contact adhesive.
 - l. Slip insulation over pipe before making joints. Split type insulation is acceptable on fittings only. Provide factory pre-manufactured insulation fittings. Where pre-manufactured fittings are unavailable, miter cut fittings shall be used with approval of Owner's Mechanical Construction Manager. Install insulation in conformance with manufacturer's recommendations, including glued and taped joints. If receiver is mounted outside, provide UV protection for pipe insulation on the liquid line from the receiver to the refrigeration rack by application of a covering or coating specifically for the purpose of UV protection and as recommended by the manufacturer.
 - m. Cover exterior refrigerant pipe insulation (including heat reclaim lines) and interior prep room lines with .020 inch thickness UV inhibited PV jacketing and fitting covers. Seal jacketing against vapor and weather.

- n. Install insulation in such a manner to ensure a properly functioning system. Reinstall an installation that is deemed unacceptable by the Walmart Mechanical Construction Manager.
4. Penetrations:
 - a. Seal penetrations through exterior building walls and walk-in coolers and freezers with urethane foam and silicone caulk as specified in Section 07900 and as detailed on Refrigeration Drawings.
 - b. Fire Barrier Penetrations: where pipes pass through fire rated walls, partitions, ceilings, and floors, maintain the fire rated integrity. Provide fire stopping in compliance with the requirements of Section 07840.
 5. Electrical:
 - a. Make final electrical connections, including slave wiring, to refrigerated cases, evaporators, field installed refrigeration control valves, defrost heaters, cooler and freezer box door lights and anti-sweat heaters, and compressor houses. Make connections per wiring diagrams and instructions from equipment supplier. Comply with the requirements of Section 16100 and applicable electrical codes.
 6. Control Tubing:
 - a. Install tubing such that there is sufficient slack. Avoid stretching and sharp bends. Properly support tubing away from contact with sharp or abrasive objects.
 - b. Always connect control tubing to refrigeration system or components through a service valve.
 - c. Remove breakaway Schrader valve depressor.
 - d. Do not over torque flare nuts.
 7. DX System Installation Requirements:
 - a. Install electronic suction pressure regulator valves, thermostatic expansion valves, liquid solenoids, thermostats, and heat exchangers. Provide sufficient pipe at evaporator outlet to install thermostatic expansion valve sensing bulb, ensuring 100% contact with pipe.
 - b. P-Traps shall be one piece, short radius type at bottom of risers. Size P traps to match horizontal pipe or coil outlet pipe. Do not reduce trap to riser size. Take vertical risers as high as possible (just below structure). On risers above 16 feet, provide double oil traps spaced as shown on Drawings.
 - c. Pitch horizontal suction lines minimum of one inch per 20 feet of run in direction of refrigerant flow. Ensure no oil traps are formed in piping layout.
 - d. Liquid supply line tees shall be bullheaded inside cases. Suction lines shall not be bullheaded.
 - e. Install 1/4 inch packed angle king valve on top of inverted trap on inlet side of field installed condensers. Install valve at highest point in the discharge line. Provide packed angle valves with brass or steel caps.
 - f. Suction lines and return lines that are teed into a common return line shall be teed into the top. Liquid lines shall come off of the bottom.
 - g. Provide Schrader valve access on each suction line leaving evaporators.
 - h. Verify Schrader valves have cores securely installed and caps are installed.
- B. Condensate Piping System Installation Requirements:
1. Provide condensate lines from evaporators to outside of walk-in freezers and coolers, and adapt to individual PVC trap.
 2. Clean markings off of PVC with solvent.
 3. Install self-regulating heating cable and insulation on condensate drains inside walk-in boxes that are to operate at or below 32°F.
 4. Install unions on condensate drains in walk-ins close to drain pan.
 5. Allow clearance for evaporator drain pans to hinge open. Install common condensate header outside the walk-in and terminate condensate lines into header.
 6. Paint non-insulated copper drain lines to match walk-in box.
 7. Maintain slope of one inch per ten feet of horizontal run for condensate lines.
- C. Hangers and Supports:
1. Install hangers, supports and anchor devices as specified in Section 15050.
 2. Install hangers and supports to allow controlled movement of piping systems, permit freedom of movement between pipe anchors, and accommodate normal expansion and contraction due to changes in temperature.
 3. Install hangers and supports so that piping live and dead loading or stresses from movement are not transmitted to connected equipment.
 4. Install hangers for insulated pipe sized to encompass insulation including support shields.

5. Where pipes of various sizes are supported together by trapeze hangers, space hangers for the smallest pipe size or install intermediate supports for smaller diameter pipes.
6. Adjust hangers to distribute loads equally on attachments and achieve the indicated slope of piping.
7. Remove sharp edges and burrs from refrigeration system hangers and supports.
8. Remove excessive rod materials from hangers that protrude 2 inches or more from the hangers after adjusting and pitch have been established.

3.2 IDENTIFICATION

- A. Case, Walk-In, and Evaporator Identification:
 1. Provide engraved plastic identification tags 2 inch by 3 inch in size, attached with screws, pop rivets or adhesive to case, Walk-In, and Walk-In evaporator.
 2. Identify circuits with corresponding number and circuit from REM plans.
 3. Identify cases with an approximate location of field installed control valves.
- B. Refrigeration Equipment Identification:
 1. Provide engraved plastic identification tags 2 inch by 3 inch in size, attached with screws or pop rivets.
 2. Identify refrigeration equipment, including compressor houses, racks, condensers, sensor or thermostat locations, and hot water tanks.
 3. Valve Nameplates: Provide factory custom-stamped metal identification tags for field installed refrigeration system control valves and flow sensors as scheduled on the drawings.
 4. Tags shall be brass material and shall be securely attached to valve or sensor body.
 5. Provide tags by Emedco.com, (866) 222-4743 or equivalent.
- C. Nameplates and labels shall be installed prior to refrigeration system start-up.

3.3 CASE SETTING

- A. Set cases level and in line with transit. Shim at each vertical support or at maximum four foot intervals with galvanized plates, as floor conditions require. Where manufacturer's installation instructions differ from Owner's specifications, consult with Walmart Mechanical Construction Manager.
- B. Install cases per manufacturer's installation instructions. In addition, apply butyl caulking compound all around case joints. Reseal joints if seal is broken.
- C. Install a bead of butyl sealant and cover with clear tape on the top and back exterior joints for glass door cases.
- D. Install a finish bead of silicone on interior case joints (bottom, back and interior top of case). Sealant shall match case interior color.
- E. Do not cut bottom case rails.
- F. Hang case shelving and place pans in refrigerated cases, including door shelving in dairy cooler.

3.4 WALK-IN COOLER/FREEZER EVAPORATOR COILS

- A. Examine areas to receive equipment, review proposed locations of equipment and piping, and verify that they are free of interferences. Comply with requirements for installation tolerances and other conditions affecting unit performance.
- B. Locations of equipment on Drawings are approximate. Field verify exact locations before roughing in piping and electrical work.
- C. Accurately layout, mark, and drill necessary holes in walk-in box panels. Cut holes only with drill bits and hole saws. Cut holes only as large as required to accommodate pipes, hanger rods, and conduits, refer to drawing detail for piping penetrations.

- D. Hang or mount evaporator coils plumb and level in accordance with manufacturer's instructions and Refrigeration Drawings.
- E. Maintain manufacturer's recommended clearances so as to not restrict air flow.
- F. Support piping separately so that piping is not supported off of evaporator coil units.
- G. Install electrical devices furnished by manufacturer.
- H. Install interconnecting refrigeration piping between evaporator coils and refrigeration piping.
- I. Install horizontal suction pipe extension for installation of TXV sensing bulb. Bulb shall be in direct contact with refrigeration piping and not installed on any braze joint.
- J. Install walk-in cooler/freezer refrigerant sampling intake devices and necessary interconnecting tubing back to refrigerant detection units.
- K. Install condensate lines for walk-in coolers/freezers.
- L. Install heat trace and insulation for condensate drain lines in walk-in coolers/freezers operating below 32 F.
- M. Fit condensate lines in walk-in coolers/freezers with a union to facilitate cleaning of condensate line and removal of evaporator coil drain pan.

3.5 TESTING, EVACUATING, CHARGING, AND FILLING DX REFRIGERANT SYSTEM

- A. Notify Walmart Mechanical Construction Manager 72 hours in advance of pressure/vacuum and evacuation tests.
- B. Testing
 1. When refrigeration connections have been completed, test refrigerant piping system for leaks with dry nitrogen at a minimum of 150 PSIG, but not to exceed 200 PSIG, with all valves in the system open except compressor suction and discharge valves relief valves, and transducers which must be kept closed during pressure testing and evacuation procedures.
 2. Physically test all joints with a soap solution.
 3. System shall hold maximum pressure for 24 hours.
 4. If leaks are found, isolate leaks, discharge gas, repair leaks, and then repeat test.
 5. Do not release pressure until making final connections.
- C. Evacuating
 1. Evacuate system with a 2 stage vacuum pump specifically manufactured for vacuum duty and having capacity of at least 6 CFM and the capability of pulling vacuum of 50 microns or less within a 24 hour period. Do not evacuate system by use of the refrigeration compressor. Connect pump to both low and high side evacuation valves with copper tube. Compressor service valves shall remain open. Attach high vacuum gage, capable of registering pressure in microns, to system for pressure readings. Do not operate hermetic or semi-hermetic motor compressors during evacuation because of reduced electric strength of atmosphere within motor chamber. To check system pressure, provide hand valve between pressure gage and vacuum pump which can be closed to isolate system and check pressure.
 2. Isolate transducers from vacuum testing.
 3. Evacuate each system to an absolute pressure not exceeding 1,500 microns.
 4. Break vacuum to 2 PSIG with dry nitrogen.
 5. Repeat evacuation process two more times.
 6. Install drier of required size in liquid line.
 7. Leave vacuum running for not less than two hours without interruption, valve off, and remove vacuum pump.
 8. Evacuate system to 500 microns and hold for 24 hours.
 9. Verify vacuum procedure and test with Walmart Mechanical Construction Manager.
 10. Break final vacuum to 2 psig with specified refrigerant.

D. Charging and Filling

1. Provide primary refrigerant as indicated on refrigeration Drawings and as required for proper operation of systems. Check the refrigeration Drawings and the equipment manufacturer's labeling prior to charging of refrigeration system.
2. Add refrigerant to system through a liquid line filter/dryer in charging line.
3. Charge refrigerant directly from original containers.
4. Charge system according to OEM procedures.
5. Record amount of refrigerant used on Owner provided Verisae form. Email to mcequip@Walmart.com and Walmart Mechanical Construction Manager.
6. Write refrigerant charge per rack in black indelible marker on each system compressor breaker panel.
7. Fill compressors with oil to manufacturer's recommended levels and fill oil reservoirs to 1/2 full. Top off the reservoirs with oil after the system has run for a minimum of 24 hours.
8. Refrigerant charge shown on Refrigeration Drawings is a calculated estimate only. Fully charge refrigeration system at start-up.

3.6 PRE-START-UP

A. Document the following Pre-Start-Up information, at a minimum, on Handover Documents

1. Check electrical connections at rack. Turn main breaker OFF and verify that no power is present at all three legs with a meter. Verify tightness of electrical connections.
2. Check main power voltage across each supply leg at the compressor rack. Voltage shall be within 10 percent of required.
3. Check control voltage.
4. Energize system for 24 hours in advance of starting any compressor.
5. Verify cleanliness of evaporator coils
6. Verify proper expansion valve installation.
7. Verify that evaporator and condenser fans are clear of debris.
8. Verify evaporator fan operation.
9. Verify that case, walk-in cooler/freezer doors close properly and are closed.
10. Verify operation of case lights and switches.
11. Verify that door seals are not damaged.
12. Verify high and low pressure control settings.
13. Verify that field wiring connections have been completed.
14. Verify condenser pressure fan cycling control operation.
15. Verify temperature set-points.
16. Verify alarm set-points.
17. Verify defrost schedule.
18. Verify that compressor discharge service valve is fully open.

3.7 SYSTEM START-UP

- A. Refer to equipment manufacturers start-up documentation for additional requirements.
- B. Schedule start-up so that refrigeration systems are operational and running prior to manufacturer representative visit to perform system commissioning with the Contractor.
- C. Include qualified service technicians, necessary tools, and other supplies required by manufacturer's field service representative to perform commissioning activities identified in Contract Documents.
- D. Conduct system start-up as follows:
1. Adjust valves, expansion valves, liquid hold-back valves, balance valves, compressor high and low pressure switches, receiver pressurization, and subcooler outlet pressure regulator.
 2. Complete refrigerant and oil charge.
 3. Adjust oil float levels and replace liquid, suction, and oil line filter/dryers.
 4. Verify pressure and temperature gauges are accurate.

- E. After compressor is started, continue charging until system has sufficient refrigerant for proper operation. Do not charge receiver level past 40%. Do not leave compressor operating unattended and unmatched until system is properly charged with refrigerant and oil. Charge receivers to 30 percent with unit in heat reclaim in 100 percent condenser and condenser fan controls set properly. Maintain these levels throughout maintenance service period. If at end of maintenance period, receiver level has dropped, completely re-check refrigeration rack and case system for leaks. Repair leaks and bring system back to original charge level.
- F. Do not add oil while system is short of refrigerant unless oil level is inadequate for system operation.
- G. Set expansion valve superheat on systems per manufacturer's recommendations. Balance multi-plex systems to within 2°F of target and with not more than 2°F variation in discharge air temperature between cases. Verify superheat settings after fixtures have been loaded with product.
- H. Prior to opening any rack systems to add or replace cases, evaporators, etc, install new suction filter in the suction line canister. Then 24 to 48 hours after the work is completed and all final adjustments have been made, provide and change liquid line filter cores, oil system filter using Sporlan OF style filter, and suction filters. Filters are to be rated for wax removal. Contractor to properly dispose of oil and components replaced.
- I. Test and adjust controls to ensure a refrigeration system operating to Owner's design specifications.
- J. Run refrigeration system for a minimum of 100 hours prior to turnover to Owner for merchandising or stocking. 100 hour run time begins when refrigeration system is running and connected loads are at correct operating temperatures. 100 hour period is to be used to adjust expansion valves, calibrate sensors, etc.
- K. Verify refrigeration alarm system is functioning correctly 24 hours prior to food delivery.
- L. Complete system balance by the end of the fifth day of start-up.
- M. Complete Refrigeration Installation Handover Document / Sign Off Sheet and submit as specified in Part 1.
- N. Final payment will not be made until Refrigeration Installation Handover Document / Sign Off Sheet and Verisae documentation is received and job notebook is completed and placed in the mechanical refrigeration house.

3.8 CONDENSING UNIT START-UP

- A. Refer to equipment manufacturers start-up documentation for additional requirements.
- B. Evacuate refrigeration compressor rack and associated piping prior to adding refrigerant charge.
- C. Evacuate condensing units and associated piping prior to adding refrigerant charge.
- D. Verify line voltage and check motor rotation prior to operation.
- E. Operate equipment controls and safeties to verify proper function. Adjust valves and controls to place condensing units in full operation.
- F. Verify that motor amperages and air flow rates for condensing units agree with manufacturer's data.
- G. Complete Handover Documents.

3.9 CONTRACT COMPLETION, STORE POSSESSION AND RE-GRAND OPENING DAY

- A. Coordinate and execute the Handover Documents as soon as final system adjustments are completed.
- B. Finish work and furnish Owner's Mechanical Construction Manager with a complete and operating refrigeration system at Contract Completion.

- C. Owner may take possession of completed or partially completed portions of work although time allotted for completion of work may not have expired. Taking possession of work shall not be deemed acceptance of any work that has not been completed in accordance with Contract Documents.
- D. Temperature and valves shall be adjusted and control strategies modified as necessary as cases are loaded with product and conditions within store environment change.
- E. Have a mechanic on job site from 7:00 AM to 6:00 PM on the day before Re-Grand Opening and the day of Re-Grand Opening. Mechanic shall check in with both the Store Manager and the Field Project Manager when arriving and prior to leaving.

3.10 FIELD QUALITY CONTROL

- A. Maintain a clean and orderly work area. On a weekly basis remove from jobsite scrap, waste, and debris resulting from refrigeration field work.
- B. Installation materials shall be new and without defect. If requested, Contractor shall submit evidence as to quality of systems built, including but not limited to, material test reports, packing slips, material data sheets, employee qualification and training documentation records, brazed joints, insulation mock ups, leak testing and electrical function testing records.
- C. Prior to concealing joints with insulation or piping in walls, floors, or ceilings, clean and test piping in accordance with these specifications. Piping shall be leak-free.
- D. Contractor shall assure quality of brazing done by their organization and shall employ skilled craftsmen following qualified brazing procedures. If directed by the Walmart Mechanical Construction Manager, cut out five randomly selected joints to verify use of dry nitrogen during brazing operations. Inspect joints for oxidation in the presence of the Mechanical Construction Manager. For each joint which shows evidence of oxidation, cut out an additional joint. If four fittings are found oxidized, rework all joints including those removed for inspection.
- E. On completion of refrigerated work, remove tools, equipment, excess materials, scrap, waste, and other debris resulting from work, and clean walk-in coolers/freezers, cases, roof areas adjacent to condensers, and refrigeration compressor house.

3.11 MAINTENANCE

- A. Provide a 90 day maintenance service period from the date of Re-Grand Opening to include maintenance and assurance of proper operation of the entire refrigeration system. The service period shall include maintenance for primary refrigerant and routine maintenance and emergency services. Upon start-up, submit the names of local service companies authorized by the OEM for maintenance service to MCM.
- B. Response time to emergency service calls shall be within two hours. In the event the Contractor fails to respond to emergency calls or fails to perform required maintenance or repairs during the maintenance period, the Owner will have the right to have the repair or maintenance performed by another contractor. In this case, the Contractor agrees to pay the Owner the invoiced amount of the services performed plus 15 percent.
- C. If the service subcontractor discontinues or drops their service level because the Contractor has failed to make payment to the subcontractor on completed maintenance work, Owner may remove the Contractor from bidder eligibility for future new store work until such time that disputes or claims are settled.
- D. Perform inspection of installation at end of maintenance service period.
 1. Make necessary corrections and adjustments. Notify Walmart Mechanical Construction Manager (MCM) prior to inspection.
 2. Provide lubrication, leak tests of all joints, flare nuts, and tightening of strapping. Perform leak test on all fixtures and rack service points, fittings and valves.

3. Change replaceable suction, liquid, and oil filters. Place suction, liquid, and oil filters in a sealable plastic bag to prevent setting off any leak detection system. Leave oil filters and dryers in motor room for inspection by Walmart Mechanical Construction Manager.
 4. Assure all deviations have been resolved.
- E. At the end of maintenance services period, certify in a letter to the Owner that equipment and materials installed or connected are functioning properly. Include certification that systems are free of leaks and are maintaining satisfactory temperatures at normal control adjustments.

END OF SECTION

**REFRIGERATION INSTALLATION
HANDOVER DOCUMENT / SIGN OFF SHEET**

All sections of this document must be completed before the installation will be accepted.

Store No. _____ Location: _____ Store Type: _____
City, State SC, SAMS, NM

Grand Opening Date: _____

Project Type: _____
New SC Store/ Sam's Club, Relocation, Remodel, Capital Expenditure (CapEx)

Installing Contractor: _____
Contractor's name and branch location, if applicable

Equipment Supplier: _____
Hill PHOENIX, Kysor Warren, Zero Zone, Hussmann

Refrigerant: _____
R 407A, R410A, etc.

System Type: _____
Direct Expansion (DX)

Heat Reclaim: _____
Domestic Water, N/A

Bldg Automation System (EMS): _____
Novar, Danfoss, CPC

Verisae Data Submitted: _____
Date Submitted or N/A

Comments: _____

APPROVAL

The work carried out during this project is complete and the standard achieved is acceptable.

Name of Walmart Mechanical Construction Manager Signature Date

Notice to OWNER'S MCM:

By signing this form, you are confirming the following:
The work detailed above is complete and all systems are operating as intended.
All handover documentation has been completed and you are satisfied with its contents.
All issues are either resolved or you are satisfied with the plan for resolution.

**REFRIGERATION INSTALLATION
HANDOVER DOCUMENT / SIGN OFF SHEET
Machine Rooms**

All sections of this document must be completed before the installation will be accepted.

Store No. _____ Location: _____ Store Type: _____
City, State SC, SAMS, NM

Name of technician carrying out checks and completing this form Date

Type of machine room _____
Rack, hybrid house, weatherpac

Machine room supplier _____
Hill PHOENIX, Kysor Warren, Zero Zone

- Are weatherpacs bolted to steel?..... yes / no
- Are all penetrations properly sealed?..... yes / no
- Do all power sockets and lights operate correctly?..... yes / no
- Do all exhaust fans operate correctly? yes / no
- Are all weatherpac doors hung properly and operating correctly? yes / no
- Is there any damage to the room which needs repair? yes / no
- Are all shields and hoods installed correctly?..... yes / no
- Are Operation and Maintenance (O and M) manuals left on site?..... yes / no
- Are drawings mounted on the walls of machine rooms? yes / no
- Have liquid line filter dryers, oil system dryers, and suction line filter driers
been changed after 24 hours of run time? yes / no
- Is leak detection installed? yes / no
- Has leak detection been tested and certified functional? yes / no
- Are electrical drawings mounted inside electrical panels? yes / no
- Are all electrical distribution panels labeled correctly? yes / no
- Are all trunking lids and junction box covers in place? yes / no
- Have all relevant labels been fixed to major items of equipment? yes / no
- Is the machine room clean and free from rubbish? yes / no

Capital Expenditure (CAPEX) and Remodel Projects

Have all existing, redundant materials (conduit, pipework, etc.)
been stripped out or made safe?..... yes / no

Comments: _____

**REFRIGERATION INSTALLATION
HANDOVER DOCUMENT / SIGN OFF SHEET
Refrigeration Vacuum Test**

All sections of this document must be completed before the installation will be accepted.

Store No. _____ Location: _____ Store Type: _____
City, State SC, SAMS, NM

Owner's Construction Manager _____

Installing Contractor _____

Contractor's Address _____
Street _____

City, State, ZIP _____

Contractor's Phone _____

Contractor's Email Address _____

Name of Person Attesting to Vacuum _____
Phone _____

Gauge Used for Testing _____

Manufacturer Type Model # Range in Microns

	A	B	C	D	E	F
First						
Second						
Final						
Date of Final						
Pressure at Check-In						

Signature _____ Date _____

Comments: _____

Allow the oil pressure switch to trip on each compressor to ensure proper operation. After oil pressure trips, wait two minutes and check crankcase heater operation. Record amp draw of each crank case heater.

C1 _____ C2 _____ C3 _____ C4 _____ C5 _____ C6 _____

Adjust and record compressor's start delay timer setting.

C1 _____ C2 _____ C3 _____ C4 _____ C5 _____ C6 _____

Adjust and record compressor's HP cut out switch setting.

C1 _____ C2 _____ C3 _____ C4 _____ C5 _____ C6 _____

Is EMS suction transducer calibrated? yes / no

Record the EMS rack suction pressure settings. Cut In _____ Cut Out _____

Check and record the rack suction pressure. EMS _____ Gauge _____

Check and record the suction temperature. EMS _____ Meter _____

What is the rack superheat? _____

Have all Evaporator Pressure Regulators (EPRs) been set correctly? yes / no

Note: Individual EPR settings to be recorded on case start-up documents.

Check and record the ambient temperature. EMS _____ Meter _____

Is EMS discharge transducer calibrated? yes / no

Check and record the discharge pressure. BAS _____ Gauge _____

Check and record the discharge temperature. BAS _____ Meter _____

Check and record the drop leg temperature. BAS _____ Meter _____

Does this rack have hot water / heat reclaim? yes / no

Record heat reclaim control settings. Reclaim t'stat _____ Electric heater t'stat _____

Note: Reclaim thermostat should be set to 140°F. Electric back up thermostats should be set to 130°F.

Check and record correct heater element voltage. _____

Record the rack high pressure BAS lockout setting. _____

Does this rack have ambient subcooling (surge)? yes / no

Check and record the BAS surge setpoints. Cut In _____ Cut Out _____

Check for correct operation. Is system operating OK? yes / no

Does this rack have subcooling? yes / no

Record liquid subcooling temp BAS set point. _____

Record actual liquid temperature. _____

Record EPR / EEPR setting (as applicable). _____

Record outlet pressure regulator (OPR) setting (if applicable). _____

Record bypass valve setting (if applicable). _____

Confirm correct operation. Is system operating OK? _____ yes / no

Condenser Manufacturer _____

Condenser Model No. _____

Is condenser clean and free from debris? _____ yes / no

Are condenser fan motors rotating correctly? _____ yes / no

Does store location require condenser fins to be coated? _____ yes / no

Does this condenser have a Variable Freq. Drive (VFD) controlling the fan motors? _____ yes / no

Confirm correct settings and operation of VFD. _____ yes / no

If no VFD, confirm correct condenser control by BAS. _____ yes / no

Confirm correct settings and operation of condenser split. _____ yes / no

Confirm correct operation of condenser drain down system. _____ yes / no

Is inverted trap installed on inlet side of condenser pipe work? _____ yes / no

Is test valve installed on inlet side of condenser pipe work? _____ yes / no

Record setting of liquid hold back valve. _____

Is receiver level alarm device operating? _____ yes / no

Record level of refrigerant in tank. _____%

Are caps for all valves installed and tightened at end of startup? _____ yes / no

Record setting of rack high pressure cut out switch. _____

Is sufficient oil in the oil reservoir? _____ yes / no

Is the oil level in each compressor correct? _____ yes / no

Is the oil clear in color and free of oxidation after minimum 24 runtime? _____ yes / no

Comments: _____

**REFRIGERATION INSTALLATION
HANDOVER DOCUMENT / SIGN OFF SHEET
Rack A**

All sections of this document must be completed before the installation will be accepted.

Store No. _____ Location: _____ Store Type: _____
City, State SC, SAMS, NM

Name of technician carrying out checks and completing this form Date

All system identification labels installed? yes / no

All expansion valve strainers cleaned? Check three strainers per rack. yes / no

List circuit numbers of strainers checked. _____

Are condensate drains operating correctly? yes / no

Are all glass doors adjusted properly? yes / no

Are cases shimmed every 4 feet? yes / no

Are case to case joints sealed? yes / no

At bottom penetrations in cases, is foam shaved flat and sealed? yes / no

System No. _____ Make _____

Case No. _____ Model _____

Length (feet) _____

Float Circuit? yes / no

EPR Setting _____ psi Lighting Amps _____

BAS Setting Cut In _____ °F Fan Amps _____

BAS Setting Cut Out _____ °F Defrost Amps _____

Superheat Setting _____ °F Trim Heater Amps _____

Confirm that the breakers to the following circuits are labeled correctly.

Lighting yes / no

Fans yes / no

Defrost yes / no

Trim Heaters yes / no

System No. _____ Make _____

Case No. _____ Model _____

Length (feet) _____

Float Circuit? _____ yes / no

EPR Setting _____ psi Lighting Amps _____

BAS Setting Cut In _____ °F Fan Amps _____

BAS Setting Cut Out _____ °F Defrost Amps _____

Superheat Setting _____ °F Trim Heater Amps _____

Confirm that the breakers to the following circuits are labeled correctly.

Lighting _____ yes / no

Fans _____ yes / no

Defrost _____ yes / no

Trim Heaters _____ yes / no

System No. _____ Make _____

Case No. _____ Model _____

Length (feet) _____

Float Circuit? _____ yes / no

EPR Setting _____ psi Lighting Amps _____

BAS Setting Cut In _____ °F Fan Amps _____

BAS Setting Cut Out _____ °F Defrost Amps _____

Superheat Setting _____ °F Trim Heater Amps _____

Confirm that the breakers to the following circuits are labeled correctly.

Lighting _____ yes / no

Fans _____ yes / no

Defrost _____ yes / no

Trim Heaters _____ yes / no

**REFRIGERATION INSTALLATION
HANDOVER DOCUMENT / SIGN OFF SHEET
Rack Data Collection for Verisae**

Store No. _____ Location: _____ Store Type: _____
City, State SC, SAMS, NM

Project Type (circle one): New Store Relocation Expansion

Rack Letter (circle one): A B C D E F G
Remote Condenser 1 Remote Condenser 2
Remote Condenser 3 Remote Condenser 4
Remote Condenser 5 Remote Condenser 6
Remote Condenser 7

Refrigerant Type (circle one): R22 R404A R422D R422A R134A R407A Other _____

Full Charge _____ lbs. _____ oz.

Charge Method (circle one): Actual Receiver Calculation On Site Measurement

Temperature (circle one): Low Medium

Manufacturer (circle one): Hill PHOENIX Kysor Tyler Systematic Zero Zone Other _____

Model No. _____

Serial No. _____

Rack Letter (circle one): A B C D E F G
Remote Condenser 1 Remote Condenser 2
Remote Condenser 3 Remote Condenser 4
Remote Condenser 5 Remote Condenser 6
Remote Condenser 7

Refrigerant Type (circle one): R22 R404A R422D R422A R134A R407A Other _____

Full Charge _____ lbs. _____ oz.

Charge Method (circle one): Actual Receiver Calculation On Site Measurement

Temperature (circle one): Low Medium

Manufacturer (circle one): Hill PHOENIX KysorHussmann Zero Zone Other _____

Model No. _____

Serial No. _____

**HVAC/REFRIGERATION/EMS
REQUEST FOR INFORMATION
PROCESS FLOW CHART
WAL-MART STORES, SUPERCENTER, SAM'S CLUB,
NEIGHBORHOOD MARKET**

