



SECTION 23 00 00
COMMERCIAL HVAC SYSTEMS

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PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Commercial HVAC systems including the following:
 - 1. Packaged rooftop units. (E-Series) (K-Series) (Z-Series).
 - 2. Split systems. (T-Series).
 - 3. Small splits.
 - 4. Unit heaters.
 - 5. Industrial furnaces.

1.2 RELATED SECTIONS

- A. Section 23 05 00 - Common Work Results for HVAC.
- B. Section 26 05 00 - Common Work Results for Electrical.

1.3 REFERENCES

- A. Air-Conditioning, Heating, and Refrigeration Institute.
 - 1. AHRI 210/240 - Performance Rating of Unitary Air-Conditioning & Air-Source Heat Pump Equipment.
 - 2. AHRI 270. - Sound Performance Rating of Outdoor Unitary Equipment.
 - 3. AHRI 340/360 - Performance Rating of Commercial and Industrial Unitary Air-Conditioning and Heat Pump Equipment.
- B. American Society of Heating, Refrigerating, and Air-Conditioning Engineers
 - 1. ASHRAE 62.1 - Ventilation for Acceptable Indoor Air Quality.
 - 2. ASHRAE 90.1 - Energy Standard for Buildings Except Low-Rise Residential Buildings.
- C. ASTM International.
 - 1. ASTM B117 - Standard Practice for Operating Salt Spray (Fog) Apparatus
- D. Intertek: A Nationally Recognized Testing Laboratory.
 - 1. ETL listed
- E. Underwriters Laboratory (UL):
 - 1. Listed products directory.
- F. Underwriters Laboratory Canada (ULC):
 - 1. Listed products directory.
- G. United States of America Military

1. Military Specification MIL-DTL-53084A - Primer, Cathodic Electrodeposition, Chemical Agent Resistant.

1.4 SUBMITTALS

- A. Submit under provisions of Section 01 30 00 - Administrative Requirements.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 1. Preparation instructions and recommendations.
 2. Storage and handling requirements and recommendations.
 3. Installation methods.
 4. Wind and seismic certifications.
- C. Shop Drawings: Include system components, utility requirements and connections, relationship with adjacent construction. Include required clearances and access for servicing.
 1. Wiring schematics and diagrams for power and control wiring.
- D. Maintenance and operation information and instructions.

1.5 DEFINITIONS

- A. AFUE: Annual Fuel Utilization Efficiency.
- B. IEER: Integrated Energy Efficiency Ratio.
- C. EER: Energy Efficiency Ratio.
- D. SEER: Seasonal Energy Efficiency Ratio.

1.6 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with requirements of authorities having jurisdiction and applicable codes at the location of the project.
- B. Manufacturer Qualifications: Minimum 5 years' experience manufacturing similar products.
- C. Installer Qualifications: Minimum 2 years' experience installing similar products.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store products in manufacturer's unopened packaging bearing the brand name and manufacturer's identification until ready for installation.
- B. Comply with manufacturer's recommendations. Handle materials to avoid damage.

1.8 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

1.9 WARRANTY

- A. Provide manufacturer's standard limited warranty: _____ years.
 1. Heat exchangers: _____ years.
 2. Compressors: _____ years.
 3. Economizers: _____ years.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer: Allied Commercial, which is located at: 215 Metropolitan Dr.; West Columbia, SC 29170; Toll Free Tel: 800-448-5872; Email: [request info \(\)](mailto:request info ()); Web: www.allied-commercial.com
- B. Substitutions: Not permitted.
- C. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 - Product Requirements.

2.2 PACKAGED ROOFTOP UNITS (E-SERIES)

- A. Packaged Rooftop Units: E-Series by Allied Commercial.
 - 1. LCH - Gas / Electric.
 - 2. LGH- Electric / Electric.
 - 3. Capacity: 3 Tons.
 - 4. Capacity: 4 Tons.
 - 5. Capacity: 5 Tons.
 - 6. Capacity: 6 Tons.
 - 7. Capacity: 7.5 Tons.
 - 8. Capacity: 8.5 Tons.
 - 9. Capacity: 10 Tons.
 - 10. Capacity: 12.5 Tons.
 - 11. Capacity: 13 Tons.
 - 12. Capacity: 15 Tons.
 - 13. Capacity: 17.5 Tons.
 - 14. Capacity: 20 Tons.
 - 15. Capacity: 25 Tons.
 - 16. Capacity: 30 Tons.
 - 17. Capacity: 35 Tons.
 - 18. Capacity: 40 Tons.
 - 19. Capacity: 45 Tons.
 - 20. Capacity: 50 Tons.
- B. Performance requirements:
 - 1. Must meet or exceed ASHRAE 90.1 minimum standards.
 - 2. 3-5 Ton units:
 - a. AHRI 210.
 - b. AHRI 240.
 - 3. 6 Ton units:
 - a. AHRI 340.
 - b. AHRI 360
 - 4. CSA listed.
 - 5. ETL listed.
 - 6. UL listed.
 - 7. ULC listed.
- C. Cabinet:
 - 1. Exterior panels: Heavy-gauge galvanized steel with two-layer enamel paint finish.
 - 2. Perimeter Base Rail: Heavy-gauge galvanized steel.
 - a. Forklift slots; on three sides, not directly below condenser coil.
 - 3. Rigging holes on all four corners.
 - 4. Raised or flanged edges around duct and power entry openings.
 - 5. Return airflow choice: Factory shipped:
 - a. Down flow.
 - b. Horizontal flow.

- 1) Convert in field; Horizontal Discharge Kit.
 - 2) Horizontal airflow requires Horizontal Roof Curb.
 - 3) Horizontal Return Air Panel Kit is also required if converting a down flow configuration into horizontal.
6. Electrical lines: Brought through base of unit via horizontal knockouts.
 7. Gas lines: Brought through base of unit via horizontal knockouts.
 8. Insulation: Panels adjacent to conditioned air; insulated with non-hygroscopic fiberglass insulation.
 - a. Unit base is fully insulated.
 - 1) Serves as air seal to roof curb.
 9. Access Panels: Compressor, controls, heating areas, blower, air filter, and economizer.
 - a. Hinged Access Panels, factory installed: Sealed with quarter-turn latching handles; tight air and water seal.
 10. Condensate Drain Pan: Corrosion resistant double sloped.
 - a. Stainless steel drain pan.
 11. Service Valves.
- D. Cooling System: Capable of operating from 0 to 125 degrees F (-18 to 52 degrees C) without installation of additional controls.
1. Compressors: Scroll Type, R-410A refrigerant.
 - a. Overload protected.
 - b. Internal excessive current and temperature protection.
 - c. Isolated from condenser and evaporator fan air streams.
 - d. Vibration isolation: Mounted on elastomeric grommets.
 2. Thermal Expansion Valve.
 3. High capacity filter/driers.
 4. High pressure switches.
 5. Low pressure switches.
 6. Freezestats.
 7. Crankcase heaters.
- E. Coil Construction: Condensing and evaporator coils.
1. Copper tube, rippled and lanced aluminum fins mechanically bonded to copper tubes, and factory leak tested.
 2. Evaporator Coils: Balanced port thermal expansion valves.
 - a. Compressor circuits on coil: Divided across face of coil and active through coil depth. Freeze protection; pressure and leak tested: 500 psi (3447 kPa).
 - b. Compressor circuits on coil: Divided by rows that are active across the entire surface area of the supply air.
 - c. Flexible immersed coating electrodeposited by dry film process:
 - 1) ASTM B117.
 - 2) ASTM 1153.
 - 3) MIL-P-53084.
 3. Condenser Coils:
 - a. Eco-last condensing coil: Aluminum lanced fins thermally bonded to aluminum flat tubes and factory leak tested.
 - b. Flexible immersed coating electrodeposited by dry film process:
 - 1) ASTM B117.
 - 2) ASTM 1153.
 - 3) MIL-P-53084.
- F. Gas Heating System: Induced draft.
1. Fuel type: Natural gas.
 2. Ignition: Direct spark pilot.
 3. Electronic sensors: Flame.
 4. Switches: Flame rollout, high heat limit, and safety.

- a. Induced draft failure: Operating to altitude of 2000 feet (610m) with no derate to manifold pressure.
 - 5. Controls: Fan and limit.
 - 6. Service access: Controls, burners and heat exchanger.
 - 7. Heat Exchanger: Tubular.
 - a. Aluminized steel.
 - b. Stainless steel.
 - 8. Gas piping system tight and free of leaks when pressurized to maximum supply pressure.
 - 9. Gas Valve: Two-stage, redundant type gas heat valve with manual shutoff.
 - 10. Gas Valve: Single stage gas heating.
 - 11. Gas Burners: Inshot, aluminized steel.
 - 12. Gas piping system: Leak free when pressurized to maximum supply pressure.
 - 13. Low NOx.
 - 14. Field Installed Accessories:
 - a. Combustion Air Intake Extensions.
 - b. Vertical Vent Extension Kit.
 - c. LPG/Propane Kit.
 - d. Low Temperature Vestibule Heater.
- G. Electric Heating System: Electrical resistance heater.
- 1. Reset thermal limit protection.
 - 2. Single point power supply.
 - 3. Heater Element: Nickel chromium wire.
 - a. Individually fused.
 - 4. Electric heater slides out of unit for service.
 - 5. Heating Controls:
 - a. Support 2 stages of heating control from thermostat or DDC.
 - b. Delay time of 30 seconds between low and high heat stages.
- H. Supply Air Fan (Blower): Double inlet type, galvanized steel with forward curved blades.
- 1. Statically and dynamically balanced.
 - 2. Continuous or automatic control for occupied periods.
 - 3. Motor and Drives:
 - a. Thermal overload protected motors with automatic reset.
 - b. Direct drive ECM.
 - 1) Single Zone Variable Air Volume (VAV): Factory w/ VFD and phase protection.
 - 2) Variable Air Volume (VAV): Factory w/VFD.
 - c. Belt drive:
 - 1) Permanently lubricated ball bearings (for belt drive motors).
 - 2) Adjustable sheaves on belt drive motors for blower speed adjustment.
 - 3) Optional low and high static motor/drive combinations and optional drive kits.
 - 4) Auto Blower Belt Tensioner: Factory.
- I. Supply Air Filters: Disposable 2 inch furnished as standard.
- 1. High Efficiency Air Filters
 - a. 2" MERV 13 Filters.
 - 1) Field installed.
 - b. 2" MERV 8 Filters.
 - 1) Field installed.
- J. Condenser Fans: Corrosion resistant propeller type.
- 1. Condenser Fan Motor: Direct drive with permanently lubricated ball bearings.
 - a. Watertight with thermal overload protection and automatic reset.
 - b. Motor mount isolated from fan safety guard.

- c. ECM motors.
- d. PSC motors.
- e. Standard efficiency.

K. Controls:

1. Unit Controller: Solid state control board to operate unit.
2. Scrolling digital display.
3. Push button navigation.
4. Guided menu setup.
5. Provide 5 degrees F temperature difference between cooling and heating set points meeting ASHRAE 90.1 Energy Standard.
6. Display alarms, alarm history and system status.
7. Component and cooling/heating mode run test capability.
8. Accept CO2 sensor inputs.
9. Economizer control.
10. Blower on/off delay.
11. 2-stage heat/4-stage cool compatible.
12. Warm-up mode.
13. DDC compatible.
14. Indoor air quality input.
15. Low ambient control down to 0 degrees F.
16. Component runtime and cycle count data collection.
17. Blower proving switch strike 3.
18. Phase/voltage monitoring/protection.
19. Real time clock (timestamps).
20. USB interface with profiles and firmware upgrade capability.
21. Controls Options:
 - a. SCR Electric heat control.
 - b. CO2 Sensor: Field installed.
 - c. Dirty Filter Switch:
 - 1) Field installed.
 - d. Blower Proving Switch:
 - 1) Field installed.
 - e. Phase/Voltage Monitoring Protection.
 - f. BACnet:
 - 1) Field installed.
 - g. LonTalk:
 - 1) Field installed.
 - h. Novar ETM-2051:
 - 1) Field installed.
 - i. Novar LSE.
 - j. CPC Direct Interface.
 - k. Fresh Air Tempering Sensor:
 - 1) Field installed.
 - l. Smoke detector supply:
 - 1) Field installed.
 - m. Smoke detector return.
 - 1) Field installed.

L. Serviceability:

1. Wiring: Keyed and labeled field connections, color coded and continuously marked wire to identify point-to-point component connections.
 - a. Not in contact with hot-gas refrigerant lines or sharp metal edges.

M. Accessories:

1. Economizer:

- a. Down flow.
 - b. Horizontal.
 - c. Hoods provided:
 - 1) Field installed.
 - d. Control:
 - 1) Single Sensible:
 - a) Field installed.
 - 2) Differential Dual Sensible:
 - a) Field installed.
 - 3) Global (field provided sensor): Factory installed.
 - 4) Single Enthalpy:
 - a) Field installed.
 - 5) Differential Dual Enthalpy:
 - a) Field installed.
2. High Performance Economizer:
- a. Dampers: Gear driven.
 - 1) Plug-in connections to unit.
 - 2) Nylon bearings.
 - 3) Enhanced neoprene blade edge seals.
 - 4) Flexible stainless steel jam seals.
 - 5) High torque, 24 V fully modulating spring return motor.
 - 6) Minimum damper position: Adjustable.
 - 7) Damper linkage and shafts: Plated.
 - b. Control module:
 - 1) Inputs and outputs based on parameter settings.
 - 2) Automatic sensor detection.
 - 3) Alarm message display.
 - 4) Non-volatile memory: Maintains setting during power failure.
 - 5) Keypad: Setting parameters.
3. Outdoor Air Damper: Motorized.
- a. Field installed.
4. Outdoor Air Damper: Manual; Hood provided.
- a. Field installed.
5. Dehumidification system with secondary coil: Factory installed.
6. Power exhaust fan:
- a. Field installed.
7. Roof curb: Field installed.
8. Barometric relief damper.
- a. Down flow; hoods provided, field installed.
 - b. Horizontal; hoods provided, field installed.
9. Energy Recovery System: Field installed.
10. Ceiling Diffuser: Field installed.
- a. Flush.
 - b. Step down.
11. Transition: Field installed.
- a. Supply.
 - b. Return.
12. UVC lamps:
- a. Field installed.
13. Coil Guards: Field installed.
14. Hail Guards: Field installed.
15. Disconnect Switch:
- a. Field installed.
16. Condensate drain trap.
- a. Plastic:
 - 1) Field installed.

- b. Copper:
 - 1) Field installed.
- 17. GFCI Service Outlets (field wired):
 - a. Field installed.
- 18. GFCI Service Outlets; unit powered: Factory installed.
- 19. HACR Circuit breaker: Factory installed.
- 20. UVC Germicidal lamps.

2.3 PACKAGED ROOFTOP UNITS (K-SERIES)

A. Packaged Rooftop Units: K-Series by Allied Commercial:

1. KCA / KCB - Electric / Electric.

- a. Capacity: 2 Ton.
- b. Capacity: 2.5 Ton.
- c. Capacity: 3 Ton.
- d. Capacity: 4 Ton.
- e. Capacity: 5 Ton.
- f. Capacity: 6 Ton.
- g. Capacity: 7.5 Ton.
- h. Capacity: 8.5 Ton.
- i. Capacity: 10 Ton.
- j. Capacity: 12.5 Ton.
- k. Capacity: 15 Ton.
- l. Capacity: 17.5 Ton.
- m. Capacity: 20 Ton.
- n. Capacity: 25 Ton.

2. KGA / KGB - Gas / Electric.

- a. Capacity: 2 Ton.
- b. Capacity: 2.5 Ton.
- c. Capacity: 3 Ton.
- d. Capacity: 4 Ton.
- e. Capacity: 5 Ton.
- f. Capacity: 6 Ton.
- g. Capacity: 7.5 Ton.
- h. Capacity: 8.5 Ton.
- i. Capacity: 10 Ton.
- j. Capacity: 12.5 Ton.
- k. Capacity: 15 Ton.
- l. Capacity: 17.5 Ton.
- m. Capacity: 20 Ton.
- n. Capacity: 25 Ton.

3. KHA / KHB - Heat Pump.

- a. Capacity: 2 Ton.
- b. Capacity: 2.5 Ton.
- c. Capacity: 3 Ton.
- d. Capacity: 4 Ton.
- e. Capacity: 5 Ton.
- f. Capacity: 6 Ton.
- g. Capacity: 7.5 Ton.
- h. Capacity: 8.5 Ton.
- i. Capacity: 10 Ton.
- j. Capacity: 12.5 Ton.
- k. Capacity: 15 Ton.
- l. Capacity: 17.5 Ton.
- m. Capacity: 20 Ton.

4. KCA - High Efficiency.

- a. Capacity: 6 Ton.
 - b. Capacity: 7.5 Ton.
 - c. Capacity: 8.5 Ton.
 - d. Capacity: 10 Ton.
 - e. Capacity: 13 Ton.
 - f. Capacity: 15 Ton.
 - g. Capacity: 17.5 Ton.
 - h. Capacity: 20 Ton.
 - i. Capacity: 25 Ton.
5. KGA - High Efficiency.
- a. Capacity: 6 Ton.
 - b. Capacity: 7.5 Ton.
 - c. Capacity: 8.5 Ton.
 - d. Capacity: 10 Ton.
 - e. Capacity: 13 Ton.
 - f. Capacity: 15 Ton.
 - g. Capacity: 17.5 Ton.
 - h. Capacity: 20 Ton.
 - i. Capacity: 25 Ton.
- B. Performance requirements:
1. Must meet or exceed ASHRAE 90.1 minimum standards.
 2. 3-5 Ton units:
 - a. AHRI 210.
 - b. AHRI 240.
 3. 6 Ton units:
 - a. AHRI 340.
 - b. AHRI 360
 4. CSA listed.
 5. ETL listed
 6. UL listed.
 7. ULC listed.
- C. Cabinet:
1. Exterior panels: Heavy-gauge galvanized steel with two-layer enamel paint finish
 2. Perimeter Base Rail: Heavy gauge galvanized steel.
 - a. Forklift slots; on three sides, not directly below condenser coil.
 3. Rigging holes on all four corners
 4. Raised or flanged edges around duct and power entry openings.
 5. Return airflow choice: Factory shipped:
 - a. 2 to 12.5 Ton units:
 - b. Down flow.
 - c. Horizontal flow.
 - 1) Convert in field; Horizontal Discharge Kit.
 - 2) Horizontal airflow requires Horizontal Roof Curb.
 - 3) Horizontal Return Air Panel Kit is also required if converting a down flow configuration into horizontal.
 6. Electrical lines: Brought through base of unit via horizontal knockouts.
 7. Gas lines: Brought through base of unit via horizontal knockouts.
 8. Insulation: Panels adjacent to conditioned air; insulated with non-hygroscopic fiberglass insulation.
 - a. Unit base is fully insulated.
 - 1) Serves as air seal to roof curb.
 9. Access Panels: Compressor, controls, heating areas, blower, air filter, and economizer.
 - a. Hinged Access Panels - Factory installed: sealed with quarter-turn latching handles and tight air and water seal.

10. Corrosion Protection:
 - a. MIL-P-53084.
 - b. ASTM B117.
 - c. ASTM 1153.
 - d. MIL-P-53084.
 11. GFI Service Outlets (field wired).
 12. Disconnect Switch.
 - a. Up to 80 amps.
 - b. Up to 150 amps.
 13. Hail Guards - Field installed.
 14. Coil Guards - Field installed.
 15. Horizontal Discharge Kit.
 16. Return Air Adaptor Plate.
 17. Horizontal Return Air Panel Kit.
- D. Cooling System: Capable of operating from 30 to 125 degrees F (-1 to 52 degrees C) without installation of additional controls.
1. Compressors: Scroll Type, R-410A refrigerant.
 - a. Overload Protected.
 - b. Internal excessive current and temperature protection.
 - c. Isolated from condenser and evaporator fan air streams.
 - d. Vibration isolation: Mounted on elastomeric grommets.
 2. Thermal Expansion Valve.
 3. High capacity filter/driers.
 4. High pressure switches.
 5. Freezestats.
 6. Reversing Valves: Four-way interchange reversing valve.
 7. Defrost Control.
 8. Crankcase heaters.
- E. Coil Construction: Condensing and evaporator coils, silver soldered.
1. Copper tube, rippled-edge aluminum fins, flared shoulder tubing connections, and factory leak tested.
 2. Evaporator Coils: Balanced port thermal expansion valves,
 - a. Compressor circuits on coil: Divided across face of coil and active through coil depth. Freeze protection; pressure and leak tested: 500 psi (3447 kPa).
 - b. Flexible immersed coating electrodeposited by dry film process:
 - 1) ASTM B117.
 - 2) ASTM 1153.
 - 3) MIL-P-53084.
 3. Condenser Coils:
 - 1) K-Series 7.5 to 12.5-ton: Single formed coil.
 - 2) K-Series 2 to 7.5-ton: Two independent coils.
 - 3) K-Series 13 to 25-ton: Angled, slab design.
 4. Condensate Drain Pan: Plastic, sloped meeting ASHRAE 62.1.
 - a. Side or bottom drain connections.
 - b. Reversible to allow connection at back of unit.
 5. Outdoor coil fan motors: Shaft up, wire basket guard; thermal overload protected.
 - a. Permanently lubricated Ball bearings.
 - b. Permanently lubricated sleeve bearings.
 6. Outdoor coil fans: PVC coated, furnished fan guard.
 7. Condensate Drain Trap: available in copper or PVC.
 8. Drain Pan Overflow Switch.
 9. Low Ambient Kit.
- F. Gas Heating System: Induced draft.

1. Fuel type: Natural gas.
 2. Ignition: Direct spark pilot.
 3. Electronic sensors: Flame.
 4. Switches: Flame rollout, High heat limit, and safety.
 - a. Induced draft failure: Operating to altitude of 2000 feet (610m) with no derate to manifold pressure.
 5. Controls: Fan and limit.
 6. Service access: Controls, burners and heat exchanger.
 7. Heat Exchanger: Tubular.
 - a. Aluminized steel.
 - b. Stainless steel.
 8. Gas piping system tight and free of leaks when pressurized to maximum supply pressure.
 9. Gas Valve: Two-stage, redundant type gas heat valve with manual shutoff.
 10. Gas Valve: Single-stage.
 11. Gas Burners: Inshot, aluminized steel.
 12. Low NOx.
 13. Field Installed Accessories:
 - a. Combustion Air Intake Extensions.
 - b. Vertical Vent Extension Kit.
 - c. LPG/Propane Kit.
 - d. Low Temperature Vestibule Heater.
- G. Electric Heating System: Electrical resistance heater.
1. Field installed.
 2. Fuse Block.
 - a. Field Installed.
 3. Reset thermal limit protection.
 4. Single point power supply
 5. Heater Element: Nickel chromium wire.
 - a. Individually fused.
 6. Electric heater slides out of unit for service.
 7. Heating Controls:
 - a. Support 2 stages of heating control from thermostat or DDC.
 - b. With delay time of 30 seconds between low and high heat stages.
- H. Supply Air Fan (Blower): Galvanized steel with forward curved blades.
1. Constant Air Volume(CAV).
 2. VAV (Single Zone Variable Air Volume).
 3. Wheel: Balanced, statically and dynamically.
 4. Bearings: Ball bearings
 5. Adjustable pulley for speed change.
 6. Blower assembly slides out of unit for servicing.
 7. Motor: Overload protected.
 - a. Direct drive: Sleeve bearings.
 - b. Belt drive: Ball bearings.
- I. Supply Air Filters: Disposable 2 inch furnished as standard. Field installed.
1. 2" MERV 13 Filters.
 2. 2" MERV 8 Filters.
- J. Controls:
1. Unit Control: 24V transformer (secondary) with built in circuit breaker protection.
 2. Heat/Cool Staging: 2 heat/2 cool staging with third party DDC controls or thermostat.
 3. Low voltage terminal block.
 4. Night setback mode.
 5. Controls Options:

- a. Smoke detector supply:
 - 1) Field installed.
 - b. Smoke detector return:
 - 1) Field installed.

- K. Serviceability:
 - 1. Wiring: Keyed and labeled field connections, color coded and continuously marked wire to identify point-to-point component connections.
 - a. Not in contact with hot-gas refrigerant lines or sharp metal edges.
 - 2. Electrical Plugs.
 - 3. Access Panels.
 - 4. Blower Access.
 - 5. Technical Expansion Valve Access.
 - 6. Coil Cleaning.
 - 7. Standard Components.
 - 8. Compressor Compartment

- L. Accessories:
 - 1. Economizer:
 - a. Down flow.
 - b. Horizontal:
 - c. Hoods provided:
 - 1) Field installed.
 - d. Control:
 - 1) Global (field provided sensor): Factory.
 - 2) Single Enthalpy:
 - a) Field installed.
 - 3) Differential Dual Enthalpy:
 - a) Field installed.
 - 2. High Performance Economizer:
 - a. Dampers: Gear driven.
 - 1) Plug-in connections to unit.
 - 2) Nylon bearings.
 - 3) Enhanced neoprene blade edge seals.
 - 4) Flexible stainless steel jam seals.
 - 5) High torque, 24 V fully modulating spring return motor.
 - 6) Minimum damper position: Adjustable.
 - 7) Damper linkage and shafts: Plated
 - b. Control module:
 - 1) Inputs and outputs based on parameter settings.
 - 2) Automatic sensor detection.
 - 3) Alarm message display.
 - 4) Non-volatile memory: Maintains setting during power failure.
 - 5) Keypad: Setting parameters.
 - 3. Outdoor Air Damper: Hood provided.
 - a. Down flow"
 - 1) Field installed.
 - b. Horizontal:
 - 1) Field installed.
 - 4. Power exhaust fan:
 - a. Field installed.
 - 5. Roof curb:
 - a. Down flow:
 - 1) Field installed.
 - b. Horizontal:
 - 1) Field installed.

6. Barometric relief damper: Hoods provided.
 - a. Down flow:
 - 1) Field installed.
 - b. Horizontal:
 - 1) Field installed.
7. Energy Recovery System: Field installed.
8. Ceiling Diffuser: Field installed.
 - a. Flush.
 - b. Step down.
9. Transition: Field installed.
 - a. Supply.
 - b. Return.
10. UVC lamps:
 - a. Field installed.
11. UVC Germicidal lamps:
12. Indoor Air Quality (CO2) Sensors.
13. Coil Guards:
 - a. Field installed.
14. Hail Guards:
 - a. Field installed.
15. Disconnect Switch:
 - a. Field installed.
16. Condensate drain trap"
 - a. Plastic:
 - 1) Field installed.
 - b. Copper:
 - 1) Field installed.
17. GFCI Service Outlets (field wired)
 - a. Field installed
18. VFD Manual Bypass Kit: available on units equipped with VAV option.

2.4 PACKAGED ROOFTOP UNITS (Z-SERIES)

- A. Packaged Rooftop Units: Z-Series by Allied Commercial.
 1. ZGA / ZGB - Gas / Electric.
 2. ZCA / ZCB - Electric / Electric.
 3. ZHA / ZHB - Heat Pump.
 4. Capacity: 3 Ton.
 5. Capacity: 4 Ton.
 6. Capacity: 5 Ton.
 7. Capacity: 6 Ton.
 8. Capacity: 7.5 Ton.
 9. Capacity: 8.5 Ton.
 10. Capacity: 10 Ton.
 11. Capacity: 12.5 Ton.
- B. Performance requirements:
 1. Must meet or exceed ASHRAE 90.1-2010 minimum standards.
 2. 3-5 Ton units:
 - a. AHRI 210.
 - b. AHRI 240.
 3. 6 Ton units:
 - a. AHRI 340.
 - b. AHRI 360
 4. CSA listed.
 5. UL listed.

6. ULC listed.
- C. Cabinet:
1. Exterior panels: Heavy-gauge galvanized steel with two-layer enamel paint finish
 2. Perimeter Base Rail: Heavy gauge galvanized steel.
 - a. Forklift slots; on three sides, not directly below condenser coil.
 3. Rigging holes on all four corners.
 4. Raised or flanged edges around duct and power entry openings.
 5. Return Airflow Choice: Down flow; factory shipped.
 - a. Convertible in field to horizontal flow.
 6. Electrical lines: Brought through base of unit via horizontal knockouts.
 7. Gas lines: Brought through base of unit via horizontal knockouts.
 8. Insulation: Panels adjacent to conditioned air; insulated with non-hygroscopic fiberglass insulation.
 9. Access Panels: Compressor, controls, heating areas, blower, air filter, and economizer.
 - a. Hinged access panel; condenser section.
 10. Corrosion Protection:
 - a. MIL-P-53084.
 - b. ASTM B117.
 - c. ASTM 1153.
 - d. MIL-P-53084.
 11. Hail Guards; field installed.
 12. Coil Guards, field installed.
- D. Cooling System: Capable of operating from 35 to 125 degrees F (-1 to 52 degrees C) without installation of additional controls.
1. Compressors: Scroll Type, R-410A refrigerant.
 - a. Overload protected.
 - b. Internal excessive current and temperature protection.
 - c. High capacity filter/driers.
 - d. High pressure switches.
 - e. Vibration isolation: Mounted on elastomeric grommets.
 2. Reversing Valves: Four-way interchange reversing valve.
 3. Crankcase heaters.
- E. Coil Construction: Condensing and evaporator coils, silver soldered.
1. Copper tube, rippled-edge aluminum fins, and flared shoulder tubing connections, and factory leak tested.
 2. Evaporator Coils: Pressure and leak tested to 500 psi (3447 kPa).
 - a. Flexible immersed coating electrodeposited by dry film process:
 - 1) ASTM B117.
 - 2) ASTM 1153.
 - 3) MIL-P-53084.
 3. Condenser coils:
 - a. Eco-Last coil system: All aluminum construction.
 - 1) Over-core reinforcement.
 - 2) Coil-mounting isolators.
 - 3) Sheet metal isolators.
 - 4) Coil Stabilizers.
 - 5) Flexible immersed coating electrodeposited by dry film process on corrosion hardened units only.
 4. Condensate Drain Pan: Plastic, sloped meeting ASHRAE 62.1.
 - a. End drain connection.
 5. Outdoor coil fan motors: Shaft down, mounted fan guard; thermal overload protected.
 - a. Permanently lubricated bearings.
 6. Outdoor coil fans: PVC coated, furnished fan guard.

7. Condensate Drain Trap: available in copper or PVC.
 8. Drain Pan Overflow Switch.
 9. Low Ambient Kit
- F. Gas Heating System: Induced draft.
1. Motor: PSC; ball bearings.
 2. Fuel type: Natural gas.
 3. Ignition: Direct spark pilot.
 4. Sensors: Electronic flame.
 5. Switches: Flame rollout, High heat limit, and safety.
 - a. Induced draft failure: Operating to altitude of 2000 feet (610m) with no derate to manifold pressure.
 - 1) High altitude de-rate above 2000 feet (610 m) is 2 percent per 1000 feet (2 percent per 305 m) less than standard de-rate of 4 percent per 1000 feet (4 percent per 305 m).
 6. Controls: Fan and limit.
 7. Service access: Controls, burners and heat exchanger.
 8. Heat Exchanger: Tubular.
 - a. Aluminized steel.
 9. Gas piping system tight and free of leaks when pressurized to maximum supply pressure.
 10. Gas Valve: Two-stage, redundant type gas heat valve with manual shutoff.
 11. Gas Valve: Single-stage.
 12. Gas Burners: Aluminized steel inshot with powder metal flame retention ring.
 13. Low NOx.
 14. Field Installed Accessories:
 - a. Vertical Vent Extension Kit.
 - b. LPG/Propane Kit.
- G. Electric Heating System: Electrical resistance heater:
1. Field installed.
 2. Fuse Block.
 - a. Field Installed.
 - b. Fusible link thermal limit protection.
 - c. Single point power supply.
 - d. Heater Element: Nickel chromium wire.
 - 1) Individually fused.
 - e. Electric heater slides out of unit for service.
 3. Heating Controls:
 - a. Support 2 stages of heating control from thermostat (ZG models).
 - b. Support 1 stage of heating control from thermostat (ZC models).
- H. Supply Air Fan (Blower): Galvanized steel with forward curved blades.
1. Constant Air Volume (CAV).
 2. Wheel: Balanced, statically and dynamically.
 3. Bearings: Ball bearings.
 4. Adjustable pulley for speed change.
 5. Blower assembly slides out of unit for servicing.
 6. Motor: Overload protected.
 7. Belt drive: Ball bearings.
- I. Supply Air Filters: Disposable 2 inch furnished as standard.
- J. Controls:
1. Unit Control: 24V transformer (secondary) with external fuse protection.
 2. Heat/Cool Staging: 2 heat/2 cool staging control system or thermostat.
 3. Night setback mode.
 4. Controls Options:

- a. BACnet.
 - b. Thermostat.

- K. Serviceability:
 1. Wiring: Labeled field connections, color coded and continuously marked wire to identify point-to-point component connections.
 - a. Not in contact with hot-gas refrigerant lines or sharp metal edges.
 2. Electrical Plugs.
 3. Access Panels.
 4. Tool-less filter access panel.
 5. Blower Access.
 6. Coil Cleaning.
 7. Standard Components.
 8. Hinged Compressor access panel.

- L. Accessories:
 1. Economizer:
 - a. Down flow.
 - b. Horizontal.
 - c. Hoods provided:
 - 1) Field installed.
 2. High Performance Economizer:
 - a. Dampers: Gear driven.
 - 1) Plug-in connections to unit.
 - 2) Nylon bearings.
 - 3) Enhanced neoprene blade edge seals.
 - 4) Flexible stainless steel jam seals.
 - 5) High torque, 24 V fully modulating spring return motor.
 - 6) Minimum damper position: Adjustable.
 - 7) Damper linkage and shafts: Plated.
 - b. Control module:
 - 1) Inputs and outputs based on parameter settings.
 - 2) Automatic sensor detection.
 - 3) Alarm message display.
 - 4) Non-volatile memory: Maintains setting during power failure.
 - 5) Keypad: Setting parameters.
 3. Control: Single Enthalpy.
 - a. Field installed.
 4. Outdoor Air Damper: Hood provided.
 - a. Downflow.
 - 1) Field installed
 - b. Horizontal
 - 1) Field installed
 5. Power exhaust fan:
 - a. Field installed.
 6. Roof curb:
 - a. Downflow.
 - 1) Field installed
 - b. Horizontal.
 - 1) Field installed
 7. Ceiling Diffuser: Field installed. =
 - a. Flush.
 - b. Step down.
 8. Indoor Air Quality (CO2) Sensors
 9. Coil Guards:
 - a. Field installed.

10. Hail Guards:
 - a. Field installed
11. Condensate drain trap.
 - a. Plastic:
 - 1) Field installed.
 - b. Copper:
 - 1) Field installed.

2.5 SPLIT SYSTEM OUTDOOR CONDENSING UNITS (T-SERIES)

- A. Split System Outdoor Condensing Units: T-Series by Allied Commercial.
 1. Model: TAA Air Handler.
 2. Model: TPA Heat Pump.
 3. Model: TSA Condensing Unit.
 - a. 6 Ton.
 - b. 7.5 Ton.
 - c. 10 Ton.
 - d. 12.5 Ton.
 - e. 15 Ton.
 - f. 20 Ton.
- B. Performance requirements:
 1. Must meet or exceed ASHRAE 90.1-2010 minimum standards.
 2. 3-5 Ton units:
 - a. AHRI 210.
 - b. AHRI 240.
 3. 6 Ton units:
 - a. AHRI 340.
 - b. AHRI 360.
 4. Sound Tested:
 - a. AHRI 270
 - b. AHRI 370
 5. CSA listed.
 6. ETL listed.
 7. NEC listed.
 8. CEC listed.
 9. UL listed.
 10. ULC listed.
- C. Split Systems Heat Pump and Condensing Units
 1. Maximum sound rating:89 dB.
 2. Cabinet: Pre-painted finish, heavy-gauge galvanized steel.
 - a. Removable panels.
 - b. Heavy duty steel base channels rails: Fork slots and lifting holes.
 - c. Control box: Factory wired.
 - 1) Inside cabinet.
 - 2) Sized for field installed DDC or other control modules.
 3. Compressor: Scroll type; uniform suction flow, constant discharge flow.
 - a. Internal excessive current and temperature protection.
 - b. Single stage compressor(s).
 - c. Vibration isolation: Secured to elastomeric mounts.
 - d. Defrost control: Outdoor temperatures below 42 degrees F (6.1 degrees C).
 - 1) Adjustable defrost cycle.
 - 2) Diagnostic LEDs.
 - 3) Terminal strip for field wiring.
 - 4) Condenser coil thermostat.

- 5) Short-cycle protection.
 - 4. Crankcase heater.
 - 5. Refrigerant System Refrigerant: R410-A.
 - a. Fully serviceable liquid and suction line service valves.
 - b. High pressure switch: Manual reset.
 - c. Loss of charge (low pressure) switch: Automatic reset.
 - d. Hi-capacity driers: Trap refrigerant contaminants.
 - e. Refrigerant line connections and field wiring: Located outside the unit.
 - f. Reversing valve Refrigerant flow.
 - g. Condenser Coil(s): Copper tube construction with machine fitted aluminum rippled and/or lanced fins, flared shoulder tubing connections, silver soldered brazed joints, and factory leak tested.
 - 1) Flexible immersed coating electrodeposited by dry film process:
 - a) ASTM B117.
 - b) ASTM 1153.
 - c) MIL-P-53084.
 - 6. Coil Fans/Air Mover: Direct drive, propeller fan(s).
 - a. PVC coated steel fan guards; removable.
 - b. Totally enclosed fan motors with rain shield.
 - 7. Low Ambient Operation: Down to 30 degreesF outdoor air temperature.
 - 8. Field Installed Options/Accessories:
 - a. Coil / Hail Guards: Heavy duty metal mesh enclosures.
 - b. Low Ambient Control Kit: Allowing unit operation down to 0 degreesF outdoor air temperature.
- D. Split Systems Air Handling Units:
- 1. Standards:
 - a. AHRI 340.
 - b. AHRI 360.
 - c. CEC listed.
 - d. CSA listed.
 - e. ETL listed.
 - f. NEC listed.
 - 2. Cabinet: Painted, heavy gauge, galvanized steel cabinet.
 - a. Fiberglass insulation.
 - b. Removable side panels. Service access.
 - c. Electrical inlets: Inside cabinet.
 - d. Refrigerant piping knockouts provided both sides of cabinet.
 - 3. Control box. Separate unit in cabinet.
 - 1) Relocatable.
 - 2) Low voltage terminal strip, factory installed.
 - 3) Blower contactor.
 - 4) All controls prewired at factory.
 - 4. Thermostatic Expansion Valve (TXV): Factory installed for refrigerant flow regulation.
 - a. One expansion valve per circuit.
 - b. Internal check valves.
 - 5. Refrigerant Coil(s): Copper tube construction with machine fitted aluminum rippled and/or lanced fins, flared shoulder tubing connections, silver soldered brazed joints, and factory leak tested.
 - a. Flexible immersed coating electrodeposited by dry film process:
 - 1) ASTM B117.
 - 2) ASTM 1153.
 - 3) MIL-P-53084.
 - 6. Refrigerant piping:
 - a. Sweat connections internal to cabinet.
 - b. Condensate drain: extends outside of cabinet.

- 1) Positioned for vertical or horizontal flow applications.
7. Freezestat: field installed.
8. Electric heat section: Separate add on in matching cabinet.
 - a. Cabinet: Painted, heavy-gauge galvanized steel.
 - 1) Hardware provided to secure cabinets together.
 - 2) Removable panels.
 - b. Electric heaters: Helix wound, nichrome elements; field installed directly in airstream.
 - 1) Capacities:
 - a) 10 kW.
 - b) 15 kW.
 - c) 20 kW.
 - d) 25 kW.
 - e) 30 kW.
 - f) 35 kW.
 - g) 40 kW.
 - 2) Limit controls: Overheating protection.
9. Hot water coil: Separate add on in matching cabinet.
 - a. Cabinet: Painted, heavy-gauge galvanized steel.
 - 1) Foil-faced fiberglass insulation.
 - 2) Hardware provided to secure cabinets together.
 - 3) Removable panels.
 - b. Coil: Copper tube construction with machine fitted aluminum rippled and/or lanced fins, flared shoulder tubing connections, silver soldered brazed joints, and factory leak tested.
 - c. Valves and pumps: Furnished by installer.
10. Supply Air Filters: Disposable 2 inch furnished as standard. Field installed.
 - a. 2" MERV 11, 5 inch (127 mm) pleated filters.
 - b. 2" MERV 16, 5 inch (127 mm) pleated filters.
 - 1) MERV Filter Mounting Kit.
11. UVC Germicidal Light Kit: ETL approved.
 - a. Rapid start ballast; LED indicators.
 - b. 208/230 V/1ph power supply.
 - 1) Stepdown transformer
12. Supply Air Fan (Blower): Galvanized steel with forward curved blades.
 - a. Constant Air Volume(CAV).
 - b. Wheel: Balanced, statically and dynamically.
 - c. Bearings: Ball bearings lubricated and sealed.
 - d. Adjustable pulley for speed change.
 - e. Blower assembly slides out of unit for servicing.
 - f. Motor: Overload protected.
 - 1) Belt drive: Ball bearings.
 - g. Single Zone VAV Supply Fan VFD Kit:
 - 1) ASHRAE 90.1-2010 Section 6.4.3.10
 - 2) California Code of Regulations Title 24.
 - 3) Blower speeds:
 - a) Low: 66 percent of high speed for partial-load cooling
 - b) High: Full load cooling.
 - 4) Operation range: -40 to 125 degrees F (-40 to 52 degrees C).
13. Drain Plan: Plastic, corrosion resistant, and reversible.
14. Float switch: Prevents condensate overflow.
15. Return air grilles: Anodized aluminum.
16. Accessories:
 - a. Economizer: Factory assembled and wired, dampers and controls for field installation.
 - 1) Damper linkage and shafts: Plated.

- 2) Cabinet: Painted, heavy-gauge galvanized steel.
 - a) Foil-faced fiberglass insulation.
 - b) Hardware provided to secure cabinets together.
 - c) Removable panels.
 - d) Flanged for easy duct connections:
 - 1) Outdoor air and return air.
 - 3) Standard economizer:
 - a) Dampers: Gear driven.
 - 1) Plug-in connections to unit.
 - 2) Neoprene seals.
 - 3) 24 V fully modulating spring return motor.
 - 4) Minimum damper position: Adjustable.
 - 5) Damper linkage and shafts: Plated.
 - b) Control module:
 - 1) Can operate based on outdoor air temperatures.
 - 2) IAQ sensor: maintains 55 degrees when CO2 is higher than given set point.
 - 3) Demand control ventilation (DCV) LED: Indicated IAQ reading is higher than set point and requires more fresh air.
 - 4) Free cool LED: Outdoor air is suitable for free cooling.
 - 4) High performance economizer:
 - a) Dampers: Gear driven.
 - 1) Plug-in connections to unit.
 - 2) Nylon bearings.
 - 3) Enhanced neoprene blade edge seals.
 - 4) Flexible stainless steel jam seals.
 - 5) High torque, 24 V fully modulating spring return motor.
 - 6) Minimum damper position: Adjustable.
 - 7) Damper linkage and shafts: Plated.
 - b) Control module:
 - 1) Inputs and outputs based on parameter settings.
 - 2) Automatic sensor detection.
 - 3) Alarm message display.
 - 4) Non-volatile memory: Maintains setting during power failure.
 - 5) Keypad: Setting parameters.
- b. Differential enthalpy Control: Chooses between outdoor or return air; whichever has the lowest enthalpy.
- 1) Field installed in economizer damper.

2.6 SMALL SPLITS

- A. Small Splits: By Allied Commercial.
 1. Model: SCU Air conditioner:
 - a. Dry Charge
 2. Model: SHP Heat pump:
 - a. Dry charge
 3. Model: ACBX Air Handler:
 - a. 3 Ton.
 - b. 4 Ton.
 - c. 5 Ton.
- B. Performance requirements:
 1. Must meet or exceed ASHRAE 90.1-2010 minimum standards.
 2. 3-5 Ton units:
 - a. AHRI 210.
 - b. AHRI 240.

3. UL listed.
 4. ULC listed.
- C. Split System Heat Pumps and Air Conditioners.
1. Standards:
 - a. AHRI 210 certified.
 - b. AHRI 240 certified.
 - c. UL Listed.
 - d. ULC Listed.
 2. Sound Ratings: 78 dBA maximum.
 3. Design ambient: up to 125 degrees F (53 degrees C).
 4. Cabinet: Baked polyester painted finish over galvanized steel.
 - a. Metal louvered exterior panels.
 - 1) Easily removable for servicing; two screws per panel.
 - b. Rounded corners.
 - c. External gauge ports.
 - d. Base pan: Ported, for water and debris drainage.
 5. Compressor: Scroll, high efficiency. R410A refrigerant.
 - a. Overload Protection.
 - b. Internal excessive current and temperature protection.
 - c. Vibration isolation: Mounted on elastomeric grommets.
 6. Coil: Copper tube with aluminum fins.
 - a. Raised coil to prevent debris collection.
 7. Components
 - a. Filter drier.
 - 1) Bi-directional.
 - b. Service valves.
 - c. Trade available components.
 - d. Indoor coil orifice shipped with outdoor unit.
 - 1) Charged with 15 feet (4.6 m) of line set.
 - e. Discharge muffler.
 - f. Solid-state, time-initiated, temperature terminated defrost system.
 - g. Low pressure switch: Charge loss protection.
 - h. High pressure switch: Compressor protection.
 - i. Defrost control:
 - 1) Diagnostics.
 - 2) Short cycle protection.
 - 3) Quiet Shift capable.
 - 4) Field selectable: 30/60/90 minutes.
 8. Accessories:
 - a. Blower off delay kit
 - b. Sound covers.
 - c. Freezestats.
 - d. Loss of charge kit.
 - e. Compressor time off control.
 - f. Low ambient kit.
 - g. Fossil flue kit.
 - h. Crank case heater.
 - i. High pressure cutout kit.
 - j. Thermal expansion valve kit.
 - k. Short cycle protection kit.
- D. Split System Dry-Charged, Heat Pumps and Air Conditioners.
1. Standards:
 - a. UL Listed.
 - b. ULC Listed.

2. Sound Ratings: 80 dBA maximum.
3. Design ambient: up to 125 degrees F (53 degrees C).
4. Cabinet: Baked polyester painted finish over galvanized steel.
 - a. Metal louvered exterior panels.
 - 1) Easily removable for servicing; two screws per panel.
 - b. Rounded corners.
 - c. External gauge ports.
 - d. Base pan: Ported, for water and debris drainage.
5. Compressor: Scroll, high efficiency. Nitrogen charged for replacements of R22 components only.
 - a. Overload Protection.
 - b. Internal excessive current and temperature protection.
 - c. Vibration isolation: Mounted on elastomeric grommets.
6. Coil: Copper tube with aluminum fins.
 - a. Raised coil to prevent debris collection.
7. Components
 - a. Filter drier.
 - 1) Bi-directional.
 - b. Service valves.
 - c. Trade available components.
 - d. Indoor coil orifice shipped with outdoor unit.
 - 1) Charged with 15 feet (4.6 m) of line set.
 - e. Discharge muffler.
 - f. Solid-state, time-initiated, temperature terminated defrost system.
 - g. Low pressure switch: Charge loss protection.
 - h. High pressure switch: Compressor protection.
 - i. Defrost control:
 - 1) Diagnostics.
 - 2) Short cycle protection.
 - 3) Quiet Shift capable.
 - 4) Field selectable: 30/60/90 minutes.
8. Accessories:
 - a. Blower off delay kit.
 - b. Sound covers.
 - c. Freezestats.
 - d. Loss of charge kit.
 - e. Compressor time off control.
 - f. Low ambient kit.
 - g. Crank case heater.
 - h. High pressure cutout kit.
 - i. Thermal expansion valve kit.
 - j. Short cycle protection kit.

E. Air Handler for Heat Pump and Air Conditioner Applications:

1. Standards:
 - a. UL Listed.
 - b. ULC Listed.
2. Thermostatic Expansion Valve (TXV): Factory installed for refrigerant flow regulation.
3. Cabinet: Painted, heavy gauge, galvanized steel cabinet.
 - a. Foil faced insulation.
 - b. Removable side panels: Service access.
 - c. No external fastener heads protruding from cabinet sides.
 - d. Tool-less filter access; installation, removal, and replacement.
 - e. Electrical inlets: Cabinet top and sides.
 - f. Stacked or split into two separate sections.
4. Components:

- a. Blower: Multi-speed permanent split capacitor (PSC), single phase motor.
 - 1) Slide mounted for easy removal and maintenance.
 - 2) Up flow application.
 - 3) Down flow application.
 - 4) Horizontal application.
 - b. Transformer and blower relay.
 - c. Filter: Frame type.
 - d. Distributor tubing: Sleeved.
5. Drain Plan: Plastic, UV resistant; dual pipe drains.
6. Accessories:
- a. Counter flow kit.
 - b. Combustible floor kit.
 - c. Single point power kit.
 - d. Electric heat kit. Require 3 phase service.
 - 1) 10 kW.
 - 2) 15 kW.
 - 3) 20 kW.

2.7 UNIT HEATERS

- A. Unit Heaters: LF24. Gas Unit Heaters; Duct Furnaces by Allied Commercial.
- 1. Standard Units:
 - a. 100,000 Btuh.
 - b. 115,000 Btuh.
 - c. 145,000 Btuh.
 - d. 172,500 Btuh.
 - e. 195,000 Btuh.
 - f. 230,000 Btuh.
 - g. 250,000 Btuh.
 - h. 300,000 Btuh.
 - i. 345,000 Btuh.
 - j. 390,000 Btuh.
 - 2. Compact Units:
 - a. 30,000 Btuh.
 - b. 45,000 Btuh.
 - c. 60,000 Btuh.
 - d. 75,000 Btuh.
- B. Performance Requirements:
- 1. CSA certified.
 - 2. CEC listed.
 - 3. High altitude rating: All units may be fired at full input up to 2000 ft above sea level. See detailed product information for necessary derating on units based on altitude.
- C. Ships completely assembled: Controls factory installed, wired, and tested.
- D. Fuel type:
- 1. Natural Gas.
 - 2. LPG/Propane.
- E. Venting:
- 1. Horizontal.
 - 2. Vertical.
- F. Cabinet: Painted, heavy gauge, steel cabinet.
- 1. Insulated panels.
 - 2. Louvers: Adjustable.

- 3. Mounting: 3/8 in x 16 rivet nuts for unit suspension.
- G. Electrical Junction Box: Electrical and safety controls.
 - 1. Location:
 - a. Outside of cabinet.
 - b. Inside of cabinet.
 - 2. Transformer:
 - a. 120 / 24 V.
 - b. 115 / 24 V.
 - 3. Combination ignition/fan timer control.
 - 4. Terminal strip: thermostat connections.
 - 5. Diagnostic LED.
- H. Fan: Direct driven.
- I. Heating system:
 - 1. Combination control valve: 24 volt.
 - a. Manual shutoff.
 - b. Gas pressure regulation.
 - 2. Ignition: Solid state, timer controlled, direct spark.
 - a. Intermittent; only when required.
 - 3. Flame sensor:
 - a. Initiates three attempts at re-ignition before lock out.
 - 4. Combustion air inducer: Operates only during heating cycle purging flue vents.
 - a. Pressure switch: proves inducer operation prior to gas valve actuation.
 - b. Blower motor: Direct drive, sleeve bearings, and thermally protected.
 - c. Rotatable 90 degrees left or right of vertical to facilitate installation.
 - 5. Heat Exchanger: Tubular.
 - a. Aluminized steel.
 - b. Stainless steel.
 - 6. Burner Assembly: Inshot, aluminized steel.
 - a. Venturi air and gas mixer.
 - b. Removable as unit. Burners removable individually.
 - 7. Limit control: Factory installed and set.
- J. Venting:
 - 1. Vertical: Single wall and type B-1 double wall vent pipe.
 - 2. Horizontal: Single wall or Allied-approved stainless steel vent kits.
- K. Hanging Brackets: for field installation.
- L. Options:
 - 1. Discharge Nozzles: Fully assembled painted heavy gauge steel.
 - a. Orientation:
 - 1) 30 degrees.
 - 2) 45 degrees.
 - 3) 60 degrees.
 - 4) 90 degrees.
 - 2. Hanging bracket kit: Suspends heats on two pipe hangers.
 - a. Brackets and necessary hardware.
 - b. Pipe hangers: 3/4 inch not furnished; field provided.
 - 3. LPG/Propane conversion kit:

2.8 INDUSTRIAL FURNACES

- A. Gas Furnaces: Model LG14 by Allied Commercial.
 - 1. 225,000 Btuh.

2. 275,000 Btuh.
 3. 350,000 Btuh.
 4. 450,000 Btuh.
 - a. Orientation:
 - 1) Horizontal.
 - 2) Vertical.
- B. Performance Requirements:
1. UL listed.
- C. Cabinet:
1. Base frame and blower deck: 16-gauge (1.52 mm) steel.
 2. Front header box: 14-gauge (1.99 mm) aluminized steel.
 3. Side panels: Removable.
 4. Observation door.
- D. Heat exchanger 14-gauge (1.9 mm) stainless steel.
- E. Fuel Pump: Two stage.
- F. Burn: Stainless steel flame retention head, 115 V.
- G. Overload Protection: 115/230 V. factory wired for 230 V.
1. Blower motor, fans, and limits controls.
- H. Flue Travel: aluminized steel.
- I. Blowers: Primary, and secondary; rail mounted, slide out.
1. Belt driven.
 2. Motor: Factory wired for 230 V. 3450 rpm.
 - a. 1.5 Hp (1.12 kW)
 - b. 2.0 Hp (1.49 kW).
 3. Oil burning Kit: Barometric control included.
 - a. Oil burner: 7 Amps at 115 V.

PART 3 PRODUCTS

3.1 EXAMINATION

- A. Verification of Conditions: Examine areas and conditions under which Work is to be performed and identify conditions that may be detrimental to proper or timely completion.
1. Verify locations of all connections; i.e. piping and wiring.
- B. Do not proceed until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install products in accordance with manufacturer's instructions, approved submittals, and in proper relationship with adjacent construction.
- B. For roof curbs refer to appropriate sections in Division 07 for detailed specification information on roof curbs.
- C. Cast-in-place equipment bases: See appropriate sections in Division 03 for detailed specification of cast-in-place concrete or miscellaneous cast-in-plate concrete.
- D. Connections: Ducts, drains, gas piping, and wiring; see appropriate sections in Division 23 and 26 for detailed specifications information.

3.3 FIELD QUALITY CONTROL

- A. Testing: Test units for proper operation. Adjust until satisfactory results are obtained.
 - 1. Employ the use of a factory authorized representative to coordinate efforts.
- B. Replace any controls or equipment that fails to functioning properly or is damaged.
- C. Perform startup procedure per manufacturer's instructions.
 - 1. Employ the use of a factory authorized representative to coordinate efforts.
 - 2. Inspect entire unit for damages.
 - 3. Verify all systems and components are operating and performing to specification.
 - a. Verify all system calibrations are functioning normally.
- D. Replace filters: After testing and startup has been completed.
- E. Have manufacturer's representative, train maintenance personnel.
- F. Prepare and submits reports.

3.4 CLEANING AND PROTECTION

- A. Protect from damage during construction operations. Promptly repair any damaged surfaces. Remove and replace work which cannot be satisfactorily repaired.
- B. Clean products, prior to Substantial Completion, using materials recommended by the manufacturer.

3.5 OCCUPANCY ADJUSTMENT

- A. Adjust systems to meet actual needs of occupants.
 - 1. Months after Substantial Completion: _____ months.
 - a. Number of visits: _____.

END OF SECTION