Drainage Reports

Abbreveated Water & Sewer Need Reports

Water Study

Wastewater Study

Stormwater Waiver Application

SKYSONG 6 & QUADRANT 3 PARKING STRUCTURE EXPANSION
BASIS OF DESIGN AND OUTLINE SPECIFICATION

INTRODUCTION

The information contained herein is to be utilized by the Developer, Tenant, Contractor, and Design Team as the basis of design for SkySong 6 and the associated expansion of SkySong Quadrant 3 Parking Structure Expansion. The majority of this BOD deals with systems within the building, however, additional information may be included as it relates to project background.

The BOD is the documentation of the primary thought processes and assumptions behind design decisions that were made to meet the Owner's Project Requirements (OPR), otherwise known as design intent. This BOD describes the systems, components, conditions and methods chosen to meet the design intent. The BOD will be modified and redistributed as changes in the plan occur.

BUILDING DESCRIPTION

SkySong Innovation Center is a +/-42 acre mixed-use development located at the SEC Scottsdale Road and East McDowell Road in Scottsdale, Arizona.

The new SkySong 6 is a 6-story approximately 150,000 GSF building to be located at the NWC of SkySong Boulevard and Innovation Way (NWC of the SkySong shade sail). Quadrant 3 Parking Structure Expansion is a Grade + 4 level, 655 space (gross) expansion of the existing Grade + 5 Parking Structure located on the SWC Quadrant of SkySong Boulevard and Innovation Way replacing the existing 140 existing surface parking stalls (net add of 510 stalls).

In SkySong 6 the 1st floor of the building will consist of the 3 Entry Lobby spaces, Office Areas, and Core Restrooms. The 2nd, 3rd, 4th, 5th, and 6th floors will function as standard office space. Each floor will also consist of restrooms, break rooms, copy rooms, equipment rooms, and auxiliary space as required for support the floor's functions. The SWC of the 2nd floor will also include a 650 s.f. community room that opens to a 600 s.f. exterior balcony by way of an accordion window wall system. The SEC of the 4th floor will include a 400 s.f. exterior balcony.

CODES AND STANDARDS

A. The following codes and standards shall be adhered to in the design of this project:

1. 2012 International Building Code as amended by the City of Scottsdale
2. 2012 International Mechanical Code as amended by the City of Scottsdale
3. 2012 International Plumbing Code as amended by the City of Scottsdale
4. 2012 International Energy Conservation Code as amended by the City of Scottsdale
5. National Fire Protection Codes (latest editions)
6. NFPA 90A – HVAC Systems
7. 2005 NEC

8. 2010 ASHRAE 90.1 Energy Standards for Buildings Except Low Rise Residential
9. 2010 ASHRAE 62.1 Ventilation for Acceptable Air Quality
10. 2010 ASHRAE 55 – Thermal Environmental Conditions for Human Occupancy
11. Americans with Disabilities Act (latest edition)

PERFORMANCE CRITERIA

A. Outdoor Design Parameters as published by ASHRAE Station WMO 722780, Phoenix, Arizona.

1. 0.4% Summer design for load calculations:
   i. 110.2 deg F Dry Bulb, 70 deg F Wet Bulb
2. 1% Winter design for load calculations:
   i. 40.1 deg F Dry Bulb

   ii. Based on using the above design temperatures, there will be approximately 0.8% of the time (70 hours per year) when the system cannot maintain normal operating parameters.

B. Summer Indoor Design Conditions

1. 75 deg F at 0-65% Relative Humidity

C. Winter Indoor Design Conditions

1. 72 deg F at 0-50% Relative Humidity

SITE DESIGN

A. Scope – See attached site plans for limited site improvements around each structure.

1. Limited parking north of the building, see attached site plan.
2. Enhanced walkway on the west side of the building.
3. A trash enclosure at the NEC of the building.
4. Electrical yard for emergency generator and option to have external SES (alt) at the NEC of the building.
5. Limited site lighting.
6. Rework of patio area under the SkySong shade sail.
7. Redevelopment of the existing surface parking east of the Quadrant 3 Parking Structure into the expansion structure.

B. Civil – See attached civil narrative

C. Landscape – See attached landscape narrative

BUILDING DESIGN

A. Structure – See attached structural narrative for post-tension basis of design.

   1. Rooftop screening is to be TS frame with prefinished 1-1/2" corrugated metal deck siding.

B. Floor to Floor is 15'-6" 1st to 2nd and 13'-6" all other.

C. Elevator shaft is to be ground face CMU exposed on the lobby side with alternate for floor to floor (studs) shaft wall with porcelain tile veneer.

D. Stair shafts are floor to floor (studs) shaft wall. Concrete pan stairs with metal handrail similar to SkySong 4.

   1. The east stair will extend to the roof for rooftop maintenance access. Provide prefinished 1-1/2" corrugated metal deck siding at roof.

E. Exterior walls – Consist of a floor to floor thermally broken window system with 1" insulated glazings and insulated panels with exterior composite or press break cladding as shown on the elevations. Framed EIFS sections on the west end of the building to match SkySong 3. As an alternate the vertical cladding elements on the west and north side, provide EIFS in lieu of composite panels. 1st floor cast in place columns around perimeter are exposed; sack rub and painted.

F. Glazing – 1" Dual-Pane Insulated Low-E (see elevations for locations). Basis of design:

   1. Viracon VUE 1-30 is the primary

   2. Viracon VUE 1-50 is the field accent

   3. Viracon VNE 24-63 is the entry and corner accent

G. Elevators – 3 car group MRL with equipment on top floor

   1. Capacity – 2 @ 3,500 lbs & 1 @ 4,500 lbs (medical emergency car backed up by generator)

   2. Speed – 350 fpm

   3. Upgraded finishes similar to SkySong 3 & 4

   4. Programing – Service call button on back of 4,500 lbs elevator should be overridden by passenger call on front [if other 2 passenger elevators are already in use]

H. See attached exhibits for lobbies and interiors

I. Roof – 60 mill single ply PVC roof with R-30 rigid insulation above roof. Provide alternate for single ply TPO.

J. The balconies will have ½" glass guardrails.

K. See attached plans and elevations for more information.

PARKING STRUCTURE DESIGN

A. Structure – Match existing precast design.

B. Ramp – The ramp only occurs from grade to the 2nd level. All other levels are accessed from the existing garage.

C. Include demoing the removable panels on the existing garage for access to the new sections.

D. The new garage will receive similar metal lath cladding on the north side (as the south side of the existing), on the SEC (as the SEC of the existing), and on the west side (relocated from the west side of the existing.

E. The top level will be designed for pole lights to match existing that can be upgraded to car canopies.

BUILDING OPERATING SCHEDULE

A. Office Areas

1. Monday thru Friday – 5:00 AM to 6:00 PM

ENGINEERING SYSTEMS
BASIS OF DESIGN AND OUTLINE SPECIFICATION

KEY PARAMETERS

A. Energy Efficiency – Building is to be designed to be LEED Silver Certified

B. Indoor Air Quality – Use minimum MERV 8 filtration

C. Temperature Control - Tight temperature control everywhere.

D. Flexibility – Space uses can be modified without major changes to base mechanical system.

E. Noise – System designed to be quiet in noise-sensitive areas. Equipment located outside of noise-sensitive areas.

F. Redundancy – System will be designed to provide partial redundancy in case of equipment failure.

HVAC SYSTEM BASIS OF DESIGN

Main Building System

The main building will be served by a high efficient water-source heat pump system. The system will utilize two (2) roof mounted fluid coolers, one (1) electric boiler, three (3) condenser water pumps (one (1) being standby/backup), five (5) variable frequency drives to operate pump motors, two (2) roof mounted energy recovery units to provide code required ventilation to building, condenser water loop throughout building, and ten (10) 3.5 ton water-source heat pump units for core lobby(s) and restroom(s).

1. Energy Recovery Units – Two (2) @ 10,500 CFM each

   The supply ducts from ERV-1 and ERV-2 serve 1st floor through 6th floor and will be routed down two main chases located at each end of the building at the core stairwells. Supply ducts shall extend horizontally on each floor to provide ventilation air to all water-source heat pumps provided as part of tenant improvement. The return ducts shall also extend from the ERV's down the two main chases and stub into the return air plenum at each floor level. All supply and return ductwork located on the roof shall be lined with 2" duct liner. All supply and return ductwork within the shaft is not required to be lined.

2. Fluid Cooler – Two (2) @ 650 GPM each

   The fluid coolers shall be operate to maintain the condenser water setpoint in cooling mode utilizing a spray pump and a discharge fan. This shall be operated via the energy management system.

3. Pumps – Three (3) @ 325 GPM each

   The condenser water pump(s) shall started from the energy management system when there is a demand for cooling or heating. Pumps shall be variable speed (one is standby).

4. Boiler – 135 KW

   The boiler shall operate to maintain a loop temperature in heating mode. This shall be operated via the energy management system.

5. Elevator Machine Rooms – One (1) 3 ton

   The elevator machine room(s) will be provided with dedicated ductless split system units with air-cooled condensing units on the roof. The temperature within each room will be set at 80 deg F and will be monitored by the Building Automation System. An alarm will be declared at the BAS if the room temperature rises above 90 deg F.

6. Exhaust System (Core Restrooms and Janitor's Rooms) – One (1) @ 3500 CFM

All restroom and janitor areas will be exhausted by roof-mounted exhaust fans sized per ASHRAE 62.1-2010 and City of Scottsdale code requirements. Exhaust stub-out s shall be provided on each floor sized for 10% extra exhaust for tenant use. The fans will operate based on a time schedule set thru the building energy management system.

ENERGY MANAGEMENT SYSTEM

The facility will be provided with an Allerton BACnet based energy management system. The control system will consist of a high-speed, peer-to-peer network of DDC controllers, a control system server, and a web-based operator interface. System software will be based on a server/thin client architecture, designed around the open standards of web technology. The control system server will be accessed using a Web browser over the control system network, the owner's local area network, and (at the owner's discretion) over the Internet. The intent of the thin-client architecture is to provide operators complete access to the control system via a Web browser. No special software other than a web browser will be required to access graphics, point displays, and trends, configure trends, configure points and controllers, or to download programming into the controllers.

The system will use the BACnet protocol for communication to the operator workstation or web server and for communication between control modules. All of the I/O points, schedules, setpoints, trends and alarms specified in the Sequence of Operation will be BACnet objects. The system will be a distributed control system and all damper actuators will be electric. The energy management system will monitor energy usage by system as well as building and landscape water usage. The system will provide trend logging of system performance. The DDC system will be accessible locally and thru an external communications gateway as deemed appropriate by the Tenant. The energy management system will utilize temperature sensors which allow local adjustment of the temperature within a predetermined range.

GENERAL HEATING, VENTILATING AND AIR CONDITIONING OUTLINE SPEC

All equipment shall be U.L. or E.T.L. listed.

All fans shall be U.L. listed and AMCA certified.

All ductwork shall be fabricated from new galvanized steel sheets conforming to the 2012 International Mechanical Code and SMACNA Standards. Opposed blade dampers shall be provided in all branch ducts and in all ceiling diffusers and registers. Supply ducts shall be insulated with 2" fiberglass duct wrap with foil scrim kraft vapor barrier. Rectangular return ducts shall be insulated with 1-1/2" internal duct liner. All ductwork on the roof or exposed to weather shall be insulated with 2" thick duct liner.

Coil condensate drain piping shall be type "M" copper tubing with wrot copper fittings. All condensate drain piping indoors shall be insulated using flexible closed cell foamed plastic pipe insulation.

Air and water testing and balancing shall be provided by a certified, independent AABC or NEBB test and balance agency.

WATER SOURCE HEAT PUMP

A. GENERAL

1. Furnish and install Water Source Heat Pumps, as indicated on the plans. Equipment shall be completely assembled, piped and internally wired. Capacities and characteristics as listed in the schedule and the specifications that follow.
2. Units shall be supplied completely factory built capable of operating over an entering water temperature range from 20° to 120°F (-6.7° to 48.9°C) as standard. Equivalent units from other manufacturers may be proposed provided approval to bid is given 10 days prior to bid closing. All equipment listed in this section must be rated and certified in accordance with Air-Conditioning, Heating and Refrigeration Institute/International Standards Organization (AHRI/ISO 13256-1). All equipment must be tested, investigated, and determined to comply with the requirements of the standards for Heating and Cooling Equipment UL-1995 for the United States and CAN/CSA-C22.2 NO.236 for Canada, by Intertek Testing Laboratories (ETL). The units shall have AHRI/ISO and ETL-US-C labels.
3. All units shall be fully quality tested by factory run testing under normal operating conditions as described herein. Quality control system shall automatically perform via computer: triple leak check, pressure tests, evacuation and accurately charge system, perform detailed heating and cooling mode tests, and quality cross check all operational and test conditions to pass/fail criteria. Detailed report card will ship with each unit displaying status for critical tests and components. Note: If unit fails on any cross check, it shall not be allowed to ship. Serial numbers will be recorded by factory and furnished to contractor on report card for ease of unit warranty status. Units tested without water flow are not acceptable.

B. BASIC CONSTRUCTION

1. Horizontal units shall have one of the following air flow arrangements: Left Inlet/Straight (Right) Discharge; Right Inlet/Straight (Left) Discharge; Left Inlet/Back Discharge; or Right Inlet/Back Discharge as shown on the plans. Units must have the ability to be field convertible from straight to back or back to straight discharge with no additional parts or unit structure modification. Horizontal units will have factory installed hanger brackets with rubber isolation grommets packaged separately.
2. Vertical units shall have one of the following airflow arrangements: Left Return/Top Discharge, Right Return/Top Discharge, as shown on the plans.
3. If units with these arrangements are not used, the contractor is responsible for any extra costs incurred by other trades. All units (horizontal and vertical) must have a minimum of two access panels for serviceability of compressor compartment. Units having only one access panel to compressor/heat exchangers/expansion device/refrigerant piping shall not be acceptable.
4. All interior surfaces shall be lined with 1/2 inch (12.7mm) thick, 1-1/2 lb/ft3 (24 kg/m3) acoustic type glass fiber insulation. Insulation placement shall be designed in a manner that will eliminate any exposed edges to prevent the introduction of glass fibers into the air stream.
5. The heat pumps shall be fabricated from heavy gauge galvanized steel with powder coat paint finish on the front access panels.

6. Standard cabinet panel insulation must meet NFPA 90A requirements, air erosion and mold growth limits of UL-181, stringent fungal resistance test per ASTM-C1071 and ASTM G21, and shall meet zero level bacteria growth per ASTM G22. Unit insulation must meet these stringent requirements or unit(s) will not be accepted.
7. All horizontal units to have factory installed 1" (25.4mm) discharge air duct collars, 2" (25.4mm) filter rails with 2" (25.4mm) filters factory installed, and factory installed unit-mounting brackets. Vertical units to have field installed discharge air duct collar, shipped loose and 2" (25.4mm) filter rails with 2" (25.4mm) filters factory installed. If units with these factory-installed provisions are not used, the contractor is responsible for any extra costs to field install these provisions, and/or the extra costs for his sub-contractor to install these provisions.
8. All units must have an insulated panel separating the fan compartment from the compressor compartment. Units with the compressor in the air stream are not acceptable. Units shall have factory installed 1 inch (25.4mm) wide filter rails for filter removal from either side. Units shall have a 1 inch (25.4mm) thick throwaway type glass fiber filter. The contractor shall purchase one spare set of filters and replace factory shipped filters on completion of start-up. Filters shall be standard sizes. If units utilize non-standard filter sizes then the contractor shall provide 12 spare filters for each unit.
9. Cabinets shall have separate holes and knockouts for entrance of line voltage and low voltage control wiring. All factory-installed wiring passing through factory knockouts and openings shall be protected from sheet metal edges at openings by plastic ferrules. Supply and return water connections shall be copper FPT fittings. All water connections and electrical knockouts must be in the compressor compartment corner post as to not interfere with the serviceability of unit. Contractor shall be responsible for any extra costs involved in the installation of units that do not have this feature. Contractor must ensure that units can be easily removed for servicing and coordinate locations of electrical conduit and lights with the electrical contractor.
10. Contractor shall install 2-inch (50.8mm) filter frame with removable access door and 2 inch (50.8mm) Glass Fiber throwaway filters on all units.

C. FAN AND MOTOR ASSEMBLY

1. Blower shall have inlet rings to allow removal of wheel and motor from one side without removing housing. Units shall have a direct-drive centrifugal fan. The fan motor shall be an ECM variable speed ball bearing type motor. The ECM fan motor shall provide soft starting, maintain constant CFM over its static operating range and provide airflow adjustment in 25 CFM increments via its control board. The fan motor shall be isolated from the housing by rubber grommets. The motor shall be permanently lubricated and have thermal overload protection. A special dehumidification mode shall be provided to allow lower airflows in cooling for better dehumidification. The dehumidification mode may be constant or automatic (humidistat controlled). Airflow/Static pressure rating of

the unit shall be based on a wet coil and a clean filter in place. Ratings based on a dry coil, and/or no air filter, shall NOT be acceptable.

D. REFRIGERANT CIRCUIT

1. All units shall contain an EarthPure® (HFC-410A) sealed refrigerant circuit including a high efficiency scroll or rotary compressor designed for heat pump operation, a thermostatic expansion valve for refrigerant metering, an enhanced corrugated aluminum lanced fin and rifled copper tube refrigerant to air heat exchanger, reversing valve, coaxial (tube in tube) refrigerant to water heat exchanger, and safety controls including a high pressure switch, low pressure (loss of charge) switch, water coil low temperature sensor, and air coil low temperature sensor. Access fittings shall be factory installed on high and low pressure refrigerant lines to facilitate field service. Activation of any safety device shall prevent compressor operation via a microprocessor lockout circuit. The lockout circuit shall be reset at the thermostat or at the contractor supplied disconnect switch. Units that cannot be reset at the thermostat shall not be acceptable.
2. Hermetic compressors shall be internally sprung. The compressor shall have a dual level vibration isolation system. The compressor will be mounted on specially engineered sound-tested EPDM vibration isolation grommets or springs to a large heavy gauge compressor mounting plate, which is then isolated from the cabinet base with rubber grommets for maximized vibration attenuation. Compressor shall have thermal overload protection. Compressor shall be located in an insulated compartment away from air stream to minimize sound transmission.
3. Refrigerant to air heat exchangers shall utilize enhanced corrugated lanced aluminum fins and rifled copper tube construction rated to withstand 625 PSIG (4309 kPa) refrigerant working pressure. Refrigerant to water heat exchangers shall be of copper inner water tube and steel refrigerant outer tube design, rated to withstand 625 PSIG (4309 kPa) working refrigerant pressure and 500 PSIG (3445 kPa) working water pressure. The refrigerant to water heat exchanger shall be "electro-coated" with a low cure cathodic epoxy material a minimum of 0.4 mils thick (0.4 - 1.5 mils range) on all surfaces. The black colored coating shall provide a minimum of 1000 hours salt spray protection per ASTM B117-97 on all external steel and copper tubing. The material shall be formulated without the inclusion of any heavy metals and shall exhibit a pencil hardness of 2H (ASTM D3363-92A), crosshatch adhesion of 4B-5B (ASTM D3359-95), and impact resistance of 160 in-lbs (184 kg-cm) direct (ASTM D2794-93).

4. Refrigerant metering shall be accomplished by thermostatic expansion valve only. Expansion valves shall be dual port balanced type with external equalizer for optimum refrigerant metering. Units shall be designed and tested for operating ranges of entering water temperatures from 20° to 120°F (-6.7° to 48.9°C). Reversing valve shall be four-way solenoid activated refrigerant valve, which shall default to heating mode should the solenoid fail to function. If the reversing valve solenoid defaults to cooling mode, an additional low temperature thermostat must be provided to prevent over-cooling an already cold room.

E. DRAIN PAN

1. The drain pan shall be constructed of galvanized steel and have a powder coat paint application to further inhibit corrosion. This corrosion protection system shall meet the stringent 1000-hour salt spray test per ASTM B117. If plastic type material is used, it must be HDPE (High Density Polyethylene) to avoid thermal cycling shock stress failure over the lifetime of the unit. Drain pan shall be fully insulated. Drain outlet shall be located at pan as to allow complete and unobstructed drainage of condensate. Drain outlet for horizontal units shall be connected from pan directly to FPT fitting. No hidden internal tubing extensions from pan outlet extending to unit casing (that can create drainage problems) will be accepted. The unit as standard will be supplied with solid-state electronic condensate overflow protection. Mechanical float switches will NOT be accepted.
2. Vertical units shall be furnished with a PVC FPT condensate drain connection and an internal factory installed condensate trap. If units without an internal trap are used, the contractor is responsible for any extra costs to field install these provisions, and/or the extra costs for his sub-contractor to install these provisions.

F. ELECTRICAL

1. A control box shall be located within the unit compressor compartment and shall contain a 50VA transformer, 24 volt activated, 2 or 3 pole compressor contactor, terminal block for thermostat wiring and solid-state controller for complete unit operation. Reversing valve and fan motor wiring shall be routed through this electronic controller. Units shall be name-plated for use with time delay fuses or HACR circuit breakers. Unit controls shall be 24 Volt and provide heating or cooling as required by the remote thermostat/sensor.

G. SOLID STATE CONTROL SYSTEM (CXM)

1. Units shall have a solid-state control system. Units utilizing electro-mechanical control shall not be acceptable. The control system microprocessor board shall be specifically designed to protect against building electrical system noise contamination, EMI, and RFI interference. The control system shall interface with a heat pump type thermostat. The control system shall have the following features:

    a. Anti-short cycle time delay on compressor operation.
    b. Random start on power up mode.
    c. Low voltage protection.
    d. High voltage protection.
    e. Unit shutdown on high or low refrigerant pressures.
    f. Unit shutdown on low water temperature.
    g. Condensate overflow electronic protection.
    h. Option to reset unit at thermostat or disconnect.
    i. Automatic intelligent reset. Unit shall automatically reset the unit 5 minutes after trip if the fault has cleared. If a fault occurs 3 times sequentially without thermostat meeting temperature, then lockout requiring manual reset will occur.
    j. Ability to defeat time delays for servicing.

k. Light emitting diode (LED) on circuit board to indicate high pressure, low pressure, low voltage, high voltage, low water/air temperature cut-out, condensate overflow, and control voltage status.
l. The low-pressure switch shall not be monitored for the first 120 seconds after a compressor start command to prevent nuisance safety trips.
m. 24V output to cycle a motorized water valve or other device with compressor contactor.
n. Unit Performance Sentinel (UPS). The UPS warns when the heat pump is running inefficiently.
o. Water coil low temperature sensing (selectable for water or anti-freeze).
p. Air coil low temperature sensing.

H. WARRANTY

1. Warranty equipment for a period of 12 months from start up or 18 months from shipping (which ever occurs first).
2. Extended 4-year compressor warranty covers compressor for a total of 5 years.

CONDENSER WATER PIPING

A. PIPING

1. Condenser water piping shall be black steel pipe ASTM A120 or A53 grade A or B, ERW or BW, standard wall Schedule 40 through 10" diameter. Larger diameter pipe shall have wall thickness as follows:

Pipe Diameter Inches	Wall Thickness, Inches
up to 12"	0.375
14" & Larger	0.500

B. FITTINGS

1. Fittings for steel piping, 2" and smaller, shall be either screwed or welded. Screwed fittings shall be either Class 150, standard black malleable iron conforming to ANSI B16.3 OR CLASS 125, STANDARD black cast iron conforming to ANSI B16.4 Weld fittings shall be either standard weight steel butt-welding fittings conforming to ANSI B16.9 or forged steel socket-welding fittings, 2000 pound Schedule 40 conforming to ANSI B16.11.
2. Fittings for steel piping, 2-1/2" and larger shall be either standard weight steel butt-welding fittings, conforming to ANSI B16.9 or Victaulic or equivalent mechanical pipe couplings in conjunction with roll grooved pipe, as specified in Section 23 20 00.

3. Mechanically formed tee connections and couplings for copper piping system as specified in Section 23 20 00, may be utilized where approved by the Engineer and Owner's Representative.

C. FLANGES

1. Flanges for steel piping system shall be forged steel, weld neck or slip-on, 1/16" raised face Class 150 flanges conforming to ANSI B16.5.
2. Flange connections for valves and equipment shall match the rating and drilling of the valves and equipment furnished.
3. Where specifically required by the application, black cast iron Class 125, standard threaded plain face companion flanges may be utilized for flanged connections in threaded piping systems.
4. Gaskets shall be 1/16" thick ring type non-asbestos material suitable for the temperatures and pressure application
5. Flange bolting shall be carbon steel machine bolts or studs and hex nuts, ASTM A307, Grade B.

D. QUALITY ASSURANCE

1. All pipe and fittings shall be of domestic (U.S.) origin.

DUCTLESS SPLIT SYSTEM AIR CONDITIONING UNITS

A. The ductless split system shall utilize Variable Speed Inverter Compressor Technology. The system shall consist of a horizontal discharge, single phase outdoor unit, a matched capacity indoor section that shall be equipped with a wired wall mounted controller. The unit capacities shall be as listed on the mechanical schedules.

B. Quality Assurance:

1. The units shall be tested by a Nationally Recognized Testing Laboratory (NRTL) and shall bear the ETL label.
2. All wiring shall be in accordance with the National Electrical Code (N.E.C.) and local codes as required.
3. The units shall be rated in accordance with Air-conditioning, Heating, and Refrigeration Institute's (AHRI) Standard 240 and bear the ARI Certification label.
4. The units shall be manufactured in a facility registered to ISO 9001 and ISO 14001, which is a set of standards applying to environmental protection set by the International Standard Organization (ISO).
5. A dry air holding charge shall be provided in the indoor section.
6. The outdoor unit shall be pre-charged with R-410a refrigerant for 70 feet (20 meters) of refrigerant tubing for the 1-2 ton units or 100 feet (30 meters) of refrigerant tubing for the 2.5 ton unit.
7. System efficiency shall meet or exceed the SEER values as shown on the mechanical equipment schedule.

C. Delivery, Storage and Handling:

1. Unit shall be stored and handled according to the manufacturer's recommendations.
2. The controller shall be shipped inside the carton with the indoor unit and shall be able to withstand 105°F storage temperatures and 95% relative humidity without adverse effect.
3. The units shall have a manufacturer's parts and defects warranty for a period five (5) year from date of installation. The compressor shall have a warranty of seven (7) years from date of installation. If, during this period, any part should fail to function properly due to defects in workmanship or material, it shall be replaced or repaired at the discretion of the manufacturer. This warranty does not include labor.

D. Outdoor Condensing Unit

1. The outdoor condensing unit shall be compatible with the indoor unit. The connected indoor unit shall be of the same capacity as the outdoor unit.
2. The outdoor unit shall be equipped with a control board that interfaces with the indoor unit to perform all necessary operation functions.
3. The outdoor unit shall be capable of operating at 0°F (-18°C) ambient temperature without additional low ambient controls (optional wind baffle shall be required).
4. The outdoor unit shall be able to operate with a maximum height difference of 100 feet (30 meters) between indoor and outdoor units.
5. System shall operate at up to a maximum refrigerant tubing length of 100 feet (30 meters) between indoor and outdoor units without the need for line size changes, traps or additional oil.
6. The outdoor unit shall be completely factory assembled, piped, and wired. Each unit must be test run at the factory.
7. Outdoor unit sound level shall not exceed 50 Db(A),

E. Cabinet: The casing shall be constructed from galvanized steel plate, finished with an electrostatically applied, thermally fused acrylic or polyester powder coating for corrosion protection.

F. Condenser Fan: The fan blade(s) shall be of aerodynamic design for quiet operation, and the fan motor bearings shall be permanently lubricated. The outdoor unit shall have horizontal discharge airflow. The fan shall be mounted in front of the coil, pulling air across it from the rear and dispelling it through the front. The fan shall be provided with a raised guard to prevent external contact with moving parts.

G. Condenser Coil: The L shaped condenser coil shall be of copper tubing with flat aluminum fins to reduce debris build up and allow maximum airflow. The coil shall be protected with an integral metal guard. Refrigerant flow from the condenser shall be controlled by means of an electronic linear expansion valve (LEV) metering device. The LEV shall be controlled by a microprocessor controlled step motor.

H. Compressor: The compressor shall be a DC rotary compressor with Variable Speed Inverter Drive Technology. The compressor shall be driven by inverter circuit to control compressor speed. To prevent liquid from accumulating in the compressor during the off cycle, a minimal amount of current shall be automatically, intermittently applied to the compressor motor windings to maintain sufficient heat to vaporize any refrigerant. No crankcase heater is to be

used. The outdoor unit shall have an accumulator and high pressure safety switch. The compressor shall be mounted to avoid the transmission of vibration.

I. Electrical: Power for the indoor unit shall be supplied from the outdoor unit according to the manufacturer's wiring diagram. The outdoor unit shall be controlled by the microprocessor located in the indoor unit. The control signal between the indoor unit and the outdoor unit shall be pulse signal 24 volts DC.

J. Indoor Unit

1. The indoor unit shall be factory assembled, wired and tested. Contained within the unit shall be all factory wiring and internal piping, control circuit board and fan motor. The unit, in conjunction with the wired, wall mounted controller shall have a self-diagnostic function, 3-minute time delay mechanism, an auto restart function, and a test run switch. Indoor unit and refrigerant pipes shall be purged with dry nitrogen before shipment from the factory.

K. Unit Cabinet: The cabinet shall be formed from high strength molded plastic with smooth finish, flat front panel design with access for filter. The unit shall be wall mounted by means of a factory supplied, pre-drilled, mounting plate.

L. Indoor Fan: The indoor unit fan shall be high performance, double inlet, forward curve, direct drive fan with a single motor. The fans shall be statically and dynamically balanced and run on a motor with permanently lubricated bearings. The indoor fan shall consist of three (3) speeds: Low, Mid, and Hi and Auto. The fan shall have a selectable Auto fan setting that will adjust the fan speed based on the difference between controller set-point and space temperature. Indoor unit sound level shall not exceed 45 dB(A) at high speed.

M. Filter: Return air shall be filtered by means of an easily removable washable filter.

N. Coil: The evaporator coil shall be of nonferrous construction with pre-coated aluminum strake fins on copper tubing. All tube joints shall be brazed with PhosCopper or silver alloy. The coils shall be pressure tested at the factory. A condensate pan and drain shall be provided under the coil. A condensate mini-pump shall be provided integral to the unit.

O. Electrical: The power to the indoor unit shall be supplied from the outdoor unit according to the manufacturer's wiring diagram.

P. System Control: The control system shall consist of a minimum of two (2) microprocessors, one on each indoor and outdoor unit, interconnected by a single non-polar two-wire cable. Field wiring shall run directly from the indoor unit to the wall mounted controller with no splices. The microprocessor located in the indoor unit shall have the capability of monitoring return air temperature and indoor coil temperature, receiving and processing commands from the wired controller, providing emergency operation and controlling the outdoor unit. The control voltage from the wired controller to the indoor unit shall be 12/24 volts, DC. The control signal between the indoor and outdoor unit shall be pulse signal 24 volts DC. The system shall be capable of automatic restart when power is restored after power interruption. The system shall have self-diagnostics ability, including total hours of compressor run time and diagnostics codes for indoor and outdoor units shall be displayed on the wired controller panel.

Q. Wall-mounted Controller: The indoor unit shall be connected to a wall mounted wired controller to perform input functions necessary to operate the system. The wired controller shall have a large liquid crystal display (LCD). There shall be a built-in weekly timer with up to eight pattern settings per day. The controller shall consist of an On/Off button, Increase/Decrease Set Temperature buttons, a Heat/Cool/Auto mode selector, a Timer Menu button, a Timer On/Off button, Set Time buttons, and a Fan Speed selector button. The controller shall have a built-in temperature sensor. Temperature shall be displayed in either Fahrenheit (°F) or Celsius (°C). Temperature changes shall be by increments of 1°F (1°C) with a range of 67°F to 87°F (19°C to 30°C). The controller shall display operating conditions such as set temperature, room temperature, pipe temperatures (i.e. liquid, discharge, indoor and outdoor), compressor operating conditions (including running current, frequency, input voltage, On/Off status and operating time), LEV opening pulses, sub cooling and discharge super heat. Normal operation of the wired controller shall provide individual system control in which one wired controller and one indoor unit are installed in the same room. The maximum control cable distance shall be 1,500 feet (500 meters).

1. Approved manufacturers include LG, Panasonic, Mitsubishi, Sanyo, Daikin, or prior approved equal.

R. Refrigerant Piping

S. Copper Tubing: ASTM B-880, Type ACR hard drawn. Type "L" above ground and Type "K" below grade, dehydrated with capped ends

T. Fittings: ASME B16.22 wrought copper.

U. Joints: Braze, AWS A5.8 BcuP silver/phosphorus/copper alloy with melting range 1190 to 1480 degrees F (640 to 805 degrees C.).

PLUMBING SYSTEM BASIS OF DESIGN

A. Plumbing Fixtures

The building plumbing system will consist of low water-use "flow" and "flush" fixtures according to the following specs:

1. Water Closets
   Flush-Valve Wall-hung, 1.28 GFP, battery sensor operated

2. Urinals
   Flush-Valve Wall-hung, 1/8 GFP, battery sensor operated

3. Lavatories
0.5 GPM Aerator, hard-wired sensor operated

B. Hot Water (Core/Shell Building Areas)

Hot water will be provided using (4)30-gallon electric water heaters to serve the core/shell areas.

C. Hot Water (Tenant Improvement Areas)

Hot water for the tenant improvement areas will be provided under the tenant improvement construction phase and will consist of a dedicated electric instantaneous water heater at each sink.

Domestic water supply piping shall be copper tubing, type "L" above ground and type "K" below ground.

All waste and vent piping shall be cast iron. PVC DWV pipe and fittings permitted below slab.

The roof drainage system for all flat roofs shall include main roof drains and overflow drains. Overflow drains shall daylight 12" above finished grade. Roof drains shall daylight or tie into the underground storm drainage system. All roof drainage system piping shall be cast iron.

All plumbing fixtures shall be the same manufacturer as installed in previous building SS IV or as directed by The Plaza Companies.

ELECTRICAL SYSTEMS
BASIS OF DESIGN AND OUTLINE SPECIFICATION

POWER

The Service Entrance Section (SES) will be a freestanding, single-metered, 3000 amp, 277/480 volt, 3 phase, 4 wire switchboard. The SES will be capable of serving the 150,000sf office area at 16.5 watts/SF.

The main Distribution Switchboard serving the 1st through 6th floor office tenants will provide (2) 200 amp 277/480V panels per floor, for lighting and HVAC needs. The power for receptacle and other miscellaneous 120V loads will be served from a single 150 KVA transformer and (2) 225 amp MCB, 120/208V panels per floor. Power for the roof mounted AC units and the elevators will originate from individual switches or circuit breakers within this main switchboard. All panels and transformers will be located within the electrical room on each floor. A 250 KW emergency generator rated at, 277/480V, 3 phase, 4 wire switchboard (.8 PF), ATS switch and all associated distribution gear will be provided for all legally required and life safety power needs. See attached 1-line.

Receptacles will be provided throughout the TI spaces as required to serve all equipment and to provide convenience power. All wiring shall be in strict compliance with all applicable standards and sections of the NEC as required.

LIGHTING

The lighting for the typical office tenants will be provided with ceiling mounted LED fixtures and recessed downlights. The LED troffers will be a high quality, mid-priced, LED, direct/indirect fixture installed at a rate of 1 per 100sf which will achieve 50-60 footcandles throughout the office areas. Occupancy sensor, time delay type light switches will be located as required for a simple, practical lighting control scheme. Emergency lighting fixtures and circuiting will be provided as required per life safety codes.

Exterior lighting will be provided with pole mounted light fixtures equipped with metal LED lamps. All local lighting and energy codes will be adhered to.

TELEPHONE/DATA

An empty conduit system will be provided for tenants voice and data requirements. An 8' x 4' telephone mounting board will be provided on each floor, connected by (2) 4" conduits. A 3/4" empty conduit will be stubbed-up above the ceiling for tenant provided plenum rated cabling to each voice/data location.

FIRE ALARM

A code compliant Class A Addressable Fire Alarm System will be provided, complete with all required initiating and signaling devices.