

SCOPE OF WORK

COMMUNICATIONS/SECURITY/AUDIO-VISUAL SYSTEMS DESIGN CRITERIA

1.01 SCOPE OF WORK AND SYSTEM DESIGN CRITERIA

A. General Requirements

1. Work shall include the furnishing of labor, material, equipment and tools required for the complete installation of each system.
2. All materials, obviously a part of the Communications/Security/A-V Infrastructure and necessary to its proper operation, but not specifically mentioned or shown on the Drawings, shall be furnished and installed without additional charge.

B. Standards and Codes

1. All work shall be in accordance with the following:
2. The 2014 edition of the National Electrical Code (NFPA 70).
3. The 2015 edition of the Life Safety Code (NFPA 101).
4. Building Industry Consulting Service International (BICSI)
5. The Telecommunications Distribution Methods Manual (TDMM)
6. The National Electrical Safety Code (NESC)
7. The National Electrical Safety Code (ANSI C-2).
8. National Electrical Manufacturers Association (NEMA)
9. Telecommunications Industries Association (TIA)
10. Electronic Industries Association (EIA)
11. Institute of Electrical & Electronics Engineers (IEEE)
12. Underwriters Laboratories (UL)
13. American Standards Association (ASA)
14. Federal Communications Commission (FCC)
15. Occupational Safety and Health Administration (OSHA)
16. American Society of Testing Material (ASTM)
17. Americans with Disabilities Act (ADA)
18. Local city and county ordinances governing electrical work.
*In the event of conflicts, the more stringent provisions shall apply.

C. Materials

1. All materials used in this work shall be new and shall bear the inspection label of Underwriters' Laboratories.
2. The published standards and requirements of the Telecommunications Industries Association (TIA), Building Industry Consulting Service International (BICSI), National Electrical Manufacturers Association (NEMA), the American National Standard Institute (ANSI), the Institute of Electrical and Electronic Engineers

(IEEE), and the American Society of Testing Materials (ASTM), are made a part of these Specifications and shall apply wherever applicable.

3. Materials and equipment furnished shall be of current production by manufacturers regularly engaged in the manufacture of such items, for which replacement parts are available.
4. When more than one unit of the same class of equipment or material is required, such units shall be the products of a single manufacturer or partner manufacturers that offer a certified solution.
5. Components of an assembled unit need not be products of the same manufacturer, but must offer a certified end-to-end solution.
6. Manufacturers of equipment assemblies, which include components made by others, shall assume complete responsibility for the final assembled unit.
7. Components shall be compatible with each other and with the total assembly for the intended service.

D. Examination of Surface Conditions

1. Prior to the start of work, the Contractor shall carefully inspect the installed work of other trades and verify that such work is complete to the point where installation may properly commence. Start of work indicates acceptance of conditions.
2. Install equipment in accordance with applicable codes and regulations, the original design and the referenced standards.
3. In the event of a discrepancy, immediately notify the Project Manager.
4. Do not proceed with installation until unsatisfactory conditions and discrepancies have been fully resolved.

E. Protection of Systems and Equipment

1. Protect materials and equipment from damage during storage at the site and throughout the construction period. Equipment and materials shall be protected during shipment and storage against physical damage, dirt, theft, moisture, extreme temperature and rain.
2. Damage from rain, dirt, sun and ground water shall be prevented by storing the equipment on elevated supports and covering the sides with securely fastened protective rigid or flexible waterproof coverings.
3. During installation, equipment shall be protected against entry of foreign matter on the inside and be vacuum cleaned both inside and outside before testing, operating or painting.
4. As determined by the Project Manager, damaged equipment shall be fully repaired or shall be removed and replaced with new equipment to fully comply with requirements of the Contract Documents. Decision of the Project Manager shall be final.
5. Damaged paint on equipment and materials shall be repainted with painting equipment and finished with the same quality of paint and workmanship as used by the manufacturer.

- F. Access to Equipment
1. Equipment shall be installed in location and manner that will allow convenient access for maintenance and inspection.
 2. Working spaces shall be not less than specified in the National Electrical Code (NEC) for voltages specified.
 3. Where the Project Manager determines that the Contractor has installed equipment not conveniently accessible for operation and maintenance, equipment shall be removed and reinstalled, one time only, as directed by the Project Manager, at no additional cost to the Owner. "Conveniently accessible" is defined as being capable of being reached without the use of ladders or without climbing or crawling under or over obstacles such as motors, pumps, belt guards, transformers, piping and duct work.
- G. Cleaning
1. During construction, and prior to Owner acceptance of the building, remove from the premises and dispose of packing material and debris caused by communications/security work.
 2. Remove dust and debris from interiors and exteriors of electrical equipment. Clean accessible current carrying elements prior to being energized.
- H. Testing and Verification
1. Verification by inspection includes examination of items and comparison of pertinent characteristics against the qualitative or quantitative standard set forth in the Specifications. Inspection may require moving or partially disassembling the item to accomplish the verification, included as part of the work at no additional cost to the Owner.
 2. The Contractor shall verify by formal demonstrations or tests that the requirements of this Specification have been met. The Contractor shall demonstrate that the communications/security systems, components and subsystems meet Specification requirements in the "as-installed" operating environment during the "System Operation Test." Even though no formal environmental testing is required, the Contractor shall measure and record temperature, humidity and other environmental parameters and the environmental conditions, which were encountered during the "System Operation Test."
 3. The Contractor shall carefully plan and coordinate the final acceptance tests so that tests can be satisfactorily completed. The Contractor shall provide necessary instruments, labor and materials required for tests, including the equipment manufacturer's technical representative and qualified technicians in sufficient numbers to perform the tests within a reasonable time period.
 4. The Contractor shall satisfy all items detailed in the final acceptance check-off list (punch list). The list shall be a complete representation of specified installation requirements. At the time of final acceptance punch list items shall be corrected until the system is found to be acceptable to the Owner and the Project Manager.

5. After the Contractor systems have been installed and tested, the completed test plan shall be signed by the communications/security Contractor Project Manager and submitted for approval.

1.02 UNDERGROUND ENTRANCE CONDUITS

- A. The service Entrance Facility (EF/MDF) shall be designed according to the information herein.
- B. Four (4) 4-inch PVC Schedule 40 or HDPE conduits shall extend from the public right-of way to the Main Telecommunications Room (MR/MDF) or Entrance Facility terminating space.
- C. The number of bends in a conduit section run shall not exceed two (2) 90-degree bends or equivalent of sweeps and radius bends. Each bend shall have a radius in accordance with existing standards.
- D. Outside Plant conduit segments shall not exceed 400 LF. Maintenance holes shall be installed in cases where a conduit segments exceed 400 LF. Maintenance hole size shall be 4' x 4', minimum.
- E. Conduits shall be encased in concrete (2,500 PSI) where: minimum depth cannot be attained, conduits pass under roads or driveways, and/or bend points are subject to movement (trenched only).
- F. Conduits shall terminate inside the building so that the conduit extends 4 inches beyond the surface from which it emanates. Conduits shall be plugged with mechanical-type seals to ensure that foreign matter does not enter the building.
- G. All conduits shall have a non-corrosive pull-tape installed.
- H. A detectable orange warning tape shall be installed 18 inches above the conduits (trenched only).

1.03 MAIN TELECOMMUNICATIONS ROOM (MR/MDF) / TELECOMMUNICATIONS ROOMS (TR/IDF)

- A. Walls of the MR/MDFs and TR/IDFs shall be lined with rigidly installed, wall to wall framing of Trade Size ¾-inch A-C plywood, 8-ft high.
- B. Backboards shall be rigidly installed and painted with a non-conductive fire-retardant overcoat.
- C. Sleeves that extend from floor cores shall extend 1-inch to 4-inches AFF.

- D. All sleeves shall be firestopped where required.
- E. Equipment racks/cabinets shall be secured and grounded.
- F. Conduits located in the ceiling shall protrude 2-in into the MR/MDF or TR/IDF.

1.04 BACKBONE PATHWAYS

- A. A minimum of three (3) 4-inch conduits/sleeves shall connect MR/MDFs and TR/IDFs.
- B. All in-slab / beneath-slab backbone pathways shall be Schedule 40 PVC conduits.
- C. All backbone pathways routed in ceiling spaces shall be rigid metal, intermediate metal or electrical metallic tubing.
- D. The maximum conduit segment length shall not exceed 100 LF. Pull boxes shall be installed in conduit runs that exceed 100 LF. Pull box sizing shall be in accordance with the BICSI Telecommunications Distribution Methods Manual (TDMM).

1.05 BACKBONE CABLES

- A. Voice/data backbone cables shall be a combination of optical fiber and/or copper cabling.
- B. Backbone systems shall be coordinated with service providers.
- C. CATV backbone cables shall be coaxial cabling. Backbone systems shall be coordinated with service providers.
- D. Incoming CATV service shall be provided and installed by local CATV service provider.
- E. Cable support shall be provided by one or more of the following: conduits, cable tray, and j-hooks.

1.06 GROUNDING, BONDING, AND ELECTRICAL PROTECTION

- A. The grounding system shall not rely on the plumbing system.
- B. Bonding conductors shall be run with a minimum number of bends. The bends placed in the conductor shall be sweeping.
- C. All bonding connections shall be made with listed bolts, crimp pressure connectors, clamps or lugs. Exothermic welding may be used.

- D. Multiple busbars shall be placed in the EF/MDF MR/MDF, and every TR/IDF of the building and shall be directly bonded with, minimally, a 6-AWG copper conductor.
- E. Conductive backbone cable shall be bonded at each sheath opening.
- F. Ground busbar shall be ¼-inch solid copper, 4-inch x ¼-inch x 12-inch, minimum.

1.07 HORIZONTAL PATHWAYS

- A. To avoid electromagnetic interference (EMI), all pathways shall provide clearances of at least 4-ft from large motors or transformers, 1-ft from conduit and cables used for electrical power distribution and 5-inches from fluorescent lighting.
- B. All in-slab / beneath-slab pathways shall be Schedule 40 PVC conduits.
- C. All backbone pathways routed in ceiling spaces shall be rigid metal, intermediate metal, electrical metallic tubing, electrical non-metallic tubing, or j-hooks.
- D. The number of bends in a conduit section run shall not exceed two (2) 90-degree bends or equivalent of sweeps and radius bends. Each bend shall have a radius in accordance with existing standards.
- E. The maximum conduit segment length shall not exceed 100 LF. Pull boxes shall be installed in conduit runs that exceed 100 LF. Pull box sizing shall be in accordance with the BICSI Telecommunications Distribution Methods Manual (TDMM).

1.08 HORIZONTAL CABLING

- A. Voice and Data cabling systems shall be installed in staff/administrative and residential spaces. Voice and data cabling shall be Category 6; jacks shall be Category 6.
- B. Wireless access point (WiFi) cabling systems shall be installed in common areas, leasing and administrative areas, and amenity spaces. Wireless access point (WiFi) cabling shall be Category 6A; jacks shall be Category 6A.
- C. CATV cabling systems shall be installed in staff and residential spaces. CATV cable shall be Series 6 Quadshield or Series 11 Quadshield (over 150'). All connectors shall be 75-ohm, compression "F" type. CATV drops may be combined with voice/data drops in a combination outlet.
- D. Structured Media Enclosures for voice, data and CATV terminations shall be installed in each residential unit. Structured Media Enclosures shall be equipped, at minimum, with a bridged telephone module, 4-way video splitter, 6-port or 8-port Category 6 patch module, and one (1) 120V/15A duplex receptacle (by electrical).

- E. Emergency phones shall be installed in parking deck.
- F. The distance from the termination point in the TR/IDF to the outlet shall be 295' or less.
- G. Horizontal cabling shall not contain more than one (1) transition point between different forms of the same cable type.
- H. Horizontal cabling shall be grounded in compliance with ANSI/NFPA 70 requirements and practices, except where superseded by other authorities and codes. In addition to horizontal cables these grounding requirements apply to all cross-connect frames, patch panels, racks and active telecommunications equipment.
- I. All connectors that provide electrical connections between 100-ohm balanced cables shall meet the requirements of ANSI/TIA/EIA-568-B.2.
- J. All cables shall be homerun from the outlet to the termination block or splitter. Daisy-chain installations are not allowed.
- K. Residential units shall be equipped with one (1) combination 1-data/1-tv outlet in each bedroom opposite the bed wall, two (2) combination 1-data/1-tv outlets on opposite walls in the living room, one (1) 1-data outlet at all desk areas, one (1) combination 1-data/1-tv outlet in each study, one (1) 1-voice outlet mounted above-counter in the kitchen.
- L. Each staff/administrative location shall be equipped with one (1) 1-voice/1-data outlet minimum.

1.09 CCTV – ACCESS CONTROL

- A. Access control and CCTV systems shall be installed in parking deck, common areas, leasing areas, amenity spaces, and pedestrian ingress/egress of the building. Access control and CCTV cabling shall be installed in accordance to manufacturers' recommendations.

1.10 AUDIO/VISUAL

- A. Audio/Visual system(s) shall include multi-zone/multi-source audio system (receivers, amplifiers, switchers, CD/MP3 players, in-ceiling speakers, landscape speakers, etc.), video systems (tuners, DVD players, projectors, etc.), and audio systems to support video systems (stereo, surround sound, modulated sound, stand-alone and in-wall speakers, etc.) in conference rooms and the amenity areas (fitness room, theater, dining, pool area, club room, etc.) of the property.

1.11 EMERGENCY RESPONDER RADIO COVERAGE (ERRC) SYSTEM

- A. Emergency Responder Radio Coverage (ERRC) systems shall be provided in accordance with the 2015 International Fire Code (IFC), section 510. The ERRC system shall allow for a minimum signal strength of -95dBm in 95 percent of all areas on all floors of the building.
- B. Provide all signal booster antennas, head end repeater units, remote repeater units, cabling, racks, base stations, fiber transceivers, etc. required for a fully functioning system.

1.12 DISTRIBUTED ANTENNA SYSTEM (DAS)

- A. Distributed Antenna Systems (DAS) shall be provided for cellular phone signal amplification throughout the facility.
- B. Provide all signal booster antennas, head end repeater units, remote antenna units, cabling, racks, base stations, fiber transceivers, etc. required for a fully functioning system.

1.13 EQUIPMENT

- A. All CATV backbone distribution equipment (excluding conduit and pathway equipment) from the right-of-way to the telecommunications rooms shall be provided and installed by the CATV service provider.
- B. Contractor shall provide and install all CCTV and access control equipment required for complete operational CCTV and access control systems.
- C. Contractor shall provide and install all audio/visual equipment required for complete operational audio/visual systems.
- D. Contractor shall provide and install all horizontal cabling, jacks, faceplates, patch panels, 110 blocks, structured media centers, conduits, sleeves, ladder rack, grounding system, firestopping, equipment racks, wire managers, backboards, labeling, and miscellaneous hardware required for the structured cabling system.
- E. Contractor shall not substitute products or brands without the consent of the communications/security/audio-visual consultant.

END OF SECTION

SCOPE OF WORK

ELECTRICAL SYSTEMS DESIGN CRITERIA

1.01 SCOPE OF WORK

The following text is intended to establish a minimum standard for a complete electrical system for the Brewery South multifamily residential project located in San Antonio, TX.

1.02 CODES AND STANDARDS

- A. Electrical systems will be designed and installed in conformance with the following codes and standards:
1. The 2015 International Building Code with local Amendments
 2. Municipal ordinances governing electrical work
 3. National Electrical Code, 2014 Edition, with City of San Antonio Amendments
 4. National Fire Protection Association, NFPA 70, 72, and 101
 5. Americans with Disabilities Act (ADA)
 6. Fair Housing Act (FHA) and (HUD) Section 221 (D)(4) multifamily project requirements
 7. Regulations of the local utility company with respect to metering and service(s)

1.03 EQUIPMENT AND MATERIALS

- A. All material shall be new and shall conform to the standards where such have been established for the particular material in question. Publications and Standards of the organizations listed below are applicable to materials specified herein.
1. American Society for Testing and Materials (ASTM)
 2. Underwriters Laboratories Inc. (UL)
 3. National Electrical Manufacturers Association (NEMA)
 4. Insulated Cable Engineers Association (ICEA)
 5. Institute of Electrical and Electronic Engineers (IEEE)
 6. National Fire Protection Association (NFPA)
 7. American National Standards Institute (ANSI)
- B. All material shall be Underwriters Laboratories Inc. (UL) Listed and UL Labeled.
- C. Material of the same type shall be the product of one manufacturer.

1.04 ELECTRICAL SERVICE, DISTRIBUTION AND METERING

- A. Service Requirements

1. The electric service will be delivered to the site via pad mounted utility transformers. 208/120V transformers shall be utilized for the residential units and common areas.
2. Residential Units - The secondary service for the residential dwelling units will be 208/120V, 3-phase, 4-wire. The secondary service will extend from the transformers to switchboard(s) at the garage basement level. The switchboards will feed 208/120v 3-phase main breaker meter centers located in three electrical closets throughout the building(s) on level 1. The meter centers will feed 208/120v 1-phase 3 wire load centers within the dwelling units.
3. The common areas will be served from distribution panels in the basement level garage to panelboards within the common area(s).
4. Residential Garage– The secondary service for the garage and the 3-phase equipment (elevators, pumps, etc.) shall be 208/120V, 3-phase, 4-wire and extend from the pad mounted transformers to a distribution panel within the garage.
5. The following electrical service characteristics will be coordinated with the utility company:
 - a. Service voltages
 - b. Available short circuit current
 - c. Load analysis, connected and estimated demand
 - d. Power Company charges for establishing service that are to be paid by the Owner

B. Electric Services

Residential/Common Areas/Garage – Each transformer will feed a switchboard (2 total), with the owner providing any secondary feeders/duct banks.

C. Metering

1. House and Garage Areas
 - a. Provide a meter for each house service. Metering requirements will be coordinated with the utility company.
2. Residential Dwelling Units
 - a. Residential electric service(s) will not be metered at the utility origination point. Each dwelling unit will be separately metered via utility company meters located at the meter centers.

1.05 NORMAL ELECTRICAL DISTRIBUTION

- A. Acceptable manufacturers of electrical equipment will be Square D, General Electric, Siemens or Eaton.
- B. Disconnect switches will be heavy duty type with lockable handles. General duty shall be allowed for equipment serving dwelling units.

- C. Distribution Panels and Panelboards
 1. Panelboards 600A and smaller shall be Lighting and Appliance type; 800A and larger shall be Distribution type.
 2. Panelboards shall be circuit breaker type utilizing bolt-on breakers.
 3. Panelboards shall be dead front type and bus bars shall be tin-plated aluminum. A neutral bus and copper ground bus will be provided in each panel. Each panel shall have 15% spare space capacity and devices.
 4. Minimal circuit breaker short circuit ratings shall be 10,000 AIC operating at 208/120V; 14,000 AIC operating 480/277V.

- D. Services and Feeders
 1. Services and feeders shall be aluminum, except for SER cable serving dwelling units, which shall be copper per HUD requirements.
 2. Aluminum conductors shall be compact, XHHW-2 (90 degrees C). Conductors shall be AA-8000 series. Aluminum conductors will not be allowed for feeders serving mechanical loads, pumps or elevators.
 3. Equipment grounding conductors will be installed in all feeder raceways.

- E. Branch Circuits
 1. All branch circuits shall be copper. Equipment grounding conductors will be installed in all raceways.
 2. MC Cable shall be limited to branch circuits concealed in walls or above ceilings. Unless noted otherwise, MC Cable shall not be run directly into surface-mounted panelboards, cabinets, switches or other devices, but conduit shall be used to the first branch circuit device.
 3. Dwelling unit branch circuits shall be served by load centers located in each dwelling unit.

- F. Conduit System
 1. Raceway installed below grade, below slabs, and within concrete shall be Schedule 40 PVC conduit. Raceways installed subject to damage shall be galvanized rigid steel (GRS) conduit. All other raceway shall be electrical metallic tubing (EMT).
 2. EMT fittings shall be steel set screw for dry, indoor environments, while gland and ring compression type shall be used for wet locations. Connectors shall have insulated throats.
 3. The minimum conduit size shall be 1/2", except flexible conduits between outlet box and lighting fixtures may be 3/8".
 4. Flexible conduits shall be steel metallic type with liquid-tight type used in exterior mechanical equipment and other damp/wet locations.
 5. Fire pump feeder raceway shall be galvanized rigid steel conduit.
 6. All electrical junction and outlet boxes shall be accessible. The design will locate the boxes so that they are not visible in the public common areas.

- G. Conductors
 - 1. Conductors shall be a minimum No. 12 AWG. Conductors No. 10 AWG and smaller shall be solid copper, 90 degrees C, type THHN/THWN-2. Conductors larger than No. 10 AWG shall be stranded copper, 90 degrees C THHN/THWN-2.
 - 2. Insulation voltage level rating shall be 600V for low voltage systems.
 - 3. Conductors shall be color coded on a uniform basis throughout the entire project to identify different voltages and systems.
- H. Receptacles
 - 1. Receptacle in all areas shall have a 20A rating.
 - 2. Receptacles in outdoor locations, restrooms, janitor's closets, kitchens and pump rooms shall be GFCI type.
 - 3. Receptacles will be located within the range of reach limits as defined in the applicable accessibility standards.
 - 4. Receptacles will be located in all corridors and lobbies at not more than 100' centers. Finish of devices in public spaces will be compatible with surrounding spaces.
 - 5. Receptacles in mechanical equipment areas shall be located not greater than twenty-five (25) feet from equipment.
 - 6. GFCI receptacles shall be provided on the roof with circuit capable of handling window washing equipment.
 - 7. A GFCI receptacle shall be located at each tree located on the site and coordinated with Landscape for exact power requirements and location.
- I. Devices (Common Areas):
 - 1. All devices shall be specification grade in public and back-of-house areas.
 - 2. Device plates shall be smooth high-impact nylon type with finish to match the device(s). Stainless steel device plates shall be provided in the toilet rooms, mechanical rooms, loading dock areas and damp areas. Jumbo or mid-size plates shall be provided for devices in masonry walls. Floor outlet boxes shall have brass trim. Exterior devices shall have weatherproof gasketed covers.
 - 3. Receptacles shall be as follows:
 - a. 20A, 125V, Duplex Type: Hubbell CR5362
 - b. 20A, 125V, Duplex Type GFI outlet: Hubbell GF5352
 - c. 20A, 125V, Isolated Ground, Duplex Type: Hubbell IG5352.
 - 4. Switches shall be 20A, 120/277V, Single Pole, Rocker, Silent Operation type with ground screw: Hubbell CS 1221.
 - 5. Wall mounted dimmers shall be Lutron "Nova T" Series, slide type or equal.
 - 6. The acceptable manufacturers of devices shall be Hubbell, Arrow-Hart and Pass & Seymour/Sierra.
 - 7. Duplex receptacles with USB port(s) are to be located throughout the common areas and coordinated with interior designer.

- J. Devices (Dwelling Units):
 - 1. All devices shall be residential grade in dwelling units.
 - 2. Device plates shall be smooth high-impact nylon type with finish to match the device(s). Floor outlet boxes shall have brass trim.
 - 3. Receptacles shall be as follows:
 - a. 20A, 125V, Duplex Type: Leviton 5320
 - b. 20A, 125V, Duplex Type GFI outlet: Leviton 6899
 - 4. Switches shall be 20A, 120V, Single Pole, Rocker, Silent Operation type with ground screw: Leviton 1451-2
 - 5. Wall mounted dimmers shall be Lutron “Nova T” Series, slide type or equal.
 - 6. The acceptable manufacturers of devices shall be Leviton, Eagle and Pass & Seymour/Sierra.
 - 7. All dwelling units shall be required to have smoke detectors with sounder bases, 120V and battery power and connect to other smoke detectors within the same unit.
 - 8. There shall be one duplex receptacle with USB port(s) located at the kitchen counter, entry niche and on each side of beds on bed walls within bedrooms.

1.06 LIGHTING AND LIGHTING CONTROL

- A. General
 - 1. The lighting design (fixture layout, fixture selection and method of control) in public spaces shall be prepared in collaboration with the Interior Designer and/or Lighting Designer. The total building envelope shall meet the requirements and/or restrictions of any local energy codes.
 - 2. Energy efficient fluorescent and LED lighting will be used in public spaces. All building support areas will be provided with fluorescent or LED lighting.
 - 3. The color temperature of fluorescent or LED lamps shall be 2,700 degrees K and a minimum CRI of 70. Fluorescent lamps shall be T8 energy saving type.
 - 4. All incandescent lamps shall be 120V unless otherwise specified.
 - 5. Rough service lamps will be provided for all fixtures located in elevator pits.
 - 6. Specified lamp manufacturers will be Osram/Sylvania, Philips, and General Electric.
 - 7. All fluorescent and compact fluorescent ballasts shall be electronic.
 - 8. Specified ballast manufacturers will be Motorola, Magnetek, General Electric, Advance or Universal.
 - 9. Occupancy control systems will be used in public restrooms and other common areas where required by code.
 - 10. Daylighting control sensors will be used in public spaces and common areas where required by the City of San Antonio and IECC 2015.
- B. Exterior Landscape/Site Lighting
 - 1. All site lighting fixtures such as building lighting and parking lot area lighting

shall be controlled on separate circuits from the landscape lighting fixtures through time clocks, photocells or the Building Management System.

2. Parking garage lighting fixtures shall be fluorescent strips with “bug-eyes” utilized for emergency lighting.
3. Control will be provided with photocell, astronomical time clock control or through the building management system for the following typical outside lighting circuits with suggested times of operation to be tailored by the Operator.

	On	Off
1) Signage	Dusk	Dawn
2) Path or entry roadway	Dusk	Dawn
3) Landscape	Dusk	2:00 AM
4) Building Facade	Dusk	2:00 AM

The control shall provide the following capabilities as a minimum:

- 1) Photocell On - Photocell Off
- 2) Photocell On - Time Clock (BMS) Off
- 3) Time Clock (BMS) On - Time Clock (BMS) Off
- 4) Manual Override - For Select Zones

C. Dwelling Units

1. The lighting within the dwelling unit must comply with the adopted version of the International Energy Code (IECC). Currently the City of San Antonio is under the 2015 IECC which requires 75% of the lamps within the unit to be high efficacy.

D. Emergency Lighting

1. Emergency circuits requiring continuous illumination within paths of egress will not be switched. Other emergency circuits, such as fixtures in mechanical and electrical rooms, will be switched.
1. Emergency illumination will be accomplished via battery-powered lighting fixtures. If LED fixtures are desired where emergency egress lighting is required, emergency inverters will need to be utilized to achieve emergency requirements. This includes corridors, common areas, and interior courtyards.

1.07 FIRE ALARM SYSTEM

- A. There shall be 1 complete fire alarm system per building.
- B. The Fire Safety System shall be a micro-processor based, network oriented, addressable multiplexed stand-alone fire alarm initiating device monitoring and supervising system and life safety type voice alarm annunciation system. The system design shall comply with NFPA, American Disabilities Act, Fair Housing Act (HUD) and local requirements. System monitoring, communication and signals shall be over two (2) wire plenum rated, shielded twisted pair circuits. All wire runs shall be run in ceiling plenums. Where run

- in walls or exposed to physical damage, wiring will be run in conduit.
- C. The system shall monitor the status of all fire protection systems and transmit fire alarm or supervisory signals to the building occupants and other locations as necessary. Initiating device circuits shall be Class B, Style B. Signaling line circuits shall be Class B, Style 4. Notification appliance circuits shall be Class B, Style Y.
 - D. The system shall respond to a fire emergency through support and control of the following:
 - 1. Pre-programmed smoke control sequences by designated zone and emergency automatic and/or manual control of HVAC air systems
 - 2. Elevator recall command
 - 3. Central station notification
 - 4. Sprinkler flow switches
 - 5. Shunt tripping of elevator feeder overcurrent devices
 - E. The fire alarm control panel shall annunciate alarm and trouble signal by individual device, and shall permit disable by individual device and shall permit resound by zone.
 - F. A separate remote annunciator panel shall be installed in the lobby of each building.
 - G. The fire alarm control panel/system shall have the following features:
 - 1. Battery back-up
 - 2. Alpha numeric annunciator display
 - 3. Integral event printer
 - 4. Selective individual sensor sensitivity
 - 5. Alarm silence, system reset; trouble acknowledge and supervision
 - 6. Automatic sensor integration for alarm verification
 - 7. Sensor sensitivity status (dirty condition); transient surge suppression on incoming power source, any interface conduits and any system communication circuits outside the building footprint
 - H. Acceptable manufacturers of the fire alarm system shall be equal to one manufactured by Simplex, Notifier, or Cerberus/Pyrotronics.
 - I. Devices
 - 1. Photoelectric smoke detectors shall be installed in the following areas:
 - a. Electric, mechanical, and telephone/data rooms
 - b. Elevator lobbies, machine rooms and hoistways
 - c. As required to actuate smoke control equipment (including doors).
 - 2. Manual stations shall be installed at all exit doors and outside of each stairwell door on each floor.
 - 3. Manual stations and horns shall be the recessed type. Audio/visual signaling

devices shall be used where required by the applicable accessibility codes. Devices shall be installed in visually remote areas wherever possible.

J. Alarm Signals

1. Receipt of an alarm signal from an area detector, manual fire alarm station, or sprinkler system shall result in transmission of an evacuation alarm to the fire floor, the floor above, and the floor below, and transmission of a fire alarm to the local fire department headquarters.
2. Hold down buttons will be provided at the Fire Alarm Control Panel to disconnect the local horn to permit emergency phone transmission.
3. Audible and visual devices shall be located to comply with the American Disabilities Act and Fair Housing Act (HUD). The minimum audible level of an alarm signal shall be 75 db minimum within a sleeping room. The alarm shall achieve a db level of 15 above the ambient conditions of normal use or occupancy.

1.08 COMMUNICATIONS CONDUIT SYSTEM

- A. An empty raceway system and/or cable tray system will be provided for voice, data, CATV and security systems.
- B. Provide four (4) 4" conduits from the main telephone room to the property line. Terminate conduits at utility manholes. Provide 20' x 8' x 3/4" plywood main backboard.
- C. Provide eight (4) 4" conduits/sleeves vertically up through the building for telephone distribution. Provide 8' x 8' x 3/4" plywood backboard on each floor. Provide (1) 4" conduit to the roof.
- D. Provide a #3/0 insulated copper ground conductor from main telephone room ground bus to electrical grounding electrode system. Provide #3/0 insulated copper ground conductor from main telephone room ground bus up through each tenant floor telephone room. Terminate on ground bus at each floor. Provide 12' of #6 copper insulated ground conductor at each tenant floor backboard.
- E. Provide four (2) 4" conduit/sleeves vertically up through the building for other low voltage system cabling. Provide 4' x 8' x 3/4" plywood backboard.

END OF SECTION

SCOPE OF WORK

MECHANICAL SYSTEMS DESIGN CRITERIA

1.01 SCOPE OF WORK

The following text is intended to establish a minimum standard for a complete mechanical system for the Brewery South residential project located in San Antonio, TX.

1.02 SYSTEMS SUMMARY

- A. Split System DX with electric resistance heat. SEER rating will be determined by the National Green Building Standards.
- B. Garage ventilation will be provided for basement garage level.

1.03 SCOPE OF WORK AND SYSTEM DESIGN CRITERIA

A. General Requirements

1. The scope of work described herein shall include (except where otherwise noted) the furnishing of all materials, equipment, appurtenances, accessories, connections, labor, etc., required and/or necessary to completely install, clean, inspect, adjust, test, balance and leave in safe and proper operating condition all mechanical systems.
2. All equipment shall be labeled with black plastic nameplates with 2" high white letters. .
3. All equipment, materials, accessories, etc. used as part of the mechanical work shall be new, of the best grade and quality and of current production, unless specified otherwise. Equipment not specified in the contract documents may be suitable for the intended use and shall be subject to approval by the Engineer.
4. All equipment, products and materials shall be free of defects and shall be constructed to operate in a safe manner without excessive noise, vibration, leakage, or wear.
5. All air filters shall be UL Class 2. All residential filters shall be 1" thick pleated MERV 8 (minimum) type. All commercial filters shall be 2" thick (or greater) pleated MERV 8 (minimum) type.

B. Codes and Standards

1. This project is governed by the 2015 International Building Code, 2015 International Mechanical Code, ASHRAE 90.1 (2013 EDITION) Energy Code, 2014 National Electric code, latest edition of NFPA 101 (Life Safety Code) 90A, as well as all locally adopted codes, standards, ordinances, or amendments.
2. The HVAC systems shall be installed in accordance with current ASHRAE,

ANSI, ASME and SMACNA guidelines and standards.

C. HVAC Design Conditions

1. Summer indoor design conditions shall be 75°F dry bulb (+/- 2°F) and 50% relative humidity (+/- 5%) for all conditioned spaces (humidity uncontrolled).
2. Summer outdoor design conditions shall be 105°F dry bulb and 74°F wet bulb.
3. Winter indoor shall be 70°F dry bulb.
4. Winter outdoor shall be 17°F dry bulb.

D. Indoor Air Quality (IAQ)

1. Minimum air quality, including filtering and humidity control, shall be in accordance with the 2015 International Mechanical Code.
2. The building common areas will be designed to maintain a slightly positive pressure.
3. Outdoor air for all dwelling units shall be via operable windows (natural ventilation).

E. Related Electric Work

1. Except as otherwise specified or noted, electrical equipment shall be as specified herein.
2. Motor controls, system controls, starters, pilot lights, push buttons, etc. shall be furnished by the Contractor complete as a part of the motor or apparatus which it operates. Electrical equipment shall be wired for the voltage, as shown on the Electrical Drawings.
3. Motors shall be standard NEMA continuous duty type. Each motor shall have ample capacity to drive the equipment to which it is connected at its full load capacity without loading the motor beyond its nameplate ratings, and shall have overload protection.
4. Starters shall be Allen-Bradley as specified herein. Starters for motors $\frac{1}{3}$ HP and smaller shall be manual AB Bulletin 600; for $\frac{1}{2}$ HP and larger, magnetic, AB Bulletin 709. Starters for motors with remote or automatic control shall be magnetic. Relays, interlocks and auxiliary contacts shall be provided as specified and required.
5. Motor controls shall be either "Hand-Off-Auto" switches AB Bulletin 800 or "On-Off" push buttons with one indicating light, AB Bulletin 800. "Hand-Off-Auto" switches shall be provided for automatically controlled apparatus.
6. Motor starters not an integral part of equipment shall be installed under the Electrical Specifications.
7. Electrical power wiring to disconnects, starters, motors and similar devices shall be provided under the Electrical Section.
8. Contractor shall provide all system controls, line and low voltage control and interlock wiring in conduits in accordance with materials and installation

requirements of Electrical Section. All starters shall be labeled on face of starter.

9. All starters, control devices (other than those located in the Electrical Closets and Storage Rooms) shall be flush-mounted types.
 10. All starters for three-phase equipment shall have overload devices in all three (3) phases.
 11. Wiring diagrams shall be furnished by the Mechanical Contractor.
 12. Equal products of Westinghouse, General Electric, Square D, Cutler-Hammer, Furnas or Clark will be acceptable.
- F. Pipe and Ductwork Penetrations
1. Sleeves shall be installed in all masonry or concrete walls, floors, roofs, etc. for pipe and ductwork penetrations. Sleeves for pipe shall be schedule 40 black steel. Sleeves for ductwork shall be 20 gauge galvanized steel. Sleeves shall be sized to provide a minimum of ¼" clearance between the sleeve and pipe or duct. For insulated pipes or ducts, the clearance shall be between the sleeve and the insulation.
 2. As far as possible, all pipe and ductwork penetrations shall be provided for at the time of masonry or concrete construction. Where drilling is required, only core drills shall be used. Star drills shall not be used.
 3. All pipes penetrating walls or floors of any construction shall be installed with escutcheon plates on both sides of the penetration securely fastened to the wall or floor. In exposed areas, the finishes of escutcheon plates shall be coordinated with the architect. All escutcheon plates shall be sized to completely conceal the penetration.
 4. Ductwork penetrating walls or floors of any material shall be installed with closure plates on both sides of the penetration. Penetrations through exterior walls shall be sealed weather-tight.
 5. Ductwork in floor/ceiling assemblies shall be provided with ceiling radiation dampers rated for 165°F.
- G. Cleaning
1. At all times, the premises shall be kept reasonably clean and free of undue amounts of waste, trash and debris by periodic cleaning and removal. After completion, all foreign material, trash and other debris shall be removed from the jobsite.
 2. Prior to operating any fan or air handling unit, provide temporary filters similar to final filters and temporary filter media over the air inlet.
 3. After all equipment has been installed, but prior to testing and balancing, all equipment, piping, ductwork, etc., shall be thoroughly cleaned both inside and out.
 4. Final filters shall then be installed where required, and all systems shall be tested and balanced.
 5. After testing and balancing and just prior to Owner review and acceptance, all systems shall be finally cleaned and shall be left ready for use.
 6. Open ended ductwork shall be protected from dirt and debris.

H. Outline of HVAC System

Corridors, Amenities, Leasing Areas

1. The residential corridors shall be ventilated with unconditioned air via ventilation fans installed in the corridors.
2. All amenity and leasing areas shall be heated and cooled via air cooled split-system DX Heat Pump units with electric resistance heat by Goodman or approved equal. SEER rating will be 15. The tonnage will be as follows: 300 square feet or less – 1.5 ton (4 kW); 301 to 450 square feet - 1-1/2 tons (5 kW); 451 to 600 square feet - 2 tons (6 kW); 601 to 750 square feet - 2-1/2 tons (8 kW); 751 to 900 square feet – 3 tons (8 kW); 901 to 1,050 square feet – 3-1/2 tons (10 kW); 1,051 to 1,200 square feet - 4 tons (15 kW). Any space over 1,200 square feet will have two (2) or more units and will be sized based on the previous schedule. Air handlers shall be vertical type located in HVAC closets. Condensing units shall be located on the roof deck. The air distribution shall be rectangular fiberglass ductboard with flexible duct take-offs. Flex take-offs up to 30 feet are acceptable. All condensate drain pipe shall collect at hub drains, floor drains or mop sinks as provided by the plumbing contractor. Provide a ducted return system. Each HVAC system shall be controlled by an independent 7-day programmable thermostat with automatic changeover.
3. Public restrooms shall be provided with a ceiling mounted cabinet fan sized for 75 cfm exhaust per water closet or urinal fixture. Janitor Closets shall be provided with a ceiling mounted cabinet fan sized at 50 CFM. Pool equipment rooms shall be provided with a ceiling mounted exhaust fan sized for the requirements of the space. Each exhaust fan's airflow shall be routed horizontally within uninsulated sheetmetal duct to an exterior wall cap. Exhaust fans shall be wired to the light switch of the room it serves.

Dwelling Units

1. Residential Units - Residential units shall be heated and cooled via DX split system equipment with 14SEER and electric strip heating.
2. The condensers shall be by Goodman, First Company, Bryant, Trane, or equal. The efficiency ratings of the matched indoor and outdoor units shall be minimum 14 SEER. The tonnage will be and duct layouts will be determined by the requirements of Manual J, D, and S sizing criteria per the 2015 IECC.
3. Condensers within 180 feet of their corresponding air handler shall include accessories required by the manufacturer for long length refrigerant line sets. Oversized refrigerant piping and associated components shall be provided where deemed necessary by the manufacturer.

4. Vertical air handler units shall be provided with a minimum of 10 feet of main supply ductwork. Return air shall be from a wall return grille. The filter would be located in the air handler when possible to facilitate service. Duct board may be used for the discharge supply plenum and flexible ductwork up to 40 feet are acceptable for the residential units only.
5. Provide one 24x12 return grille for all apartments served by a 1 ½ and 2 ton system. 30x12 return air grille for all apartments served by a 2.5 ton system and a 30x18 return air grille for all other tonnages for the dwelling units.
6. Every apartment shall utilize approximately seven (7) residential grade air devices (Airmate or equal) with integral damper / opposed blade damper (sidewall double deflection grilles). The air handler units shall be controlled using a 7-day programmable thermostat with setback capability. Kitchen range exhaust will be recirculating. Kitchens will be exhausted to the exterior via a wall mounted exhaust fan at 100 CFM. Bathrooms will be equipped with low noise exhaust fans (less than 3.0 Sone) and be vented horizontally to the outside of the building to a wall cap, manufactured by Broan or equal. The vent caps shall have a paint grip coating for field painting. Laundry dryer vents will be routed horizontally to exterior wall caps. The toilet and bath vent caps shall be mounted side by side where possible. The dryer vent shall be routed in the most direct route possible. Laundry dryers shall be provided by the developer. Laundry rooms shall include a transfer grille having a minimum 120 sq. in free area. A minimum of two 10x6 transfer grilles shall be provided to transfer air between the living area and bedrooms per ACCA Manual D requirements.
7. All thermostats shall be located on interior walls and away from dwelling unit entries. The location of a thermostat and shall be 8" from the corner of a wall and not centered.
8. Trash Room(s) - A roof mounted trash exhaust fan shall exhaust 50 cfm per trash deposit room. The exhaust grille at each floor will have a combination fire / smoke damper or sub duct system (if allowed by the City) and volume damper in grille. The exhaust fan will operate continuously. The main trash room on all project types having a compactor or bins shall be heated for freeze protection and cooled to maintain 68°F. The main trash collection rooms shall be exhausted at 5 air changes per hour.
9. Miscellaneous Areas:
 - a. Resident lobby levels will be heated and cooled using small split system heat pump units with backup resistance heat. A 7- day programmable thermostat with locking cover shall control the system.

- b. The elevator machine room and elevator shaft shall be cooled using a DX split system with a remote condenser located nearby. The system shall be controlled by a cool/auto/fan/on/off thermostat; (set point 85°F adjustable).
- c. The multifamily common areas will be heated and cooled using a 1.5 to 5-ton split system units per space type. A 7-day programmable thermostat with locking cover shall control the systems.
- d. Provide freeze protection for the fire pump room, if applicable, using a suspended electric unit heater. The fire pump room shall include ventilation or air conditioning to maintain a space under energized conditions at 104°F.
- e. The elevator hoist way will be provided with a relief hood/or wall louver with damper having electric actuators interlocked to the fire alarm control panel. The damper will fail open upon a loss of power or a fire alarm signal to allow smoke in the hoist way to be vented to the outdoors.
- f. The telecommunications closets will be air conditioned using a wall mounted mini-split DX system.
- g. Common area restrooms shall be exhausted with a ceiling mounted fan routed to exterior wall louver.

Enclosed Parking Decks

1. Enclosed parking decks shall be mechanically ventilated by means of wall prop exhaust fans at each level discharging into vertical chases terminating at the top level with area grate.
2. Fans shall be sized to provide 0.75 cfm per sq. ft. of enclosed parking area. One fan shall be sized to provide 0.05 cfm per sq. ft. of enclosed parking area and shall run continuously. Remaining fans shall be controlled by carbon monoxide/nitrogen dioxide detection system.
3. Carbon monoxide/nitrogen dioxide detectors shall be placed at an interval of 100 ft. diameter spacing.

1.04 HVAC SYSTEM COMPONENTS

A. Air Handling/Cooling Units:

a. Unitary air conditioning equipment shall be split systems with factory-assembled refrigeration tubing and control panel, as indicated on drawings. Each component-containing refrigerant shall be factory tested, dehydrated, charged, and shall have published ratings. All air conditioning equipment shall conform to standards of AGA, ARI 240, U.L. 559, and USASI B9.1, and shall be U.L. listed. Heat pump unit and indoor fan coil unit shall be factory-rated for use together to provide heating and cooling capacities and operating efficiencies within 5% of quantities specified on the drawings.

b. Heat Pump Unit: Provide air-cooled heat pump unit for each system.

Heat pump unit shall be completely packaged factory assembled, electrically operated unit, consisting of hermetic compressor or compressor safety controls, air-cooled condenser coil with circulating fan, refrigerant reservoir or receiver, charging valve (long line set package as required) and heavy duty structural frame, provide housing, valves, piping, and wiring as required.

- 1) Entire heat pump shall be completely factory charged with amount of refrigerant and lubricating oil recommended by manufacturer.
- 2) Refrigerant lines shall be sized by unit manufacturer and shall be warranted for lengths shown on the mechanical drawings. All traps, accumulators and any other required compounds should be shown on shop drawings.
- 3) Compressor shall be covered by a minimum five-year warranty.
- 4) All roof top mounted equipment shall be installed on isolation vibration pads.

c. Indoor Fan-Coil Unit: Air handling unit shall be constructed of heavy gauge galvanized steel, zinc coated and painted with a baked enamel finish. Contained within the cabinet shall be an electric resistant coil for heating. Interior of cabinet shall be insulated with a permanent fireproof glass fiber material. Cooling coils shall be copper tubes and aluminum fins. Provide internal drain pan with primary and secondary drain connections. Secondary connection shall be routed to above a bathtub if a float switch is not acceptable to the local jurisdiction. Blower motor shall be permanently lubricated 120V multi-speed. Blower wheel shall be forward-curved centrifugal type, and mounted on vibration rails with rubber isolators. Unit shall be factory assembled and furnished complete with all components and controls. Unit to be U.L. listed. Unit shall be selected to match heat pump unit with a minimum of 14 SEER. Equal Products: First Company, Carrier, Bryant, Lennox, EMI or Trane.

d. Refrigerant Piping: Refrigerant lines shall be furnished for field connection between air-cooled heat pump unit and evaporator unit. Tubing shall be factory dehydrated. Insulate all refrigerant lines. Use silver solder for refrigerant pipe. Insulation for refrigerant pipe shall be foil enclosed molded fiberglass or closed cell foamed plastic tubular pipe insulation per energy code. Long line refrigerant pipe size shall be as recommended by manufacturer. Line sizes and piping shall conform to ASHRAE Guide and Data Book, Refrigerant Piping Systems. Piping shall conform to Safety Code for Mechanical, Refrigeration USASI B9.1 and ARI 260.

1. Procedure: Joints and connections in refrigerant piping shall not be installed in partitions or walls or where inaccessible for testing, inspection, and rework.
2. Refrigerant lines shall not be routed underground.
3. During construction, cap all tubing to prevent moisture from entering; keep in dry location.
4. Leak Testing and Recharging: Upon completion of installation of air conditioning equipment, test all refrigerant piping, components and accessories including quick-connect refrigerant connectors for evaporator and heat pump unit; test with a halide torch; prove tight by Contractor to assure a leak-tight refrigerant system. If leaks are detected at the time of installation or during warranty period, remove entire refrigerant charge from system, correct leaks, and retest system. After system is found to be leak free, evacuation shall be accomplished by use of a reliable gauge and a vacuum pump capable of pulling vacuum of at least one mm Hg accordance with equipment manufacturer's printed instructions. System leak testing, evacuation, dehydration, and charging with refrigerant shall comply with requirements contained in ARI Standard 260.

1.05 AUTOMATIC CONTROLS

- A. A 7-day programmable thermostat shall be furnished in all dwelling units. Leasing and common areas shall use a 7-day programmable thermostat.
- B. An averaging thermostat shall be furnished for all rooftop units. A sensor shall be located on level two and the top level.
- C. Unit heaters and wall heaters shall have integral thermostat.
- D. Common area exhaust fans shall be controlled with an occupancy sensor.
- E. Dwelling unit bath fan shall be separately switched from lights.

1.06 DUCTWORK & ACCESSORIES

- A. Ductwork systems shall be classified as follows:
 1. Low pressure (less than 2" w.c.) - from all return and exhaust duct work.
 2. Residential (1 inch or 1.5 inch fiberglass duct board and flex duct).
- B. Ductwork shall be constructed of galvanized sheet steel according to the latest edition of SMACNA ductwork construction standards applicable to the system pressures described above, or fiberglass duct board for supply and return air systems only.
- C. Duct liner shall be 1" thick, 3 lb. density, Johns-Manville "Permacote Linacoustic" or approved equal by CertainTeed or Knauf.

1.07 LOUVERS, GRILLES, REGISTERS AND DIFFUSERS

- A. Furnish and install all louvers, grilles, registers and diffusers of the size, type, capacity, and characteristics as required.
- B. Louvers shall be extruded aluminum, drainable blade, 6-inch thick, with screens. Provide dampers and operators as required. Louvers shall be finished with baked enamel coating of color as selected by the Architect. Louvers shall be as manufactured by Greenheck.
- C. Public and residential air distribution devices shall consist of residential style steel ceiling and/or sidewall supply registers with integral face control volume dampers, and steel louver finned return air grilles and aluminum exhaust registers. Air distribution devices shall be as manufactured by AirMate and Titus.

1.08 UNITARY EXHAUST AND SUPPLY FANS AND VENTILATORS

- A. Furnish and install all unitary exhaust and supply fans and ventilators of the size, type, capacity and characteristics as required.
- B. Roof mounted exhaust fans shall be direct or belt-driven centrifugal type, with aluminum "mushroom" hood, screen, damper, and roof curb.
- C. In-line exhaust fans shall be direct or belt-driven centrifugal type, with integral back draft damper, suspended from structure with vibration isolation.
- D. Fans and ventilators shall be as manufactured by Cook, or approved equals by Greenheck.

1.09 HVAC INSULATION

- A. The work done under this section shall include all labor, materials, accessories, services and equipment necessary to furnish and install all insulation, complete, as indicated on the Drawings and as specified herein.
- B. Materials as specified in this section shall be manufactured by Johns-Manville or Knauf or equal.
- C. Ductwork
 - 1. All metal ducts shall be insulated other than environmental exhaust ductwork.
 - 2. Insulation shall be 2" thick blanket, 1-½ pound density with reinforced foil faced vapor barrier. Insulation shall be securely adhered to ductwork. All joints shall be sealed with 3" wide strips of the vapor barrier materials and applied to form a continuous vapor seal.
- D. All insulation must meet applicable codes for Flame Spread and Smoke developed rating.

1.10 BALANCING & ADJUSTING

- A. The work described by this section of the specifications consists of furnishing all materials, instruments, labor, and appurtenances to balance and adjust all of the air and water systems furnished and installed under the HVAC Division of the specifications.
- B. Duct leakage tests and blower door tests may be required by the National Green Building Program.
- C. The balancing and adjusting firm or company shall specialize in air balancing, shall show a specific record of having balanced other systems of similar size and complexity and which has been in business for at least five years, and shall be certified by the Associated Air Balance Council (AABC) or National Environmental Balance Bureau (NEBB). All test and balance work shall be performed according to AABC or NEBB Standards.
- D. Dwelling units shall not require an air test and balance other than what is required by the National Green Building program.

END OF SECTION

SCOPE OF WORK

PLUMBING SYSTEMS DESIGN CRITERIA

1.01 SCOPE OF WORK

The following text is intended to establish a minimum standard for a complete plumbing system for the Brewery South project located in San Antonio, TX.

1.02 SYSTEMS

- A. Systems to be provided under the Plumbing design section shall be as listed below. The connection point for all systems from the site utilities shall be at 5'-0" from the exterior of the building unless specifically otherwise noted.
1. Domestic cold, hot and hot water recirculation systems
 2. Sanitary, drainage, waste and vent systems
 3. Primary and emergency storm drainage systems
 4. Natural or gas systems

1.03 DESIGN STANDARDS

- A. Plumbing systems shall be designed and installed in accordance with the requirements of the following codes, standards and design guides:
1. The International Plumbing Code, 2015 Edition, with San Antonio Amendments
 2. The International Building Code, 2015 Edition, with San Antonio Amendments
 3. The International Gas Code, 2015 Edition, with San Antonio Amendments
 4. International Energy Conservation Code, 2015 Edition
 5. Americans with Disabilities Act (ADA)
 6. American Society of Plumbing Engineers (ASPE) Data Books
 7. National Fire Protection Association (NFPA) Standards:
 - a. NFPA 54 - National Fuel Gas Code
 8. Plumbing Drainage Institute (PDI)
 9. Underwriters Laboratories Inc. (UL)
 10. National Sanitation Foundation (NSF)
 11. Local Building and Inspection Department requirements
 12. Local Health Department requirements
 13. HUD Requirements for 221 (D)4 Projects

1.04 DOMESTIC WATER SYSTEM

- A. A new or recent flow test from the hydrant nearest to the site is required to determine the flow and pressure characteristics of the existing water service. Should the existing water service be inadequate to meet the demands for the project, a triplex booster pump system will be designed to provide sufficient pressure to all fixtures and equipment. Additionally, a

water analysis is required to confirm the existing water quality and determine if additional treatment is required.

- B. Due to the varying topographic nature of the site the pressures are estimated to vary between 68-107 psi. A domestic water booster pump is being designed as an add alternate at this time.
- C. The preliminary estimate to the facility is to provide an 8" combination domestic water and fire service.
- D. Domestic Hot and Cold Water Systems Materials
 - 1. The underground service shall be cement lined ductile iron pipe with mechanical joint fittings. Polyvinylchloride (PVC) pipe and fittings of the appropriate service and pressure ratings will be considered as a deductive alternate based on site conditions.
 - 2. Underground branch piping 2-1/2" and smaller shall be type "K" soft rolled copper with no joints.
 - 3. Above ground piping shall be Polypropylene piping, Aquatherm Green pipe SDR 7.4 for cold & hot water systems 3" and smaller, or SDR 11 for hot water systems 4" and larger and all cold water systems based on the required minimum pressure rating and use temperature, see chart below. Piping, fittings, and joints to comply with NSF 61-G, NSF 61, and NSF 372. Provide pipe wrap or insulation for piping in all plenum applications that meet the requirements of ASTM E84. When piping will be exposed to UV light for more than 30 days a factory UV protection must be provided per the manufacturer's recommendations. Fittings/Joints: Shall be aquatherm green pipe electro-fusion welded PP-R joints and fittings, ASTM F2389, NSF 61 certified.
 - 4. Above ground alternate: Chlorinated Polyvinyl Chloride (CPVC) Schedule 40, ASTM F-441 and D-2846 (100 psi at 180 degrees F). Piping, fittings, and joints to comply with NSF 61-G, NSF 61, and NSF 372. Fittings: Schedule 40 socket type CPVC, ASTM F-439 and F-441. Joints: Solvent cement and primer for CPVC piping, ASTM F-493. All metal thread connections to fixtures and fittings (tub spout, showerhead, etc.) shall be connected with a brass transition fitting.
 - 5. Above ground alternate: Cross-linked polyethylene (PEX) plastic tubing, PEX-a grade, ASTM F-876; ASTM F-877 (100 psi at 180 degrees F). Brass, copper or engineered plastic (EP) fittings, ASTM F-1960. Piping, fittings, and joints to comply with NSF 61-G, NSF 61, and NSF 372. Fittings/Joints: Cold expansion fitting with PEX reinforcing rings, ASTM F-1960 or cold expansion fitting with metal compression sleeve, ASTM 2080.
 - a) Acceptable PEX manufacturers/systems:
 - (1) Uponor Wirsbro Aquapex tubing with ProPEX fittings
 - (2) Rehau Raupex tubing with EVERLOC fittings
 - b) All PEX tubing and fittings shall be from the same manufacturer.

- c) Galvanized pipe and nipples are not acceptable for any portions of the domestic water system.

- E. Domestic hot water and hot water recirculation systems shall be designed for a maximum velocity of 5.0 feet per second; all remaining domestic water systems shall be designed for a maximum velocity of 8.0 feet per second. The domestic water system shall be designed to provide between 30 psi to 80 psi to all fixtures and equipment.

- F. Control valves shall be provided for the domestic hot and cold water supply to all risers and specific areas such as restrooms, food service areas and building separations. Valves shall be located in back of house or service areas with access panels or above lay-in ceilings. No access panels will be permitted in public spaces. The tower riser control valves will be provided with an access panel concealed below the lowest guestroom vanity or above the ceiling in the closet in the lowest level unless specifically otherwise noted.

- G. Shock absorbers shall be provided on all domestic cold water service to flush valve fixtures in restrooms. Shock absorbers will also be provided on domestic hot and cold services to washing machines, dishwashers and all other equipment with quick closing valves.

- H. Automatic trap primers with multiple outlet distribution assemblies will be provided for floor drains in all required locations. Water conservation lavatory waste type trap primers will be specified for all available locations.

- I. Freezeless (wall hydrants and hose bibbs) will be provided near service entry locations and around the perimeter of the building on approximately 100-foot intervals. Hot/cold water hose stations will be provided at the Loading Dock, Ground floor trash room and 4th floor chutes. Hose bibs/roof hydrants will be provided on roof top for maintenance.

- J. Reduced pressure zone backflow preventers shall be provided within the building on the main water service if not provided on the site service. A full size valved bypass is to be provided at the main backflow preventer location. Additionally, reduced pressure zone backflow preventers will be provided at all domestic water connections to mechanical systems, water-cooled ice machines, laundry equipment, and pool or irrigation supplies if required. Kitchen/food service equipment requiring cross connection protection shall be provided with the appropriate backflow prevention device.

- K. Sub-meters will be provided on all ancillary domestic water supplied systems to allow for a reduction of sewer rates if allowed by local utilities. Possible applications include HVAC equipment supply, pool and fountain supply, water cooled ice machine supply and irrigation supply.

1.05 DOMESTIC HOT WATER SYSTEM

- A. One (1) domestic hot water temperature system shall be designed for the supply of the required hot water systems in the facility. Systems shall be provided with a pumped recirculation system to maintain the required water temperature where required.
- B. All public and dwelling units fixtures shall be served by a 120 degrees F system supplied by electric tank type water heaters, 95% minimum efficiency.
- C. The preliminary design is to be based on one (1) 50 gallon 6 KW water heater which will provide a total of approximately 27 GPH recovery with a 90 degree temperature rise.
- D. Alternate: Domestic hot water to be provided by a central boiler system (Teal).

1.06 SANITARY, DRAINAGE, WASTE AND VENT SYSTEMS

- A. Conventional waste and vent systems shall be designed for all public and back of house and dwelling unit fixtures.
- B. Amenity spaces will be provided with conventional waste and vent drainage systems.
 - 1. All drains located in trash compactor rooms shall be routed to discharge to a grease interceptor per City of San Antonio requirements.
- C. Sanitary, Drainage, Waste and Vent Systems Materials
 - 1. Underground piping shall be cast iron hub and spigot pipe and fittings; schedule 40 PVC pipe with solvent cement fittings will be considered as a deductive alternate.
 - 2. Above ground piping shall be cast iron no-hub pipe, fittings and standard no-hub clamps.
 - 3. Schedule 40 PVC pipe with solvent cement fittings will be considered as a deductive alternate for all vent piping and branch piping to fixtures where not located within a plenum ceiling.
- D. Floor drains not receiving a continuous discharge will be provided with a lavatory waste type or automatic trap primer.
- E. Permanent sump pumps will be provided in all elevator pits with the outlet routed to an acceptable location for indirect discharge into a hub drain. Sump pumps located in hydraulic elevator pits will be provided with an oil interceptor on the hub drain discharge prior to connection to the sanitary system.
- F. Condensate, pool and fountain backwash shall discharge indirectly to the sanitary system.

1.07 STORM DRAINAGE SYSTEM

- A. Primary and emergency roof drainage systems shall be designed per local rainfall sizing requirements. If no sizing criteria are available, the primary system will be designed for a

100-year storm with a 60-minute duration and the emergency system for a 100 year storm with a 15-minute duration.

- B. Emergency storm drainage will be provided with either a separate emergency system piped independently to a visible discharge at the exterior of the building, or through the use of parapet scuppers.
- C. Storm Drainage System Materials
 1. Underground piping shall be cast iron hub and spigot pipe and fittings; schedule 40 PVC pipe with solvent cement fittings will be considered as a deductive alternate.
 2. All above ground piping shall be cast iron no-hub pipe, fittings and heavy-duty clamps.
 3. Schedule 40 PVC pipe with solvent cement fittings will be considered as a deductive alternate for vertical piping where not located within a plenum ceiling; horizontal piping from drains and at offsets of the rainleader stacks is to be cast iron.
- D. Condensate or other clear water wastes shall not be discharged to the storm drainage system.

1.08 GAS SYSTEMS

- A. A natural gas system will be designed for supply to all required equipment including Teal system, fire pits, BBQ grills at ground floor pool deck and internal courtyards, and pool water heaters as needed.
- B. The gas meter and pressure-reducing valve are to be provided and installed by the local utility company for delivery at low pressure gas (10"-14" water column) for distribution throughout the building.
- C. Gas System Materials
 1. Exterior underground piping shall be schedule 40 steel pipe with factory applied plastic coating and butt weld fittings, or FM Approved polyethylene plastic gas piping with fusion welded joints.
 2. Above ground piping shall be schedule 40 steel pipe with 3,000 lb. forged steel socket weld fittings for piping 2" and smaller and schedule 40 steel pipe with butt weld fittings for piping 2-1/2" and larger. Schedule 40 steel pipe with 150 lb. malleable iron threaded fittings will be acceptable on piping systems 2" and smaller.
 3. Corrugated stainless steel tubing (CSST) will be considered as a deductive alternate for piping 2" and smaller when acceptable to the local authorities.
- D. Gas valves shall not be installed above ceilings. Valves on the gas service to kitchen/food service areas will be located in a wall-mounted cabinet with an electrical solenoid emergency shut-off valve interconnected with the kitchen fire suppression system.

1.09 INSULATION

- A. The following systems and equipment shall be insulated:
 - 1. Domestic cold, hot and hot water recirculation systems
 - 2. Domestic hot water storage tanks
 - 3. Horizontal portions of the primary roof drainage systems
 - 4. Above ground drains and horizontal piping receiving condensate, chilled water or ice machine discharge

- B. Insulation Materials
 - 1. Preformed fiberglass pipe insulation with a self-sealing all service jacket sized in conformance with the 2009 Edition of the International Energy Conservation Code.
 - 2. All insulation materials shall be rated to not exceed a flame spread of 25 and smoke development of 50.

1.10 MISCELLANEOUS REQUIREMENTS

- A. Swimming Pool/Water Features
 - 1. Sanitary, domestic water and gas services shall be provided by the Plumbing Contractor for final connection by Pool/Water Feature Contractor.

END OF SECTION