

Project: Mercy Clemson Apartments (Clemson, SC)

Mechanical, Electrical, Plumbing, Low Voltage/Technology Systems

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General

The intent of this document is to highlight the Electrical, HVAC, and Plumbing decisions made prior to the schematic design phase, and provide a design guide for the detailed design phase of the project. At this time, the project is not going to be LEED or a “Green” project. The project is an affordable housing project.

Codes and Standards

Electrical, plumbing and HVAC systems design will conform to the requirements of the listed codes and standards and any supplementary requirements of the authorities having jurisdiction

- International Building Code, 2021 Edition with SC Amendments
- International Mechanical Code, 2021 Edition with SC Amendments
- International Plumbing Code, 2021 Edition with SC Amendments
- International Fire Code – 2021 edition
- American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE)
- Sheet Metal and Air Conditioning Contractor National Association (SMACNA)
- Air Moving and Conditioning Association (AMCA)
- Association Air Balance Council (AABC) or NEBB
- Electric Code NEC 2020 Edition
- IECC 2009 Edition (Energy Code)

Electrical Design Guide

Lighting

1. Provide residential grade LED lighting fixture package in each apartment to include puck lights (for entry, hallway, kitchen general lights, kitchen island, closets, 4 in living rooms, and overhead bath lights), vanity fixture over each bath sink, and wall sconce at balconies.
2. Provide ceiling fans with lights kit in apartment unit bedrooms and living rooms with 1 switch for fan speed and 1 switch for light controller.
3. Provide separate switch for apartment unit bathroom vanity lights, separate switch for apartment unit bath overhead lights, and separate switch for apartment unit bath exhaust fan.

4. Provide surface mounted LED lighting fixtures spaced 12' on center in corridors. Provide decorative LED wall sconce fixtures at each apartment entry door. Provide battery back-up emergency lighting fixtures at 30' on center in residential corridors. Provide battery back-up exit signs at all exits and at a distance of no more than 100' of travel distance along egress path.
5. Provide decorative light fixtures and recessed down lights in Amenities spaces – controlled by motion sensors. Fixtures to be selected by Interior Designer.
6. Provide LED strip fixtures in all back of house areas controlled by occupancy sensors.

Receptacles / Branch Circuit Wiring

1. Provide residential grade receptacles (Arc Fault, Tamper Resistant, GFCI) at locations required by code in residential units.
2. Residential units – Provide combo duplex receptacle / USB type A and C outlet in kitchen and each bedroom.
3. Provide 120V, 20A receptacle and 240V/1, 30A receptacle in laundry room for each washer and dryer.
4. Provide weatherproof GFI receptacles at no more than 20' from exterior HVAC units.
5. Provide type NM cabling in residential for branch circuits in type III, IV, and V construction. Provide MC cabling in residential for branch circuits in other types of construction. No NM cabling allowed in residential HVAC closets. Provide MC cabling for branch circuits in Amenities areas.
6. All exposed areas shall have wire and conduit.
7. Provide connections to all HVAC and Plumbing equipment.
8. Provide connection to all landscape lighting.
9. Provide power for one lighted monument sign at site entrance.
10. Communications closets (MDF/IDF) shall have full wall plywood with two dedicated quadruplex outlets.
11. All equipment that requires power will be provided with power including all pumps.

Fire Alarm System

1. Provide a main addressable fire alarm system with central fire alarm control panel in the Leasing Office, remote annunciator at location directed by fire marshal, dialer for remote monitoring and fire alarm sub-panel at each apartment building. Provide pull stations, tamper/flow switches, smoke detectors, door holders, system smoke detectors with 520Hz low frequency sounder bases (outside and inside sleeping areas in apartments), heat detectors, and horn strobe units as required by NFPA 72 and 101. Wiring as directed by manufacturer's representative. Provide surge suppression at each entrance (power and signal) to each building.
2. Provide a \$250,000.00 deductive alternate for building emergency responder radio amplification system as part of the base bid.

Distribution

1. The electrical service voltage will be 240/120V, 1PH, 3W fed from power company pad mounted transformers to electrical services.
2. Provide single phase in / single phase out meter centers for residential units. Provide 110A/2 (see unit requirements below) in each meter socket to serve each apartment.
3. Building 1 – Provide 240/120V, 1200A electrical service and 1200A MCB meter center (with TVSS protection) on exterior of the building to serve half of residential units and house loads. Provide (1) 200A breaker for house panel. Provide 1000A electrical service and 1000A MCB meter center (with TVSS protection) opposite end exterior of the building to serve residential units.
4. Building 2 – Provide 240/120V, 1200A electrical service and 1200A MCB meter center (with TVSS protection) on exterior of the building to serve half of residential units and house loads. Provide (1) 200A breaker for house panel. Provide 1000A electrical service and 1000A MCB meter center (with TVSS protection) opposite end exterior of the building to serve residential units. Provide a 240/120V 600A electrical service and 600A MCB house panel for Amenity spaces.
5. Building 3 – Provide 240/120V, 1200A electrical service and 1200A MCB meter center (with TVSS protection) on exterior of the building to serve half of residential units and house loads. Provide (1) 200A breaker for house panel. Provide 1000A electrical service and 1000A MCB meter center (with TVSS protection) opposite end exterior of the building to serve residential units.
6. Building 4 – Provide 240/120V, 1600A electrical service and 1600A MCB meter center (with TVSS protection) on exterior of the building to serve half of residential units and house loads. Provide (1) 200A breaker for house panel. Provide 1600A electrical service and 1600A MCB meter center (with TVSS protection) opposite end exterior of the building to serve residential units.
7. Building 5 – Provide 240/120V, 1200A electrical service and 1200A MCB meter center (with TVSS protection) on exterior of the building to serve half of residential units and house loads. Provide (1) 200A breaker for house panel. Provide 1000A electrical service and 1000A MCB meter center (with TVSS protection) opposite end exterior of the building to serve residential units.
8. Typical Unit - Each 100A/2 or 110A/2 breaker in the meter center will serve a 125A MLO load center with plug-in breakers in each apartment.
9. Typical Unit - Provide a 125A MLO load center served with 3#1/0(AL)(CU)G. – SE cable in each residential apartment.
10. All metering provided by power company.

HVAC Systems Design Guide

1. HVAC equipment will generally be single zone, DX fan coil units with matching condensing units (heat pumps). Outdoor units will be mounted on grade, on 3'x3' concrete pads with minimum of 24" clearance between each unit. Units will be by Carrier (residential style): with matching programmable thermostats Units will have minimum 14.3 SEER2 ratings, 7.5 HSPF2. All spaces other than the apartments shall have low ambient cooling capabilities down to 25 degrees except for units serving exterior zones. HVAC refrigerant lines shall be insulated. Refrigerant line sets shall be routed within naturally vented shafts located at the exterior walls of the building.
2. Common areas toilets shall be exhausted by ceiling mounted fans sized at 70 cfm per urinal/water closet. Each toilet room shall be provided with its own fan, controlled by a wall switch located next to the light switch. The exhaust duct shall be rigid duct, routed to an exterior wall and terminated with a wall cap.
3. Apartments fan coil units will be the vertical configuration type located in the mechanical closets. They will be wall hung above a water heater. The return air will not be ducted but will be drawn in through a grille above the door to the closet. Condensate drain lines can be CPVC if contractor can provide UL test results for empty CPVC piping in a plenum. Condensate will be routed to a drain in the mechanical closet. A/C units for the apartments shall be sized at approximately 600 square feet per ton. Electric heat has been sized to provide approximately 20 degrees F. of temperature rise. (Heater sizes are based on 208VAC single phase).
4. Apartments will be mechanically ventilated. Ventilation air for apartments will be brought in to the FCU from an exterior wall hood ducted with insulated (1.5" thick duct wrap) 4" diameter duct to the mechanical closet. A motor operated damper will be provided for the OA duct within the FCU closet. A CRD will be required where the OA duct penetrates the ceiling. OA will be brought into the unit when the thermostat has a call for heating or cooling and the supply fan is energized. Outside air will not be brought in continuously.
5. Apartment supply ductwork will be 1.5" thick fiberglass duct board (R-6) and insulated flexible duct except where duct is routed in the attic as is the case for top floor units which shall have R-8 (2" thick) duct board. Apartment ductwork will be routed in the floor/ceiling assembly or attic for top floor. Apartment supply grilles will have a ceiling radiation damper. Run-outs to ceiling diffusers/grilles shall be long runs, so that the airflow is from an exterior edge of a room (furthest from the fan coil unit) in towards the interior wall.
6. Apartment bathroom exhaust fans shall be ceiling mounted, with a ceiling radiation damper. Fan shall be rated for 50 cfm at 0.25" static pressure. Apartment toilet exhaust will be routed with 4" diameter rigid metal duct to an exterior wall cap.

7. Apartment dryer exhaust ducts will be 4" diameter sheet metal routed to the exterior wall with a wall cap with integral back draft damper/flap. A placard shall be provided at each laundry room indicating the length of run for that particular unit. We will add 5'-0" for each 90 degree elbow and 2'-6" for each 45 degree elbow. We will include 5'-0" for vertical drop to dryer wall box. Dryers will be provided by Owner, and a cut sheet for the dryer will be sent to the Engineer so we may put them on our Permit Drawings for review by the Building Department.
8. Apartment unit walk-in closets with one (1) or more exterior walls or closets that are accessed through a bathroom shall have supply air grilles.
9. Laundry Rooms will have a make-up air grille installed above the door of the Laundry Room to allow make up air to the dryer for proper dryer performance, and to comply with Dryer Manufacturer Installation Guidelines. Grilles will be provided in addition to undercut doors.
10. The Leasing/Amenities Facility and other "Common" areas of this project shall have the A/C sized at approximately 350 sq.ft./ton. The individual A/C units will be no greater than 5 tons. The fan coil units will be floor mounted vertical units, installed in Mechanical Closets with matching roof mounted condensing units, complete with sheet metal supply and return ductwork, diffusers/grilles, and a ducted return. Outdoor air will be through wall louvers. Supply duct shall be externally insulated with fiberglass duct wrap. Diffusers shall be provided at one per 300 square feet. Condensate from the Fan Coil Units shall be CPVC and shall spill in a hub drain (provided by Plumbing) located in the Mechanical Closet. Thermostats shall be digital, programmable type. Zoning of the Commons area shall be done so that Exterior Zones are separated from Interior Zones so as to provide optimal temperature control.
11. Common areas (including corridors) are to be balanced by a third party Test & Balance contractor.
12. Sprinkler Riser Rooms and Domestic Water Service Entry rooms shall be freeze protected with Electric Wall Heaters.
13. Common storage rooms will be heated, using Electric Wall Heaters where required to freeze protect any sprinkler or domestic water piping.
14. Corridors: Corridors are open breezeways. No mechanical ventilation is required.
15. Fire Alarm Control Panel Rooms: Rooms that contain the Fire Alarm Control Panel with will be mechanically cooled (and heated) via ductless heat pump split system, with wall mount fan coil units. This is to comply with Manufacturer requirements for Temperature and Humidity constraints for the Control Panels.
16. Maintenance Room: This room will be conditioned via ductless split system, with a wall mount fan coil unit.

Plumbing Design Guide

Apartment Buildings

1. Separate water services with separate backflow preventers will be required for potable building water and fire protection water service. Backflow equipment has not been determined whether or not it will be in Plumbing scope or Civil scope.
2. Water and fire mains will enter the building at a dedicated riser room within the apartment building.
3. The Siamese fire department connection will be located on the exterior wall **OR** remote to the building depending on fire hydrant location. The FDC shall be within 100' of an active fire hydrant.
4. Each apartment unit will be provided with a remote read water meter in each unit. Water lines serving each apartment will be no larger than a 1" service for one bath units and a 1½" for two bath units. If available water pressures permit, line sizes may be reduced, down to a minimum of ¾" for each apartment.
5. Electrical Water Heaters (EWH) for the residential units will be located inside mechanical closets below Fan Coil Units. In each unit the EWH shall be ~40 gal., 4.5KW for one bath units and ~50 gal., 4.5 KW for two bath units. Water heaters will meet new NAECA requirements and have an energy factor of 0.95.
6. Three-inch sanitary risers will run down through the building from the bathrooms, kitchen, laundry room, & water heater room. These risers will be collected together below the ground floor, collected into a common sewer main, and routed to 5'-0" outside the building from each apartment building section to a site manhole provided by civil.
7. Water supply mains for each apartment building section will originate from the water service entrance located in the riser room and route above the main floor corridor to the water heater room of each main floor apartment unit. A water pipe riser will be located in each water heater closet rising from the ground floor unit to the top floor unit. A water supply line will branch off of the water supply riser in into each unit's water heater room to supply water to each unit. The remote read water meter and a shut-off valve will be located in each unit's water heater closet.
8. Low water use plumbing fixtures will be specified and installed in accordance with the requirements of the International Plumbing Code. All water closets will be flush tank type and floor mounted.
9. Sewer lines above grade shall be solid core PVC SCH.40, sewer lines below grade shall be solid core PVC SCH. 40, and vent lines shall be PVC.
10. Stormwater from downspouts and courtyard drains will be collected by civil and routed below grade to connect to civil storm system.

11. Condensate shall be routed to a Civil storm connection with a hub drain located on each floor of the apartment mechanical closet stacks.
12. Water lines shall be CPVC and insulated with pipe insulation only in exterior walls, attics, and other areas where piping may be subject to freezing. Hot water shall be insulated per code requirements.
13. Heat trace and insulation will be provided on all water and fire pipes that are exposed and at risk for freezing. Exposed p-traps will be heat traced and insulated as well for residential over parking deck in areas that could freeze.
14. The community center will be served with domestic water sized for the expected fixture demand of the area. A separate water heater will be provided for the amenities area.
15. Non-freeze wall hydrants with locking covers shall be provided every 100' along the building.

Fire Protection

1. The apartment building sections will be sprinkled per NFPA 13-R.
2. The design, layout and installation of all fire protection systems will be the responsibility of the Fire Protection Contractor. Plumbing drawings will show the location of the fire sprinkler riser, fire department connections and detail of the fire risers. Performance specifications for automatic fire wet-sprinkler systems will be provided.
3. All building fire protection design requirements shall be coordinated with the authorities having jurisdiction prior to completion of building design. Drawing shall be approved by the local Fire Marshall prior to submittal.

Low Voltage (LV) Systems Narrative

Horizontal Data/Voice Cabling System, Amenity Cabling

1. Provide one Telecommunications Outlet (wall plate) consisting of two (2) Category 6 cable drops at each required data outlet location.
2. All horizontal cables will be "homerun" to the nearest telecom Room and terminated on rack-mounted Category 6 patch panels in a Star Topology.
3. At a minimum, each personnel or administrative office shall have one (1) dual outlet (wall plate), conference room shall have two (2) dual outlets, unless otherwise directed.
4. Leasing Office Front Desk will have a minimum of four (4) 2 drop data outlets.
5. Provide all horizontal data drops with Category 6 patch cable assemblies for Local Area Network (LAN) electronics (supplied by others) within the Data Room/MDF.

6. All patch panels, LAN/WAN Electronic Equipment, vertical and horizontal cable management troughs; overhead ladder rack for cable management, patch panels, power requirements and other user equipment will be mounted within the Data Room/MDF equipment racks permanently mounted to the floor and/or walls within these rooms.
7. All cables above ceilings will be managed with appropriately sized J-Hooks for each bundle of cables.
8. All Administrative Area cable bundles will be arranged so they are located above aisle and walkways and not over desks, personal workspaces/offices, etc.
9. All equipment racks and cable management equipment shall be grounded to a proper ground system tied back to the main electrical ground.
10. All outlets and patch panels will be labeled with a legible, self-adhesive and self-laminating, machine printed label. In addition, a matching label for each cable drop will be fastened six inches from the end to the cable length behind the wall plate and behind the patch panels for easy identification once a technician is behind the plate or patch panel for service.
11. All Category 6 cabling will be tested and certified using an All Category 6 cabling will be tested and certified with a Fluke DSX-5000 tester or equivalent.
12. Final test reports shall be given to the Owner in a bound and digital copy.
13. Repairing, replacing and retesting any cables that are found to be deficient will be required at no additional cost to the project.

Residential Unit Cabling

1. Provide one Telecommunications Outlet (wall plate) consisting of two (2) Category 6 cable drops at each Television outlet in each Living Room and each Bedroom.
2. Provide a flush wall mounted Primex 4200 ND Pro Smart panel enclosure in each unit located in a bedroom closet.
3. Provide a Category 6 data module capable of terminating all TV outlets plus 50% in the media center.
4. Homerun each cable from outlet to the Smart Media Center located in the Bedroom closet and terminate on data module.
5. All outlets will be labeled with a legible, self-adhesive and self-laminating, machine printed label six inches from the end at both ends.
6. All Category 6 cabling will be tested and certified with a Fluke DSX-5000 tester or equivalent.
7. Repairing, replacing and retesting any cables that are found to be deficient will be required at no additional cost to the project.

Fiber LAN/WAN Backbone

1. A high speed indoor/outdoor 12 fiber multistrand single mode fiber optic LAN/WAN backbone connection will be provided between the Main Distribution Frame (MDF) and all (each) IDF Room stack.
2. Within the building's data MDF and the IDF's, backbone fiber strands are terminated and housed in rackmount "Small Form Factor" fiber optic enclosures at both ends of fiber.
3. All fiber cabling (each strand) will be tested bi-directionally at both 850 nanometers (nm) and 1300 nm operational wavelengths.

4. Repairing, replacing and retesting any cables that are found to be deficient will be required.
5. The Fiber cabling system and all components will be installed, tested, and certified for warranty.
6. The Owner network fiber optic cables shall be installed using two (2) x 4" PVC conduits from the MDF to the first floor IDF in each building.

Low Voltage Conduits

1. Provide four (4) x 4" Conduit to the property line and coordinate exact location with the Internet Service Provider (ISP).
2. Provide two (2) x 4" Conduits to each additional building first floor IDF Room from the Building MDF for connect the multiple buildings.
3. If a building has multiple IDF Rooms, connect the multiple IDF rooms to the first entry IDF Room with two (2) Conduits for each IDF stack.
4. Depending on site and soil conditions, the connecting conduits may be installed underground or in first floor corridor spaces.

Low Voltage/Telecom Rooms

1. MDF and IDF Rooms shall have ¾" fire retardant plywood blemish free on one side.
2. The MDF walls shall be covered with 8' x 4' plywood from the back wall and both side walls with no gaps between sheets and from corner to corner.
3. Mount with bottom of plywood 6" AFF. Mount blemish free side out.
4. Provide one 120 VAC quad outlet per sheet of plywood backboard.
5. Provide a ground bar for MDF and each IDF and tie to electrical ground.
6. Provide four (4) conduit sleeves between each floor IDF rooms.
7. Provide four (4) conduit sleeves into corridor above the ceiling for exiting the IDF into corridor ceiling space.
8. All sleeves and conduits shall be fire-stopped.

Telephone Trunk & Tie Lines

1. Telephone Incoming Service shall be provided/provisioned by the Owners contracted Internet Service Provider.
2. Include a "Private Owner Network" 12 strand (minimum) single mode fiber optic cable to tie the existing MDF to the additional buildings IDF Telecom Rooms for expansion or additional systems such as Security, CCTV, Card Access, etc.
3. Terminate fiber optic cable on small form factor fiber connectors on each end and mount in fiber optic rack mounted patch panels.

Security Systems

1. Security System will be tampering resistant low-lux IP CCTV Cameras strategically placed in all building entrances, elevators, amenity spaces and other appropriate high-risk areas.
2. All CCTV cameras shall be recorded on a Networked Video Recorder (NVR) with 30-day storage on CCTV video hardened hard drives.
3. The NVR will be rack mounted in the same rack as Data patch panels in the main Data Room.
4. Card Access will be designed for secure doors using an industry standard HID/RFID/NFC type reader.

5. If Residential Unit Doors are equipped with Smart Locks, all locks will be compatible with all other locks on the property and operate with the same credential fob.
6. Coordinate all entry devices for secured doors with the hardware schedule.

Audio Visual Systems Cabling

1. Audio/Visual (TV) outlet shall include one television outlet of two CAT6 cables per TV outlet, mounted at 18" and 60" with adjacent power outlet at each data outlet.
2. Provide a "Pass Thru" flexible conduit beside the data outlet locations at 18" and 60" for passing through of HDMI and ethernet cables from the television to auxiliary equipment below the TV.
3. Category 6 cabling shall be installed above the ceiling for each TV outlet to the nearest Telecom Room and terminated on a rack mounted patch panel.
4. Provide overhead ceiling speakers for all amenity spaces.
5. Provide a networkable stereo amplifier (AV Receiver) capable of streaming, Wi-Fi, Bluetooth, HDMI ARCe connectivity, etc.
6. Provide a multiplexor (if required for amenity spaces).
7. Provide A/V Control4 system for controlling A/V in all amenity spaces.
8. Provide outdoor rated speakers for sound in pool area, pet parks, social gathering areas and outside courtyards.
9. Provide all A/V installation, programming and training.

Wi-Fi Network

1. A Wi-Fi Network shall be provided for all amenity spaces, parks, co-work & gathering spaces, pool area, etc. to provide full coverage via Wi-Fi Access Points (WAP).
2. Category 6 cabling shall be installed above the ceiling for each WAP beginning from the nearest Telecom Room and terminated on a rack mounted patch panel.
3. The far end (WAP location) shall be installed in a flush ceiling mounted single gang box and terminated in an RJ 45 Cat 6 jack.
4. The WAP will be installed and configured by Owners IT integrator or ISP (if ISP is providing Managed Wi-Fi).
5. In the residential Units the far end (WAP location) shall be installed in a flush ceiling mounted single gang box and terminated in an RJ 45 Cat 6 jack which is closely centrally located in the center of the Unit.
6. The WAP will be installed and configured by Owners IT integrator or ISP.

Emergency Responder Radio Communications System

1. An Emergency Responder Radio Coverage (ERRC) System for Emergency Responder radios may be required in the building per IFC Section 510 or by local ordinance.
2. Provide a two (2) hour rated vertical access and pathway throughout the building for the risers of the ERRCS system.
3. As an alternate, two hour rated "Dragon Cable" may be substituted with FM approval for the risers.
4. If Dragon Cable is approved, all components in the two-hour riser shall be rated at two hours, i.e., enclosures, tee terminations, etc.
5. Provide building rated horizontal access and pathways throughout the building corridors for the horizontal cable/antennas of the ERRCS system.

6. Coordinate rough in installation of horizontal antenna cable in corridor ceilings before drywall installation.
7. Provide Article 510 required testing by an authorized ERRCS radio installer with an FCC certification for General Radio Operators license.
8. The final design and/or As-Built drawings by the Radio Installer shall be submitted directly to the local Fire Marshal or Chief Safety Officer of the AHJ for review.

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