

**Landmark Double Creek Phase II
Apartments
11301 Farrah Lane
Austin, Texas**

**MEP
GENERAL SPECIFICATIONS**

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GENERAL SPEC

15010/16010 - GENERAL PROVISIONS FOR MECHANICAL AND ELECTRICAL WORK

GENERAL

REFERENCE

1. All conditions including but not limited to Consultant Specifications and drawings, General and Supplementary Conditions, Architectural Specifications and drawings are part of these specifications and accompanying drawings and are binding upon all applicable drawings.
2. All contractors shall become familiar with all Contract documents; failure to do so shall not relieve any contractor of responsibility or be used as a basis for additional compensation due to the omission of architectural or structural details from the mechanical or electrical drawings or specifications. All pertinent documents and specifications are available at the Architect's office.

DRAWINGS AND SPECIFICATIONS

1. Contractors shall furnish all necessary fixtures, appliances, materials and labor needed to provide the intent of the specifications and drawing's. The mechanical and electrical intent of these specifications and drawings is to provide documents for installations which will be complete in every respect and which will operate properly and to the standards of all applicable codes and manufacturers.
2. Completely review and understand the structural and architectural completed design affecting the mechanical and electrical work and furnish all parts and labor required to provide satisfactory operation. The drawings accompanying these specifications are diagrammatic and do not show every possible connection of every device and pipe in every situation. Details are subject to change due to local ordinances or changes from other consultants. Contractor shall remain updated at all times as to any new changes.
3. Contractor shall always base the bid on the better quality and or quantity of work when ever a discrepancy exist between the drawings or the specifications and the drawings unless directed by the owner.
4. The contractors shall utilize the information provided in these specifications and accompanying drawings. At no time shall a drawing be scaled to determine dimensions. All dimensions shall be acquired through the properly dimensioned drawings.
5. Contractors shall become familiar with the project site and working conditions through visits to the site and verify any existing items that may be indicated on the drawings, noting any hazardous situations, soil conditions as well as any local requirements.
6. There shall be no deviations from the Contract Documents without written approval of the Architect \ Engineer. Contractor shall submit a written request for interpretation form the Architect or Engineer for any item in the construction documents that is unclear or questionable prior to installation.

SHOP DRAWINGS & SUBMITTALS

1. Submittals under this section shall include the following items, as applicable:
 - A. Water heaters, plumbing fixtures and including all trim.
 - B. HVAC plan showing duct layout and sizing, refrigerant and condensate piping, details of all equipment and equipment schedules including all SEER and EF ratings.
 - C. Ventilating, Cooling and heating equipment.
 - D. Grilles and registers with type of material and manufacture cut sheets.
 - E. Insulation.
 - F. Switchgear, panel boards, load centers, control devices and disconnect switches.
 - G. Lighting fixtures.
 - H. Bases and foundations for all equipment.
2. Submittal for other items, including the following items:
 - A. Storm, waste and vent piping.
 - B. Hot and cold water piping, fittings and valves.
 - C. Traps, escutcheons, hangers and supplies.
 - D. Sealants and sleeves used for penetrations through walls, floors and ceilings.
 - E. Drain piping and fittings for Condensate.
3. Detailed shop drawings shall be submitted for all special or custom-built items or equipment. Shop drawings shall also be submitted along with cut sheets and details for approval in all cases for scheduled appliances and devices depicted on the construction documents. Any deviation to the construction documents shall be approved prior to installation through the shop drawings and approval process.
4. Approval of submittals provides only an acceptance of the manufacturer and quality, this acceptance in no way relieves the contractor for any errors or omissions in the submittals or for compliance with the intent of the contract documents. The contract documents are based on specific equipment, accessories, processes and arrangements, any deviation from these shall be approved prior to installation.

UTILITY LINES AND ELEVATIONS

1. Responsibility for locating, uncovering, disposing of, or maintaining all existing utility lines shall rest solely with the Contractor, who shall plan and conduct his operations in a manner to insure safe conditions at all times. Locations and elevations, along with the method of tie-in of utilities as shown on the drawings have been obtained by conferences with the Owner, utility companies, or other sources, and are shown as a guide only without guarantee as to accuracy.
2. Contractor is responsible for verification at the site, the exact location, size, elevation, direction of flow and operating pressure of all existing utility mains to which a connection is to be made. Any changes to the design shall be as directed by the Architect, without additional cost to the Owner.

GENERAL SPEC

INDUSTRY STANDARDS

1. The following industry standards shall apply, as applicable to the Work of this section, except where the requirements of the contract documents are more stringent or differences are required by local codes.

AGA	American Gas Association
AMCA	Air Moving & Conditioning Association
ANSI	American National Standards Institute
ASME	American Society of Mechanical Engineers
ASHRAE	American Society of Heating, Refrigeration & Air Conditioning Engineers
ASTM	American Society of Testing Materials
AWWA	American Water Works Association
GVI	Gas Vent Institute
IECC	International Energy Conservation Code
IEEE	Institute of Electrical & Electronic Engineers
IES	Illuminating Engineering Society
NBFU	National Board of Fire Underwriters
NEC	National Electrical Code
MENA	National Electrical Manufacturer's Association
NFPA	National Fire Protection Association
OSHA	Occupational Safety and Health Administration
UL	Underwriter's Laboratories
SMACNA	Sheet Metal and Air Conditioning Contractors National Association.

CODES AND ORDINANCES

1. Perform the Work in strict accordance with the local, state and national codes and ordinances; and the regulations and requirements of other ruling authorities having jurisdiction. The requirements of the codes, ordinances, and regulations of the authorities shall not relieve the Contractor from the responsibility of the requirements of the Contract Documents where specific conditions call for a higher quality or greater quantity of work than the requirements of the authority.

FEES

1. Obtain and pay for all permits, licenses, metering, and inspection fees required by all authorities having jurisdiction for work on the project.

GUARANTEE

1. All equipment, materials and labor shall be guaranteed against defects in material and installation for a period of one year from final acceptance by owner. The guarantee shall include lost refrigerant and oils which is a result of defective materials or faulty installation, without additional cost to the Owner. A minimum five-year warranty shall be required for air conditioning compressors and a minimum six-year warranty water heater tanks.
2. Properly register the guarantees of equipment to protect the warranty. Contractors and manufacturers guarantees executed by the Contractor shall be presented to the Owner prior to final acceptance inspection.

GENERAL SPEC

PRODUCTS

QUALITY ASSURANCE

1. All materials used on the project shall be new and of the quality specified. All like materials shall be of the same manufacturer and model unless otherwise specified and approved.
2. All materials of a type for which the Underwriters Laboratories have established a standard shall be listed by the Underwriters Laboratories and shall bear the UL Label.
3. By submitting a bid on the Work, the Contractors set forth that they have the necessary technical training and ability to perform the Work in a satisfactory manner by skilled workers, properly licensed and experienced in their respective trades, up to the best standard of the trade, complete and in good working condition.

SUBSTITUTION OF EQUIPMENT

1. The design of mechanical and electrical systems is based on equipment of specified manufacturers and information published in their standard catalogs. Substitution equipment shall be complete with all components, trim arrangements and other accessories which are cataloged as standard equipment by the specified manufacturer, whether or not these items are specifically scheduled in the drawings or specifications. Any additional items that may be required by the substitute equipment manufacturer for proper operation of equipment within the intent of the contract Documents shall also be furnished. Optional items shall be included as required by the Contract Documents. Approval of submittal data shall not relieve the Contractor from this requirement.
2. Coordinate the substitute item with the work of other trades in regards to electrical characteristics, motor starters, horsepower, space requirements, ingress and egress, and other such characteristics peculiar to the substitute equipment that will affect the work of other trades.
3. The noise level of substitute equipment shall not exceed the noise level of specified equipment.
4. Contractor shall bear all costs in connection with any changes required by the individual characteristics of the substitute equipment.
5. Should any substitute equipment prove unsatisfactory during installation or during the guarantee period, the Contractor shall replace the substitute equipment with the specified equipment upon direction of the Owner.

EQUIPMENT BASES AND FOUNDATION

1. Each piece of equipment shall be provided with an approved base and foundation, as required by the Contract Documents.
2. Condensing units shall be mounted on a city approved base, or a four-inch thick reinforced concrete pad provided by the mechanical contractor, or as shown on drawings.

GENERAL SPEC

ACCESS PANELS

1. A permanent access door or panel conforming to the interior surroundings and approved by the Architect shall be provided for each piece of equipment or device concealed under the floor, above ceiling, in walls or other inaccessible areas where access may be required for maintenance, inspection, or for emergency conditions. The access assembly shall be sized according to the intended use for the equipment or device served but in no case smaller than 12"x12" unless approved by the local authority.

ELECTRIC MOTORS

1. Unless otherwise specified, all motors, motor starting equipment, pushbuttons and overloads shall be furnished by the contractor furnishing the equipment. The installation of all power wiring, motor starting equipment and pushbuttons, unless a prewired component of major equipment shall be performed under Section 16.
2. Supply all motors required to drive equipment specified. Motors shall be manufactured by General Electric, Westinghouse, or Grainger in accordance with AIEE and NEMA standards, and shall be suitable for across the line starting unless otherwise specified.
3. Motors shall be of the size, speed, phase and voltage specified and of the type recommended by the manufacturer for the service intended.

EXECUTION

MANUFACTURER'S RECOMMENDATIONS

1. Delivery, storage, protection and installation of all equipment shall be in accordance with the manufacturer's recommendations.

EXCAVATING AND BACKFILLING

1. Contractor shall perform all excavating, trenching and backfilling necessary for the installation of the Work, including shoring, bailing and pumping to maintain trenches and keep them in dry conditions until the Work has been tested and approved.
2. Water and sewer lines shall be laid in separate trenches with minimum spacing as required by code.
3. Trenches for pipe shall be excavated to required depths; the bottoms graded to produce the required fall. Rock shall be excavated to a depth of six inches below trench bottom.
4. After lines have been tested, inspected and approved by the Owner and ruling authorities, remove forms and debris and backfill in horizontal layers not to exceed six-inch thickness. Water jet each layer and compact to a density that will prevent excess settlement, exercising care to prevent disturbing pipe position or injuring pipe coating.

GENERAL SPEC

INTERFERENCES

1. Furnish and install all necessary offsets and fittings in piping, ductwork, and other such items as required to install the Work as closely as possible to walls, ceilings, or structure in order to take up a minimum amount of space. Correct interferences with the work of other trades. Where space requirements conflict.
2. Piping which requires a stated grade for proper operation shall be given precedence where interferences occur.

PIPING AND CONDUIT

1. Pipe shall be square cut to fit, ends reamed, and cleaned inside and outside prior to installation.
2. All pipe shall be run concealed unless specifically indicated otherwise on the drawings.
3. Screwed joints shall be made with the best Teflon tape or pipe dope, used on male threads only.
4. Each trade shall furnish all pipe supports required for work. All horizontal runs of piping shall be supported by pipe hangers spaced not more than ten feet apart or closer when necessary to prevent sagging. Hangers for copper pipe shall have nylon insulated bushings or pipe shall be wrapped with fifteen pound felt.
5. Pipe openings shall be closed with caps or plugs to prevent mechanical injury or entrance of unwanted water, condensation or debris until final connections are made.
6. All unconcealed piping passing through floors, ceilings or walls shall be provided with chrome plated brass escutcheon plates of sufficient diameter to cover the sleeve opening and fit snugly around the pipe. Opening around pipes shall be caulked to provide an air tight seal.

CONSTRUCTION REQUIREMENTS

1. All piping, ductwork, conduit, and other such items to be concealed shall be installed according to General contractors construction schedule to avoid the delay of the work of other trades and job progress. The Contractor is required to install work with relation to finish lines established by the General Contractor and shall be entirely responsible for the correctness of the Work with reference to finish, elevations, and fit.
2. All equipment and controls shall be located and arranged to provide for proper maintenance and comply with all local and national codes.
3. Contractor shall remove all surplus material and debris caused by this work.
4. All necessary cutting and patching of walls, floors, partitions and ceilings required for proper installation of work shall be by the Contractor providing the work and at his expense. This work shall be performed neatly and in a manner acceptable by the Architect.

GENERAL SPEC

SAFETY GUARDS

1. Furnish and install all safety guards required. All belt driven equipment, projecting shafts and other rotating parts shall be enclosed or adequately guarded.

LOCATION OF OUTLETS

1. All lighting outlets, receptacles, switches, grilles, registers, diffusers, and other devices shall be located to present symmetrical arrangements of tiles, panels or similar surfaces with respect to the mechanical and electrical outlets. The final determination of the exact location of each outlet and the arrangements to be followed shall be acceptable to the Architect.

EQUIPMENT FURNISHED BY OTHERS

1. Install and connect equipment furnished by other trades or Owner where shown on drawings or specified. Coordinate with the supplier to have the equipment at the place of installation in accordance to General contractor's construction schedule.

PAINTING

1. Refer to the Architectural Specifications for finish painting of mechanical and electrical work or equipment.
2. The protective painting of equipment and piping shall be provided by the trade furnishing the equipment or piping. All underground ferrous pipes shall be given a liberal coat of acid resisting paint having a bituminous base before backfilling. All ferrous uninsulated lines in concealed spaces shall be given two coats of black asphaltum varnish. Hangers and supports that will be subjected to exterior or damp conditions (other than those requiring a special finish) shall be given a coat of black asphaltum varnish.
3. Nameplates on equipment shall not be painted. Cover and protect the nameplates during the painting operation.
4. Electrical device covers shall not be installed until finish coat of paint is completed. Device handles and receptacles shall be covered and protected during the painting operation to preserve the original factory bright new finish.

SLEEVES

1. Furnish and install all sleeves shown on the drawings, as specified herein, as specified in the Architectural and Structural Specifications, and as required by codes.
2. Unless otherwise specified, sleeves shall be 26 gauge galvanized steel.
3. Oversized sleeves shall be provided for insulated lines to pass full thickness of insulation.
4. Where piping and conduit penetrate fire rated assemblies, sleeves shall be provided and the space between the pipe or insulation and sleeve sealed with an approved firestop compound.

END OF SECTION

GENERAL SPEC

15300 - PLUMBING SYSTEMS

GENERAL

DESCRIPTION

1. The Work covered under this section of the specifications shall include but not be limited to Work as outlined in the following sections. The titled sections will follow this section in the order listed.

15310	Sanitary Drainage Systems
15320	Hot and Cold Water Systems
15330	Plumbing Insulation
15340	Plumbing Fixtures
15360	Testing and Adjusting
15370	Disinfection of Water Systems

REFERENCES

1. Refer to Section 15010/16010 - General Provisions for Mechanical and Electrical Work.

PRODUCTS

1. Products shall be as specified under the above listed sections.

EXECUTION

1. Contractor shall arrange and pay for taps, curb and street cuts, connections, valveing, extensions of lines from utility main through meters as located on drawings, and connections to the building systems.
2. Branch sizes to each fixture shall be in accordance with the following schedule, unless otherwise indicated on the drawings.

<u>FIXTURE</u>	<u>WASTE</u>	<u>VENT</u>	<u>COLD WATER</u>	<u>HOT WATER</u>
Water Closet	3"	2"	1 / 2 "	-
Urinal	2"	1-1/2"	3/4"	-
Lavatory	1-1/2"	1-1/4"	1 / 2"	1 / 2"
Sink	2"	1-1/2"	1 / 2"	1 / 2"
Mop Sink	2"	1-1/2"	1 / 2"	1 / 2"
Drinking Fountain	1-1/2"	1-1/4"	1 / 2"	-
Bathtub/Shower	2"	1-1/2"	1 / 2"	1 / 2"
Washing Machine	2"	1-1/2"	1 / 2"	1 / 2"
Hose Bibb	-	-	3/4"	-

END OF SECTION

15310 - SANITARY DRAINAGE SYSTEMS

GENERAL

DESCRIPTION

1. Provide, install and connect all soil, waste and vent piping as specified, as shown on drawings, and as required for complete, properly operating systems, and in accordance with local codes and ordinances and all governing authorities.

PRODUCTS

EXTERIOR

1. From five feet outside the building wall to connection with the existing sanitary sewer system shall be type 1, grade 1, and polyvinyl chloride (PVC) pipe conforming to ASTM D-1785.

INTERIOR

1. To a point five feet outside building wall shall be service weight cast iron soil pipe and fittings conforming to ASTM A-74. Where allowed by local codes, pipe may be schedule 40, type 1, grade 1, polyvinyl chloride (PVC) pipe conforming to ASTM F-891 or ASTM D-1785.

CLEANOUTS

1. Cleanouts shall be the same size as pipe, except no larger than four inches. Cleanouts shall be heavy brass plugs screwed into cleanout ferrules, or PVC type where allowed. Where cleanouts occur in walls of finished areas, they shall be concealed behind chrome plated access covers. Exterior cleanouts at grade shall meet all local and national requirements, PVC type shall be allowed if approved by local authority. Install exterior cleanouts in 4" thick x 12" square concrete pad set flush with finish grade.

EXECUTION

SOIL AND WASTE LINES

1. Horizontal soil and waste lines shall be given a grade of 1/4 inch per foot where possible but not less than 1/8 inch per foot. Refer to construction drawings for slope.
2. Changes in pipe size on soil and waste lines shall be made with reducing fittings or recessed reducers. Changes in direction shall be made by use of 45 degree wyes or half wyes except that sanitary tees may be used on vertical stacks and short 1/4 bends may be used in soil and waste lines where the change in direction of flow is from horizontal to vertical.

GENERAL SPEC

VENTS

1. Each plumbing vent or stack projecting above the roof shall be flashed and made watertight with three pound sheet lead flashing, projecting in all directions from the vent a minimum of six inches, extending up the entire height of the vent and turned down inside the pipe a minimum of one inch. If approved by the Architect, plastic flashing assemblies may be used on PVC piping, provided equal protection is maintained.

CLEANOUTS

1. Cleanouts shall be provided where indicated on the drawings or where required to facilitate cleaning of all lines and at each change in direction greater than 45 degrees and in each horizontal run at intervals not exceeding 100 feet.

END OF SECTION

15320 - HOT AND COLD WATER SYSTEMS

GENERAL

DESCRIPTION

1. Provide, install and connect all hot and cold water piping as specified, as shown on drawings, and as required for complete, properly operating systems, and in accordance with local codes and ordinances.

PRODUCTS

EXTERIOR

1. From a point five feet outside the building wall to connection with the existing water service shall be class 160, type 1, grade 1, polyvinyl chloride (PVC) pipe conforming to ASTM D-1785.

INTERIOR

1. To a point of five feet outside building wall shall be type L copper with wrought solder joints above slab; type M copper may be used only when allowed by local codes and ordinances.
2. At contractors option all water piping shall be BF Goodrich Flow Guard Gold CPVC, or Evertuff CPVC by Coastline Plastics, LLC. If local authority approves.

EXECUTION

1. Install a ball valve on each water line entering the building. Valve shall be located outside building in a valve box. Provide a tee with drain valve and vacuum breaker in box.
2. Make all connections to ferrous equipment with dielectric unions.
3. All connections to risers or fixtures shall be from the top of mains and all piping shall be pitched at least one inch in twenty-five feet so that it can be drained completely at the low points. Piping shall be pitched up toward risers and fixtures for proper air relief.
4. Install shut-off valves or stop/risers at each cold and hot water connections to each plumbing fixture. Valves shall be Zurn or equal.

END OF SECTION

GENERAL SPEC

15330 - PLUMBING INSULATION

GENERAL

DESCRIPTION

1. Furnish and install insulation on water piping as specified, as shown on drawings, and as required for complete, properly operating systems, and in accordance with Local codes and ordinances.

PRODUCTS

HOT WATER PIPING

1. Insulate with one inch thick fiberglass insulation equal to Johns-Manville Microlock with HP jacket and Zeston 2000 fitting covers in exposed areas, and VB reinforced foil kraft vapor barrier in concealed areas; two inch thick on piping installed in exterior walls exposed on both sides or in spaces exposed to outdoor temperatures.

COLD WATER PIPING

1. Insulate piping installed in exterior walls exposed both sides or in spaces exposed to outdoor temperatures with two inch thick fiberglass insulation as specified in 2.01.

EXECUTION

1. Install on piping after work has passed all required tests and inspections.
2. Insulation shall be applied with all joints carefully fitted to eliminate voids and shall be full specified thickness through walls, floors, ceilings, and sleeves.
3. Where water lines extend through concrete slabs, sleeve lines with one inch foam insulation.

END OF SECTION

GENERAL SPEC

15340 - PLUMBING FIXTURES

GENERAL

DESCRIPTION

1. Furnish and install all fixtures specified and shown on the drawings and or selected by owner.

PRODUCTS

1. All fixtures shall be as scheduled on the drawings or selected by owner shall be new and free from waves, kiln marks, and discoloration.
2. All supplies shall be chrome plated brass.
3. Water Heaters shall be equal to State or A.O. Smith, complete with heat traps, pressure and temperature relief valve, dielectric unions and temperature gauge. Install expansion tanks where required by local authorities

EXECUTION

1. Install all fixtures in accordance with manufacturer's recommendations at elevations indicated on Architect's drawings.
2. Grout fixtures to surfaces with pure white Portland cement
3. Extend line from pressure/temperature relief valve to exterior of building, turn-down elbow at six inches above finished grade.
4. The Plumbing Contractor shall install disposers, if indicated on drawings and shall connect dishwashers.

END OF SECTION

15360 - TESTING AND ADJUSTING

GENERAL

DESCRIPTION

1. All pipes shall be tested before they are backfilled, concealed, insulated, painted, or otherwise covered up or rendered inaccessible. Testing shall be accomplished by sections of lines or systems as required by the conditions during construction and as required by the Authorities or Owner's agent.
2. The Contractor shall take all precautions to prevent damage to the building and its contents during testing. The expense to repair any damage caused by testing shall be the responsibility of the testing contractor.
3. Any leaks in piping systems shall be repaired and retested until proved tight.

EXECUTION

SOIL, WASTE, AND VENT LINES

1. After all soil, waste, and vent lines have been set up, all the outlets shall be temporarily plugged up. Minimum test pressure for all sections of piping shall be ten feet of water column. The pipes shall be filled with water and allowed to remain so for at least four hours. A final test shall be made after all vertical and horizontal pipes have been installed and the fixtures roughed in, and before the sanitary connections are made. As before, all pipes shall be filled to the top of the vertical lines and allowed to remain so for four hours.

WATER SYSTEMS

1. All water lines shall be tested under a hydrostatic pressure of 100 psig and proved tight. All valves and faucets shall be tested by opening and closing to insure proper shut off and no valve packing leaks.

END OF SECTION

15370 - DISINFECTION OF WATER SYSTEMS

GENERAL

DESCRIPTION

1. After the hot and cold water systems are complete with all water heaters and fixtures connected and systems tested, all water piping systems shall be disinfected.
2. Furnish a certificate to be included in the Owner's Manual, authenticated by proper health authority, that all water piping disinfection has been made satisfactorily.

EXECUTION

1. The systems shall be flushed out completely and filled with water. The shut-off valve to the city water main shall be closed. All fixture outlets shall be opened slightly and a solution of sodium hypochlorite introduced at a manifold connection supplied by the plumber at the meter. The solution shall consist of one gallon of five percent sodium hypochlorite to 200 gallons of water. Solution shall be introduced by means of a pump furnished under this trade until an orthotolidin test each outlet shows residual chlorine. The solution shall be allowed to remain in the system for 24 hours after which the entire system shall be flushed with city water.
2. Timing of the 24-hour soak is preferred to take place during a non-work day and the Owner's agent notified of the date.

END OF SECTION

15500 - WET AUTOMATIC SPRINKLER SYSTEMS

GENERAL

DESCRIPTION

1. The work covered under this section of the specifications consists of furnishing all labor, equipment, materials and performing all operations in connection with the installation of a complete, hydraulically designed NFPA-13R, wet automatic fire sprinkler system as specified, for the entire project. The work shall include, but not be limited to the following:
 - A. Complete design and working drawings meeting all the requirements outlines in Section 15500.
 - B. Wet pipe automatic sprinkler system.
 - C. Sprinkler heads.
 - D. Water distribution system.
 - E. Valves.
2. The Fire Protection System shall comply with all applicable City, State, and National codes and ordinances, and the codes, ordinances and regulations of all other ruling authorities having jurisdiction. The system shall meet all applicable requirements of the City Fire Department.
3. The Contractor shall state in his bid the number of sprinkler heads in the system, and list the extra charge or credit for each sprinkler that may be added or deducted from this number.
4. Contractor shall arrange sprinkler heads referenced to room centerlines and axes to establish a pattern complimentary to the finished ceiling.
5. Sprinkler piping shall be concealed in all but strictly mechanical or utility areas.

PRODUCTS

SPRINKLER HEADS

1. Sprinkler heads shall be brass plated flush heads in areas with finished ceilings. Sprinkler heads in utility or mechanical areas shall be standard bronze finish, side wall, pendant or upright heads are required. Sprinkler heads to have white escutcheons. Heads shall be Tyco or approved substitutes.

PIPING

1. Piping shall be schedule 40 black steel pipe using screw thread joints. If allowed by local codes, other types of piping may be used, but only those listed for fire sprinkler service in the NFPA.

GENERAL SPEC

EXECUTION

1. Furnish and install complete piping system.
2. Furnish and install all valves and accessories required by the ruling authorities.
3. System test and drain valves shall be coordinated with the Architect by specifically calling to the Architect's attention the location of these subsystems.
4. System shall be thoroughly cleaned by flushing out with water or compressed air until it is free from sand, oil, or other foreign matter, prior to the installation of heads and orifices.
5. Upon award of the Contract for the Fire Protection System, the Contractor shall prepare preliminary drawings and secure the approval of the Architect. On approval of the Architect, the Contractor shall prepare detailed working drawings for the system and secure the approvals of the local Fire Marshal, the Owner's insurance carrier, and any other approvals required. A copy of the approval letters shall be delivered to the Architect/Engineer before the Work is started.
6. On completion of the Work, the Contractor shall prepare a letter of guarantee, which shall guarantee the Work against defects in materials and installation as outlined under the General Conditions.
7. Secure the approval or seal of the State Rating Bureau and provide this document to the Architect.

END OF SECTION

GENERAL SPEC

15600 - HEATING, VENTILATING AND AIR CONDITIONING SYSTEMS (HVAC)

GENERAL

DESCRIPTION

1. The work covered under this section of the specifications shall include but not be limited to work as outlined in the following sections. The titled sections will follow this section in the order listed.

15615	Heating and Cooling Equipment
15620	Air Distribution
15630	HVAC Insulation
15650	Ventilating Systems
15695	Cleaning, Testing and Balancing

REFERENCES

1. Refer to Section 15010/16010 - General Provisions for Mechanical and Electrical Work.

PRODUCTS

1. Products shall be as specified under the above listed sections.

EXECUTION

1. All materials and installations shall be in accordance with the local mechanical code and with standards set forth by SMACNA, ASHRAE, and NFPA, as applicable.
2. It is the responsibility of this Contractor to check the amount of space available for each item. The Contractor shall not submit for approval any item of equipment for which there is not adequate space. Similarly, it shall be the responsibility of the Contractor to determine that there is adequate space provision for bringing each item into the building.
3. The entire system shall be free from vibration and objectionable noise. Connections to vibrating machinery shall be isolated by the use of vibration isolation. If any objectionable noise or vibration is discovered during or after installation is completed, all necessary corrective work shall be performed at the Contractor's expense, including the replacement of equipment not complying with the requirements, or the installation of suitable vibration absorbers.
4. All penetrations through the walls and roof shall be flashed and counter flashed weatherproof.

END OF SECTION

GENERAL SPEC

15615 - HEATING AND COOLING EQUIPMENT

GENERAL

DESCRIPTION

1. Furnish and install all heating and cooling equipment as shown on the drawings, and as required for complete, properly operating systems, and in accordance with local codes and ordinances.

PRODUCTS

AIR COOLED CONDENSING UNITS

1. Equipment shall be as manufactured by Trane, Carrier, York, Lennox, Goodman, or approved substitute.
2. Casing shall have zinc coated steel formed channel members. Exterior surfaces shall be phosphatized, epoxy primed, and finished with baked-on enamel.
3. The compressor shall be resiliently mounted, having built-in crank shaft lubrication, and current temperature sensing motor overload. The system shall be protected by high and low pressure switches and a five-minute compressor timed off cycle controller.
4. Condenser fan shall have vertical discharge, statically and dynamically balanced direct drive fan, and zinc plated steel blades and hubs. Motor shall have permanently lubricated ball bearings, built-in current and thermal overload protection, and fan relay.
5. Condenser coil shall be air-cooled. Aluminum fin secondary surface shall be mechanically bonded to primary surface of seamless copper tubing.
6. Controls shall include a 24-volt thermostat and subbase with switches for heat-cool-off and fan-auto-on.

FAN/COIL UNITS

1. Equipment shall be as manufactured by First Co., Trane, Carrier, York, Lennox, Goodman, or approved substitute.
2. Units shall be equipped with aquatherm heating coil, primary/secondary drains, high efficiency cooling coil, and insulated drain pan.
3. Blower shall be centrifugal type, statically and dynamically balanced. Motor shall have factory-lubricated bearings and shall be multi-speed, direct drive.
4. Casing shall not be hot dipped galvanized steel.

GENERAL SPEC

EXECUTION

CONDENSING UNIT

1. Mount unit on four inch thick reinforced concrete slab on grade or on roof as detailed.
2. Assemble and install all components furnished per manufacturer's instruction.
3. Connect all refrigerant piping so unit and piping circuits are serviceable. Provide and install charging valves in valve compartment.
4. Charge system with proper quantity of refrigerant for proper operation of unit to scheduled requirements.
5. Refrigerant lines passing through walls or ceilings shall be sealed weather tight.

FAN/COIL UNITS

1. Mount unit in furred down ceiling, platform or floor mounted vertical units as shown on the drawings. Provide unrestricted airtight return air plenum. Provide size of a recommended fan coil manufacturer ceiling access panel for ceiling mounted units only. Access panel shall also be airtight with gasket between door and frame.
2. Connect required controls and extend primary/secondary drains as shown on drawings.

END OF SECTION

15620 - AIR DISTRIBUTION

GENERAL

DESCRIPTION

1. Furnish and install a complete system of supply, return, plenums, connections, grilles, registers, diffusers, and all other accessories incidental thereto for complete air conditioning and heating systems.
2. Ductwork and other sheet metal work shall be fabricated after checking all building and structural conditions as well as other mechanical work. Any required relocations, conversions of sizes and other adjustments required to install the ductwork within the space limitations for same shall be done at the expense of the Contractor.
3. Ductwork shall be properly insulated. Refer to Section 15630.

PRODUCTS

DUCTWORK

1. All ductwork shall be the product of an experienced metal shop. Any careless or faulty work shall be removed and replaced with work conforming to the Contract requirements.
2. Ductwork shall be constructed of galvanized or zinc electroplate steel sheets. At contractor's option, ductwork may be flexible duct with minimum ½ inch thick fiberglass insulation (R-8 in attics and R-6 in furred areas) and vapor barrier or rigid fiberglass ductboard with vapor barrier. Ductwork, plenums and other such items shall be airtight. Any leaks or duct noises shall be corrected at the Contractor's expense.
3. Standard rectangular low-pressure ductwork shall be in accordance with the standards established by SMACNA.
4. Furnish and install UL listed fire dampers required in accordance with code requirements.

AIR DISTRIBUTION DEVICES

1. Grilles and registers shall be furnished with frame styles, deflecting device, dampers, and other accessories as shown on the schedule, as manufactured by Nailor or approved substitution.
2. Wall louvers shall be Ruskin recessed frame double weather stop and with bird screen, or approved substitution.
3. Furnish and install screens on all duct, fan, or other mechanical openings or equipment furnished by this contractor, which lead to outdoors. Screens shall be 16 gauge ½ inch mesh in removable galvanized frames.

GENERAL SPEC

EXECUTION

DUCTWORK

1. Ducts having a dimension greater than 18 inches shall be cross-broken. Changes in direction shall be made with full radius elbows, square elbows fitting with turning vanes, or short radius elbows with turning vanes.
2. Ductwork shall be installed in accordance with the requirements of SMACNA and shall be approved by the Architect before it is concealed.
3. Provide isolating canvas connection on each vertical air handler. Connections shall be Ventfab or approved substitute.
4. Interior ductwork shall be supported from the building structure. Ductwork shall be concealed, except in strictly mechanical or utility spaces, or room without ceilings as shown on plans.
5. Access doors shall be provided for access to all dampers, fusible links and where required for maintenance and cleaning operations. Access doors serving insulated ducts shall be double skin doors with one inch of insulation on the door. Where duct size permits, the access doors shall be 16 inches x 18 inches. Access doors shall be as manufactured by Lloyds, or approved substitution.
6. Location of ceiling outlets are approximate and shall be coordinated with other trades to make symmetrical patterns, or pattern established by the Architect's reflected ceiling plan.
7. Unless otherwise specified, all outlets shall be properly set to be parallel with building lines.
8. Flex duct shall be installed as not to have sagging.
9. Duct tape shall not be used to connection purposes.

END OF SECTION

15630 - HVAC INSULATION

GENERAL

DESCRIPTION

1. Furnish and install insulation for HVAC systems as specified, as shown on drawings, and as required for complete, properly operating systems, and in accordance with Local Codes and ordinances.

PRODUCTS

DUCT LINING

1. One inch thickness of Owens-Corning fiberglass ductliner type 200, or approved substitute.
2. The insulation applied inside ducts shall be guaranteed by the manufacturer to withstand the velocity and properties of the air being handled without erosion or deterioration of insulating or acoustical properties.

EXTERNAL DUCT INSULATION

1. External duct insulation shall be Johns-Manville Microlite R-8 with FSK reinforced foil vapor barrier. Round flex ductwork shall have insulation rating of R-6 in dropped ceiling areas and R-8 in attic spaces.

ACCEPTABLE MANUFACTURERS

1. Approved products as manufactured by Owen-Corning Fiberglass, or Armstrong Company may be used.

EXECUTION

DUCT LINING

1. The ductwork dimensions shown on the drawings shall be the clear dimensions on the inside of the liner. All sheet metal ducts shall be enlarged in order to provide this clearance.
2. To retain liner, use clips and speed washers at twelve inches on center for all ducts with a dimension of eighteen inches or larger on a side.
3. Lined sections of ductwork need not be externally insulated, unless specifically specified.
4. The liner shall be applied to the inside of the duct with heavy density side to the air stream and shall be secured to the duct with adhesive Insul-Coustic Number 225, or approved substitution, completely coating the clean sheet metal.

GENERAL SPEC

5. All joints in the insulation shall be firmly butted and tightly sealed with adhesive. Liner shall be accurately cut and ends thoroughly coated with adhesive so that when the section is installed, the liner shall make a firmly butted and tightly sealed joint.

EXTERNAL DUCTWORK INSULATION

1. Insulate all supply and return ductwork. Vapor seal all joints and seams with materials and procedures as recommended by the manufacturer.
2. Any insulation showing splits, damage, or coming loose shall be replaced.
3. Insulate refrigerant suction lines and primary condensate drains from connection at unit with ½ inch thick Armstrong Armaflex flexible foam insulation.

END OF SECTION

15650 - VENTILATING SYSTEMS

GENERAL

DESCRIPTION

1. Furnish and install all ventilating systems as shown on the drawings, and as required for complete, properly operating systems, and in accordance with local codes and ordinances.

PRODUCTS

1. Exhaust fans shall be as scheduled on drawings.
2. Exhaust ductwork shall be prime grade galvanized steel or flexible duct. Ductwork penetrating rated ceiling shall be 26 gauge.
3. Wall and roof exhaust hoods shall be equal to Broan, flashed and counter flashed.
4. Dryer vent assemblies shall be made of smooth 26 gauge galvanized steel construction, complete with end fittings.

EXECUTION

1. Mount exhaust fans, secured to structure. Extend ductwork as required to location shown on drawings.
2. Install dryer vents per manufacturer's instructions. Extend duct to exterior termination with back draft damper. All joints in duct shall be made without the use of screws and taped. Refer to drawings for sizes.

END OF SECTION

15695 - CLEANING, TESTING AND BALANCING

GENERAL

DESCRIPTION

1. Contractor shall thoroughly clean, test and balance all systems. Testing and balancing of the HVAC systems shall be conducted by a competent and experienced technician.
2. Refer to Section 15010/16010 - General Provisions for Mechanical and Electrical Work for additional testing requirements and proper handling of test results.

PRODUCTS

1. Contractor shall provide and connect all necessary gauges and instruments to make tests and to perform balancing operations. The gauges and instruments shall be certified and tested for accuracy. The Contractor shall furnish all equipment, fuel, electricity and personnel required.

EXECUTION

CLEANING

1. Evaporator and condenser coils shall be completely cleaned and flushed out to remove all debris and foreign materials.
2. Refrigerant and lubricating oils shall be checked and charged per manufacturer's instructions.
3. After all duct systems have been completed; they shall be cleaned by operating fans for four hours with temporary filters in place. New filters shall be installed on the day of final acceptance inspection.

BALANCING

1. Balance all air moving equipment and air outlets to deliver indicated quantity plus or minus five percent.
2. Operating characteristics such as amps, volts, and RPM of all rotating machinery shall be recorded. Inlet and outlet refrigerant temperatures and pressures of each condensing unit shall be recorded.
3. All outside and inside temperature conditions shall be recorded as to date, time, wind, humidity, temperature, and other specifics. Air entry conditions, air quantities and air leaving conditions for each cooling coil shall be reported. Head pressure and suction pressure of refrigerant shall report. Lock all balancing dampers in final position.
4. All results shall be reported on forms equal to those published by SMACNA. Recorded results shall be included in the Owner's Manual.

GENERAL SPEC

5. Contractor shall demonstrate that the entire system is functioning in accordance with the drawings and specifications.
6. Make one inspection each month for a period of three months to insure proper operating conditions.

END OF SECTION

16200 - ELECTRICAL SYSTEMS

GENERAL

DESCRIPTION

1. The Work covered under this section of the specifications shall include but not be limited to Work as outlined in the following sections. The titled sections will follow this section in the order listed.

16220 Electrical Equipment
16230 Electrical Devices
16250 Conductors and Conduit
16280 Lighting Fixtures
16290 Fire Alarm System

REFERENCES

1. Refer to Section 15010/16010 - General Provisions for Mechanical and Electrical Work.
2. The Work covered consists of furnishings all labor equipment, devices and materials for complete electrical systems.
3. Verify the electrical capacities of all motors and equipment furnished under other divisions and provide power as required to completely connect equipment.

PRODUCTS

1. Products shall be as specified under the above listed sections.

EXECUTION

1. Unless the requirements are superseded by local ordinances, the local utility companies, other ruling authorities, or the drawings or specifications, the latest edition of the National Electrical Code shall be recognized as a minimum acceptable standard for work under this division.
2. All conduits, outlet boxes, cabinets and other such wiring devices shall be timely placed in walls, ceilings, slabs, beams and other areas as construction progresses.

MARKING

1. Contractor shall install typed cards for all panel circuits, shall stencil all disconnect switches and equipment they serve. Stenciling shall be in white paint. Each fire alarm system junction box shall be tagged for identification.

GENERAL SPEC

TESTING

1. Contractor shall thoroughly test all systems and see that they are free from grounds, cross connections between conductors, and in proper working order.

RECORD FOR OWNER

1. Prepare a neat brochure or packet folder to be delivered to the Architect. The packet shall contain the following:
 - A. All warranties, guarantees and manufacturer's directions on equipment and materials covered by this contract.
 - B. Approved fixture brochures, wiring diagrams, control diagrams, and as-built drawings.
 - C. One-line diagram of building electrical system with fuse sizes noted at each fused switch.

END OF SECTION

16220 - ELECTRICAL EQUIPMENT

GENERAL

DESCRIPTION

1. Furnish and install all electrical equipment as shown on the drawings, and as required for complete, properly operating systems, and in accordance with local codes and ordinances.

PRODUCTS

LOAD CENTERS

1. Load centers shall have hinged doors and shall be bussed for 120/240-volt single-phase feed with solid neutral and thermal magnetic breakers equal to GE Power mark. Number of circuits and capacities shall be as required by code. Boxes shall be arranged for recessed mounting and constructed of code gauge steel.
2. Each load center shall have a clearly designated directory of circuits. Breakers shall be bussed for sequence phasing, and multiple pole breakers shall have common trips on all poles. Acceptable manufacturers are GE, Square D, or Cuttler Hammer.
3. Furnish and install arc-fault breakers in load centers for bedroom outlets.

DISCONNECT SWITCHES

1. All disconnect switches shall be heavy duty fused safety switches unless noted or required otherwise. General-purpose enclosures shall be furnished except in damp locations and exposed to the weather where rain tight enclosures shall be furnished. Acceptable manufacturers are GE, Square D, or Cuttler Hammer.
2. Furnish and install all fuses necessary for leaving the installation complete and in working order, including a complete set of fuses in each switch. All fuses shall be Bussman Fusetron of proper capacities.

EXECUTION

GROUNDING

1. All non-carrying metallic parts of electrical equipment and conduits shall be securely grounded to a common ground bus. Ground bus shall be connected to the water main with a copper wire. Jumpers shall be installed; bypassing all valves and water meters.
2. The neutral bus at the service entrance shall also be connected to the water main in the same manner as outlined above.
3. The grounding system shall conform to the requirements of NEC Article 250, the local inspection authorities and the local power company.
4. Balance all phases at all load centers.

GENERAL SPEC

5. On completion of work, furnish and deliver to the Owner a full box of each size of fuses used; in no case less than four fuses of any size.

END OF SECTION

16230 - ELECTRICAL DEVICES

GENERAL

DESCRIPTION

1. Furnish and install all electrical devices as shown on the drawings, and as required for complete, properly operating systems, and in accordance with local codes and ordinances.

PRODUCTS

OUTLET BOXES

1. Provide at each outlet or device an outlet box in which raceways and conductors shall terminate. Outlet boxes shall be standard galvanized steel provided with knock-outs. Non-metallic outlet boxes may be used with Romex wiring provided with grounding conductor. Where grouped switches or receptacles are shown, use ganged boxes.
2. Outlet boxes for lighting fixtures in addition to cable clamps shall each be provided with 3/8" fixture stud fastened through from the back of the box where it can be used to support the weight of the fixture.
3. Sizes and type of outlet boxes shall be sufficient to accommodate structural conditions, number and size of raceways and conductors entering, device or fixture served, and splices contained therein.
4. Outlet boxes shall be installed in a manner to minimize air infiltration.

WIRING DEVICES

1. Wiring devices shall be equal to the following:
 - A. Single pole switches:
 - B. Three way switches:
 - C. Duplex receptacles:
 - D. Or as per owner selection
2. Wall plates for devices shall be equal to Sierra D-Line, plastic. Ganged devices shall be installed under one cover plate.
3. Verify location of all outlets on jobsite with Owner's Agent. All outlets may be moved six feet as Owner's Agent directs, prior to rough-in, at no additional cost to Owner provided this movement does not violate any local or national code.

GENERAL SPEC

EXECUTION

1. Boxes shall be set plumb and true in building surface and furnished with suitable plaster rings where so required.
2. Outlet boxes for switches shall be mounted at a standard height of 48 inches from the floor unless indicated otherwise and shall be located on the strike side of doors. Boxes for receptacles shall be mounted at a height of 15 inches from the floor except where shown otherwise on the drawings or as directed otherwise. Refer to plans for fire housing and ADA mounting heights.
3. Exterior mounted devices and fixtures shall have watertight boxes.
4. Furnish and install draft insulators for switches and receptacles mounted in exterior walls.
5. Outlet boxes located on opposite sides of rated walls shall be offset by 24 inches, in separate stud spaces.

END OF SECTION

16250 - CONDUCTORS AND CONDUIT

GENERAL

DESCRIPTION

1. Furnish and install all conductors and conduit as shown on the drawings, and as required for complete, properly operating systems, and in accordance with local codes and ordinances.
2. The contractor shall install conduits for primary electrical service and shall install conductors and conduit for the secondary service, and shall install transformer pad and required barriers. The utility company will install the primary conductors and the transformer.

PRODUCTS

CONDUCTORS

1. All conductors for secondary service from transformer to meter centers shall be type THW copper, in conduit. All conductors for service from meter centers to dwelling unit load centers shall be M.C. cable. All branch circuit conductors within the building shall be copper M.C. cable or Romex as approved by local codes. Conductors installed underground shall be type THW in conduit.
2. No conductor, including switch legs, shall be smaller than #12 AWG except for low voltage control wiring. Wire sizes #8 AWG and smaller shall be solid members, #6 AWG and larger shall be stranded.
3. Mains and feeders shall run their entire length without joints or splices. Joints in branch circuits shall occur only where such circuits divide as shown on the drawings, and shall then consist of one through circuit to which shall be spliced the branch from this circuit in a splice box.
4. Electrical contractor shall increase conductor capacities for circuit or feeder lengths over 75 feet in developed length and repeat increase for each additional 75 feet in developed length to compensate for voltage drop.

CONDUITS

1. All underground conductors shall be installed in schedule 40 PVC conduit. All conduits shall bear the Underwriter's Laboratories Seal of Approval. All conduits in parking garage shall be EMT.

GENERAL SPEC

EXECUTION

1. Number two size wire and larger shall be connected with solderless type connector sufficient in size to enclose all strands of the conductor and securely fasten them. Wire smaller than number two shall be joined with Minnesota Mining Scotchlocks of insulated and metal shielded type. Special precaution shall be taken to insure all joints are made tight. Contax paste shall be used on all aluminum joints and terminations.
2. No wire shall be drawn into a conduit until all work of a nature which might cause injury to the conductor is completed. An approved cable pulling compound may be used as a lubricant where necessary but no materials which may be injurious to the wire covering or insulation shall be used.
3. The Electrical Contractor shall provide cords and plugs for ranges.

END OF SECTION

16280 - LIGHTING FIXTURES

GENERAL

DESCRIPTION

1. Furnish and install all fixtures specified and shown on the drawings, or as selected by owner.

PRODUCTS

1. All lighting fixtures shall be as scheduled on the drawings or equal in every respect.
2. Install a lighting fixture on each lighting outlet shown. Should any designations be omitted on the Drawings, the fixtures shall be of the same type as used in rooms of similar occupancy.
3. All fixtures shall be complete with new lamps of Westinghouse, GE, or Sylvania manufacturer.

EXECUTION

1. Install all fixtures in accordance with manufacturer's instructions at locations indicated on the Drawings. Center fixtures on mounting surfaces, unless indicated otherwise. Fixtures not substantially centered on mounting surfaces shall be relocated on request of the Owner's Agent at no additional cost to the Owner.
2. Immediately before final inspection, thoroughly clean all fixtures, inside and outside, including plastics and glassware. All trim shall fit properly to adjacent surfaces. Adjust optical devices and/or aim fixtures at night per Owner's direction.

END OF SECTION

16290 - FIRE ALARM SYSTEMS

GENERAL

DESCRIPTION

1. Furnish all labor, materials, tools, equipment and related items required for complete installation of fire alarm system.
2. The Contractor shall be responsible for all engineering and design of the system.
3. The fire alarm system shall provide supervision of the flow switch and tamper valve of each fire sprinkler system; shall provide general alarm; and communicate signals to a constantly attended station via two telephone lines.
4. System shall conform to requirements of local city and state codes, designed and installed under supervision of licensed person.
5. System shall contain min. 20,000 volt surge protectors, or larger if required by manufacturer protecting all components of the system. Each system shall be equipped with grounding of all equipment conforming to manufacturers requirements and all local and national fire and electrical codes.
5. Submit four copies of proposed system design consisting of drawings, specifications, and catalog data covering all systems and equipment.

PRODUCTS

1. System shall include, but not be limited to the following:
 - A. Fire alarm control panel with annunciator, standby battery and signal lights.
 - B. Flow and tamper switches.
 - C. Audible and visual devices.
 - D. Wiring of all components.
 - E. Surge protectors.
2. All components shall bear the UL label and shall comply with all requirements of the Owner's insurance carrier.

EXECUTION

1. Contractor shall determine locations for all devices and coordinate such location with the Architect and the local authority.
2. Contractor shall arrange for the Electrical Contractor to install needed boxes, conduit and 120-volt wiring.

END OF SECTION