SCOPE OF WORK

Install HVAC units in 4 3br units located at Carpenter Hill site

Electrical upgrades to 125 AMP service

Installation of HTP lifetime tank water heaters

Dry wall repair and replace as needed plus paint

Electrical Drops

- Electricians will make a necessary drop for the water heater.
- Electricians will make a necessary drop for the cook stove.
- Electricians will make a necessary drop for HVAC.

Sheetrock Replacement

- Repair and replace any areas that might have to be removed for installation of new service duct, wiring etc.
- Refinish and paint all areas as necessary to match the existing locations
- Painting in Sherwin Williams cashmere or natural linen will be available in medium luster.

Water Heaters

- Remove the existing gas water heater.
- Cap off any remaining gas lines.
- Install the new HTP 40-gallon water heater to current code.

SCOPE OF WORK

Heating, Ventilation and Air Condition

- The contractor shall supply a new 3-ton single stage heat pump with 15 seer air condition, and all parts needed to complete the project.
- Contractor will remove all gas furnaces (furnaces shall remain the property of the AHA) AHA maintenance shall remove old furnaces from the grounds.
- Scope of work includes every item of labor, materials, devices and appurtenances for uniform air distribution.
- The Contractor shall install an additional return air in the upstairs interior.
- All work under this heading shall be executed in strict accordance with, laws regulation, and ordinance of national, state and local codes.

- None of the terms are provisions of the specifications shall be construed as waving or canceling any rules, regulations or requirements of the above authorities.
- All exposed rotating machinery is equipped with guards.
- All compressors and outdoor coils should have a ten (10) year factory warranty. All other functional parts including thermostats shall have a five (5) year factory warranty.
- All units will be a 3-ton single stage 15 seer with heat pump.

SHEET METAL (LOW PRESSURE)

- This contractor shall furnish and completely erect and install all supply, return, exhaust, outside area, etc. as necessary to complete the systems. All metal ducts shall be fabricated of galvanized copper bearing steel sheets of Tennessee Coal and Iron Company, American Rolling Mills or approved equal manufacturer.
- All ductworks can be fabricated and erected in accordance with the following recommendations of ASI-IREA guide for low pressure duct.

Filters

- After the project is completed, remove filters from furnaces and or grills, clean and install clean new filters.

Refrigerant Pipe

- Installed by mechanics killed in this type of work, Type "L" ACR copper tubing , clean, and ride with nitrogen at the factory, assembled with wrought copper fitting for refrigeration use. Make a solder joint with Sil-FOS backed with nitrogen. Refrigeration piping and specialties to be sized and must be isolated to prevent transmitting equipment vibration to any part of the structure. After systems have been proven tight, entire systems, including condensing unit and coil, shall be evacuated to 500 microns of mercury and held for 24 hours; then apply full charge of Puron lubricating oil. Each system shall include drier, strainer, sight glass, and expansion valves. Vacuum must be measured with a vacuum gauge that can be read accurately below 500 microns.

Temperature Controls

- Furnish all labor, materials equipment and equipment and services necessary for proper installation and operation of an electrical system control. This contractor shall be responsible for all control wiring. Furnish complete wiring diagram showing all interlock wiring in addition to temperature control wiring diagram. Wiring to be color coded and installed in accordance with NEC.

- Upon completion of work the contractor shall instruct operating personnel in the use of automatic control systems.

Balancing And Adjusting

- All systems should be balanced and adjusted to the satisfaction of AHA. Deliver balance data to the AHA for approval. Include the following items:
    1. Adjust all fan belts to the proper tension.
    2. Check all motors and patches and set speed to avoid overloading.
    3. This contract shall have all Air systems balance to provide performance specified.
    4. Check all systems for noise and vibration which may be objectionable.
    5. After you are satisfied that all systems may be acceptable to AHA, call for an inspection.
    6. Systems will not be accepted until properly balanced.
    7. Tabulate data showing all motor nameplate amps, initial, middle and final amp readings specified CFMS; initial, middle and final CFM reading. Deliver to AHA

Air Systems Balancing Procedures

1. Open all volume control, shut doors with door grilles, insert clean filters and set outside air and return air dampers.
2. Set pattern for side wall grilles.
3. Set deflectors, velocitrols and other devices at takeoff for uniform flow through registers and diffusers.
4. Make preliminary settings on splitters.
5. Take first reading on all devices. Do not adjust as you do.
6. Analyze reading, total CFM, high and low CFM red, ATC.
7. Make adjustments on splitter ER and fan speed if necessary.
8. Take a second set of complete readings. Again, do not adjust
9. Analyze readings and make corrective adjustments on splitters and volume control.
10. Take a third set of readings and force if necessary.

Notes:

A. Outside air quality and duct leakage can be judged by subtracting total air readings from total of supply readings.
B. Try to do as much balancing wood splitters as possible and use volume controls on grills and diffusers to trim.
C. Use a velocity measuring device, such as Alnor velometer, which will give instantaneous velocity readings.
D. Check average on fan motor and fan speed.

SCOPE OF WORK

Electrical

- The contractor will leave existing meter packs and upgrade to 400 amp and provide a new 125 amp inside box. Contractors shall supply all labor, wire, and breakers for new boxes. The outside boxes should have a 125 amp disconnect. All old boxes and wire shall remain the property of the AHA. The contractor shall make a new drop for AC units, electric range and water heater on the interior. The contractor shall also make necessary drops for the outside unit.

Conduit;

Galvanized rigid steel conduit may be used for underground or import concrete and shall be used in all electrically hazardous locations. ¾-inch shall be the minimum size conduit allowed. Rigid nonmetallic conduit may be used for service entrance, feeders, and branch circuits with the following specifications requirement.

- Conduit will be schedule 80 PVC
- PVC shall not be used in suspended floor slabs
- A grounding conductor shall be provided in each conduit. Conduit shall not be used as a grounding conductor.

Conduit Elbows and Couplings

- NM wiring may be used in the interior of residential apartment buildings. Wiring shall be in compliance with NEC and any local/ state requirements.

  Conduit shall be installed as shown below

- Rigid conduit-article. 46, NEC
- EMT-article 348, NEC
- Rigid nonmetallic-article 347, NEC

- NM article 336, NEC
- Conduit system shall be continuous from Outlet to outlet, from Outlet to cabins and pull or junction boxes. They shall be rigid steel, electrical metallic tubing (EMT), Ridgid non-metallic polyvinyl (PVC), or polyvinyl chloride coded Ridgid electrical conduit as specified herein. Lock nut bushings shall secure the system in such a way as to be electronically continuous throughout. Conduit and shall be caps to prevent entrance of foreign materials during construction.
- Conduit shall be run parallel to building lines and long sweeps bends shall be utilized.
- If no.4 or larger conductors enter a cabinet, pull box, junction box or auxiliary gutter, the conductors shall be protected by a bushing. Also on all conduit one and one-fourth (1 ¼) and larger, install bushing shall be utilized.
- Ropes shall be installed in an empty or spare can do is to facilitate the pulling of future conductors. The contractors shall provide sleeve and insert, correctly located in the structure, as required for his or her work.
- Insert shall be steel and of proper size for loads encountered.
- Equipment shall be installed in accordance with manufacturer recommendations to form with the details and applications indicated.
- Provide necessary support for all equipment and appurtenances as required. This include but are not limited to, frames or supports for items such as transformers, fans, electrical panels and other similar items requiring supports, floor-mounted equipment shall be set on a 4' high concrete housekeeping pad.

Trenching

- Whichever possible, all exterior below voltage conduit and wire system shall be installed with a minimum of 24 in of cover, unless you tell me otherwise. Banks of trenches shall be kept vertical as practical, and where required, shall be properly seated and braced. Rock shall be Excavated to a minimum depth of 4 inches below trench depth specified period over depth Shall be backfilled with loose moistened and thoroughly can't. Any water accumulated in the trench shall be removed by pumping before back feeling commences.
- Trenches shall be backfilled with excavated material approved for back feeling or other materials free from large clods of Earth or stone, deposit it in Thoroughly and carefully compacted 6 in layers, until the conductor / conduit has cover of not less than 18 in. The

remainder of the material shall be back field into the trench, more sense and tamped and 12 in layers.

- Existing utility lines to be retained, whether known or uncovered during excavation operations shall be protected from damage during operation, shall be protected from damage during excavation and back feeling and, if damaged it shall be restored to original condition.
- Power wires and connectors
- All wire and cable should meet the requirements of the latest edition of the national electrical code (NEC) and shall be soft drawn copper unless otherwise noted. Wire & cable shall be new and permanently marked with size, grade of insulation, voltage a manufacturer's name on outer covering at regular intervals. Each conductor and the natural conductor Shall be factors color coded with a separate color for each, the color code indicated below shall be used consistently throughout the electrical system installation, unless otherwise specified
- Phase 240V Black, Red, Blue, White, and Green
- Type THWN or THNN wire shall be installed and raceways above grade in permanent dry location
- Location type THW or THWN wire should be used, and raceways exposed to moisture, in concrete slabs on feel or below grade.
- Type NM cabling may be used in the residential apartment building only. Cable shall be installed in a manner that meets all NEC requirements.
- Connectors for branch-circuit number 10 AWG and smaller shall be tapered spiral wound square spring with a hard insulating cover, commonly referred to as "wire nuts". The skirt on the insulated covers shall be of a size and designed to prevent exposure of any bear conductor when properly installed.
- Connectors on circuits with copper conductor conductors larger than 10 AWG Shall be power cable compression type, hex screw or both plant type. Connector shall be highly conductive and corrosion resistant material. Apply corrosion inhibitors such as Penetrex to connections for aluminum conductors.
- Connections for cable size is 250 kcmil and larger should not have less than two clamping elements are compression indent.

- Splices and Joint shall be insulated with material approved for the particular use, location, voltage and temperature.
- All Cable shall be continuous from original to panel or equipment termination without running splices unless otherwise specified.
- No more than three circuits shall be contained in each home 4 branch circuit.
- Wraparound labels with numbering designation shall mark control wiring in each box and in each termination.
- The contractor shall use due care to prevent damage to the conductor and insulation during installation. Conductors should not be installed in conduit or Raceway until the Raceway system is complete.

ELECTRICAL

- The wiring devices shall be specification grade.
- Products from the following manufacturers have been determined to be acceptable.
    - General Electric
    - Hubble
    - Pass & Seymour
    - Bryant
    - Leviton
- Provide wiring devices of the type, color and electrical rating for the service has indicated
- The types of electrical wiring devices require for the project include the following;
    - Receptacles
    - general duty duplex: duplex general duty type receptacles shall be 2 poles, 3 wire grounding with green hexagon equipment ground screw, Ground Terminal internally connected to mounting yoke, 20 a, 125 volts and metal plastic ears, side wiring only, NEM a configuration 5-20 or unless and except where otherwise indicated. All receptacles shall be ivory-colored.
    - Weatherproof receptacles: weatherproof receptacle Shaw consists of the receptacle type indicated mounted in a box with a gasketed, weatherproof, cast metal cover plate in separate cap over the receptacle opening. The Caps shall be permanently attached to the cover plate by a spring hinge flap. The waterproof Integrity shall not be affected when heavy duty specification attachment plugs are

inserted. Cover plates on our plate boxes mounted flush in the wall Shall be gasket it to the wall and it watertight Manor.

- GFCI receptacles: ground-fault interrupter receptacle shall be fed through type capable of protecting connected downstream receptacles on a single circuit, Ivory, grounding type, UL rated Class A, Group 20 ampere rating, 125 volt with solid-state ground-fault sensing and signaling, with a 5 milliampere ground fault trip level, equipped with 20 ampere plug configuration, NEMA 5-20r.
- Stove receptacles: stove receptacle 50 amp, 125 / 250 volt, NEMA 14-50r 3p, 4w flush mount, straight blade, industrial grade, side wire.
- Testing wiring devices to ensure electrical continuity of grounding connection, after energizing circuitry, demonstrate compliance with requirements of the project. Test each receptacle for proper polarization and ground continuity.

Air Conditioning disconnects.

- The contractor shall furnish and install all disconnects.
- The following manufactures are approved on this project.
  1. Square D
  2. Cutler-Hammer
  3. Provision specified in this section
  4. Manufacturing workmanship and materials shall comply with applicable provisions of NEMA, ANSI, ICEA and UL standards.
  5. Electrical equipment shall be UL-listed and comply with UL standards in all cases where UL has published a list and standards applicable to the type of equipment required to be provided.
- Ground Rods
  1. UL listed copper bond is still, 3/4-inch diameter by 10 ft long.

ACCEPTABLE MANUFACTURERS

A.) Blackburn, St Louis, Missouri

B.) Carolina Galvanizing, Aberdeen, North Carolina

C) Knight Metalcraft, Portland, Tennessee

- Grounding Electrode Cable
  1. Bare stranded soft temper copper, ASTM 83. Cable to be sized per National Electrical Code requirements.

- Ground Conductors
    1. Size equipment grounding conductors as with accordance with NFPA 70, NEC table 250–94 and 250–95
    2. HW insulated copper ASPM B3
    3. Conductors # 10 AWG and smaller; Solid
    4. Conductor # 8 AWG and larger: concentric stranded
    5. Color Coded: Equipment grounds shall have green color insulation or green tape band at the end of the conductors.
- Ground Connections
    1. All conductor to conductor, conductor to ground rod and conductors are structure connections of # 6 AWG and larger size conductors shall be permanent Cadweld exothermic welded connections. Ground conductor splice with a CADWELD exothermic weld a connection shall be considered as a continuous conductor. All grounding connections to equipment show used bolted tugs. When the conductor is #6 or larger, the lug shall be joined to the conductor by Cadwell exothermic process.
    2. All connections of # 8 and smaller and all connections to conduit, equipment or other items where grounded conductors must be removable shall be using mechanical connections.
    3. All mechanical ground connectors shall be UL-listed and shall be certified to have been tested to and passing IEEE STD 837– 1989 for both above ground and below grade installations. If not certified to IEEE Std 837-1989, the conductor shall be sized using the fusing formula in IEEE Std 80-1986.
- **ACCEPTABLE MANUFACTURERS**:
    a) AMP Inc. Harrisburg, Pennsylvania
    b) Burdy Corp. Norwalk, Connecticut
    c) ERICO Products, Inc. Cleveland, Ohio
    d) T & B Corp. Bridgewater, NJ
    1. Provide positive grounding of AC systems neutrals, electrical equipment enclosures and conductor enclosure systems (conduit, wireways. Etc) at the main disconnect device. Provide an effective permanent and continuous ground path for conduits, equipment, and conductor closures. The grounding path must have the

capacity to conduct safely fault current likely to be imposed on it, which shall have sufficiently low impedance to limit voltage to ground and to facilitate operation of circuit protective devices in the circuit. Clean all contact surfaces to which ground connections are to be made. Remove non-conductive coating such as paint, lacquer and oil film from threads and other contact surfaces to assure electrical connections and continuity. Make connections to ensure a permanent ineffective electrical connection. Make connection to equipment and Equipment enclosures with terminal love welded to the conductor with the CADWELD Process.

- Grounding Electrode Systems
    1. A metal underground pipe in direct contact with the earth for 10 feet or more. The electrical path shall not contain any insulated joints.
    2. All Man-Made Electrodes shall be free of paint varnish and other non-conductive coatings. When more than one electrode is used, each Electro shall be at least 10 feet from any electrode of another sub-system. Further, all sub-system Electrode shall be bonded together.
    3. Metal gas piping systems shall not be used as a grounding electrode.
- Equipment and enclosing grounding systems.
    1. Make mechanical connections and couplings on metal conduit systems and enclosures wrench tight. On metallic conduit for circus rated 100 amperes and higher, install grounding bushing a switchboard grounding lug or the next grounding bushing in the pull box. Use continuous copper conductor size in accordance with NEC table 250–95. Install green insulated equipment ground wire sizing in accordance with any see table 250–95. On circuits over 250 volts to ground, install ground bushings where metal conductors enter enclosure through concentric, eccentric or oversized knockout in accordance with any see table 250–95 to enclosure ground point and adjacent grounding bushings.
    2. The contractor shall perform a test of the grounding network after it has been installed and before any equipment has been placed into operations. The resistance between absolute earth and the ground Electrode shall not exceed 25.0 ohms. The Electrical Contractor shall be responsible for installing two additional 10 foot driven grounding rods within 50 feet of the transformer pad if the test

results exceed 25.0 ohms. This shall include the necessary grounding electrode conductor.

- The contractor may provide a like product upon approval of the agency. The product must be equal to or superior to any product as shown in this specification.