

DIVISION 11 – MECHANICAL

Section 11A GENERAL REQUIREMENTS

PART 1

GENERAL

A-1111 RELATED WORK:

- a. Division 6 – Finish Carpentry and Millwork

A-1112 PLANS AND SPECIFICATIONS:

- a. These specifications govern the furnishing of all materials and the installation of the same under the subject of mechanical work and are divided into the following headings: GENERAL, PLUMBING, and HEATING AND VENTILATING.
- b. The Mechanical Contractor is directed to read Special Conditions Turnkey and shall be required to conform to any and all provisions therein.
- c. The Mechanical contractor is responsible for the work under all headings and shall hereinafter in Division 11 of these specifications be referred to as the "Contractor". Mechanical plans and, by reference general and electrical plans, are a part of this specification.
- d. The Mechanical Plans indicate the extent and general arrangements of the various mechanical systems. Changes in locations or arrangement required by job conditions shall be made by approved Change Order.

A-1113 MATERIALS AND EQUIPMENT:

- a. All work and materials specified are to be new and of the quality described and essentially the standard product of the manufacturer. The use of manufacturers' names in specifying equipment or material herein determines the material or equipment to be used.
- b. Unless other wise specified, where two or more units of the same class equipment or material are to be used for similar purposes, they shall be the products of the same manufacturer. All equipment shall be installed in accordance with the manufacturer's recommendations.

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**A-1114      CLEANING:**

- a. All dirt, rubbish, grease, or stains due to the operations of the Mechanical Contractor shall be removed from all floors, walls, fixtures, etc., with the premises left in perfect condition. All mechanical equipment furnished under this contract shall be set and connected, ready for operation.

**A-1115      PERMITS AND FEES:**

- a. Contractor shall secure all necessary permits or licenses to carry work, and shall pay all lawful fees, taxes, etc., in connection with work. He shall arrange for all tests and inspections on any or all parts of work, required by authorities and organizations having jurisdiction, and shall pay all charges for the same.

**A-1116      LAW AND ORDINANCES:**

- a. Work performed shall be in accordance with all local and state or national codes, laws and ordinances pertinent to such work. In case of any conflict wherein methods or standards on installation of materials specified do not equal or exceed requirements of laws or ordinances but not specified or shown on drawings shall be furnished without extra charge as if shown or specified.

**A-1117      JOB FOREMAN:**

- a. The Contractor shall have a competent representative available at all times while the project is under construction who will be responsible for coordination of the trades and installation of work according to plans and specifications.

**A-1118      FOUNDATIONS, BASES AND SUPPORTS:**

- a. Contractor shall furnish all special foundations, bases, and supports required for the proper installation and operation of any equipment furnished under this Division. Equipment with moving parts shall have special cork or rubber-and-metal isolation bases for prevention of noise and vibration.

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**A-1119 MOTORS AND CONTROLS (S):**

- a. Contractor shall furnish motors and integral motor starters for mechanical equipment.
- b. Unless otherwise specified or noted, all motors less than ½ HP shall be wound for single phase, 60-cycle, 120-volt current.
- c. Motors shall be constructed in accordance with NEMA standards, shall be applied to operate at not more than 100% of their rating, and shall have ball or roller bearings.
- d. Where motor sizes are increased above those shown on plans, due to variations in manufacturers' equipment, the Developer and Subcontractor will ascertain the requirements and make due allowances for increased service thereto. Any additional cost in electrical work caused by variation in manufacturers' equipment shall be the responsibility of the Developer and Subcontractor.

**A-1120 WORK TO BE PERFORMED BY OTHER TRADES:**

- a. Electrical Subcontractor is responsible for all wiring, including interconnecting wiring between controls and any electrical temperature control wiring.
- b. The Developer will perform the following work in connection with mechanical contract.
- c. Build into building construction all pipe sleeves, bolts and inserts necessary for supporting mechanical equipment. These items will be furnished by the Contractor and will be set in place by him.
- d. Provide all chases, shafts and recesses necessary for installation of all mechanical equipment and furring necessary to conceal piping, ductwork, etc. The Contractor shall provide all necessary information as to size, exact location of chases, recesses, furring, etc., required.
- e. Provide wall, floor, and roof openings necessary for installation of the mechanical systems. Contractor shall provide exact size and location of such openings, and shall be responsible for completed installations being watertight and waterproof.

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- f. Provide bases and supports for principal items of mechanical equipment. The Contractor shall provide exact size and location and shall be responsible for all bases and supports other than these specified above.

**A-1121 OPERATION AND MAINTENANCE INSTRUCTIONS (O&M):**

- a. The Developer shall furnish the Indian Housing Authority two bound sets of operating and maintenance instructions covering all equipment furnished under specifications for each total contract. The instructions shall be assembled in an indexed brochure. Separate equipment brochures will not be acceptable. NOTE: These manuals must be delivered to the above before final payment.
- b. A competent supervisor shall instruct the Indian Housing Authority representative in the care, operation and maintenance of the equipment.

**A-1122 PROTECTION OF MATERIAL AND WORK:**

- a. Protect and preserve all materials, supplies, and equipment and all work performed.

**A-1123 FINAL AND GUARANTEE:**

- a. Nothing herein contained may be construed to relieve the Developer and Contractor from making good and perfect work in all details of construction or installation, and he will be held responsible to provide and furnish necessary material, and to perform all necessary labor, and to bear all expenses incidental to the satisfactory completion of the work embraces herein.
- b. At final inspection, prior to purchase by the Indian Housing Authority, the Developer and Contractor shall demonstrate completely the system and equipment performance. Developer and Contractor shall guarantee all labor, material, and equipment furnished under this contract against any defects developing from faulty or poor workmanship or material for a period of one (1) year from date of final acceptance by the Indian Housing Authority. The Developer or contractor shall remedy any defect appearing within that time without extra charge to the Indian Housing Authority within a reasonable time after notice. The term "defect" excludes

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occurrences, as would naturally follow improper treatment, accident or wear and tear of normal use.

- c. Furnish written guarantees for each piece of mechanical equipment so covered by manufacturer's warranties. These shall be furnished for each dwelling unit and shall be bound, indexed and labeled for the appropriate dwelling.

**A-1124 SINGUALR NUMBER:**

- a. Where any device or part of equipment is herein referred to in the singular number (such as "the pump"), such reference shall be deemed to apply to as many devices as are required to complete the installation as shown on the drawings.

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Section 11B PLUMBING:

PART 1 GENERAL

B-1111 SCOPE:

- a. The work performed under this heading includes all labor, materials and equipment to complete the various piping systems for plumbing, drainage and heating, including all pipe fittings, insulation, and valves as shown on the plans and specifications. He shall keep a competent foreman on the premises while his work is in progress.
- b. All piping shall be run substantially as shown on the plans and shall be run in the most direct manner, make the piping conform to the building construction shall be made without extra charge. Each section of pipe and all fittings, valves, etc. shall be inspected and thoroughly cleaned inside before being installed. All piping and fittings shall have working pressure ratings suitable for the operating pressures to which they will be subject. All defective pipe, fittings, valves, and other material installed shall be removed and replaced with new and good material. Pipe shall be cut accurately to measurements established at the site and worked into place without springing or forcing. Ream ends of all cut pipe.
- c. The plumber shall furnish all material, labor and transportation required for performance of the work herein described. He shall keep a competent foreman on the premises while his work is in progress.
- d. He shall obtain necessary permits and pay all fees therefore. He shall be responsible for damage to property caused by him or his employees. He shall protect his work from damage and work in harmony with other trades.
- e. From time to time as the work progresses, he shall remove all rubbish and accumulation resulting from his work. Plumbing work shall comply withal laws having jurisdiction over the work including the Local Code, State Health Department and the BOCA Plumbing Code.
- f. The Plumber shall examine the general plans and specifications, and make sure he understands the conditions under which he must work. He must visit the building site and secure first hand information regarding the location and depth of water, gas and sewer lines.

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- g. Refer to the Foundation Plan and notice the depth and location of grade beams. If necessary to run lines through concrete beam, provide sleeves in concrete.
- h. Piping shall be installed in a manner to insure absence of vibration, rubbing or other objectionable noises. All necessary expansion requirements must be provided.
- i. Pipe sizes shown on the plans are nominal, (not including insulation).

**B-1112 RELATED WORK:**

- a. Division 6 – Finish Carpentry and Millwork.

**B-1113 SITE VISIT:**

- a. The Contractor shall visit the site of the project and thoroughly familiarize himself with the existing conditions prior to submitting a proposal. Additional payment will not be authorized for extra work for reason of unforeseen conditions due to failure to make site visit.

PART II PRODUCTS

**B-1121 WASTE, VENT PIPE AND FITTINGS:**

- a. Unless otherwise required, all drain lines, vent stacks, fittings, etc., shall be PVC-DWV or ABS-DWV Schedule 40 as manufactured by WORLDS OF PLASTIC, OWNES PLASTIC CO. or ROBINTECK. All joints and connections in plastic pipe shall be made watertight with joint cement as recommended by manufacturer.
- b. Cleanouts: Accessible cleanouts shall be installed in all waste lines not over 100 feet apart in horizontal lines and elsewhere as shown or required by Code. All cleanouts shall have removable plugs.
- c. Roof Flashing: Vent through roof shall be flashed with 4 pound sheet lead with lead extending 8" away on all sides, turned-in at top and made watertight. The Plumber may use galvanized roof flashing with neoprene seal sized to fit vent stack.

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- d. **Floor Drains:** Shall be 2" discharge and located in showers and water heater closets, as shown on plan. Strainers shall be 4" diameter brass, with chrome finish, adjustable to the finished floor surface of shower or closet. Where house has its own water system, install floor drain at filter tank. (See Plumbing Fixtures, B-1127, for pitch pans at water heaters, item "1").
- e. **Standing Drains:** The plumber will furnish and install 1.1/2" standing drains with trap and 1.1/2" drain lines for washer box as shown and located on plans.

**B-1122 WATER PIPE AND FITTINGS:**

- a. Water pipe above grade within the building area shall be Type L hard copper. Under floor water pipe shall be Type K soft copper without joints and shall comply with ASTM C425-64. (See B-1523 for Sleeves).
- b. All fittings shall be seat joint type using 95-5 solder. The ends of pipe shall be reamed to full diameter and cleaned with garnet paper. Water lines to 5'-0" outside of building shall be Type K soft copper with sweated terminal fittings. Beyond 5'-0" shall be PVC Schedule 40.
- c. **Hose Bibbs:** Furnish and install where shown on plans "Freezeless" hose bibs, manufactured by ARROWHEAD BRASS PRODUCTS for 1/2" wall, with vacuum breaker, all metal construction. All connections to hose bibs shall be insulated. Furnish complete with Diverter-Stabilizer Sleeve and 16"x18" "Cover Up" access panel, both as manufactured by DIVER MANUFACTURING, INC., Cleveland, Oklahoma.
- d. **Water Supply Cut-Off Valve:** Provide interior cut-off 1" diameter gate valve in interior wall at exterior hose bib location. Install valve minimum 12" into interior wall. Utilize access panel noted above for hose bib.
- e. **Air Chambers:** 1/2" copper pipe shall be installed in water supply of each fixture. The diameter of air chamber shall be not less than the size of supply.
- f. **Plates:** Exposed pipe passing through floors and walls shall be fitted with chromium plated split ring escutcheons.
- g. **Hot Water Distribution:** Provide water service to water heaters where shown with cut-off valve at supply and threaded unions on hot and cold



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- side. Hot water piping shall be installed in partitions as specified for cold water, with proper provision for expansion and contraction.
- h. Fittings on water heater shall be brass (no galvanized). Provide electrically insulated non-metallic fittings for dielectric break I water lines at water heater. All hot water pipes shall be neatly arranged and securely anchored to avoid vibration.
  - i. Solder: "Lead Free Solder" tin/copper/nickel/silver low melting temperature.

### **B-1123 PIPE INSULATION AND SLEEVES:**

- a. The full length of all hot water pipes and all cold water pipes in exterior walls shall be covered with ARMAFLEX ½" thick pipe insulation secured with #520 ARMSTRONG adhesive.
- b. Where piping penetrates the slab, insulation must be properly sized to fit pipe and cover all fittings. All water supply lines under slab shall be sleeved with 80 pound black poly pipe throughout, and extending through slab to connection with sweeps.
- c. Where vents, revents or other piping (except gas) penetrate top plate seal voids around piping with liquid polyurethane foam. **DO NOT SEAL GAS LINE PENETRATIONS.**

### **B-1124 GAS SERVICE:**

- a. The entire installation shall conform to the rules and regulations of the local Gas Company. Verify the location of existing gas service and install gas service of 1.1/4" diameter, with cut-off at each entrance into building. Cut-off to be cast iron body with brass working parts, as approved by Indian Housing Authority.

### **B-1125 GAS DISTRIBUTION:**

- a. Gas shall enter the building above the floor line and distribute overhead above ceilings and drop in partitions. There shall be no connections within the partitions. Top plate shall be vented to the attic space where gas lines penetrate them. Provide gas to each gas-burning device, provide cut-offs and connect.

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- b. Regardless of anything herein to the contrary, where L.P. gas is used, the entire installation and distribution shall be in strict accordance with the state requirements for liquid petroleum piping.
- c. Furnish and install 3/4" gas line, with cut-off, to each water heater, central furnace, range space, and clothes dryer space. (Cap end of lines that are optional use, in addition to cut-off, at range and dryer spaces.)
- d. \*LP Gas (where applicable) - 250 gallon tank will be provided and filled to a minimum of 70% capacity at the time of acceptance by the Indian Housing Authority.

### **B-1126 FLUES:**

- a. METALBESTOS double wall insulated flue, (or HUD approved equal), with stainless steel liner, complete with BELMONT roof jack and vent cap. Provide elbows and fittings of same type as flue. Size as required for each location on plans.

### **B-1127 PLUMBING FIXTURES:**

- a. Furnish and install the following plumbing fixtures where so indicated on plans. Protect fixtures from damage during construction and replace and damaged material without cost to the Indian Housing Authority (IHA).
- b. P-1 - Water Closet: Shall be a water saver round bowl, as manufactured by KOHLER, AMERICAN STANDARD or ELJER; complete with anti-siphon float and flush valve unit, and closed front plastic seat and cover as manufactured by CHURCH, OLSONITE, or BENEKE. Furnish complete with chrome flexible supply pipe, wheel handle brass stop and escutcheon.
- c. P-2 - Countertop Lavatory: Shall be 18" round, 4"cc, vitreous china or enameled cast iron, as manufactured by AMERICAN STANDARD, KOHLER or ELJER. Fittings shall be DELTA Model No, 522 MPU, or equal by MOEN or VALLEY, per IHA approval. Furnish complete with CPB pop-up waste, tailpiece and P-trap, 3/8" lavatory wall supplies with escutcheons, wheel handle chrome plated brass stops, and flexible supply risers.
- d. P-3 - Bath & Shower Combination: Shall be GLAS-TEC Model No. 60J, fiberglass tub and shower unit; or equal, as manufactured by KORAL,

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- ELJER or KOHLER. Dimensions shall be 60" long, by 31" wide, by 72.3/4" high, overall. (NOTE: Nominal 30" wide excluding nailing flange—dimension critical in some bathrooms, refer to floor plans). Furnish complete with integral soap dish, grab bar and slip resistant floor. Bath shall comply with ANSI A124.1 and Z124.2. Fittings shall be DELTA Model No. 644, pressure balanced single handle control valve, shower head, and tub spout with diverter assembly, all in chrome finish, (3gpm water saver shower head). Furnish complete with DELTA Model No. RP291 20 gauge brass trip lever waste drain assembly, in chrome finish. Similar fittings as manufactured by MOEN or VALEY may be accepted per IHA approval. See Section 6B, Paragraph B-621, item "n", for plumbing access panel.
- e. P-4 – Fiberglass shower stall: GLAS-TEC Model No. 36AS, 36" square, with tempered obscure glass door, or equal by KORAL, ELJER, or KOHLER. Fitting to be DELTA Model No. 624 pressure-balanced single handle control valve and showerhead assembly, or equal by MOEN or VALLEY, per IHA approval. See Section 6B, Paragraph B-621, item "n", for plumbing access panel.
- f. P-5 – Kitchen Sink: Stainless Steel or Enameled Cast Iron, as selected, 32"x21" double sink, 4 hole; as manufactured by AMERICAN STANDARD, KOHLER, or ELKAY (20 gauge). Provide stainless steel mounting frame for non-self rimming sinks. Fittings shall be DELTA Model No. 624 pressure balanced single handle control valve and shower head assembly, or equal by MOEN or VALLEY, per IHA approval. Furnish complete with chrome plated brass (CPB) basket strainers with crumb cups, CPB tailpiece/drain assembly and P-trap, and CPB stops with flexible supplies.
- g. P-6 – Washer Box in Laundry: (Others will furnish washer and dryer as shown on plan). The Plumber will make all plumbing connections and furnish plastic recessed wall box, complete with waste and hot & cold water supply valves with hose connections, per MANSFIELD Model No. 526.42 or ARROWHEAD BRASS PRODUCTS Model #221.
- h. P-7 – Gas Water Heater: Furnish and install where shown on plans, one RHEEMGLAS "Fury-Plus", #41V40, 40 gallon, 40,000btu input, 40.4gph recovery, gas fired water heater, with adjustable temperature control, pressure relief valve piped to 12" above drain, and safety pilot. Water heater shall be A.G.A. approved. Furnish complete with integral foam

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insulation jacket and 5 year tank warranty. Furnish and install ASME code rated relief valve. Equipment as manufactured by STATE, REPUBLIC, or DAY AND NIGHT may be approved, provided recovery rate meets or exceeds this minimum specification.

- i. P-8 – 36" Angled Shower: MUSTEE, INC. "Neo-Angle", including Model No. 363C shower base; Model No. 238, 36"x36", pvc plastic shower surround; and Model No. 36.701 gold colored metal frame enclosure with tempered obscure glass door. Fitting to be DELTA Model No. 624 pressure assembly, or equal by MOEN or VALLEY, per IHA approval. See Section 6B, Paragraph B-621, item "n", for plumbing access panel
- j. SPECIAL NOTE: No plastic valves or stops shall be used. All fixture fittings shall be washer less valves. All exposed trim (not in cabinet work) shall be chromed.
- k. Water Well Pump: Shall be GOLD-JACUZZI submersible 1/3 to 1.1/2 horsepower as per O.E.H. recommendation, complete with pump, pump ends, motor, tank and all accessories. Provide 5-year protection plan "Sub-Shield" or equal. The contractor shall furnish this warranty to Indian Housing Authority complete with serial number, name of participant and location of pump.
- l. Furnish 24 gauge galvanized metal pitch pan beneath water heaters installed over wood plenum framing and deck. Pan is to be same size as water heater closet. Sides are to extend up 2" with hemmed edge, abutting wall studs. Gypsum board wall to sit atop pan edge, in J-metal. Plumb and seal pitch pan into 2" floor drain, extending up through plenum base, in location shown on plans.

### PART III EXECUTION

#### B-1131 PROTECTION OF WORK:

- a. At all times, take precautions necessary to properly protect the plumbing equipment and accessories from damage. Protect work from possible damage from freezing and stoppage of pipes, traps, floor drains, and waste lines by building materials. The Contractor shall repair any damage without additional charge. Protect all plumbing fixtures from use or damage until completion of building.

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**B-1132 LEAK DAMAGE:**

- a. The General Contractor shall be responsible for damages to the building, or to its contents, etc., caused by leaks in any of the equipment installed by him or his Subcontractors, through equipment or material failures, disconnected pipes, and fittings or by overflows caused by improper installation and/or protection. The Contractor shall be responsible for all repairs to merchandise, fixtures and equipment so damaged.

**B-1133 REMOVAL OF RUBBISH:**

- a. The Contractor shall keep the premises free from accumulations of waste material or rubbish caused by this work during construction period. At the completion of the work, remove all rubbish from the building site. Leave the building "Broom Clean".

**B-1134 EXCAVATING AND BACKFILLING:**

- a. Furnish all excavating and backfilling required, both inside and outside building, for the installation of all underground piping in connection with this contract.
- b. The bottom of all trench excavation shall be firm, stable and of uniform density as nearly as practicable; and unless necessary, materials shall not be disturbed below grade. All soft, wet, disintegrated, or other unsuitable materials shall be removed and any rock shall be removed to a depth of at least 6" below grade. Such removed materials shall be replaced with suitable material thoroughly compacted in place to finish the grade elevation in a satisfactory manner. Bell holes shall be provided under all bells to a minimum depth of 3". Water, gas and sewer lines in yard shall have a minimum coverage of 24". Keep trenches dry and furnish necessary pumps and power.
- c. After inspection and approval, backfill trenches with approved backfill material and solidly tamped about pipes. This material shall be carefully deposited and compacted in uniform layers as specified in Item "n". Puddling or water flooding for consolidation of materials is approved for sand only.

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- d. Earth backfilling shall be hand placed alongside and 12" above the pipe, on both sides simultaneously, inlayers not exceeding 4" depth, loose measurement. Each layer shall be thoroughly compacted. Compactions shall be not less than 90% Standard proctor Density.
- e. The Contractor shall visit the site of each building and determine the actual conditions under which work will be done. Extra payments will not be authorized for work that could have been foreseen by a careful examination of the site.

**NOTE:** Submission of a bid shall constitute acceptance by the Bidder of existing site conditions as a part of the requirements for this work.

- f. **General:** Lay all pipes in open trench except when the Local Authority gives written permission for tunneling. Open the trench sufficiently ahead of pipe-laying to reveal obstructions. Maintain easy access to fire hydrants by fire fighting apparatus. Provide trench crossings as necessary to accommodate public travel.
- g. **Width of Trench:** Excavate trenches of sufficient width for proper installation of the work. When the depth of backfill over sewer pipe exceeds 10 feet, keep the trench at the level of the top of the pipe as narrow as practicable.
- h. **Sheeting and Bracing:** As necessary to protect workmen and adjacent structures, comply with OSHA regulations. Do not remove sheeting until trench is backfilled sufficiently to protect pipe and prevent injurious caving. Cut off such sheet no to be removed at least 3 feet below finished grade.
- i. **Water Removal:** Pump or bail water from trenches and bell holes to permit proper jointing of pipes. Conduct the discharge from trench dewatering to drains or natural drainage channels.
- j. **Disposition of Utilities:** Rules and regulations governing the respective utilities shall be observed in executing all work under this heading. Active utilities shall be protected. Relocation, if required, shall be in accordance with written instructions of the Local Authority. Inactive and abandoned utilities encountered in trenching operations shall be removed, plugged or capped. In absence of specified requirements, plug or cap such utility

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- lines at least 3 feet from utility line to be installed or as required by the local regulations.
- k. **Grading Trench Bottom:** Carry machine excavation only to such depth that soil bearing for pipes will not be disturbed. Grade the bottom of trenches evenly to insure uniform bearing for all pipes. Cut holes as necessary for joints and joint making.
1. As an alternative method, optional with the Contractor, excavate trenches evenly to insure uniform bearing for all pipes. Cut holes as necessary for joints and joint making.
  2. In rock, cemented gravel, old masonry or other hard material, excavate to at least 4 inches below the pipe at all points and refill to grade with sand or gravel firmly compacted.
- l. **Special Supports:** Wherever the soil, at or below the requisite pipe grade, is unsuitable for supporting sewers or other such piping and appurtenances specified in this Division, such special supports, in addition to those shown or specified, shall be provided as the Local Authority may direct.
- m. **Tree Protection:** Protect the roots of trees to remain. Within the branch spread of such trees, perform all trenching by hand. Open the trench only when the utility can be installed immediately; prune injured roots cleanly; and backfill as soon as possible.
- n. **Backfilling:** Backfill trenches only after piping has been inspected, tested and locations of pipelines and appurtenances have been recorded.
1. For a depth of at least 12 inches above the top of the pipe, backfill by hand with earth or granular material free from large stones, rock fragments, roots and sod; exclude cinders, junk, refuse, scrap iron and unused portions of welding rods from trenches in which metal pipes are to be laid; tamp this backfill thoroughly in layers 4 inches in thickness, taking care not to disturb the pipe or injure the pipe coating.
  2. For the remaining trench depth, backfill in 6" to 10" lifts with material as specified in the preceding subparagraph,

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except that the material may contain stones, rocks, concrete or masonry materials with a maximum dimension of 4 inches, providing the voids in such coarse material are completely filled with earth or granular material. In the event that sufficient suitable material, as herein specified for trench backfill, is not available from trenching or other excavation for the project, supply and place the required additional material. Compact thoroughly the backfill to 90% Standard Proctor density. If the granular material is sand, the top 6" of the trench must be soil similar to existing finish material or to soil.

3. NOTE: Where sand is used to fill trenches, the 5' entering or leaving a building shall be clay type soil, which will prohibit the flow of water.

### **B-1135 SERVICES:**

- a. Where an approved public water and/or sewer system is available to the house, this Contractor shall connect complete to public systems. Where there is no public water or sewer system available, this Contractor shall provide a complete well and water system and septic system in accordance with the Indian Housing Authorities Bidder's Packet, the State Health Department, and the Indian Health Service.

### **B-1136 SEWER CONNECTION:**

- a. Where applicable, make a proper connection to existing city sewer and pay all costs incident thereto. Verify sewer location and depth before installing waste lines and provide a uniform grade from all fixtures to the point of discharge.

### **B-1137 TESTING AND ADJUSTING:**

- a. Plumbing contractor shall test and adjust the various mechanical systems on this job to give the required performance.
- b. Pipe work must be properly tested by the Plumbing Contractor and approved by the Housing Authority before being covered up or enclosed by building construction. The Contractor will be held responsible, and be required to pay for any damage or expense due to leaks or broken



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connections that may prove to exist before and after such work is concealed.

- c. **Waste and Vent Piping:** Plug all necessary openings to allow entire system to be filled with water to level of highest vent stack above roof. System shall hold water 30 minutes without a drop in level, 24 hours without leakages. Portion of systems may be tested as above, except that a vertical stack 10 feet above highest horizontal point to be tested may be installed and filled with water to maintain pressure. A pump may be used to attain pressure; pressure must hold 30 minutes without pumping.
- d. **Hot and cold water lines shall be made tight without dope or caulking. Test by air to 125psi. System must hold pressure for twelve (12) hours without pumping. Test to be performed after rough-in has been completed.**
- e. **Gas Piping to be tested with 50 pounds air pressure; test to remain on piping for 24 hours without drop in pressure. Final test on all piping connections to be made with soap solution.**
- f. **A final test shall be made upon completion of all piping systems. The test pressure being the maximum operating pressure of the system, without leaking.**

### **B-1138 GUARANTEE:**

- a. **All materials and labor to be guaranteed one (1) year from date of acceptance by the Housing Authority.**
- b. **When individual pieces of equipment such as water heaters, etc. are guaranteed by manufacturers for periods in excess of one year, paragraph (a) above shall in no way affect these warranties.**

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Section 11C HEATING AND VENTILATING:

PART 1                      GENERAL

C-1111 SCOPE:

- a. Work of this section consists of complete labor, materials, equipment and services and installation of all heating systems, in strict accordance with specification and the applicable drawings.
- b. The following are furnished by others: Cutting and framing for ducts and grilles, gas services to furnaces. Electrical work as explained hereinafter and all headers and buck for ducts.
- c. Except as above, this Subcontractor shall furnish all labor, material, and equipment required for a complete system as shown.
- d. Cooperation: Install roof vents, flashings, etc., before or during the application of roof. If for any reason, roof repairs are necessary after the completion of roof, this Subcontractor shall make the necessary arrangements with roofer to provide proper guarantee.

C-1112 CODES, FEES, PERMITS AND INSPECTIONS:

- a. Comply with ordinances, codes and regulations having jurisdiction over the work. Give to the proper authorities all requisite notice relating to the work and be responsible for all violation of law. Obtain any permits required and pay all fees therefore.

C-1121 MATERIALS:

- a. Furnace: Furnish and install central heat and air conditioning unit of size and capacity shown on Schedule, Section 15C, Paragraph C-1131 (i). Furnace shall be gas fired up flow with electronic ignition, A.G.A. certified, fan and limit control, replaceable air filter, and adjustable speed squirrel cage blower fan. Furnace shall be manufactured by RHEEM, LENNOX, CARRIER, BRYANT, RUDD, or FRASER-JOHNSTON (YORK). All furnaces shall have an AFUE of 78.7% minimum. Furnish to comply wit J-1 Calculations, sheet 10, & Mechanical Plan, sheet 9, of plans. Install these units with filter grills.

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- b. All Fuel Vents: Furnish and install where shown on plans all fuel, 8" jacketed flue, complete with escutcheon cover at ceiling, ceiling base support, stack, roof jack and "Jet Cap 1" as manufactured by AIR JET, or METALBESTOS, (Note: Rural sites only, if required. Do not furnish at in-town sites). Note: Location of flue as determined by HA.
- c. Dryer Vent: Furnish and install jacketed dryer vent and flashing from dryer location to outside with rain-proof roof or wall cap as required, complete with rodent screen.
- d. Combustion Air Supply: Required at each compartment containing a furnace and/or water heater; install to each such compartment two 6" round combustion air ducts into attic 4" above top of insulation. One duct shall extend 1" below ceiling line; one shall extend 12" above floor line. Secure ducts to prevent moving and provide bug screens over ducts in attics.
- e. Vent Hood: Furnish, install, complete, and make all connections to (one-in-all) range hood, 30" wide, with 2-speed fan, light socket, rear wiring, 120V electrical service, permanent washable filter and automatic damper. Hood shall vent through the roof with 7" round duct and be provided with flashing and vent cap at roof. Hood shall be mounted as detailed above range. Manufacturer shall be GENERAL ELECTRIC, KENMORE, WHIRLPOOS, ROPER, WESTINGHOUSE, or HOTPOINT.
- f. Bathroom Vent with Heat Light: Mechanical contractor shall furnish and install duct through roof with roof jack and vent cap. Coordinate work with electrical Contractor, (See Section 16A, paragraph A-1625, item c.)

C-1131 INSTALLATION:

- a. Control Thermostat/Switch System: Furnish for installation by the Electrician, a wall mounted thermostat with heat/cool/fan/off settings, as manufactured by HONEYWELL or GENERAL ELECTRIC. Thermostats shall be of type that will operate the fan without activation of the furnace burner or the condensing unit, and shall be adjustable with a range of 55 to 85, low voltage type. Thermostat shall not be installed on wall of heater closet or on exterior wall.

DIVISION 11 – MECHANICAL

- b. It will be the responsibility of the Electrician to install wiring and make all connections for control. It will be the responsibility of this Subcontractor to direct such work and give proper notice of any change required.
- c. **Flue and Flue Connections:** Furnish and install complete to all heating units, flue and flue connections. Same shall be METALBESTOS double, metal wall (no asbestos) type, assembled with necessary fittings and couplings. Provide roof flashing as required and waterproof flue cap.
- d. **Ductwork and Plenums:** Furnish and install all ducts, branches, etc., as necessary to make the complete system as shown on the drawings. All ducts shall be fabricated in accordance with SMACC Standards from galvanized steel sheets in accordance with the following:
1. **Round Duct:**

<u>Gauge</u>	<u>Diameter of Duct</u>	<u>Joints</u>	<u>Seams</u>
28	Up to 8"	2" slip	1" Lock
26	9" to 16"	2" slip	1" Lock
  
  2. **Rectangular Duct:**

<u>Gauge</u>	<u>Width of Duct</u> (Largest dimension)	<u>Joints</u>	<u>Seams</u>
26	Up to 12"	1" S-drive	1" Lock
24	23" to 30"	1" S-drive	1" Lock
  
  3. Shall be fabricated of galvanized steel, of gauge specified above, from plenum to room register boot. Metal supply plenum shall be built in absorption coefficient of not less than .70 at a frequency of 500hz.
  
  4. All joints shall be taped and made air tight before insulating, minimum three screws per joint. Strap anchor to rafters (trusses) at maximum 10'-0" o.c., and at corners and transitions. Strap anchor size to be minimum 1' wide by 16-gauge thickness.
- e. **Grilles, Registers and Diffusers:** This Subcontractor shall furnish and install all ceiling outlets, exhaust registers, supply and return grilles and registers and air control devices, as are indicated on the drawings and specified herein. Grilles shall be LIMA, BARBER-COLMAN, TITUS, or AIRMATE. Provide dampers at each register.

## DIVISION 11 – MECHANICAL

- f. Grilles and registers shall be pressed steel, factory finished in “Off-White”, with fins ½”o.c.; similar to AIRMATE #160, #140 or #190, as required for airflow direction.
- g. **Testing and Adjusting:** Upon completion, this Subcontractor shall set all valves, dampers, motors, thermostats, etc., and demonstrate that the system will maintain proper temperature and air circulation.
- h. **Heat and Cooling Loads:** Included in the plans, Sheet 10, are heat load charts using “J” manual. CFM for each room is based on air temperature at register of approximately 120 degrees heat and 58 degrees of cooling.
- i. **Furnace Schedule:** As scheduled on J-sheets, all 3 BR furnaces shall be 75,000 btu/hr input, 59,000 btu/hr output, and shall provide sufficient CFM capacity to supply air quantities shown on Mechanical Plans, minimum 1200 CFM for 3 BR & 1400 CFM for 4 BR at .5” S.P., total. Verify whether furnace shall be natural gas or liquid gas. Furnish intermittent electronic pilot (and LP gas kit if required).
- j. **OPTIONAL: Condensing Unit/Cooling Coil, Three Bedroom Units:** Shall be RHEEM RAHE-036JA Condensing Unit, with RHEEM RCLB-A036 coil; 35,000btu ARI Standard capacity (23,400btu net sensible, plus 7,200btu net latent); SEER 10.2; 3.7kw.
- k. **OPTIONAL: Condensing Unit/Cooling Coil, Four Bedroom Units:** Shall be RHEEM RAHE-042JA Condensing Unit, with RHEEM RCLB-A048 coil; 42,500btu ARI Standard capacity (26,500btu net sensible, plus 8,500btu net latent); SEER 10.10; 4.440kw.
- l. Run insulated refrigerant piping in attic, from heating and air conditioning closet to exterior soffit for installation of optional air conditioning equipment. Seal piping penetration at soffit and ceiling.
- m. **Duct Insulation:** Shall be 3” thick 3/4lb./cu. Foot, R-8 minimum density OWENS-CORNING fiberglass flexible duct insulation with factory adhered vinyl covering. Insulation shall be taped in place and tightly fitted and sealed. 3” thickness may be acquired by using one layer 1.1/2” unfaced and one layer 1.1/2” vinyl covered. Duct insulation shall meet or exceed an installed “R” value of R-8.
- n. Plenum Insulation minimum R-8 in attic and down to furnace.

DIVISION 11 - MECHANICAL

C-1132 GUARANTEE:

- a. This Contractor shall guarantee all materials, equipment and labor of this section as called for in Supplemental General Conditions. This guarantee shall include the performance of the component parts of the system in strict accordance with the intent of the specification.

DIVISION 12 - ELECTRICAL

Section 12A – ELECTRICAL

PART I                      GENERAL

A-1211            SCOPE:

- a.     The Electrician shall comply with all rules and regulations of the latest National Electric Code, National Board of Fire Underwriters and all local ordinances and codes. He shall secure and pay for all permits, fees and licenses required.
- b.     Work Included: Furnish all labor, material and equipment required for the performance of all electrical work shown on drawings and described herein. This work shall consist of a complete light and power system, a system for telephones and television antenna cables and all electrical work required for heating and ventilating and water system where required.

A-1212            COOPERATION WITH OTHER TRADES:

- a.     The Electrician shall acquaint himself with the General Plans, Specifications and conditions at the building site, which will govern the installation of his work. He shall work in harmony with other trades.
- b.     Service: The Electrician shall confer with the local light company regarding the service, meter loop, etc. He shall provide overhead service or underground service as required by Utility Company and pay all cost.
- c.     Where water well is to be provided, provide power to well pump and connect complete.
- d.     Electrical/Mechanical Work: The following work will be provided by the Electrician:
  1.     Electrical service from panel to each motor. Make proper connection to all motors and motor controllers as furnished under Mechanical and Electrical sections of specifications.
  2.     Install all control work. Install all wiring for Mechanical control systems under the direction of the Mechanical Contractor, who will furnish thermostats.

DIVISION 12 - ELECTRICAL

3. Make proper connections to range hood.

A-1213 SITE VISIT:

- a. Visit site of project prior to submitting proposal and be thoroughly familiarized with existing conditions. Failure to do so will not be cause for additional payment by reason of unforeseen conditions.

PART II PRODUCTS

A-1221 MATERIALS:

- a. Panel boards: Shall be ITE GOULD, GENERAL ELECTRIC, SQUARE "D" or equal, and of the type shown on plans.
- b. Provide ground fault breaker for outlets indicated on plan and required by code.
- c. Panel shall be as follows: 200A, 120V/240V, 1 phase, 3 wire, 40-space minimum; (with 3 spare 1P breakers).

Single Pole Circuits:

1 - Clothes Washer  
1 - Refrigerator

1 - Furnace Blower

1 - Attic Fan (Optional).

4 - (5) Ground Fault Protected Circuits feeding Bathroom & Kitchen lights & convenience outlets, as required.

7 - Circuits feeding all other lights and convenience outlets in 3 Bedroom Unit.

8 - Circuits feeding all other lights and convenience outlets in 4 Bedroom Unit.



## DIVISION 12 - ELECTRICAL

### **Double Pole Circuits:**

1 – Range – 60A

1 – Dryer – 30A

1 – Optional Use A/C outlet – 30A

1 – Water System – 30A (where required).

- d. **Grounding:** All panels and the entire system shall be grounded with #6 bare wire with approved type connectors as per Service Company instructions. All panels, wall plugs, motor frames, bathroom switches, etc., shall be grounded in strict accordance to code.
- e. **Conductors:** Conductors outdoors, underground and service shall be THW. Indoor conductors except for low voltage control and switch legs shall not be smaller than No. 12 copper. TW switch legs may be # 14 TW, if carrying switch leg only, otherwise must be # 12 TW. Conductors # 8 and larger shall be stranded. All fixture and outlet boxes shall be metal, plastic or fiberglass. Branch circuits shall be color coded, using black and red and white. Splices and joints shall be made by pressure type connectors and insulated as required by NEC. All wire shall be copper. Splices shall not be made except in pull boxes.

### **A-1222**

#### **LIGHTING FIXTURES:**

- a. The Electrical Contractor shall furnish and install all lighting fixtures as listed herein. He shall arrange for and provide adequate support for all fixtures. Fixtures shall be complete with lamp and tubes of recommended wattage.
- b. **LIGHT FIXTURE SCHEDULE:** As manufactured by PROGRESS or STARLIGHT, as follows:
  - 1. Great Room, (Ceiling Mounted); Fixture "A": P-3226-10, 3-60W.
  - 1a. Optional ceiling fan with light kit: As specified in Paragraph A-1228-A, of this section.

DIVISION 12 - ELECTRICAL

2. Kitchen, Laundry Room (Ceiling Mounted); Fixture "B": P-3504-10 or SL-8452-1, 1-60W.
3. Kitchen, (Above Sink); Fixture "C": P-3503-10 or SL-8430, 1-60W.
4. Bedrooms, (Ceiling Mounted); Fixture "D": P-4672 or SL-7528, 2-60W.
- 4a. Optional ceiling fan with light kit: As specified in Paragraph A-1228-A, of this section.
5. Bathrooms, (Wall Mounted); Fixture "E": P-3333-10 or SL-7413-1, 3-60W, G-25clear.
6. Dining Area, (Ceiling Mounted): P-3236-10, 3-60W.
- 6a. Optional ceiling fan with light kit: As specified in Paragraph A-1228, a., of this section.
7. Hallway, Walk-In Closets & Utility Closet, (Ceiling Mounted); Fixture "G": P-3643 or SL-8455, 1—60W.
8. Porches/Patios, (Wall Mounted); Fixture "H": P-5875-11 or SL-9250-47, 1-60W.
9. Garages, (Ceiling Mounted); Fixture "J": P-5729-42 or SL-763-12, 2-60W.
10. Bathroom Vent with Heat Lamp (Ceiling Mounted); Fixture "K": As specified in Paragraph A-1265, c., of this section.

NOTE: All fixtures shall be U. L. rated to wattage shown. Substitutions for brands and/or catalog numbers listed here, only as approved by Housing Authority.

DIVISION 12 - ELECTRICAL

**A-1223 PUBLIC TELEPHONE AND T.V. OUTLETS:**

- a. The Electrician shall provide wiring and plastic outlet boxes for all telephone and T.V. outlets and cover plates where shown on plan. Electrician shall provide all interior telephone wiring and connect to telephone company outdoor connection box, if available.
- b. Provide T.V. antenna coaxial cable from outlet to gable or eave for future connection to antenna furnished by others. Provide suitable pre-manufactured antenna brackets with terminal connection, and connect to coaxial cable. Coordinate location with Indian Housing Authority.

**A-1224 SMOKE DETECTOR:**

- a. Shall be RIXON-FIREMARK #ID120 or NORTON #6951, 120 V, AC, installed on separate circuit, complete with alarm and external test knob. Circuit is to be connected to disconnect located in attic per plans. (Smoke alarms in every bedroom in a series.)

**A-1225 WIRING FOR HEATING AND VENTILATING:**

- a. The Electrician shall inspect the heating and ventilating plans and specifications and provide such electrical work as called for therein. The Electrician shall provide service and make all connections to motors including disconnect switches.
- b. Under the direction of the Heating & Ventilating Subcontractor install all wiring for the temperature control system. The Heating & Ventilating Subcontractor shall furnish all thermostats and voltage transformers.
- c. Electrical Contractor shall furnish and install BROAN #162 bathroom vent with heat light, complete with 250 w. R-40 infrared bulb, in each full bath, ¾ bath and ½ bath.

**NOTE:** See Section 11B for duct through roof to be furnished and installed by Mechanical Contractor.

DIVISION 12 - ELECTRICAL

A-1226 WIRING DEVICES:

- a. Shall be P & S, GENERAL ELECTRIC, or HUBBELL as specified. Switches for lighting shall be HUBBELL 1101 Ivory, 15 amp.
- b. Duplex receptacles unless otherwise required shall be HUBBELL 5262-1 (15 AMP). Power 240-volt outlet shall be HUBBELL 7988-single outlet. All plugs shall be properly grounded according to Code. Cover plates shall be Ivorite.
- c. Height of Outlets: Unless otherwise agreed, convenience outlets shall be 18" above floor except over counter-tops they shall be 3'-8". Switches shall be 4'-0", thermostats 4'-6", and smoke detector 7'-6" (if wall mounted).

A-1227 NON-METALLIC CABLE:

- a. Except where otherwise called for, all wiring shall be in ROMEX Non-Metallic sheathed cable with metal outlet boxes. Use three-wire cable with one wire for grounding only as hereinafter called for under "Grounding". Provide metal boxes for all switches, wall plugs, ceiling lights, etc. secured to metal headers and made rigid. Where conduit, non-metallic sheathed cable, or antenna wire penetrates the tip plates they shall be sealed around with liquid polyurethane foam. Approved plastic outlet boxes may be acceptable for all connections except ceiling outlet boxes.

A-1228 CEILING FANS (OPTIONAL):

- a. 52" diameter, 4 or 5 blade, 120 volt, 60 Hx. 3 speed, heavy duty reversible motor, as manufactured by EMERSON, NUTONE or HUNTER. Fan motor to have permanently sealed and lubricated ball bearings. Fan housing to be dual mounting type, complete with reversible blades and pendant light kit with glass shades. Colors and styles as selected by IHA. Furnish one per bedroom, fixture "D", 3-60W; one (or two) in Living Room, fixture "A", 5-60W; and one in Dining Area, fixture "F", 3-60W.

DIVISION 12 - ELECTRICAL

PART III EXECUTION

**A-1231 TESTING AND GUARANTEE:**

- a. Upon completion the Electrician shall conduct an operating test on all circuits and equipment. All circuits, outlets and equipment must be in good operating condition and properly marked and indexed.
- b. The Electrician shall guarantee all work of this section as called for in General Requirements and shall repair or replace such defects occurring during this period without cost to the Housing Authority.

**A-1232 SERVICE:**

- a. The Electrician shall confer with the local Light Company regarding the service, meter loop, etc. He shall provide overhead or underground service as required by the Utility Company and pay all cost. Indexing shall be typed or clearly printed in ink.
- b. Where water well is to be provided, provide power to well pump and connect complete.

**DIVISION 13 – HOME APPLIANCES**

**SECTION 1**

**WORK INCLUDED:**

- a. Provide and install one 30" range and one 22 cu. Ft. refrigerator in each unit.

**SPECIFICATIONS:**

- 1. 30" gas range
  - a. Manual Clean
  - b. Electronic clock / timer
  - c. Seamless upswept porcelain cook top
  - d. Four 9900, BTU burners
  - e. Porcelain coated steel grates
  - f. Black glass oven door with window
  - g. Broil & serve drawer
  - h. 2 oven racks
  
- 2. 30" electric range
  - a. Manual Clean
  - b. Monochromatic Styling – White
  - c. Electronic Clock / Timer
  - i. Seamless upswept porcelain cook top
  - j. Four 9900, BTU burners
  - k. Porcelain coated steel grates
  - l. Color-coordinated Oven door with window
  - m. Broil & Serve drawer
  - n. 2 oven racks
  
- 3. 21 cubic feet refrigerator
  - a. Top-Mount
  - b. 3 full width cantilevered glass shelves
  - c. 4 gallon adjustable door bins
  - d. Clean deli drawer
  - e. 2 clear humidity controlled crispers
  - f. 2 clear dairy doors
  - g. Full-width adjustable freezer shelf
  - h. Optional ice maker IM34

**SUBMITTALS:**

- a. Submit manufacturers installation instructions.

**DIVISION 14A – SEPTIC SYSTEMS**

**The attached specifications for:**

- 1. SEPTIC SYSTEMS**
- 2. LIQUID PETROLEUM SYSTEM**

**Have been provided by the Housing Authority of Cherokee Nation.**

DIVISION 14B - LIQUID PETROLEUM SYSTEM

PART 1 GENERAL

13.01 WORK INCLUDED

A. Furnish 250 gallon tank with two stage regulator as required by the owner and all other required support items for a propane gas system with 3/4" line to dwellings where natural gas is no available.

1. Filled to 70% capacity prior to occupancy. Prior to filling add enough alcohol to tank to absorb all water in the tank in order to prevent regulator freeze up.

13.02 A. REFERENCE STANDARDS

All applicable codes



DIVISION 14A – SEPTIC SYSTEMS

PART 1 GENERAL

13.01 WORK INCLUDED

- A. Individual waste disposal systems at various locations where sanitary sewer lines are not available.
- B. 1000 gallon septic tank. Installing a 4-inch solid sewer pipe, provide necessary labor and materials to install drainfield utilizing 4 inch perforated pipe and untreated building paper. Also included under these specifications is the excavation and backfilling for water service lines. This will be only in conjunction with a waste disposal system and will not be needed at all locations.
- C. Construction will be done in a workmanlike manner and accordance with the IHS specifications. Sites will be left in a neat appearance.

13.02 REFERENCE STANDARDS

- A. IH45-Engineers recommendations and IHA standards.
- B. PVC pipe - Solid: ASTM 3034
- C. PVC pipe – Perforated: ASTM 3034
- D. SEPTIC TANK: 3000# PSI concrete; 6x6, 10/10 WWM: #4 reinforcing bars.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

3.01 INSTALLATION

- A. As per Indian Health Service standards and directions.

DIVISION 15 - WELL DRILLING

U.S. INDIAN HEALTH SERVICE

TECHNICAL PROVISIONS  
(SPECIFICATIONS)

TP-1 WELL DRILLING - INDIVIDUAL HOMES

TP-1.01 SCOPE

The work covered by this section includes the furnishing of all plant, labor, tools, equipment and materials, and performing all operations in the drilling, completing, and testing of water wells for individual homes, all in accordance with these specifications and applicable drawings.

The Contractor shall drill the type of wells as shown on the bid schedule for each of the homes as shown on the attached location maps or as directed by the Engineer. Each well shall be drilled no deeper than the depth specified by the Engineer for that particular site. If a satisfactory yield is obtained at a lesser depth, the drilling shall be terminated and the well developed at that depth.

Except as herein provided, all work and material shall conform to the recommendations of the American Water Works Association as set forth in the Appendices of the latest edition of AWWA Publication A-100-58, "Standard Specification for Deep Wells".

TP-1.02 DRILLING

The drilling may be accomplished by a cable tool, either a conventional hydraulic (mud) rotary, or an air rotary drilling machine. The equipment used shall be in good repair and be capable of drilling, as specified herein, up to a depth of 300 feet.

If drilling is accomplished by conventional hydraulic (mud) rotary, the drilling fluid shall be a guar-based fluid with self-destroying properties such as "Revert" or an approved equal. Any additives to this drilling fluid shall have the Engineer's approval.

Measuring equipment shall be immediately available at the well site. The drilling fluid shall be kept within the following limits:

- a. Maximum fluid weight will be 9.6 # / gallon
- b. Maximum "Marsh Funnel" viscosity will be 45 seconds

Test Wells: These wells shall be 4"-5" in diameter and drilled as test holes. If sufficient yield is estimated within the specified depth then the well may be completed as directed by the Engineer for a Type B or C well.

## DIVISION 15 - WELL DRILLING

A minimum yield of five gallons per minute is being sought. If a stratum which will produce in excess of 5 gpm is encountered, the well shall be developed to produce the maximum yield obtainable through the well screen, perforations or rock formation.

**Type A Wells:** These are basically open hole wells in solid material and only require casing in the upper portion of the hole through the unconsolidated materials. The upper portion of the well shall be a minimum of 8-inch in diameter to accommodate the 6-inch diameter steel casing and grout. A minimum of 15 feet of 6-inch diameter steel casing and grout shall be installed below the pitless adapter at each well to provide protection from surface contamination. The uncased portion of the well shall be drilled to as large a diameter as can be reasonably drilled through the 6-inch diameter steel casing. Type A Wells can be constructed only by specific approval of the Engineer.

**Type AA Wells:** These wells shall be constructed by drilling a hole of sufficient diameter (Approximately 6 ¼-inch) to install without undue effort, a 5-inch plastic casing. These wells shall be completed with 5-inch plastic casing. These wells shall be completed with 5-inch plastic casing, perforations or well screen, and grout. The grout shall be placed from 15 feet below the surface up to the bottom of the pitless adapter.

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**\*Type B Wells:** These are 8-inch drilled holes in unconsolidated materials complete with 5-inch casing, perforations, regular gravel pack, and grout. Type B wells shall be constructed by reaming the test well to an 8-inch diameter. The grout shall be placed from 15 feet below the surface up to the bottom of the pitless adapter. (\*Type used in the area.)

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**Type C Wells:** These are 11-inch drilled holes in unconsolidated material where an aquifer of fine sand requiring screening has been encountered. These wells are completed with 5-inch plastic casing, well screen, artificial gravel pack and grout. Type C wells shall be constructed by reaming the test well to an 11-inch diameter. The grout shall be placed from 15 feet below the surface up to the bottom of the pitless adapter.

### TP-1.03 WELL CASING

**Plastic Well Casing:** This casing shall be polyvinyl chloride (PVC) 160 spi conforming to ASTM D2672-68a.

The casing shall be stamped with the seal of approval of the National Sanitation Foundation (NSF), the manufacturer's name, and the above ASTM numbers and pressure rating.

**Plastic Well Casing Joints:** The plastic well casing shall be a PVC bell-end solvent-weld joint, 160 psi, conforming to ASTM D2672.

## DIVISION 15 - WELL DRILLING

Threading of the plastic casing itself shall not be allowed. The coupling and the pipe shall be free of moisture, dirt, grass, or foreign matter.

A solvent cement shall be applied in accordance with manufacturer's recommendations, with a natural bristle brush, inside the coupling and to the pipe for a length equal to the coupling depth. The coupling and pipe shall immediately be forced together to ensure full engagement of the pipe end into the coupling, and twisted slightly to insure an even distribution of cement on the bonded surfaces. Excess cement that collects on the outer shoulder is to be cleaned off and the joint inspected for a tight seal. Adequate time (5 to 15 minutes as required) should be allowed for each cemented joint before moving or handling.

**Well Slabs:** A concrete slab shall be installed around the well head casing. The concrete slab shall be a minimum of 36" square with the wellhead casing in the center. The concrete slab shall be installed after all plumbing and electrical work has been installed.

The well house and storage house shall have a 110 volt electric outlet with all-weather plastic outlet box.

The well house and storage house shall have installed an electric heat tape with thermostat on all water piping installed in these areas.

DIVISION 15 - WELL DRILLING

