USHA STANDARD SPECIFICATIONS

For Defense Housing Projects
(Frame Type)

Contents of the Specification

Contract Documents

Advertisement
Form of Bid
Standard Forms for Bids and Contracts
Instructions to Bidders
General Conditions
Schedule of Drawings
Alternates, if any

Detail Specifications

USHA STANDARD SPECIFICATIONS

CONTRACT DOCUMENTS

NOTE TO ARCHITECT (do not copy):

Prepare and insert here "Contract Documents" in accordance with USHA Bulletin No. 9 on Policy and Procedure for "Construction Contracts" as revised September 1, 1939, and modified in Addendum No. 1, dated January 12, 1940.

FEDERAL WORKS AGENCY

UNITED STATES HOUSING AUTHORITY

September 1940

USHA STANDARD SPECIFICATIONS

SCHEDULE OF DRAWINGS

(Specimen)

(Drawings dated (.....)

ARCHITECTURAL Drawing No.	Description
1	Site Plan
2	Block Plan A
3	Block Plan B
4	Street and Yard Work
5	Plans-Buildings Nos.....
6	Elevations-Buildings Nos.....
7	Wall Details
8	Details-Exterior
9	Details-Interior
10	Details-Mechanical

USHA STANDARD SPECIFICATIONS

ALTERNATES
(if any)

NOTE TO ARCHITECT (do not copy):

Alternate Bids complicate bidding and the evaluation of bids. It is strongly recommended that when unavoidable they be kept to a minimum in number. Attention is directed to the discussions on alternate bids given in Bulletins on Policy and Procedure:

Bulletin No. 13 - Paragraph "J"
Addendum No. 1 - Section "2"

Bulletin No. 15 -
Addendum No. 1 - Section "II"
Addendum No. 1 - Section "X" -
Paragraph 4

However, when alternate bids are unavoidable and are required in the "Bid Form," they should be specified in detail at this point in the Specification. Care should be exercised to cover the requirements for all related items of work which are affected, and to avoid conflicts.

USHA STANDARD SPECIFICATIONS

GENERAL SCOPE OF WORK

1. THE PROJECT SITE

(1) The Project Site of the _____ Defense Housing Project No. _____, in [City or Town] _____, State of _____, consists of that area within the property limits bounded in general by _____

_____

all as shown on the _____, Plan, designated as Drawing No. _____.

2. SCOPE

(1) See "General Conditions" and particularly section "Contractor," paragraph (2).

(2) In addition to the work within the project site, the Contract shall include all other work outside of the project site which may be noted or indicated on the drawings or specified.

3. WORK NOT INCLUDED IN CONTRACT

(1) The work specified in divisions "_____," "_____," and "_____" will be constructed under separate contract and shall not be included in this contract.

4. EQUIPMENT NOT INCLUDED IN CONTRACT

(1) Refrigerators and cooking ranges will be purchased and delivered under another Contract to the spaces in which they are required.

(a) The Contractor shall connect such equipment (as may require connection) as specified under respective plumbing or electrical divisions.

5. MODIFICATION OF DETAIL SPECIFICATIONS

(1) Requirements contained in the following divisions of the specifications are hereby modified as stated below.

NOTE TO ARCHITECT (do not copy) -
The following are examples of forms for any required modifications.

Clearing, Excavating and Grading

(2) On page , division "Clearing, Excavating and Grading," section 1, "Scope," delete paragraph 3, in its entirety and substitute:

"(3)_____
_____
_____"

Masonry and Concrete Work

(3) On page , division "Masonry and Concrete Work," section 2, "Masonry Materials," after paragraph 2, insert the following:

"(3)_____"

(a)_____"

Carpentry and Millwork

(4) On page , division "Carpentry and Millwork," section 10, "Subflooring," in paragraph 2 delete the sentence "_____ (quote sentence)_____." and substitute the sentence "_____ (quote sentence)_____."

(5) On page , division "Carpentry and Millwork," delete section 31, "Wood Louvers" in its entirety.

USHA STANDARD SPECIFICATIONS

CLEARING, EXCAVATING AND GRADING

1. SCOPE

(1) Clearing the site, excavating, filling and grading and related items necessary to complete work shown or specified are a part of contract unless specifically excepted. See "General Scope of Work."

(2) Excavating and backfill for sewers, water and gas piping, plumbing, heating and electrical work are specified under other divisions and are not included under this division.

(3) Provide and place any additional material needed to bring existing grades to new sub-grades indicated and/or specified.

(4) Remove from the project site and dispose of materials unsuitable for filling and excess excavated materials

(5) Provide and place top-soil as specified.

2. BENCH MARKS AND SUB-SURFACE SOIL DATA

(1) Carefully maintain bench marks, monuments, and other reference points, and if disturbed or destroyed, replace as directed.

(2) Sub-surface investigations have been made and results indicated. No responsibility is assumed for variation of sub-soil quality or condition at locations other than places shown and at time exploration was made. No claim for extra compensation, or for extension of time, will be allowed on account of obstructions in the ground or for ground water conditions inconsistent with data shown except as provided for elsewhere.

3. CLEARING THE SITE

(1) This contract includes the removal from the project site of all debris, buildings and other structures. Any existing buildings shall be demolished and not removed as a whole or in articulated sections.

(2) Before submitting proposals, bidders shall visit the site and inform themselves as to all work required incident to clearing the site. The contractor shall take the site as he finds it.

(3) Do no blasting except as directed or permitted in writing by the Authority.

4. EXCAVATING

(1) Remove completely all existing walls, floors, footings, piers and other obstructions from within ground areas to be occupied by new buildings, and for a distance of 3 feet beyond perimeter of such buildings, unless otherwise shown or noted.

(2) For buildings not having continuous foundation walls the ground area under these buildings shall be cleared of all obstructions to 36-inches below first floor level, cleared of all debris, graded to not less than 18-inches below bottom of lowest wooden member of floor construction, and thoroughly compacted so that the area pitches for adequate drainage.

(3) In surfaced and planted areas, remove all existing walls, curbs, paving, and other obstructions to a depth of not less than 24 inches below finished grade.

(4) Break up masonry or concrete bottoms of existing basements, cisterns, cesspools, and abandoned catch basins sufficiently to provide drainage.

(5) Excavate to elevations and dimensions indicated, plus sufficient space to permit erection of forms and inspection of foundation. If soil conditions permit, the Authority reserves the right to omit the forms for footings, and adjust the "Contract Price" accordingly.

(6) Material to be excavated is assumed to be earth and materials that can be removed by power shovel. If rock (as defined herein) is encountered, the "Contract Price" will be adjusted. (See "General Conditions.") Rock includes stone or boulders that cannot be broken and removed by power shovels without the use of explosives or drills.

(7) Should latent soil conditions require changes, the "Contract Price" shall be adjusted. (See "General Conditions.")

(8) Protect bottoms of excavations, if necessary.

(9) Shore and brace excavations, if necessary, to prevent cavings. Remove showing before backfilling is done, but not until permanent supports are in place.

(10) Keep excavations free from water. Do not conduct water to privately owned properties.

(11) Footings and foundations will not be permitted to be placed on earth fill, where natural bottoms are lower than the indicated levels, or where excavations are carried to levels lower than that indicated, written instruction will be given as to the manner in which to proceed.

(12) Remove or correct insanitary conditions.

5. GRADING

(1) Do all cutting, filling, backfilling, and grades necessary to bring the subgrades outside of building areas to following levels:

(a) For surfaced areas, to undersides of street and driveway paving, concrete walks, play, and other surfaced areas.

(b) For lawns and other planted areas, to be 6 inches below finished grade.

(2) Remove all debris, paper, and deleterious materials from excavations before backfilling. Do not use frozen materials for backfill. Do not backfill against foundation until permission is obtained.

(3) Deposit fill and backfill in layers not exceeding 8 inches under pavements and under other surfacing, and 12 inches under planted areas, compacting each layer.

(4) Fill old basements, cisterns, wells, cesspools and abandoned manholes and catch basins.

(5) Rocks, blocks of concrete, and masonry materials, but no debris, may be used for filling, if well distributed in earth, except for top 18 inches of fill below sub-

grade level, which fill shall be earth only.

(6) Slope ground away from building walls and grade entire area outside of buildings to a smooth, uniform surface. Finish grades not otherwise indicated shall be uniform levels or slopes between points where levels are given or between such points and existing finish grades. Abrupt changes in slopes shall be rounded. Should figures for finish grades conflict with finish contours shown, the figures shall govern.

(7) Fill to the required levels any sub-grades which settle.

6. DISPOSITION OF UTILITIES

(1) Execute all work under this heading in conformity with the rules and regulations governing the utility involved.

(2) Active utilities shown on the drawings shall be carefully protected from damage; remove or relocate only as indicated or as specified.

(3) Active utilities not shown on the drawings when encountered shall remain undisturbed until written instructions are obtained from the Authority as to their disposition. For this work, in accordance with written instructions, "Contract Price" will be adjusted.

(4) Remove, plug, or cap inactive and abandoned utilities. In the absence of specific requirements, plug or cap pipes at least 3 feet outside of new building walls.

7. TREES

(1) Remove as directed all trees and shrubs, including stumps and large roots, from project site unless otherwise indicated. Trees and shrubs to remain shall be boxed and protected.

(2) Remove interfering branches and roots of trees without injury to trunks. Do cutting and trimming only as directed.

(3) Do not grade within the area of spread of branches of trees to remain except as directed in writing.

(4) Do not burn or place debris within the area of spread of branches of trees to remain.

(5) Remove stumps and major roots from within new building areas, including 5 feet outside of new building walls.

8. DRAIN TILE

(1) Where so indicated, furnish and lay 4-inch agricultural drain tile, or 4-inch terra cotta bell and spigot tile, or 3-cell terra cotta partition tile around foundation walls on approximate level with footings.

(2) Lay drain tile with butted open joints; pitch in the direction of the flow and cover joints with burlap. Backfill over drain tile 18 inches deep and 18 inches wide with 1/4 to 1 inch broken stone or gravel, or clean cinders.

9. SUPPLYING AND PLACING TOP-SOIL

(1) Supply and place topsoil on

all lawn and other planted areas, i.e., unsurfaced areas outside of building lines.

(2) Topsoil shall be fertile, friable, natural topsoil typical of topsoil in the locality. It shall be without admixture of subsoil and shall be free of stones, lumps, plants or their roots, sticks and other extraneous matters, and shall not be delivered while in a frozen or muddy condition.

(a) Before any topsoil is delivered furnish statement giving localities from which topsoil is to be obtained, name and address of owners, approximate quantity available and kind of crops grown on soil during preceding 2 years.

(b) Furnish also one cubic yard sample of topsoil from each source of supply for inspection and approval. Delivery of topsoil may begin upon approval of such samples. Store samples on site until supply from its source is exhausted or no more topsoil is required.

(c) Upon approval of the Authority, the Contractor, prior to commencing general construction operations, may strip and store for use topsoil existing on site which conform to the above specification.

(3) Prior to placing topsoil loosen subgrade soil to a depth of 4 inches and grade to remove any ridges and depressions so that the surface is everywhere parallel to and 6 inches below finished grade. Remove all stones (over 2 inches) and sticks, rubbish and other extraneous matter.

(4) Spread topsoil to such depth that after final settlement it will be at finished grade. Rake to uniformly even surface and roll with 200-pound roller.

10. GENERAL.

(1) Keep work wet down as necessary to prevent dust nuisance to neighbors, workmen or public.

FOUNDATIONS, CONCRETE AND MASONRY WORK

1. SCOPE

(1) Concrete and masonry work and related items necessary to complete work shown or specified are a part of contract unless specifically excepted. See "General Scope of Work".

(2) Brick Foundation Walls and Footings, laid up solid of brick, with brick spread footings as indicated. All joints filled solid with mortar.

(3) Concrete Footings poured in place, width and thickness as shown. Foundation walls as follows:

(a) Solid Brick, all joints filled solid with mortar, facing brick used for all exterior exposed surfaces above grade.

(b) Concrete Masonry Units of stone or cinder concrete solid or cored, load bearing, all joints filled solid with mortar. Exterior face of units exposed above grade, texture and finish dense and uniform to match sample on file during period of bidding.

(c) Walls and piers with facing brick above ground of load bearing stone or cinder concrete units, solid or cored or of structural clay load bearing wall tile. Facing brick bonded to back up units. All joints filled solid with mortar.

(4) Concrete Footings, spread, of sizes indicated, poured in place for foundation piers as follows:

(a) Poured concrete piers doweled to concrete footings.

(b) Piers formed of pre-cast stone concrete pier blocks.

(c) Brick piers constructed of brick with joints filled solid with mortar.

(d) Pre-cast concrete pier shafts doweled to concrete footings.

(e) Cast Iron Pipe pier shafts, fitted with top and bottom flanges for securing to concrete footings on the bottom and to superstructure frame work on top as shown.

(f) Creosoted wood timber piers doweled to concrete footings.

(5) Pedestal Piles having extended cone shaped base of poured concrete, of dimensions and size indicated on drawings.

(6) Chimney: common brick or pre-cast concrete chimney units to roof line and above the roof where exposed to view roof only shall be used.

(a) Lined with Terra Cotta flue lining full height of chimney and provided with terra cotta thimbles. Where two or more rows of

lining are built into the same chimney the joints of the lining shall be staggered.

(b) Caps of pre-cast or cast in place reinforced concrete, with beveled water table formed on top. Exposed surfaces troweled smooth.

2 MATERIALS

(1) Materials, except as otherwise specified, shall conform to A.S.T.M. or Federal Specifications. Furnish samples for tests to be made by the Authority, at site or source of supply, as directed.

(2) CEMENT shall be standard portland or high early strength portland cement.

(3) Hydraulic lime shall conform to A.S.T.M. Specification C141-38T or Federal Specification SS-L-361.

(4) AGGREGATES shall be grade "A" conforming to Federal Specification SS-A-281.

(a) COARSE AGGREGATE shall be of 1 inch maximum size for all concrete except for walls and foundations which may be of 1-1/2 inch maximum size. For cement finish 1/2 inch minimum to 3/8 inch maximum.

(b) FINE AGGREGATE for cement finish shall have 5 percent maximum pass a 100 mesh sieve and 15 percent maximum pass a 50 mesh sieve.

(5) WATER shall be clean, and fit to drink.

(6) BRICK shall be new brick made from clay or shale, conforming to A.S.T.M. Specification C-62-39T. Where exposed to moisture and freezing temperatures Grade SW. Where exposed to freezing temperatures, but unlikely to be saturated with water Grade NW. Where there will be no first action or average annual precipitation under 15 inches Grade NW.

(a) Facing brick for use above grade shall be of similar color and texture, and equal to samples displayed at office of the Authority during bidding period; and free from efflorescence.

(7) STRUCTURAL CLAY LOAD BEARING WALL TILE, including necessary closures and fitters, shall be Class "LBX" A.S.T.M. C 34-39 or Grade "M" Federal Specification SS-T-341 of standard sizes and shapes and non-load-bearing wall tile Class 16-25 A.S.T.M. C-56-39 or Grade S Federal Specification SS-T-351.

(8) MASONRY CONCRETE UNITS, both hollow or solid load-bearing shall be free from deleterious matter that will stain plaster and be adequately cured by air, water or steam, in addition to meeting A.S.T.M. C 90-39, C 145-39T (Grade B), or C 129-39, or Federal Specification SS-C-621 requirements.

(a) Unless units have been cured in high pressure steam, furnish test

reports by an approved laboratory showing compliance with moisture content requirements.

(b) Units shall be standard sizes and shapes and include necessary closures and fitters.

(c) Surfaces to be plastered or stuccoed shall have a sufficiently rough surface to give good adhesion. Surfaces to be exposed or to be painted shall be smooth and in uniform texture.

(9) FLUE LINING AND THIMBLES of size shown, shall be sound, hard-burned, unwarped, fireclay flue tile, free from cracks and spalls.

(10) CONCRETE CHIMNEY CAPS shall be as shown of concrete reinforced with 2 continuous 5/8 inch round deformed steel bars.

(11) REINFORCING STEEL shall be deformed, either intermediate-billet, hard-billet, hard-rail or hard-axle grade steel, except that Beam Stirrups, Column Ties and Spirals may be plain.

(12) METAL FABRIC or wire mesh shall be made of cold drawn steel wire.

(13) METAL ACCESSORIES shall include spacers, chairs, ties, and other devices necessary for properly placing, spacing, supporting and fastening reinforcement in place.

(14) METAL ANCHORS FOR SECURING BRICK to concrete walls shall be hooked or looped cold drawn steel wires of 11 gage.

3. MASONRY MORTARS

(1) MASONRY MORTARS shall be approved mixtures of cementitious materials, sand, and water, meeting the specified requirements.

(2) CEMENTITICUS MATERIALS may be any one or mixtures of the following, provided they produce specified mortar properties:

(a) PORTLAND CEMENT complying with Federal Specification SS-C-191a, or A.S.T.M. C-9-38.

(b) MASONRY CEMENT complying with Federal Specification SS-C-181b, or A.S.T.M. C 91-38T.

(c) NATURAL CEMENT complying with A.S.T.M. C 10-37.

(d) SLAG CEMENT complying with requirements set forth for Portland cement, except for soundness which shall conform to requirements for masonry cement.

(e) PUZZLONIC CEMENT complying with requirements set forth for either Portland or masonry cement.

(f) HYDRATED LIME complying with Federal Specification SS-L-351, or A.S.T.M. C 6-31, soaked and aged in accordance with manufacturer's printed directions on containers, or aged 24 hours after proper soaking.

(g) QUICK-LIME (either pulverized or lump) complying with Federal Specifica-

tion SS-Q-351, or A.S.T.M. C 5-26, slaked and aged in accordance with manufacturer's printed directions on containers or completely slaked, and aged 72 hours for pulverized lime or 21 days for lump lime.

(b) HYDRAULIC LIME complying with A.S.T.M. C 141-38T.

(3) SAND shall comply with A.S.T.M. C 144-39T all passing a No. 8 sieve.

(4) WATER shall be clean and fit to drink.

(5) ADMIXTURES may be included in mortars; provided the resulting mortars comply with specified requirements.

(6) Mortar for all work shall have minimum compressive strength of 400 pounds at 7 days and 700 pounds at 28 days per square inch of 2 inch cube specimens.

(7) Sufficiently in advance of starting masonry work, furnish affidavits from an approved testing laboratory certifying that materials and mixtures proposed for mortar required have been tested and that they comply with all specified requirements.

(a) Properties required shall be determined in accordance with "Suggested Methods of Sampling and Testing Mortar for Unit Masonry" published in A.S.T.M. Bulletin No. 94, October 1938.

(b) Mortar for specimens shall be mixed to a flow of 100 to 115 percent, duplicating proportions of freshly mixed mortars to be delivered to mason.

(8) Mortar, after suction for 60 seconds, shall have a flow greater than 65 percent of that measured immediately after mixing.

(9) Mortar shall be accurately proportioned in strict accordance with approved tested mixtures and after tests have established mortar mixtures conforming to the specified requirements, the mixture shall not be changed without the written consent of both parties to the contract, except that:

(a) Water may be varied to suit workability and added with retempering, maintain original plastic quality by retempering prior to use, which must be within 2 hours after leaving mixer.

4. PROPORTIONING AND MIXING (Concrete)

(1) All concrete not otherwise shown or specified shall be "2000-pound concrete".

(2) Proportion cement aggregates and water to use not less than five and one-half sacks cement per cubic yard of concrete. Slump shall not exceed 5 inches and water content, including free

water contained in aggregates, shall not exceed 7-3/4 gallons per sack of cement. Proportion fine to coarse aggregate so concrete will work readily into forms without water collecting on surfaces, fine aggregate being not less than one-third nor more than one-half of total aggregate, measured separately Mix in power-operated batch mixer, at least one minute after all ingredients are in mixer.

(3) Cement, not in excess of 1 cubic foot (94 pounds) per cubic yard of concrete, may be replaced by not less than 1-1/4 cubic feet of hydraulic lime (78 pounds), provided that tests made in advance of placing concrete produce cylinder strength at 28 days not less than that produced for concrete without hydraulic lime

(4) Transport ready mixed concrete to site in water-tight agitator or mixer trucks loaded not in excess of rated capacities Discharge at site within one and one-half hours after water has been introduced into mixer.

(5) Deliver ready dry batched mixes of cement and aggregates to site in vehicles having batch compartments of proper size for rated capacity of mixer. Do not add water until batch is deposited in mixer Deposit in mixer within one and one-half hours after cement is added to batch.

5. FORMS

(1) Forms shall be of materials that will produce exposed concrete surfaces that are dense, free from honey combing, and air bubbles that expose aggregate, and equal in all respects to surfaces produced by tight, clean surfaced lumber forms.

(2) Construct forms sufficiently tight to prevent leakage of mortar, securely braced and shored to prevent displacement and to safely support construction loads. Provide access openings to clean and inspect just prior to depositing concrete Do not coat forms with material that will stain or cause injury to exposed concrete surfaces. Where soil and workmanship permit excavation to accurate dimensional sizes of footings, forms may be omitted if approved by Authority and "Contract Price" adjusted accordingly.

6. STORAGE OF MATERIALS

(1) Handle and store materials in such manner as to prevent damage or intrusion of foreign matter.

(2) Store brick and clay tile in such manner as to permit wetting within 36 hours prior to laying

(3) Store concrete units under cover that permits circulation of air and prevents absorption of water in excess of the specified moisture content.

(4) Store cement, lime, gypsum and air-setting mortars in watertight sheds with elevated floors.

7. CONSTRUCTION

(1) Exterior walls with brick facing bonded with masonry back-up shall have facing brick laid running bond, with full header (header and stretcher) bonding courses

spaced vertically as indicated maintaining levels.

(2) Build into masonry all required items. Set steel lintels and bed structural bearings in mortar, to line and level.

(3) Flue linings shall be set full height of chimney, one section ahead of masonry, bed in mortar and strike joints flush on inside. Build in thimbles to neat completely filled joints, struck flush. Keep flues free from brick and surplus mortar.

8. FIRE WALL

(1) Construct dividing fire walls, as and where, and of thickness shown between dwelling units, of non-load-bearing hollow clay tile, cinder concrete units or common brick laid up in full beds of mortar.

9. VENT GRILLS

(1) Provide and build in foundation walls and wall of Utility Room between first floor and grade, vent grills of approximate size and in locations as indicated.

(2) Grills to be standard stock pattern cast iron and provided with 16 mesh commercial bronze (Fed. Spec. RR-C-451a) (.0113 inch wire) secured to inside face of grill.

10. TERMITE PROTECTION

(1) Metal shields for prevention of termite infestation shall be provided on top of masonry and concrete walls and piers under wood framing of first floor. See "Roofing and Sheet Metal" Division.

11. TRELLIS ANCHOR BOLTS

(1) Provide and place in edges of concrete slabs forming floors of porches and platforms where wood trellises are not used and where indicated 5/16 inch diameter square head hot dip zinc coated anchor bolts or eye bolts.

(2) Firmly imbed bolts in concrete slabs as they are poured. Minimum projection of bolts 1-1/2 inches from face of concrete to outer edge of head or eye.

12. WORKMANSHIP

(1) Work plumb, level and true to line, breaking all vertical joints except where otherwise shown, or specified. Where necessary to build portions of walls to higher levels than adjacent portions, rack courses back without toothing.

(2) Lay out all facing before setting, minimize cutting closures or jumping of bond.

(3) Lay brick, clay tile and masonry units with complete bearing in full beds of mortar. Shove units in place. Wet brick and masonry units within 36 hours before laying.

(a) Before laying, butter sides forming vertical cross joints with sufficient mortar to fill the joints except at cells of end construction tile.

(b) Units disturbed after setting shall have mortar removed from all surfaces and be relaid in fresh mortar.

(4) Remove and replace damaged or defective brick or masonry units showing in finished surfaces where so directed.

13. JOINTS

(1) Except as otherwise required, joints shall be uniform and approximately 1/2 inch thick.

(2) Joints in exposed masonry surfaces shall be trowel struck, filling all holes, voids, and shrinkage cracks.

14. PROTECTION

(1) Cover top of masonry walls at end of each day's work with waterproof reinforced paper or canvas.

(2) Do not pour concrete or lay masonry in freezing weather unless approved adequate means to prevent freezing are employed.

(3) Protect work as may be necessary against soiling and damage.

15. POINTING AND CLEANING

(1) Point and fill with mortar, holes and cracks in exposed mortar joints. Cut out defective mortar joints, refill solidly with mortar and tool as specified.

(2) Clean exposed masonry surfaces with a solution of non-staining soap powder and clean water, using stiff fibre brushes. A solution of one part muriatic acid in ten parts of water may be used on exposed brick work.

(a) If acid is used, wet walls before applying solution and protect metal, stone, and other work. Rinse surfaces with clean water immediately after cleaning.

(b) Leave surfaces free from mortar and other stains at completion of work.

16. REINFORCEMENT

(1) Metal reinforcement shall be free from excessive rust, scale or coatings that will reduce bond.

(2) All bending shall be cold. Bars shall be free from kinks or bends not specified or shown. No bars shall be bent or straightened in manner that will injure the material.

(3) Place reinforcement accurately in positions shown, securely fastened and supported. Do not splice reinforcement for slabs, beams and girders. Lap wire fabric 4 inches on sides and ends. Lap temperature bars 1 foot. All other splices required or permitted shall develop working stress in the steel.

(4) Furnish shop drawings for reinforcement, including bending and setting diagrams. Make separate placing plans for each building foundation, and for all except identical floor plans. Buildings of opposite hand shall have separate placing plans.

17. FASTENING DEVICES FOR OTHER WORK

(1) Provide for installation of inserts, anchors and other fastening devices required for attachment of other work.

18. DEPOSITING CONCRETE

(1) Place no concrete until reinforcing steel, pipes, conduits, sleeves, anchors, waterproofing and other work required to be built into concrete has been inspected and approved

(2) Remove water and foreign matter from forms and excavations, and unless otherwise directed, thoroughly wet wood forms, sand and sandy loam just prior to placing concrete on them. Compact soil under slabs on ground to firm unyielding surface. Lay no concrete on frozen soil and provide adequate protection against frost action during freezing weather. Place no concrete for foundations on earth back filled or otherwise distrubed. All soil bottom for slabs and footings shall be approved before placing concrete.

(3) Transport concrete from mixer to place of final deposit as rapidly as practical by methods which prevent separation of ingredients and displacement of reinforcement, and which avoid rehandling. Deposit no partially hardened concrete.

(4) Before placing concrete adjoining construction joints, pick, brush clean and coat with neat cement grout surface of joint already in place. Thoroughly rod columns and piers to compact concrete and eliminate subsequent subsidence.

(5) Concrete slabs on ground shall be well tamped into place. Over ground surface, place six inches stone, slag or gravel consisting of five inches graded from 3/4 to 1-1/2 inch and one inch top layer graded from 1/4 to 3/4 inch. Wet, tamp and roll bed until thoroughly compacted. Lay tough waterproof paper over stone, slag or gravel to prevent concrete combining with them and immediately place concrete on paper. Avoid tearing paper.

19. CEMENT FLOOR FINISH

(1) Strike off surface of slab reasonably true at proper level for specified finish. Remove all surface water, laitance, and dirt; apply finish compound of portland cement, and fine aggregate, mixed one to two without water. Spread dry mixture to uniform thickness not exceeding 1/8 inch over screened wet slab; then float and steel trowel.

(2) Avoid excessive floating which causes free water to rise to surface. Delay steel troweling until concrete is sufficiently hard to prevent water working to surface. Bring finish to smooth surface level within tolerance of 1/8 inch in 4 feet, free from defects and blemishes, with minimum steel troweling possible in one operation.

20. CURING AND PROTECTION

(1) Protect all concrete work and cement finishes against injury from the elements and defacement of any nature during construction operations. Keep continuously wet for 7 days (High early strength 3 days) when temperature is above 50° F.

(2) Where concrete is required to be covered and kept wet, remove no forms for at least 4 days.

USHA STANDARD SPECIFICATIONS

CARPENTRY AND MILLWORK

1. SCOPE

(1) Carpentry and Millwork and related items necessary to complete work shown or specified are a part of contract unless specifically excepted. See "General Scope of Work".

(2) See "Drawings" and "Schedules" on the drawings for extent and for details of work.

2. MATERIALS - GENERAL

(1) SOFTWOOD LUMBER shall conform to and be graded in accordance with current grading rules of the lumber association having jurisdiction as listed in Federal Specification MM-L-751a, as amended.

(2) HARDWOOD LUMBER shall conform to and be graded in accordance with current grading rules of the "National Hardwood Lumber Association."

(3) "GRADE MARK," "Trade Mark," and "Mill Identification Mark" of the association having jurisdiction, shall appear on each piece of softwood lumber. A certificate of grading (inspection) issued by "National Hardwood Lumber Association," shall identify and accompany each delivery of hardwood lumber.

(4) MOLDINGS AND TRIM shall conform to "U.S. Department of Commerce Supplement to Simplified Practice Recommendation R16-29-Lumber-Moldings" (softwood) grade "B and Better" or to Commercial Standard CS76-39 (hardwood) grade "B."

(5) PLYWOOD shall conform to U.S. Department of Commerce, Commercial Standards CS45-40 and shall be branded or stamped with symbol of the grade.

(6) FLOORING material shall conform to grading rules of association under whose jurisdiction flooring is manufactured; each piece or bundle bearing manufacturer's "Trade Mark" and "Grade Mark" of said association.

(7) SURFACE lumber 4 sides to standard dimensions or work to patterns shown or required.

(8) MOISTURE CONTENT of lumber when delivered to project shall not exceed 19 percent. Finish lumber and millwork, when delivered, shall have a moisture content not exceeding 12 percent. Flooring, when delivered, shall have a moisture content of not less than 6 percent nor more than 9 percent.

3. ROUGH LUMBER - GRADES AND SPECIES

(1) Species of lumber other than those mentioned hereinafter for "Rough" and "Finished" lumber may be used at contractors' option, if approved, and provided that the material substituted is of equal grade and has comparable quality factors with the species and grades specified for various locations and items.

(2) FRAMING LUMBER for joists, lintels, beams, studs, plates, and members stressed in bending, compression or tension, shall be common dimension or better of the following species and grades:

Fir	, Douglas, No. 2
	, White, No. 1
Larch	, Western, No. 2
Pine	, Southern, longleaf No. 2
	shortleaf, No. 2 medium grain, 900F
	, Norway No. 1
	, Ponderosa, No. 1
Hemlock,	West Coast, No. 2
	, Eastern, No. 1

except that:

(a) Furring, Stripping, Grounds, Ribbons, Bridging and Blocking may be No. 2 common dimension or better.

(b) Roof Trusses, beams, stringers, posts, ceiling joists and rafters shall have a stress-grade of 1200 pounds minimum.

(3) SUB-FLOORING, WALL AND ROOF SHEATHING shall be common, of any of the following:

Fir	, Douglas, No. 1
	, White, No. 1
Larch-Fir,	(Douglas) No. 1
Pine	, Southern, No. 2
	, Northern White, No. 3
	, Western (Idaho) White, No. 3
	, Red (Norway) No. 3
	, Sugar, No. 3
	, Ponderosa, No. 3
Hemlock,	West Coast, No. 1
	, Eastern, No. 1

4. FINISH LUMBER - GRADES AND SPECIES

(1) EXTERIOR FINISH and frames for doors, and louvers shall be of any of the following:

Fir	, Douglas, B and Better, V.G. 100% Heart
Pine	, Northern White, C Select
	, Western (Idaho) White C Select
Cypress,	Red (Coast type) C Select
Redwood,	Grade A

(2) EXTERIOR SIDING shall be of any of the following:

Pine	, Northern White B and Better
	, Western White (Idaho) B and Better
Cypress,	Red (Coast Type) Clear Heart Siding
Redwood,	Clear Heart Siding
Cedar	, Western Red, Clear Port Orford, Clear

(3) EXTERIOR WOOD CEILINGS shall be of any of the following:

Fir	, Douglas, Ceiling Grade C
Pine	, Southern, Ceiling Grade C
	, White, Ceiling Grade D
	, Ponderosa, D Select
Cypress,	Ceiling Grade C
Redwood,	Ceiling Grade B

(4) INTERIOR FINISH shall be of any of the following; but only one species shall be used in any one building

Fir	, Douglas, B and Better V.G.
Pine	, Southern, B and Better
	, White, C Select
	, Sugar, C Select
	, Ponderosa, C Select
Spruce,	Engelmann, C and Better, Select
Cypress,	Red, Coast Type, C Select

, Sitka, B and Better
, Western Red, B and Better
Redwood, Grade A
Birch , "Firsts and Seconds"

(5) WOOD DOORS shall conform to "Quality No. 1" of National Door Manufacturers Association, Inc., or "Grade A" of Fir Door Institute, except as otherwise specified herein. Bond laminated door panels with "hot press synthetic resin."

(a) EXTERIOR DOORS AND SCREEN DOORS shall be fabricated of any of the following:

Fir , Douglas "100 per-cent heart" V.G.
Pine , Longleaf Southern, V.G.
, Northern White
, (Idaho) White
Redwood
Cypress, Red (Coast Type)

(b) INTERIOR DOORS shall be fabricated of any of the following:

Fir , Douglas, V.G.
Larch , V.G.
Pine , Longleaf Southern, V.G.
Northern White
(Idaho) White
Sugar
Ponderosa
Birch, (unselected for color)
Gum , Red, (unselected for color)

(6) FINISHED WOOD FLOORING over wood sub-flooring shall be strips of not less than 25/32 inch thick and not more than 2-1/4 inch face, side and end matched, of

Oak , Red or White, No. 2 Common
Pecan, No. 2 Common
Maple, Birch or Beech, Third Grade, or, not more than 3-1/4 inch face, of

Fir , Douglas, B and Better V.G.
Pine , Southern, B and Better V.G.
Hemlock, Western, B and Better V.G.

5. WOOD PRESERVATIVE TREATMENT

(1) DOOR FRAMES AND DOORS in exterior walls, door screens, and louvers to be built into exterior walls, unless fabricated from all heart lumber, shall be preservative treated and bear the Seal of Approval of "National Door Manufacturers Association," or be accompanied by an affidavit from manufacturer identifying each shipment of such items and certifying that they have been fabricated from all heart lumber or have been preservative treated in compliance with minimum standards established by "National Door Manufacturers Association" for such treatment.

(a) Brush coat all surfaces cut in fitting with a heavy application of preservative used for treatment.

6. STORAGE AND PROTECTION

(1) Protect millwork and flooring against dampness during and after delivery. Store under cover in a well-ventilated building and where not exposed to extreme changes of temperature or humidity.

(2) Do not store or install millwork and flooring in any building until concrete, masonry, and plaster work is dry.

7. CARPENTRY - GENERAL

(1) Carefully lay out, cut fit, and erect all framing, sheathing, sub-flooring, bridging, blocking and other items of carpentry.

(a) Do all cutting and carpentry work required for building in of work of other trades.

(b) Provide 2 inch clearance between chimneys and wooden construction, except that base, finish flooring, trim and grounds may be 5 inches (minimum) away from flues.

(2) Brace, plumb and level all members and secure with sufficient nails, spikes and bolts to insure rigidity.

(a) Level joists and plates resting on masonry with slate or similar material. Do not use wood wedges for leveling.

8. FLOOR AND ROOF FRAMING

(1) Set plates on masonry walls or piers level; wedge and bed in mortar.

(a) Bolt plates to foundation at corners, and at intermediate points approximately 8 feet apart, with 1/2 inch diameter bolts 2 feet long.

(2) Lap and spike together joists meeting at beams or bearing partitions or tie together with 1/8 x 1 inch strap iron secured to each joist with 3 spikes. Spike studs to joists resting on ribbon boards or block ends between studs where joists and studs are not in contact.

(3) Bridge joists with nominal 1 x 3 inch boards or approved metal bridging. Install one row for spans up to 15 feet and two rows for greater spans. Secure bridging at each end with two 8d nails. Do not nail bottom end until after subfloors have been laid.

(4) Provide at least 3-1/2 inch bearing for rafters resting on wall plates and spike to plates. Form necessary cants and Watersheds.

(a) If roof trusses are installed at the Contractors Option in lieu of ceiling joists and rafters as shown, anchor both ends of alternate trusses with 1-3" wide by 3/16" thick bent plate each secured by ring connector bolt to truss and to wall plate by 2 - #12 x 2-1/2" screws.

9. WALL AND PARTITION FRAMING

(1) Unless otherwise shown, studs shall be nominal 2 x 4 inch, spaced not over 16 inches on centers, doubled at sides of openings, tripled at corners, and placed to provide end nailing for sheathing and lath. Truss over openings over 3 feet wide, or frame lintels as shown. Arrange plates to form continuous horizontal ties, splicing single plates, staggering ends of double plates, and securely splicing plates abutting at corners.

(2) Extend bearing partition studs through floor construction to bear upon plates or beams supporting joists. Where possible, extend through two stories without splicing.

(3) Install one row of 2 x 4 inch horizontal bridging or solid blocking in each story height between studs in interior partitions.

(4) Where plates do not form a firestop, provide approved firestop in walls and partitions at each floor.

(5) Frame as required for installation and support of plumbing, heating and other items to be concealed.

10. SUB-FLOORING

(1) Sub-flooring shall be nominal 1 x 4, 6 or 8 inch dry, shiplapped, tongued and grooved or square edge stock of uniform thickness or 5/8" "sheathing grade" plywood.

(2) Unless otherwise indicated, lay sub-flooring (except plywood) at a 45 degree angle with floor joists. In buildings more than one story high, lay sub-flooring on upper floor at right angles to sub-flooring on floor below. Stagger end joints over bearings only, with cuts parallel to run of joists. Double face nail each board to each bearing with at least two 8d nails.

(a) Lay plywood with face grain at right angles to, and butt joints over, supports. Nail at edges with 6d nails not over 6 inches apart and to intermediate supports not over 10 inches apart.

11. WALL SHEATHING

(1) Wall sheathing shall be nominal 1 x 6, 8 or 10 inch stock, shiplapped or tongued and grooved, driven up tight.

(a) Face nail each board with at least two 8d nails to each support. End joints shall be staggered and over supports unless boards are end matched.

(2) Fibre board complying with Federal Specification LLL-F-321a, 25/32 inch thick, treated to inhibit absorption may be used for wall sheathing.

(a) Butt joints over supports, Nail at edges with 6d cement coated nails not over 6 inches apart and to intermediate supports not over 10 inches apart.

12. ROOF SHEATHING

(1) Roof Sheathing shall be nominal 1 x 6 or 8 inch, dressed stock square edge or matched, driven up snug or 5 ply 5/8-inch "sheathing grade" plywood.

(a) Nails from roof covering shall not penetrate through sheathing exposed as finish.

(2) Double face nail each board with at least two 8d nails to each support. End joints shall be staggered, and made over supports unless end matched.

(a) Lay plywood with face grain at right angles to, and butt joints of plywood over supports. Nail at edges not over 6 inches apart and to intermediate supports not over 10 inches with 6d cement coated nails.

13. FELT AND BUILDING PAPER

(1) Over wall sheathing apply a waterproof saturated felt, Federal Specification HH-F-191, Type I or HH-F-201, weighing not less than 14 pounds per square, or a reinforced waterproof paper Federal Specification UU-P-536, grade A, applied from the bottom up, shingle fashion, lapping edges and ends at least 3 inches and nailed through tin discs.

(2) Double thickness of felt at all internal and external corners and around windows, doors and other openings.

14. CEILING STRIPPING

(1) Provide nominal 1 inch by 3 inch wood strips, spaced 16 inches on centers at right angles to the underside of top story ceiling framing when trusses are used.

(2) Double nail stripping members with 8d nails to each bearing and make joints over bearings only.

15. VAPOR SEAL MEMBRANE

(1) Provide and install vapor seal membrane consisting of asphalt impregnated and glossy surface coated sheathing paper, weighing not less than 50 pounds per 500 square feet of which at least 20 pounds is asphalt or of any other type of material having sufficient strength and water vapor permeability of not more than 0.500 grain per square foot per hour (10.0 grams per square meter per 24 hours) when tested by method of National Bureau of Standards or Forest products Laboratory.

(2) Install vapor seal membrane before placing lathing or finish board. Membrane shall form a continuous barrier over entire area. Lap not less than 2 inches all joints, longitudinal on joist, stripping or studs and end joints on bearing only. Secure in place with large head nails or staples.

(a) Install membrane on underside of and parallel to, ceiling joists or stripping of top story and turn down on walls and partitions not less than 2 inches.

(b) Install membrane on interior face of, and parallel to, exterior wall-studs; extend above plate and turn under ceiling membrane of top story.

(3) If wood lath, metal lath or other types requiring a plaster key are used, apply the membrane slightly loose to allow plaster to push the membrane back to form the key.

(4) Completely seal with the same membrane and asphalt all openings around plumbing and heating pipes, electrical and telephone conduits, wires, electric fixtures or any other openings.

16. THERMAL INSULATION

(1) Provide and install thermal insulation on the ceilings of top story and in exterior walls of buildings as specified.

(2) Insulation shall conform to the following requirements:

(a) Loose fill shall conform to Federal

Specifications HH-I-521b, Type II, Class A or HH-I-571, Class C.

(b) Bat or Blanket insulation shall conform to Federal Specifications HH-I-521b, Type I, Class A or HH-I-571, Class A.

(c) Insulation of greater conductivity may be used, provided the total thickness is increased to produce a thermal conductance equal to material specified without exceeding the total weight of maximum density of materials specified.

(d) All vegetable, wood fiber and fiber and hair insulation shall, either by nature or by special treatment be fire resistant, vermin repulsive and not susceptible to the growth of rot-producing fungi.

(3) On the ceilings of top story place 3-5/8 inches bat, blanket or loose fill insulation.

(a) Install bat or blanket insulation and fit tight end joints to provide continuous insulation.

(b) Fit sides tight between roof structural members and around pipes, conduits and other obstructions.

(c) If bat or blanket has supporting member with flanges install it with supporting member face down; securely nail or clip flanges to joists at one foot intervals.

(d) Spread loose fill insulation evenly all over the ceiling area to a minimum thickness of 3-5/8".

(e) Provide stops of any suitable materials between ceiling joists at eaves to prevent insulation spreading into roof overhang.

(4) In exterior walls place 2 inches thick bat or blanket insulation provided with supporting member.

(a) Attach insulation to the plates and/or studs by the method recommended by the manufacturers, providing approximately equal air spaces on faces of bat or blanket.

17. WOOD GROUNDS AND BLOCKING

(1) Provide wood grounds and blocking of thickness and size as indicated or required for plaster, wood trim, base, and where required to secure other work or equipment in place.

(2) Set grounds true to line, level or plumb. Set grounds for standing trim 1/4 inch back from trim edge.

18. WOOD GUTTERS

(1) Form moulded wood gutters from solid timbers 4 inches by 6 inches of Clear all heart Redwood, B and B grade Western Red Cedar or No. 1 Common grade all heart Tidewater Red Cypress.

(2) Joints mitered 45° off the vertical, both cut ends coated with heavy white lead. Join

while lead is soft and secure with galvanized finishing nails or screws.

(3) Cut terminal ends of gutters square, plumb and fit with 1 inch thick end stop blocks cut to profile of gutter (unless otherwise shown), set in white lead and secure with galvanized finishing nails or screws.

(4) Prime back face of gutters with heavy coat of white lead before erecting in place.

(5) Erect gutters in straight, true alignment and rigidly secure in place, using not lighter than 10d galvanized nails or screws, spaced opposite to and driven into end of each rafter, lookout, or cornice facia blocking.

(6) Counter sink heads of all nails or screws and face putty all holes.

(7) Bore holes and do all cutting in wood gutters necessary for proper fitting and connecting of sheet metal work. See "Roofing and Sheet Metal Division."

19. WOOD SIDING

(1) Exterior wood siding shall be 1/2 inch by 6 or 8 inch beveled wood siding laid 4-1/4 or 6 inches respectively to weather.

(2) For flush joint siding use 25/32 inch ship lap by any standard width not more than 6 inches wide.

(3) Fit siding at joints, openings and corner boards and nail to each stud with two 8d flat-head siding nails. No joints will be permitted in first course over or under openings.

20. ASBESTOS SHINGLE AND CLAPBOARD SIDING

(1) Asbestos shingle or clapboard siding may be used in lieu of beveled wood siding.

(a) Asbestos shingles or clapboards shall not be used where flush joint siding is indicated on drawings.

(2) Asbestos shingle and clapboard shall be of dense rigid structure, thoroughly seasoned and composed of portland cement, asbestos fibers, mineral oxide colors and such other pigments as necessary to produce required colors, finishes and textures and shall comply with applicable requirements of Federal Specification SS-S-291. Exposed face, dense, close grained reproducing weathered wood texture and treated at time of manufacture with a water repellent to prolong cleanliness.

(3) Shingles shall be of uniform thickness of not less than 5/32 inch and of rectangular shape, of uniform width, 12 inches and uniform length standard with manufacturer; edges clean and square, free from gouging, undercutting or fracture.

(a) Use wavy butts or staggered butts and uniform gray or blended gray color as directed by Authority.

(4) Clapboard shall be of uniform thickness of not less than 5/32 inch, 9-1/2 inches wide and 8 feet long or other length standard with manufacturer.

(5) Use asphalt felt backer strips and non-ferrous alloy face nails furnished by the manufacturer of shingles and clapboards. Use at least three 2-inch galvanized needlepoint nails at the top of each shingle and 3 face nails at the butt end. Secure each clapboard with two 2-1/2-inch nails at top and alloy nail at bottom.

(6) Store and install shingles and clapboards according to manufacturer's directions.

(a) In case of fiber board wall sheathing install for each course of shingles 1 inch by 3 inches nailing strips securely attached to studs.

(b) Head lap not less than 1-1/2 inches; stagger joints.

(c) Insert 3 inches by 12 inches asphalt felt backer strips back of each joint where shingles or clapboards abutt.

(d) At corners butt shingles or clapboards against wood corner board or "weave" butt ends alternately, as directed by the Authority.

(e) Seal all joints at door and window frames and at all internal and external corners with asbestos calking compound.

(f) Where shorter than standard pieces are needed punch holes as near cut edge as possible and face nail in place.

(g) All cutting and punching shall be executed with asbestos shingle cutting machine specifically designed for this purpose.

21. TEMPORARY ENCLOSURES

(1) Provide temporary enclosures where necessary, maintain in good repair, and remove when no longer required.

22. ROUGH HARDWARE

(1) Provide and install all rough hardware and other items, as well as all metal fastenings of any nature for proper installation of carpentry and millwork.

(2) Nails, spikes, screws and similar items shall be of approved sizes and types sufficient to draw and rigidly secure members in place.

23. MILLWORK AND TRIM - GENERAL

(1) Carefully erect exterior and interior millwork and finish woodwork with tight joints, blind nailed where possible. Secure trim with finishing nails and set exposed heads in finished work for putty. Sand woodwork to remove all machine marks and irregularities.

(a) Carefully fit joints. Miter exterior angles, and cope interior angles. Joints, except end joints, less than 12 feet apart will not be permitted in straight runs in trim members or moldings.

(b) Glue used for exterior woodwork shall be moisture-resistant. Except in wood frames, joints in exterior millwork that are not glued shall be made in white lead and linseed oil paste.

(3) Before setting exterior finish and millwork, window and door frames, prime surfaces to be concealed with one heavy coat of lead-in-oil paint (except siding.)

(4) Leave wood trim and items of millwork free from defects and blemishes.

24. DOOR FRAMES

(1) Fabricate exterior door frames 1-5/8 inch thick (unless greater thickness is indicated) with rebates for doors and screens.

(2) Fabricate interior door frames not less than 3/4 inch thick with 1/2 inch applied stops.

(3) Heads and jambs of door frames shall be housed together.

(4) Set door frames plumb and square. Drive double wedge blocking back of jambs at nailing points, back of butts, and lock strikes. Secure with finishing nails, set for putty-stopping.

25. WOOD DOORS

(1) Fabricate exterior doors (unless otherwise indicated) 1-3/4 inches thick, of solid stiles and rails, with standard sticking worked from the solid, or applied mouldings set in white lead. Make panels flat or raised, as indicated, solid, or laminated, (with hot press synthetic resin), of standard stock thickness. Set panels in place without gluing or nailing. Provide loose wood molds for glazing.

(2) Fabricate interior doors (unless otherwise indicated) 1-3/8 inches thick, solid, or built-up (veneered) on cores of White Pine, Ponderosa Pine, Chestnut, or Douglas Fir. Build up cores of strips not over 2 inches wide glued together under pressure and then sanded to receive face and edge veneer. Make face veneer for stiles and rails 1/16 inch thick; edge veneer strips on vertical stiles 3/4 inch thick and of same material as face veneer.

(a) Moulds may be solid stuck, or loose moulded with mouldings (of same material as veneer) nailed to stiles and rails only. Panels may be solid or plywood, with both faces of same material as veneer on stiles and rails. Do not glue or nail panels in place.

(3) Interior doors, if bonded throughout with hot press, synthetic resin, may be (in lieu of panel doors) ventilated core, flush type with both faces of "Ext." grade 3-ply plywood; interior construction, rails and stiles, not less than 2 inches; core members of wood, spaced not over 4 inches; with lock blocks both sides, not less than 6 inches wide (including stile) and 20 inches long.

(4) Fabricate batten doors of lumber specified for interior finish with not less than 3/4 inches thick battens, assembled with screws. Boards shall be 3/4 inch thick T. & G. V-jointed material.

(5) See "Builders Finish Hardware." Hang doors with 1/16 inch clearance at sides and top, and 3/16 clearance at bottom except that where thresholds are not provided, clearance shall be 5/8 inch.

26. DOOR SCREENS

(1) Provide screen doors at all front and rear entrances to dwelling units.

(2) Fabricate screen doors not less than 1-1/8 inches thick of clear stock with molded and coped joints between stiles and rails, mortised and blind tenoned, wedged and set in moisture-resistant glue or provided

with not less than two dowels each set in moisture-resistant glue.

(3) Screen cloth shall be natural finish, 16-mesh commercial bronze wire having a diameter of 0.0113 inch and conforming to Federal Specification RR-C-451 a, Type B. Stretch cloth taut, without warp or buckle and secure in place in accordance with manufacturer's standard practice permitting rescreening.

(4) Provide (in lower panels) 1-inch mesh wire guard grilles, formed of 14-gage wire, galvanized after fabrication and painted with black asphaltum paint.

(5) See "Builders Finish Hardware." Hang doors with 1/16 inch clearance at sides and top and 3/16 inch at bottom.

(6) Provide duplicate bronze numbers for screen doors. Secure one number to screen door, and corresponding duplicate number to door frame.

27. ACCESS DOORS TO CRAWL SPACES

(1) Provide door and frame to access opening to crawl space of size shown and in accordance with detail drawing.

28. ATTIC VENT SCREENS

(1) Cover vent openings in cornices with 16-mesh commercial bronze screen cloth. Screen cloth shall overlap the opening not less than 1/2 inch or provided with 1/2 inch wide flanges and securely tacked in place.

(2) Vent openings in gables shall be fitted with copper baffles and screen cloth. See "Roofing and Sheet Metal."

29. HOOD AND PORCH CEILINGS

(1) Exposed ceilings of hoods over exterior entrance doors may be finished with 9/16 inch thick, matched and edge beaded or V jointed ceiling boards 3-1/4 inch face or 1/4 inch wallboard grade exterior type plywood without exposed joints or 3/4 inch thick cement plaster on metal lath. See "Lathing and Plaster."

(2) Exposed ceilings of porches nominal 2 inch thick dressed plank either "T. & G." or shiplap, and V-beaded or flush joint as shown.

30. BASES - PORCH COLUMN

(1) Provide standard stock ventilating type cast iron bases under all wood columns on porches.

31. TRELLIS WIRE ATTACHMENTS

(1) In the cornice on each side of hoods over entrance doors provide not less than six(each side) galvanized screw eyes formed of No. 8 wire for securing trellis wires. Trellis wires not included in contract.

32. TERMITE PROTECTION

(1) Metal shields for the precaution of termite infestation shall be provided on top of masonry and concrete walls and piers under wood framing of first floor. See "Roofing and Sheet Metal."

3. EXTERIOR FINISH

1) Brace and miter or cope cornices t angles, and assemble to form protection to vertical joints.

2) Exterior wood ceiling shall be /16 inches thick, dressed, matched d V-jointed or beaded; well driven p and blind nailed at each bearing. terrate end joints so that there ll be at least two boards between oints on the same bearing. Place d moulds at angles of ceiling and ertical surfaces.

4. INTERIOR FINISH

(1) Carefully miter (unless otherwise shown) and rigidly secure joints between jambs and head members of casings. Set casings 1/4 inch back from face edge of jambs and head and nail to finish and to rough jambs.

(2) Dress window stools to not less than 1-1/16 inch thickness and rebate over rough sills. Provide apron as shown with neat return cuts at ends.

(3) Base shall be one member type wood, with 3/4 inch wood shoe. Nail base to grounds and draw tight to plaster. Nail shoe mold to floor.

(4) Install 3/4 x 2-1/2 inch wood wainscot cap around inside walls of bathrooms and toilets. Securely fasten strips in place.

(5) Install firmly a 4-inch hook strip around 3 sides of each clothes closet and two shelves approximately 12 inches wide, lengthwise of closets. Support bottom shelf on hook strips and top shelf on cleats. Provide intermediate supports for shelves more than 5 feet in length. Space linen closet shelves as indicated and support on 2-inch cleats.

(a) See "Builders Finish Hardware" for hooks and similar items.

(b) Baked enamel finish metal shelves with rolled edges, attached clothes hooks or hanging rod and suitable support may be substituted (subject to approval) for wood shelves if of same size and strength.

35. ASBESTOS BOARD LINING (UTILITY ROOM)

(1) In lieu of lath and cement plaster on walls and ceilings of utility room, these areas may be covered with cement asbestos board.

(2) Cement asbestos board shall be large sheets, standard sizes, composed of portland cement and asbestos fibres, pressed, rolled or calendered to a uniform thickness of 1/4 inch, hard dense structure with smooth exposed surfaces.

(3) Provide necessary grounds and/or blocking between studs so that all joints both vertical and horizontal are made over bearings. Joints close fitting, filled with cement asbestos of the same composition and color as the board and finish smooth and flush with general plane of board face.

(4) Secure board in place with suitable nails or screws, driven through board in manner necessary to prevent breaking and cracking of material.

(5) Closely fit board around openings, penetrating pipes, and other similar items.

36. SCUTTLE OPENINGS

(1) Provide in ceilings where indicated scuttle openings for emergency access to attic spaces. Secure scuttle opening panels in place with non-ferrous metal flat head screws.

counter sink heads.

37. LINEN CLOSETS

(1) Construct linen closets as detailed providing doors, drawers and shelves as shown.

(2) Generally doors and drawers shall be standard type construction similar to corresponding items required for kitchen cabinets.

38. HANGING RODS

(1) Provide and erect metal hanging rods in all closets (except linen) and at openings to all closets where doors are not shown. See "Hardware."

39. FINISHED WOOD STAIRS

(1) See "Details" for finished wood stairs on the drawings. Frame carriages cut from nominal 2 x 12 inch framing lumber and spaced not over 18 inches apart.

(2) Make treads "Select grade", "First and Seconds" or "B and Better" "edge grain" of species of wood used for flooring, not less than 1-1/16 inch thick, with exposed edges rounded. Provide simple molding at edges and exposed ends. Rebate treads and risers, block, wedge and securely nail together and to stringers.

(3) Make face and wall strings, risers, balusters and newels of grade and species of wood used for interior finish and handrails of oak, ash, birch, beech and maple. House newels to receive treads and risers and rigidly secure in place. House balusters into treads or strings and secure and block into handrails. Fit handrails at newels and secure at joints and ends with stair rail bolts.

(4) Provide on one wall of enclosed stairs, wood handrails set on metal brackets (see "Builders Finish Hardware"), spaced as indicated and rigidly secured in place.

40. KITCHEN CABINETS

(1) Fabricate wood kitchen cabinets from sound, kiln-dried lumber with frames, rails, stiles and intermediate members not less than 3/4 inch thick and of sufficient width to insure sturdy and rigid construction.

(2) Make work tops for base cabinets of 1-1/16 inch thick maple or birch, T. & G. strips not more than 3 inches wide, glued together and bread boards 13/16 inch thick of similar material and construction with cleated ends.

(3) Shelves may be of 5-ply stock or solid stock not less than 25/32 inch thick. Glue and let shelves into ends with all corner joints nailed. Support open shelving on cleats securely fastened to adjacent construction.

(4) Make doors of 5-ply laminated stock, edges sanded smooth, or in frames of solid stiles and rails with 3-ply laminated stock panel.

(5) Make drawer fronts from straight grained stock. Slide drawers on hardwood slides with stops and partition one drawer for silverware.

(6) Provide finish hardware of wrought steel plated, including 1-1/2 inch hinges of a type similar and equal to Stanley Cabinet Hinge Nos. 1565 or 1566 or other approved type; semi-concealed or friction type catches and door and drawer pulls.

(7) Erect cabinets straight, level and plumb and securely anchor in place, with finished mouldings and fillers to fit cabinets to walls and ceilings.

(8) Prefabricated wood kitchen cabinets, shelving, work tables and counters (factory assembled complete with hardware) may be furnished if equal to requirements specified herein and if variations standard with the manufacturer are approved.

(9) Metal kitchen cabinets, shelving and work tables of gages of metal, construction and equipment as shown in manufacturers' printed catalogues (primed with rust-inhibitive paint, finished with 2 coats of enamel separately baked on in colors as selected and factory assembled complete with hardware) may be furnished in lieu of wood, subject to approval, provided:

(a) Work tops are of wood construction as specified herein or of 1/8 inch thick linoleum cemented to metal and protected with metal edges.

(b) Doors are filled with sound deadening material.

(c) Open shelving is of metal finished to conform to metal cabinets.

(10) Furnish shop drawings correctly dimensioned to fit spaces as erected and obtain approval before fabrication.

41. MEDICINE CABINETS

(1) Provide recessed type metal medicine cabinets with mirror door over lavatory in each bathroom of dimensions as follows:

Wall opening (minimum) 13x19 inches
Mirror size (minimum) 12x18 inches
Depth of Cabinet 3-1/2 inches

(2) Construct cabinets of not less than No. 20 gage furniture or auto body steel with joints welded and ground smooth. Provide each cabinet with three rolled edge metal adjustable shelves; finished with acid-resistant porcelain enamel fired on or made of "Herculite" glass (non breakable) by Pittsburgh Glass Company or of "Vitrolite" by Libbey-Owens-Ford Company or equal.

Rust-proof metal by cleaning after fabrication and "Bonderizing," "Parkerizing," "Granodizing," hot zinc coating or cadmium plating. Finish interior and exposed portions with 2 coats of baked-on enamel of approved color.

(3) Mirrors shall be No. 2 or better quality plate glass and conform to U. S. Department of Commerce, Commercial Standard CS27-36, with silvering protected by an electroplated coating of copper and a coat of mirror paint. Label with manufacturer's dated certification of quality.

(4) Set mirrors in metal frames approximately 1/2 inch wide with a fibre or felt cushion and metal backing. Fit doors with approved (brass pin) hinges, catch, stop and means of opening.

(5) Install cabinets on center line of lavatories with center of mirror 5 feet 3 inches above finished floor line.

42. BATHROOM ACCESSORIES

(1) For each watercloset, provide one paper holder, having wood or metal roller bar held between

chromium plated heavy spring wire secured to chromium plated back or base. Screw holders to wood wainscot cap strip.

(2) In each bathroom and toilet room provide one 24 inch long towel bar with non-ferrous chromium plated posts and 3/4 inch chromium plated non-ferrous metal bar or 3/4 inch pyroxylin enamel finished hard wood bar. Secure to wainscot cap.

43. WOOD FLOORS AND THRESHOLDS

(1) Clean sub-floors, free from plaster or other rubbish and dust. Inspect sub-floors, level uneven or high spots and repair damaged places. Secure any loose sub-flooring and nailing.

(2) Over wood sub-floors (except under ceramic tile) lay asphalt saturated felt weighing not less than 14 pounds per 100 square feet. Lap felt at least 3 inches at joints.

(3) Lay wood flooring square with sides and (generally) the longest way of room (over plywood at right angles to joist) with close joints snugly driven up with a hardwood block. Stagger ends to avoid joints close together. Use the poorer and shorter pieces inside of closets. Blind nail flooring with 8d wire flooring or cut steel casing nails spaced not more than 12 inches apart. Drive nails at an angle of 45°. Countersink heads with steel nail set, not with hatchet or hammer.

(4) Provide wood thresholds of same species of wood used for flooring and securely nail in place. See drawings for locations, dimensions and details.

(5) Machine sand wood floors to a true smooth finish surface, first traversing across grain and then lengthwise with grain, starting with No. 2 sand paper and graduating to No. 0 or finer sand paper or steel wool for a final buffing. Hand scrape parts of floors which cannot be machine sanded.

(6) Final buffing must be followed same day by application (specified in "Painting") of stain, filler or other finish. Protect floors with reinforced building paper and leave free from damage or machine marks.

44. APPLICATION OF BUILDERS' HARDWARE

(1) Receive, store and be responsible for all builders' hardware. Properly tag, index and file all keys in key cabinet as directed. Deliver all keys locking the key cabinet to the Authority at the completion of the work.

(2) Fit accurately, apply securely and adjust carefully all builders' hardware. (See "Builders' Finish Hardware"). Exercise care not to mar or injure work when applying hardware.

(3) Center door knobs 38 inches above floor, and center door pulls 45 inches above floor. Cover door knobs with heavy cloth. Leave hardware in working order, free from defects.

45. WEATHERSTRIPPING - DOORS

(1) The jambs, heads and sills of entrance doors to dwelling units shall be weatherstripped.

(2) Provide and install extruded brass or bronze sill member. This sill member (threshold) shall be of a type required to engage a hook type weatherstrip member to be secured on the lower edge of the door and form a tight connection when door is closed. Set sill member in mastic and secure with wood counter-sunk non-ferrous screws.

(3) Weatherstripping shall be of the spring tension type, of cold rolled spring bronze or of impregnated special alloy spring aluminum, not less than 0.008 inch thick; edges shall be hemmed.

(4) Install weatherstripping in accordance with the manufacturer's directions; accurately cut, fit, and firmly secure in place. Provide continuous seal past hardware.

USHA STANDARD SPECIFICATIONS

WINDOWS

1. SCOPE

(1) Windows and related items necessary to complete work shown or specified are a part of the contract unless specifically excepted. See "General Scope of Work."

(2) See "Schedule of Windows" for types and sizes, and drawings for location and number required. Include frames, anchors, sash, hardware, screens and casings (or stools), all erected and adjusted.

(3) Whenever it is specified in this division that the material or type of windows and screens, species of wood, weatherstripping, hardware and other items are optional with the contractor, they shall be, unless otherwise authorized by the Authority, of uniform material and type throughout the project, except concealed wood.

(4) Stock commercial windows including hardware of standard shapes and methods of fabrication will be approved, provided they conform to requirements herein specified and generally to details on drawings.

(5) Glass and glazing including putty, and field painting are specified under divisions "Glazing" and "Painting."

(6) Windows of either wood or metal in accordance with this specification may be furnished at the option of the contractor.

2. SHOP DRAWINGS

(1) Submit shop drawings and obtain approval before fabrication.

WOOD WINDOWS

3. MATERIALS

(1) Wood Window Frames may be any one of the following species and grades (containing not more than 15% moisture when delivered):

(a) Sills, sub-sills, casing, stafbeads, aprons, stops and parting strips:

Fir,	Douglas, B and better vertical grain.
Pine,	Southern, B and better. Northern White, C Select. Western (Idaho), White C Select.
Cypress,	Red (Coast type) C Select
Redwood,	Grade A.

(b) Side Stiles:

Any one of the above species and grade mentioned for frames, using vertical grain only.

(c) Other parts:

Any one of the above species, one grade lower.

(2) Wood Sash and Screens may be any one of the following species and grades:

Pine,	Northern White, Clear Idaho (White), Clear Ponderosa, clear
Cypress,	Red (Coast type) clear
Redwood,	clear

4. PRESERVATIVE TREATMENT

(1) Window frames, sash, and screens to be built into exterior walls, unless fabricated from all heart lumber, shall be preservative treate

and bear the Seal of Approval of "National Door Manufacturers Association," or be accompanied by an affidavit from manufacturer identifying each shipment of such items and certifying that they have been fabricated from all heart lumber or have been preservative treated in compliance with minimum standards established by "National Door Manufacturers Association" for such treatment.

(a) Brush coat all surfaces cut in fitting with a heavy application of preservative used for treatment.

5. DOUBLE HUNG WINDOW FRAMES

(1) Plank type double hung window frames shall be not less than 3/4" thick, with sills of clear stock, dressed to finish 1-5/8" thick, beveled as detailed.

(a) Counterbalancing equipment shall be either spring balances (two to each sash) having rust-proofed steel, or airplane wire tapes; designed to balance the sash properly, and enclosed in metal housings so as to be removable after installation of window frame; or vertical spiral rod balances of adequate size (two to each sash). Vertical balances shall be enclosed in a rigid galvannealed casing having a hanger at one end and a slotted ferrule at the other end. A cadmium-plated spiral rod equalizing lifting power of spring shall operate through ferrule. End of spiral rod shall be attached to sash by reinforcing link screwed on and end of casing anchored to frame.

(2) Fabricate and assemble frames in accordance with National Door and Window Manufacturers Association recommendations. Members shall be rebated or mortised, with tight-fitting joints.

(3) Set all window frames plumb and level.

6. PREFITTED WOOD WINDOW UNITS

(1) Pre-fitted wood window units, factory assembled, complete with sash, counterbalancing devices and weatherstripping, may be furnished if equal to specified requirements for window frames, sash and weather-stripping.

(2) Variation in design of frame, thickness of sash, counterbalancing equipment, method of assembly and weatherstripping, from that indicated and specified, will be acceptable if variations standard with the manufacturer of pre-fitted window are approved.

(3) Submit shop drawings and sample of prefitted type window and obtain approval before fabrication.

7. WOOD SASH

(1) Sash shall be stock "No. 1 Standard Sash Grade," fabricated in accordance with standard practice of "Association" or "Institution" governing manufacture. Rebates for glass shall be moulded.

(a) Double-hung window sash (unless otherwise shown) shall be not less than 1-3/8" thick up to 42" wide, and not less than 1-3/4" thick for wider sash.

(2) Fit closely and balance window sash to operate without binding.

8. WEATHERSTRIPPING

(1) Weatherstripping for double-hung wood windows shall be one member metal-to-wood rib type. At meeting

rails provide metal-to-metal two member interlooking type.

(2) Weatherstripping members for double-hung windows shall be of zinc not less than 0.018 inch thick, sheared and formed across the grain; or may be of zinc-copper alloy (copper 3/4 to 1-1/4 per cent, impurities 0.1 per cent maximum, balance pure zinc) formed irrespective of grain.

(a) Weatherstripping of adequate thickness, and of non-ferrous metal other than zinc, will be approved for use if prior approval is obtained.

(3) Install weatherstripping in accordance with the manufacturer's directions; accurately cut, fit, and firmly secure in place. Provide continuous seal past hardware.

(4) For each complete double hung wood window the average air infiltration shall not exceed 1.75 cubic feet of air per hour, per foot of crack, per mile of wind velocity. Before installing the work, submit a notarized certificate showing that weatherstripping as installed will conform to the requirement herein specified.

9. WINDOW SCREENS

(1) Provide full length top hung screens for all windows.

(2) Fabricate screen frames of clear stock not less than 1" thick with not less than 1-5/8" wide side and top rails and 2-5/8" bottom rails. Mortise and tenon, pin and glue joints with moisture-resistant glue in accordance with best trade practice for stock screens. Provide an intermediate cross rail of same width as stiles opposite meeting rail of windows.

(3) Screen cloth shall be 16-mesh wire having a diameter of 0.0113 inch and conforming to Federal Specification RR-C-451a, Type B Commercial Bronze. Stretch cloth taut, without warp or buckle and secure in place in accordance with manufacturer's standard practice permitting rescreening.

(4) Provide duplicate bronze numbers for screens. Secure one number to screen, and corresponding duplicate number to window frame.

10. HARDWARE

(1) Hardware shall conform to Federal Specification FF-H-111 or FF-H-116a of types stated.

(2) Double-hung windows.

(a) Sash fasteners Type 1139.

(b) Sash lifts (hook) Type 1201-2 each window.

(3) Screens.

(a) Hangers, Type 1825 or 1825B to suit conditions. One pair each screen.

(b) Hook and Eye, Type 1601B, size 2", 2 each screen with hook on screen.

METAL WINDOWS

11. MATERIALS

(1) Steel shall be low carbon, new billet, hot rolled solid shapes, free from defects.

(a) Sections shall be straight and true, and free from defects. Closely fit all joints. After assembly, straighten all frames and movable contact parts.

12. CASEMENT TYPE WINDOWS

(1) Light Casement Windows: Fabricate frame and ventilator of "Zee Bar" sections. Head and jamb sections of frames shall have extended legs not less than 1½" deep measured from the center line of web, either integral with frame or applied. If applied, fins shall be not less than No. 12 U. S. gage (.109") metal, welded, riveted, bolted, or screwed to frame.

(a) Sections, except muntins, not less than 1" deep from front to back, and not less than 1/8" thick.

(b) Muntins "Zee Bar" sections not less than 5/8" in face and depth.

(c) Wood surrounds standard with manufacturer shall be provided. They shall be properly secured to metal sash, and of such size and thickness as to join to outside sheathing and as necessary to secure rigidly metal windows to structural wood framing. Set wood surrounds in mastic calking compound where metal joins wood, and secure to metal frames with screws or bolts.

(2) Miter, neatly fit and electrically weld all corners; welds finished smooth.

(3) Ventilators (swing leaves) shall contact frames with continuous two-point flat contact.

(4) Muntins shall be continuous between rails and stiles, and at intersections, rigidly interlocked or welded. Punch horizontal muntins for glazing clips.

(5) Provide continuous drip molds on transom bars immediately above ventilators, and at heads where ventilators are full height of openings.

(6) Provide vertical mullion bars where combination of units is required for a single opening.

(7) Design for outside glazing: Provide sufficient number of copper-coated spring wire-glazing clips.

13. SCREENS

(1) Provide and install one screen for each vent, or for each pair of adjacent vents, with horizontal sliding wicket, stock standard with manufacturer furnishing metal windows. Screen frames shall be well made, of sturdy construction with provision for easy rewiring.

(2) The sliding wicket having a clear aperture of at least 7" wide by 12" high, to permit access to locking handles on ventilators. The clearance between locking handle and wicket shall be such that the wicket may be slid to a closed position after the ventilator is closed and locked.

(3) Include locking device for securing screen to window frame, insuring close and secure contact and easy removal.

(4) Screen cloth, 0.0113 inch nominal diameter, 16-mesh commercial bronze wire conforming to Federal Specification QQ-C-451a, Type B.

14. RUST PREVENTION

(1) After fabrication and before shipment, window frames, sash and screen frames, shall receive one coat of manufacturer's standard paint, baked on, after one of the following treatments:

(a) "Bonderizing," "Hot Dip," "Granodizing," "Parkerizing," "Thermoil-Granodizing," or

(b) Thoroughly cleaned and painted with two coats of manufacturer's standard paint, each coat separately baked on.

15. HARDWARE

(1) Hardware shall be of die cast material, of iron, bronze or steel, primed for painting. Weld, rivet or bolt hardware in place.

(a) Hinges shall be of heavy, extension, adjustable friction type, of iron or steel with fixed pins equipped with nut locking device and commercial bronze nuts, bushings and washers as necessary to prevent any ferrous contact in movable joints. Provide friction washers having ample area of friction contact surface. Design hinges to permit ready cleaning of the exterior face of the glass from the inside. Hinges shall be of ample strength and rigidity to support permanently glazed ventilator in any position without twist or sag. Hinges shall permit not more than 95 degrees swing of the ventilator. Hinge leaves shall be riveted or welded to the frame and to the ventilator. Finish hinges same as windows. At completion of project leave windows fitted for easy operation and hinges adjusted to a pull of approximately 9 pounds on the locking side.

(b) Locking handles shall be of plain substantial pattern. Handles shall be of die cast material, of rustproofed iron or of bronze of cam acting type engaging with beveled strikes, or with a raised seat integral with the frame.

16. SETTING AND ADJUSTMENT

(1) Windows and casings as received at building shall be carefully stored to prevent deformation, rust and injury and installed without delay to other work.

(2) Install windows and rigidly secure to the wood structural frame provided under division "Carpentry and Millwork". Metal to wood contacts shall be weather and water tight.

(3) Adjust ventilators after painting so that:

(a) Between the inside weathering surface of ventilators and their supporting frames, the metal-to-metal contact shall be so nearly perfect that when the ventilator is locked, it will not be possible to insert, without forcing, a metal feeler gage 1" wide and 1/32" thick at any point in the perimeter, nor will it be possible to insert, without forcing, a similar feeler gage 1/64" thick at any point along 60% of the perimeter of the ventilator.

(b) Demonstrate compliance by testing at least 10% of the windows installed as designated.

(4) Installation shall be by mechanics especially skilled in work of this character.

USHA STANDARD SPECIFICATIONS

ROOFING AND SHEET METAL WORK

1. SCOPE

(1) Roofing, sheet metal work and related items necessary to complete work shown or specified are a part of the contract unless specifically excepted. See "General Scope of Work".

(2) For extent and detail requirements see drawings.

(3) Roofing on surfaces having a pitch of more than 4 inches in 12 inches shall be cement asbestos shingles laid "American Method".

(4) Roofing surfaces having a pitch of 4 inches or less to 12 inches shall be sheet metal, flat seam.

(5) Sheet metal throughout the project shall be copper.

(a) For flashings at plumbing pipes through roofs see division "Plumbing."

(b) Flashing of plumbing pipes shall be coordinated with the work of the roofing contractor who is responsible for the proper joining of the flashing to the roof.

2. MATERIALS

(1) FELT (coal-tar-pitch saturated) either 32 or 36 inches wide, (Federal Specification HH-F-201) or (asphalt saturated) Federal Specification HH-F-191). (For use under cement asbestos shingles.)

(2) SHEET COPPER, conforming to Federal Specification QQ-C-501, Type V, 16 ounce (.0216), Class A (Hard) or Class B (Soft).

(a) Hard temper copper for gutters, downspouts, and other moulded work.

(b) Soft temper copper for base flashings and other flat work.

(3) SOLDER, composed of one half pig lead and one half tin, in bars, bearing manufacturer's name and brand.

(4) TIN, best grade virgin metal.

(5) FLUX, in paste form and non-acid.

(6) ROOFER'S PLASTIC CEMENT, shall comply with Federal Specification SS-C-153.

(7) SIZED BUILDING PAPER; weigh not less than 5 lbs. per 100 square feet.

3. SHEET METAL WORK - GENERAL REQUIREMENTS AND WORKMANSHIP

(1) Provide water and weather-tight construction for all sheet metal work. Lines, arrises and angles shall be sharp and true. Plain surfaces shall be free from waves and buckles.

(2) Avoid joints and seams as far as is possible. Where seams are soldered, tin metal for the full area of contact. Overlap seams in the direction of the flow. Soak single-locked seams

with solder and mallet flat double locked seams.

(3) Do soldering slowly, with well heated coppers, thoroughly heating the seams, and completely filling them with solder.

(4) Make ample provisions for expansion and contraction.

(5) Clean exposed metal surfaces as each section of the work is completed. Exercise care to prevent staining or discoloring other work in exposed portions of the buildings. Damaged work shall be repaired or replaced.

(6) Copper shall not come in contact with other metals, except lead; when joined to other metals, it shall be separated by a saturated fabric or canvas insulation.

4. SHEET METAL WORK

(1) BASE FLASHINGS: extend up on vertical surfaces not less than 8 inches.

(a) On flat roofs and roofs sloping less than 4 inches per foot, flat-lock with full solder joints.

(2) CAP FLASHINGS: lengths of sheets shall not exceed 10 feet; lap end joints not less than 2 inches and solder. Metal at angles shall be continuous, single locked and full soldered. Do not install until base flashing is in place and has been approved unless built in.

(3) STEP FLASHINGS: form continuous step flashings of separate pieces where vertical abut sloping roofs; build into the masonry, or let into reglets. Lap vertically not less than 3 inches and do not solder joints.

(4) VALLEY FLASHINGS FOR NON-METAL ROOFS: provide valley flashings of sheet metal strips not less than 20 inches wide with 1/2 inch water lock on edges. Install with clips or as shown.

(5) CRICKETS (SADDLES): form sheet metal crickets back of chimneys and similar projections through roofs, using flat-locked seams, full soldered.

(6) BAFFLE FLASHING: Provide and place sheet copper baffle flashing where concrete porch floors and platforms join or abut wood framing. Flashing to be as indicated on drawings and detailed.

(7) GUTTERS AND HANGERS: form of sizes and lengths shown, in 10 foot sections, joined by 1 inch lap joints. Rivet and solder joints, or provide interlocking slip joints. Make all joints lap in the direction of the flow. Round and reinforce outer edge of gutters. Provide with end pieces, caps, outlet tubes and mitres as required. Outlet tubes shall be of sufficient length to connect with downspouts. Provide room for expansion at high points.

(a) Support gutters on non-ferrous hangers. Space hangers not more than 36 inches apart and secure with brass screws.

(b) Slope gutters to downspouts at least 1/20 inch per foot.

(c) Provide flashing strips, extending under the roofing, not less than 4 inches, nail securely to roof deck.

(d) See drawings as to whether gutters and downspouts are required. See "Carpentry" for optional wood gutters.

(e) Where wood gutters are used provide all necessary sheet metal and make all sheet metal connections. Thimbles and sleeves for downspout connections shall pass through wood gutter bottoms and provide flanges on inside of gutter. Set thimbles and sleeves in mastic roofers cement or white lead and securely fasten with copper nails.

(8) DOWNSPOUTS: form of shape, sizes and lengths shown. Support, clear of the wall, by non-ferrous hooks, or by 3 inch wide metal straps having hemmed edges. Space hooks or straps not over 8 feet apart and over joints. Fasten straps to wall (bronze screws).

(a) Downspouts, crimped or corrugated, vertical joints, locked and soldered, in 10 foot lengths, horizontal joints lapped and soldered. Provide a 2 inch slip joint in every 20 feet of length.

(b) Fit downspouts into drain pipes with neatly calked and cemented joints, or with metal cap sheet, soldered to downspout.

(c) Provide goosenecks at top where off-sets occur.

(d) Provide elbows at bottom when not connected to drainpipes.

(9) STRAINERS: Provide and set loose in each gutter outlet a heavy copper wire strainer, basket type.

(10) VENTS, (Attic): Form of sheet copper as indicated and detailed.

(a) Screen cloth to be 16 mesh standard commercial bronze or copper. Solder or rivet to vent frames in secure manner.

(b) Provide suitable flanges and securely fasten vents to wood framing in each opening in gables of attic spaces. Set flanges in white lead and secure with brass screws or copper nails.

(11) CLEANING METAL: Clean all metal work when finished. Neutralize excess flux by washing with a 5 to 10 per cent solution of washing soda (or a solution of about one pound of lye in a pail of water). After cleaning, wash with clean water and oil with raw linseed oil except where other finish is required.

5. COPPER ROOFS

(1) For extent and detail requirements see drawings.

(a) Roofs pitched 4 inches or less to 1 foot shall be constructed with flat-locked and soldered seams;

6. MATERIALS

(1) COPPER shall be of 16 ounce metal.

(a) Sheets (for flat-locked seam roofing) 14 by 20 inches or 18 inches by 24 inches, in size, turned up on all edges to form 1/2 inch lock with adjoining sheets.

(2) BUILDING PAPER shall weigh not less than 20 pounds per roll of 500 square feet.

7. GENERAL REQUIREMENTS - WORKMANSHIP

(1) At eaves, lock flat seam roofing into edging strips, and provide standing seam to divert water from eaves (without gutters) over doorways.

(2) At valleys, fold seams flat, lock into valley flashings and solder.

(3) Where roofs abut vertical surfaces, form roofing sheets as base flashings, flat-lock, and solder. Turn up sheets on all abutting vertical surfaces not less than 8 inches and terminate under cap flashing as hereinbefore described.

8. LAYING PAPER

(1) Lay paper under all copper roofing parallel with eaves overlapping each layer not less than 3 inches horizontally and 6 inches vertically. Turn up not less than 6 inches on all abutting vertical surfaces. Fasten paper with nails spaced approximately 8 inches apart on all laps and edges.

9. FLAT SEAM ROOFS

(1) Lay sheets with short dimension parallel with eaves. Clip corners to permit folding; fold opposite sides of sheets in opposite directions to lock properly into adjoining sheets; fold cross seams in the direction of the flow. Secure sheets to sheathing with 2-inch wide copper cleats (two cleats on long side and one on short side of each sheet). Nail close to edges with copper nails and fold ends of cleats back over the nail heads. Flatten seams with a mallet and solder by filling the seams completely; finish seams not less than 1/2 inch wide.

10. TERMITE PROTECTION

(1) All wood shall be not less than eighteen inches above the ground except that wood outside of foundation walls may be eight inches above the ground where protected by termite shields.

(2) Provide 10 oz. hard copper shields for the prevention of termite infestation under wood framing of first floor as indicated and as follows:

(a) Where wood construction rests upon or otherwise in contact with concrete or masonry; except only the wood step in utility room.

(b) Across and around the entire area of chimney or flue base, at least 12 inches above ground level.

(c) All vertical runs of

piping extending from ground up to or through first floor construction.

(3) Shields shall be standard type and detail. Extend metal a minimum of 2 inches horizontally (unless otherwise detailed) beyond the exposed faces of masonry and pipe covering with free edges one inch wide turned down at an angle of 45° from horizontal plane. Continuous solder or interlock and tightly mallet all joints. Keep free edges at least 2-1/2" away from other construction.

(4) Connections of shields on all piping shall be continuous soldered, except that on pipes other than steam and hot water and on all cast and black iron piping, shields may be set in coal tar pitch having a softening point not less than 220° F and securely fastened in place. On insulated pipes attach shield to pipe prior to placing of insulation and extend shield two inches beyond outside face of insulation.

(5) Extend shields entirely across supporting masonry or concrete and bed or cover solidly with mortar.

(6) Where pipes, nails or bolts pierce shields, completely seal openings thereof with coal tar pitch.

11. CEMENT ASBESTOS SHINGLE ROOFS

(1) For extent and detail requirements see drawings.

(a) See "Sheet Metal Work" for flashing, cap-flashing, and other sheet metal work.

12. MATERIALS

(1) SHINGLES shall conform to requirements of Federal Specification SS-S-291, Type B, 1/4 to 5/16 inch thick, random width 6 to 10 inches, 16 inches long, laid with 2 inch head lap. Exposed surface slightly roughened by pits or ridges.

(a) Option: Multiple shingles giving the finish appearance and having the same thickness and head lap of the single shingles herein specified, will be acceptable.

(b) The color of shingles shall be gray or dark slate.

(2) FELT, asphalt saturated roofing felt weighing not less than 27 pounds per 100 square feet complying with requirements of Federal Specification HH-F-191.

(3) NAILS, roofers' flat head hard copper, of adequate sizes.

13. LAYING

(1) Lay one ply of roofing felt parallel with eaves, lapping each layer not less than 3 inches horizontally and 6 inches vertically. Nail felt with nails spaced approximately 8 inches apart on all laps. Overlap felt at ridges and hips not less than 12 inches and at valley flashings not less than 4 inches. Apply a separate strip of felt over ridges and hips overlapping the shingles before installing hip and ridge shingles.

(2) Lay shingles "American Method" 7 inches to the weather, thereby providing a 2 inch head lap.

(3) Provide standard cut shapes for hips, ridges and valleys.

(4) Lay shingles in accordance with manufacturer's directions in regular courses. Install cant strips as necessary for uniform cant of shingles.

(5) Provide double starting courses at eaves with an overhang not less than 1 inch. Valleys shall be open: approximately 4 inches of metal flashing exposed to view of each side of the valley center.

(6) Secure each shingle wit less than 2 nails of length properly fasten the shingles in no case shall nails penet completely through sheathing exposed to view underneath, penetrate flashing.

(7) Lay shingles at hips an ridges saddle type thoroughl bedded in roofers' cement.

(8) Leave shingles and sup- plementary shapes weathertig

USHA STANDARD SPECIFICATIONS

LATHING AND PLASTERING

1. SCOPE

(1) Lathing and plastering and related items necessary to complete work shown or specified are a part of contract unless specifically excepted. See "General Scope of Work."

(2) See "Schedule of Interior Finishes."

(3) Except as otherwise noted or specified, plaster base (lath) throughout shall be

(a) Gypsum Lath on interior partitions;

(b) Insulating lath on interior of exterior walls;

(c) Metal lath on walls and ceilings of utility rooms or cement asbestos board. See "Carpentry and Millwork."

(d) Ceilings of hoods over outside entrance doors covered with metal lath or wood. See "Carpentry and Millwork."

(e) Top-story ceilings where ceiling joists are 20" or more on centers metal lath shall be used as plaster base, 19" or less insulating lath may be used. See "Carpentry and Millwork" for ceiling stripping.

(4) Except as otherwise noted or specified, plaster throughout shall be

(a) Gypsum with smooth white-coat finish.

(b) Portland cement plaster on walls and ceilings of utility rooms or cement asbestos board, and portland cement plaster on ceilings of hoods over exterior entrance doors or wood. See "Carpentry and Millwork" for options.

2. MATERIALS

PORTLAND CEMENT, SAND, LIME, GYPSUM LATH, INSULATING LATH, AND GYPSUM PLASTER shall conform to either A.S.T.M. or Federal Specifications.

(1) LIME shall be either hydrated lime, or finely pulverized or lump quicklime, at the option of the contractor. Hydrated lime shall show when tested that the total free (unhydrated) calcium oxide (CaO) and magnesium (MgO) in the hydrated product does not exceed 8% by weight of the dry hydrated lime.

(a) Deliver packaged materials in unopened containers bearing manufacturers' names and brands.

(2) WATER shall be clean and free from oil, acids and other injurious matter.

(3) LIME PUTTY shall be a stiff mixture of lime and water, thoroughly slaked and allowed to cool.

(a) Putty made from pulverized quick or hydrated lime shall soak at least 72 hours after cooling and kept moist until used.

(b) Putty made from lump lime shall be slaked in accordance with manufacturer's directions and stored for at least three weeks before using. It shall be kept moist and before use shall be strained through a No. 10 sieve.

(4) GYPSUM LATH shall be 3/8" thick, stock sizes and perforated. Where gypsum lath is specified a paper-backed lath composed of zinc-coated 16-gage (.0625") wires spaced 1½" welded to 3/8" steel ribs spaced 4" may be used at contractor's option applied in accordance with manufacturer's instructions.

(5) INSULATING LATH shall conform to Federal Specification LLL-F-321a, Class B. proofed against vermin and rot-producing fungi; ½" thick, stock size.

(6) METAL LATH shall be either flat expanded, flat-rib expanded, V-rib expanded, "V" or rod stiffened flat expanded, welded or woven wire fabric and complying with Federal Specification QQ-B-101c except as otherwise specified.

(a) Expanded metal lath shall be of copper bearing steel, zinc-coated (galvanized) or coated with rust-inhibitive paint, after fabrication.

(b) Woven wire lath shall be of No. 19 (.041") gage, 2½ mesh per inch, zinc-coated (galvanized) after weaving.

(c) Welded wire fabric shall be No. 16 (.0625") zinc-coated (galvanized) wire, with absorptive paper backing either perforated or unperforated. The fabric shall not be larger than 2" by 2" mesh with stiffeners of truss loop self-furring type, or 13 (.0915") gage wire stiffeners across the backing at intervals of not more than 5". The fabric shall extend beyond the backing on two or three sides to provide reinforced laps in application.

(d) The "maximum" spacing of supports and the "minimum" weight of metal lath shall conform to the following:

SPACING OF SUPPORTS	WEIGHT OF METAL LATH IN POUNDS PER SQUARE YARD	
	WALLS	CEILING
13½" Centers.....		Flat exp., 3.0# Wire Lath, 2.48#
16" Centers.....	Flat exp., 2.5# Wire Lath, 2.48# Wire Fabric	Flat exp., 3.4# Flat Rib, 3.0# Wire Fabric
19" Centers.....	Flat Rib, 3.0#	
24" Centers.....	Flat Rib, 3.4# 3/8" Rib, 3.4# "V" or Rod Stiffened Flat exp., 3.4#	Flat Rib, 3.4# 3/8" Rib, 3.4# "V" or Rod Stiffened Flat exp., 3.4#
	Flat exp., 2.5# for solid plaster partitions	
		Flat exp., 3.4#

(7) CORNER BEADS shall be small bead type, 26-gage steel with perforated or expanded flanges not less than 2" wide, zinc-coated (galvanized).

(8) CORNERITES shall be strips of 2.5 pounds flat expanded metal lath bent at right angles to form not less than 3" legs each side.

3. GENERAL REQUIREMENTS

(1) Plaster on masonry surfaces not less than 5/8" thick, 3-coat work. Doubling back will be permitted.

(2) Plaster on gypsum and insulating lath not less than ½" thick, 3-coat work.

(3) Plaster on metallic lath not less than 3/4" thick, 3-coat work.

(4) Maintain a minimum temperature of 50° F. in spaces to be plastered. Protect plaster from freezing and too rapid drying.

(5) Install no rusted metal materials.

(6) Carry plaster down to floors on all walls and partitions.

4. INSTALLATION OF CORNER BEADS

(1) Install corner beads for all vertical and arched plastered external angles. Set vertical corner beads plumb, horizontal corner beads level, and form true arrises; extend full height or length of angles. Secure at ends and not more than 12" apart.

5. INSTALLATION OF CORNERITES

(1) Install cornerites on all interior angles where different materials occur in the surfaces to be plastered. Secure along each edge at not more than 6" intervals.

6. APPLICATION OF GYPSUM LATH

(1) End joints shall be over bearings only and staggered. Cut and neatly fit at angles, corners, around pipes and outlet boxes.

(2) Nail to wood supports with 1-1/8" 3d (13 gage), 3/8" head nails spaced approximately 4" on centers, ½" from edges, or secure with clips as recommended by manufacturer.

7. APPLICATION OF INSULATING LATH

(1) End joints shall be over bearings only, staggered and approximately 1/8" wide; bring interlocking or overlapping joints to moderate contact. In no case shall lath be forced or sprung into place.

(2) Nail at all bearings with 4d common, blued or box nails spaced approximately 4" on centers, 3/8" from edges.

8. APPLICATION OF METAL LATH

(1) Bridge joints with metal lath between materials of different nature requiring plaster.

(2) Lap flat expanded lath and wire lath ½" at sides and 1" at ends. Lap ribbed lath and welded wire fabric at the sides by nesting ribs or selvage, and 1" at the ends.

(3) Make and stagger end joints over supports. Secure side joints to supports and tie between supports at intervals not to exceed 6". Space all other attachments for securing lath, except clips, not more than 6" apart.

(4) Secure lath to horizontal wood supports with 1½" roofer's nails, or 14-gage wire staples or 1-3/8" approved nails for welded wire fabric.

(a) On vertical wood supports 1" roofer's nails will be permitted.

(5) Secure lath to metal supports with 18-gage tie wire, or zinc-coated clips of cold drawn spring steel wire not lighter than 12 gage.

(6) Lap lath over chases and recesses on all sides 4".

9. GYPSUM PLASTER

(1) Scratch coat on lath shall be one part "neat" gypsum plaster (for insulating lath quick setting) and two parts sand, by weight (approximately one part "neat" gypsum and 1½ parts sand, by volume).

(2) Brown coat on lath, and scratch and brown coats on masonry shall be one part "neat" gypsum plaster and three parts sand, by weight (approximately one part "neat" gypsum and 2¼ parts sand, by volume).

(a) If plaster is mixed by machine, the sand content may be increased to 3½ parts, by weight.

(3) Finish coat shall be three parts lime putty and approximately one part gauging plaster, by volume, or a mixture of gypsum, powdered marble and clay products producing a smooth, hard white surface.

10. PORTLAND CEMENT PLASTER

(1) Scratch, brown and finish coats shall be one part portland cement and three parts sand, by volume; add ¼ cubic feet of lime putty for each bag of cement used.

(a) Trowel finish coat to smooth, dense, straight and true surface.

11. APPLICATION OF PLASTER

(1) Before plastering, grounds, screeds, and corner beads, shall be secured in place. Dampen masonry surfaces by brushing or spraying. Do not wet gypsum lath or insulating lath.

(2) Scratch Coat: Apply with sufficient force to cause it to adhere firmly to plaster base. When the scratch coat has become firm but not dry, scratch to form a rough surface to provide a bond for the brown coat.

(3) Brown Coat: apply to true uniform planes and screed in both directions with a straight edge or floating rule (darby) to within 1/16" to 1/8" of the finished surface and leave rough to receive finish coat.

(4) Finish Coat: shall not be applied until brown coat is set and thoroughly dry. Apply 1/16" to 1/8" thick; allow to set a few minutes and trowel to a smooth, hard, polished finish.

(5) Unless otherwise shown or specified, all plaster shall be finished in true planes with dense surface without waves or depressions.

(6) Cracked, blistered, pitted and discolored plaster will not be acceptable.

12. PATCHING

(1) Point up around trim and other set work. Patch and point all plaster satisfactorily for painting. Patching of plaster shall match existing work in texture and finish, and at joining with plaster previously applied, shall finish flush and smooth. In no case shall sandpaper or other abrasive be used to clean or smooth finished plaster surfaces.

USHA STANDARD SPECIFICATIONS

GLASS AND GLAZING

1. SCOPE

(1) Glass and glazing and related items necessary to complete work shown or specified are a part of contract unless specifically excepted. See "General Scope of Work."

(2) Glaze windows with "SS-B" clear window glass, except as follows:

(a) Lights over 14" x 20" in size, "DS-B" clear window glass.

(3) Glaze doors (indicated as glazed) with "DS-B" clear window glass.

2. MATERIALS

(1) GLASS shall conform to Federal Specification DD-G-451 for Clear Window Glass, Type B.

(2) MANUFACTURER'S LABELS showing strength and quality will be required on all glass.

(3) PUTTY for glazing in wood shall comply with Federal Specification TT-P-791a, Type II, White Lead Whiting.

(4) PUTTY for metal-sash-glazing shall comply with Federal Specification TT-P-781, Type I.

(5) Furnish affidavits from manufacturers, certifying that material delivered to the project conforms to requirements herein specified. Check tests may be required by the Authority at its own expense.

3. GLAZING

(1) Rebates shall be clean and dry before glazing. Do not glaze in damp, rainy or dusty weather, or when temperature is lower than 40° F.

(2) In wood windows, do not set glass until sash have been primed. (See "Painting.") Bed glass in putty especially prepared for use with wood sprig, and apply putty as hereinafter specified.

(3) In metal windows bed glass in putty especially prepared for use with metal. Secure with wire glazing clips in full number provided (see "Windows"), and apply putty as directed by the manufacturer.

(4) In wood exterior doors, do not set glass until rebates have been primed. (See "Painting.") Bed glass in putty and secure with wood beads fastened with brass brads.

(5) Use putty as it comes from the container without adulteration and in compliance with "Notes" of applicable Federal Specifications.

(6) Bed glass completely in putty. Apply putty with sufficient pressure on the knife to insure complete adhesion to glass and to frame. Cut off putty immediately after the glass is bedded, with full, smooth, accurately formed bevels having clean-cut miters.

4. CLEANING

(1) Clean glass on both sides after putty is painted. (See "Painting.") Do not use acid solution or water containing caustic soaps. Do not disturb edge of putty with scrapers.

(2) At completion of contract, leave glass whole, free from rattle, and clean both sides.

LINOLEUM

1. SCOPE

(1) Linoleum and related items necessary to complete work shown or specified are a part of contract unless specifically excepted. See "General Scope of Work".

(2) Cover entire area of floors of Bath Rooms throughout project with linoleum.

2. MATERIALS

(1) Linoleum shall conform to Federal Specifications LLL-L-351a - BATTLESHIP of 1/8 inch thickness or LLL-L-361-JASPE of one eighth inch. The color, finish and pattern shall match a sample selected from manufacturer's standard shades and approved by the Authority. Linoleum shall be delivered in full rolls, or be factory cut to room lengths, each piece and roll labeled with manufacturer's name, brand and gage.

(2) Paste shall be water resistent, of a type recommended by manufacturer of linoleum. Deliver in sealed containers, and use without adulteration.

(3) Furnish affidavits from manufacturers, certifying that material delivered to the project conforms to requirements herein specified.

3. LAYING

(1) Maintain temperature at least 70 degrees F. in linoleum storage spaces. In rooms where linoleum is to be laid maintain temperature at least 70 degrees F. for 48 hours before, and after, linoleum is laid. Lay linoleum flat in spaces to be covered for 12 hours before pasting.

(2) Employ only workmen skilled in laying linoleum.

(3) Clean and remove grease and other matter from surfaces to be covered.

On wood sub-floors paste a layer of felt, weighing approximately one pound per square yard. Butt edges and roll, forming a smooth base for adhesion of linoleum.

(4) Paste linoleum to base, roll and obtain complete contact and adhesion.

(5) Finished work shall have a minimum of joints. Form joints by overlapping linoleum not less than 1/2 inch, cutting through both thicknesses. Cut and fit accurately at ends, edges and joinings with other materials.

(6) Finished surfaces shall be smooth and free from waves, buckles and projecting edges.

4. CLEANING AND POLISHING

(1) Remove spots and stains. Polish by waxing and machine buffing.

USHA STANDARD SPECIFICATIONS

PAINTING

1. SCOPE

(1) Painting and related items necessary to complete work shown or specified, are a part of contract, unless specifically excepted. See "General Scope of Work."

Obtain approval of colors, tints, and finishes from authority prior to application.

(2) PAINT EXTERIOR WOODWORK and siding three coats of lead-in-oil or prepared paint as specified.

(a) PRIME WINDOW FRAMES, sash and doors before glazing. Paint putty after surface has hardened.

(b) COAT PULLEY STILES and edges of wood sash with boiled linseed oil upon fitting, and after toxic retreatment if so specified in "CARPENTRY AND MILLWORK." Pulley stiles must not be painted.

(c) No paint will be required on asbestos shingle siding when used or on plaster ceilings of hoods over entrance doors when used.

(3) INTERIOR WOODWORK of kitchens, bathrooms and utility rooms painted three coats.

(a) Wood floors, stair treads and risers and handrails stained, waxed and/or varnished.

(b) Remainder of interior woodwork throughout either painted three coats or stained, waxed and/or varnished at contractor's option, in accordance with specification requirements.

(4) STAIN INTERIOR WOODWORK except floors, and woodwork in kitchens, bathrooms and utility rooms, one coat of stain and one coat of wax or two coats of stain-wax. Back paint exterior trim (see CARPENTRY.)

(a) Back paint exterior trim (see CARPENTRY): no back painting will be required on interior trim.

(b) Coat wood shelving in closets with boiled linseed oil.

(c) Stain all edges of doors after fitting.

(5) Wax-finished surfaces shall be buffed to highest sheen possible, smooth and free of excess concentrated wax.

(6) PAINTED INTERIOR WOODWORK: Paint one coat of primer and two finish coats.

(7) FINISH WOOD FLOORS wood stair treads, platforms and risers as specified.

(8) See "Carpentry" for sanding; remove all dust, dirt, et cetera, prior to application.

(9) Adequately protect finished surface by restricting passage or by protection with heavy kraft paper glued at edges and at laps until acceptance of work by Authority.

(10) PAINT PLASTER SURFACES (except kitchens, bathrooms and utility rooms) two coats of emulsified synthetic resin-water paint.

Thoroughly brush and remove all dust from surface before application

(11) TREAT AND PAINT PLASTER in kitchens, bathrooms and utility rooms, three coats of oil paint as specified.

(a) In event cement asbestos board is used on walls and ceilings of utility rooms, treat same as specified for plaster in these rooms.

(12) PAINT EXTERIOR METAL WORK (uncoated ferrous) three coats as specified.

(13) PAINT METAL WINDOWS (factory primed) two coats as specified.

(14) PAINT INTERIOR METAL WORK except radiation three coats as specified.

(15) PAINT RADIATORS with two finishing coats of oil paint as specified.

(16) PAINT PIPING exposed in all spaces where walls, trim or ceilings are painted with three coats of paint as specified for interior metal work.

(17) PAINT COVERING on all pipe, fittings, and expansion tank in attic space and on boiler (when not furnished with insulating baked enamel steel jacket) with two coats, the first coat being a canvas sizing having a varnish base and the second coat a heavy brush coat of lead in oil paint.

(18) Prime coats herein specified will not be required on items delivered to project with prime or shop coat already applied.

(19) Factory applied shop coat material shall meet approval of Authority, otherwise it shall be in accordance with material herein specified.

(a) See other divisions of specification for items specified therein to have prime or shop coat of paint.

(b) Do not paint metal having plated finish, non-ferrous metal or metal that is zinc or lead-coated unless primed or shop-coated or otherwise specifically required.

2. MATERIALS - GENERALLY

(1) BASIC COMPONENT MATERIALS entering into manufacture of paints, et cetera, herein specified shall conform to applicable A.S.T.M. or Federal Specifications.

(2) PRIMERS, UNDERCOATS, et cetera, herein specified, may be either mixed on the project or delivered factory-mixed.

(a) Thin factory-mixed paints or in accordance with manufacturer's printed directions.

(3) When prepared from paste on project, mix paints not less than 24 hours before using; cover containers during this period and strain before using. Add some thinner and all of the driers just before application.

(4) White lead and zinc oxide (paste-in-oil) shall be factory ground.

(5) Except where specifically stated otherwise, paint formulas herein are based on the use of soft paste. Heavy paste may be used, provided quantity of turpentine as given in each formula is increased by ½ gallon.

(6) Volatile mineral spirits, or a mixture of turpentine and volatile mineral spirits, may be substituted for turpentine.

(7) PAINT shall not settle badly or cake in containers and when ready for application shall be well mixed. Paints after being broken with a paddle shall be smooth, uniform, and of good brushing consistency.

(8) After application, paint shall not run or sag unless otherwise specified, shall dry to touch within 18 hours.

(9) COLOR PIGMENTS shall be color stable, finely ground substances.

(a) Colors for tinting of paints applied on plaster, masonry, and concrete surfaces shall be lime-proof colors.

(b) Pure color pigments ground in linseed oil shall be added in both paste-in-oil and ready-mixed paints as required to produce tints to match colors selected for finish paint.

(10) Prior to application, furnish affidavits from manufacturers certifying that materials delivered to the project conform to requirements herein specified.

(a) Deliver paint materials and factory-prepared paints in manufacturer's sealed containers labeled with formula of contents, and his name and address.

3. PAINT - EXTERIOR WOODWORK

(1) Formula paint:

(a) First Coat, Primer:

White-Lead Paste
(88% dry pigment).100 pounds

Vehicle
Raw Linseed Oil.. 4 gal.
Turpentine.....1-3/4 gal.
Drier..... 1 pt.
Net weight per gallon - 16 pound minimum.

(b) Second Coat:

White-Lead Paste
(88% dry pigment).100 pounds

Vehicle
Raw Linseed Oil.. 1½ gal.
Turpentine..... 1¼ gal.
Drier..... 1 pt.
Net weight per gallon - 21 pounds minimum.

(c) Third Coat:

White-Lead Paste
(88% dry pigment)..100 pounds

Vehicle
Raw Linseed Oil.. 3 gal.
Drier..... 1 pt.
Net weight per gallon - 20 pounds minimum.

or

(d) Third Coat:

White-Lead Paste
(88% dry pigment).75-80 lbs.

Zinc-Oxide Paste
(84% dry pigment).20-25 lbs.

Vehicle
Raw Linseed Oil.. 3 gal.
Turpentine..... 1 qt.
Drier..... 1 pt.
Net weight per gallon - 18⅓ pounds minimum.

(2) Prepared Paint (Factory-Mixed Only)

(a) Paints for first, second and third coats shall conform to either Federal Specification TT-P-36a, Type II, Class "A", or "B" or TT-P-101a, Type A or B as follows:

(b) Use either of the above paints in "white." If paint is to be tinted, use only Federal Specification TT-P-36a, Type II, Class "A" or "B". Class "A" for dry inland regions; Class "B" for use along sea coast.

(c) Use TT-P-101a Type A for general outside use; Type B for special outside use where sulphide fumes will darken paints containing lead.

4. PAINT - INTERIOR WOODWORK

(1) Formula Paint:

(a) First Coat, Primer:

White-Lead Paste
(88% dry pigment)..100 lbs.

Vehicle
Raw Linseed Oil... 2⅔ gal.
Turpentine..... 2 gal.
Drier..... 1 pt.
Net weight per gallon - 17 pounds minimum.

(b) Second Coat:

White-Lead Paste
(88% dry pigment)..100 lbs.

Vehicle
Raw Linseed Oil... 1⅔ gal.
Turpentine..... 2 gal.
Drier..... 1 pt.
Net weight per gallon - 18½ pounds minimum.

(c) Third Coat; Flat-Finish:

White-Lead Paste
(88% dry pigment)..100 lbs.

Vehicle
Interior Varnish.. 1 pt.
Turpentine..... 2 gal.
Drier..... ½ pt.
Net weight per gal.-23 lb.min.

or

(d) Third Coat, Semi-Gloss Finish:

White-Lead Paste
(88% dry pigment)100 lbs.

Vehicle
Interior Varnish..1½ gal
Turpentine.....1 gal
Drier..... ½ pt.
Net weight per gallon - 21 pounds minimum.

(2) PREPARED PAINTS (Factory-mixed only)

(a) First Coat, Primer: Shall conform to Federal Specification TT-P-56.

(b) Second Coat: Shall be mixed in proportions of 2 gallons of paint (Federal Specification TT-P-51a), to 1 gallon of interior varnish (Federal Specification TT-V-71).

(c) Third Coat, Flat: Shall conform to Federal Specification TT-P-51a and be applied as taken from container.

or

(d) Third Coat, Semi-Gloss: Shall be mixed, equal parts, of paints conforming to Federal Specifications TT-P-51a and TT-E-506a, Type A. If higher gloss is desired, reduce TT-P-51a and increase TT-E-506a, Type A.

5. STAIN AND WAX INTERIOR WOODWORK

(1) First Coat - Stain

Stain shall be a standard manufactured commercial brand, clear toned, pigmented, non-fading material that will not cloud nor obscure grain of the wood. Stains shall be free from dyes that would

bleed through subsequent coats of wax, paint or varnish.

or

Stain shall consist of one part raw linseed oil, one part drier and two parts turpentine with color-in-oil added to obtain color selected. If boiled linseed oil conforming to Federal Specification JJJ-O-331 is used drier may be omitted.

(2) Second Coat, Wax: (For interior woodwork other than wood sash and stools)

Wax shall be mixed in the proportions by weight of 2 parts Carnauba Wax, 2 parts ceresin and 3 parts turpentine and 3 parts gasoline (Sp. gr. about 0.73), or a prepared wax conforming to Federal Specification P-W-141, Type II. Wax shall be rubbed to produce a high sheen.

or
Stain-Wax, Factory Prepared Combination; (For interior woodwork other than wood sash and stools)

A factory-prepared mixture of stain and wax may be used on interior woodwork other than for wood sash and stools, in lieu of one coat of stain and one coat of wax with approval of Authority. The surface shall be given two coats applied in accordance with the manufacturer's directions. Buffing or wiping after each coat shall be done to create the highest sheen possible.

(3) Second Coat, Varnish (For wood sash and stools)

The second coat on wood sash and stools in spaces where woodwork is stained and waxed shall be one coat of spar varnish complying with Federal Specification TT-V-121a.

6. WOOD FLOORS

(1) Prepared Material (factory-mixed only)

(a) First Coat, Filler (on oak only)

Filler shall conform to Federal Specification TT-F-336. Filler may be thinned to obtain proper consistency; apply with a brush or mop and work into surface by rubbing across grain with mops or rags. After filler has "set", rub across grain until all surplus material is removed.

(2) Second Coat, Sealer

Sealer shall conform to Federal Specification TT-S-176 applied uniformly with a lambs-wool mop; allow to dry hard and rub smooth with clean steel wool. Sealer shall be applied as taken from the container without thinning except on maple floors, when it shall be thinned with turpentine or mineral spirits not in excess of one quart to each gallon of sealer.

(3) Third Coat, same as second coat

Surface shall be dust free before applying; allow to dry hard and rub smooth with fine steel wool.

(4) Fourth Coat, Water Emulsion Floor Wax

Floor wax shall conform to Federal Specification P-W-151, Type 2 (Concentrated). Apply with cotton string mop. After wax has thoroughly dried, buff to the highest possible sheen.

7. WOOD FLOORS OPTIONAL FINISH

(1) At the contractor's option subject to approval of the Authority a two-coat sealer may be used in lieu of the aforesaid four-coat treatment if it complies with the following conditions:

(a) The material shall be factory prepared and delivered to the project in factory-sealed containers bearing the manufacturer's name and brand.

(b) It shall be a composition that has been in commercial use, giving satisfactory service more than five years and shall have given satisfactory service and economical maintenance results on large scale housing project.

(c) It shall be composed of drying oils, vegetable or synthetic gums and waxes with mineral spirits with or without permanent coloring matter, containing no aniline dye.

(d) It shall not raise grain or show laps and shall produce a finish which after wear may be patched or touched up without showing visible laps.

(e) The material shall be applied in saturating coats, according to manufacturer's instructions, and produce a hard, tough, wear resisting, water resistant, non-staining surface which shall be buffed with fine steel wool to a polish satisfactory to the Authority, and protected as specified for other floor finishes.

8. SHELVING

(1) Thoroughly coat all surfaces of closet shelving with boiled linseed oil conforming to Federal Specification JJJ-O-331, applied hot. Wipe with clean cloths to remove surplus oil. Provide adequate ventilation to allow drying and prevent stickiness.

9. PLASTER SURFACES (other than kitchens and bathrooms)

(1) Emulsified Synthetic Resin Water Paint (Factory prepared only).

First and Second Coats shall consist of a paint made from well incorporated, highly pigmented paste consisting of water dispersing high strength lithaphone or titanium pigments or mixture thereof and a vehicle of emulsified phenolic of alkyd oleoresinous varnish which shall be miscible with water. Coloring material shall consist of alkali resisting pigment. Suitable preservative shall be added to paint if necessary. Paste when mixed with water as directed by manufacturer (in absence of specific instructions - one volume of water to two volumes of paste) shall brush easily, have good flow and spread, high hiding power, and good washability and shall not cake or skin in container. It shall set to touch within two hours and dry within six hours at temperature between 70° and 90° F.

The material, when mixed to produce a satisfactory working paint, shall recoat (5 coats in 5 days) on "galvanealed" sheet iron, plaster, sheet rock, brick, cement, celotex, masonite, and other composition wall board, without piling up or softening of the under coat. At the end of sixth day there shall be no

cracking or pulling up from previous coat or coats, no flaking, curling, chipping, pitting, or "cratering" when applied to any or all of the above-mentioned surfaces. After paint has been mixed and applied according to manufacturer's directions and allowed to dry five days, marks made with soft lead pencil (No. 2) shall be easily removable by careful washing with a sponge dampened with soapy water, without appreciably marring the surface, and black cloth shall not be soiled by gentle rubbing dry paint film. Before applying paint all iron and steel such as nail heads, et cetera, shall be cleaned and primed with oil paint to prevent rust staining.

10. PLASTER SURFACES (Kitchens, Bathrooms, et cetera)

(1) Surface Treatment: Treat plaster less than three months old by brush application with solution made by dissolving three pounds of zinc sulphate in one gallon of water. Add slight amount of color (washing blue) to prevent skipping areas. After drying not less than 48 hours, brush loose crystals from surface.

(2) Primer - First Coat: Shall conform to Federal Specification TT-P-56 and shall have some color pigment (approaching color of finish coat) added to help hiding power.

(3) Second Coat: Shall consist of one part paint conforming to Federal Specification TT-P-56 and two parts of TT-P-51a.

(4) Third Coat, Semi-gloss: Shall be mixed, equal parts, of paints conforming to Federal Specificati TT-P-51a and TT-E-506a, Type A.

(5) Third Coat, Semi-gloss:

White-Lead Paste
(88% dry pigment)...100 lb.

Vehicle
Varnish..... 1½ gal.
Turpentine..... ½ gal.
Drier..... ½ pt.
Tinting color-in-oil as required.
Net weight per gallon - 21½ pounds minimum.

11. EXTERIOR METAL WORK (UNCOATE FERROUS)

(1) First Coat - Primer:

Red Lead Paste Pigment
(95% grade).....100 lb.

Vehicle
Raw Linseed Oil....1-7/8 gal
Turpentine..... 2½ pt.
Drier (resin-free). 2½ pt.
Net weight per gallon - 24½ pounds, minimum.

or (Factory Prepared only)

Paint pigment shall consist of 66% Spanish oxide and 33% zinc chromate. Vehicle shall be a water-resistant, tough, very a herent, hard-drying liquid com posed of suitable drying oils, hard gum varnish, drier and th ner. The paint shall set to t in 2 hours; dry to firm film w in 6 hours and dry suitable fo recoating (with regular or syn tic base enamels) within 18 ho The paint shall be such that s sequent coats will not lift previous dried coats.

Net weight per gallon not less than 10 nor more than 12 pound

(2) Second Coat, Light Tints:

White-Lead Paste
(88% dry pigment).....100 lb.

Vehicle
Varnish (TT-V-121a).. 3 pt.
Turpentine..... 1½ gal.
Drier..... 1 pt.
Net weight per gallon - 22 lb.

or Second Coat, Dark Colors (Factory Prepared only):

Green paint shall conform to Federal Specification TT-P-71, "Green Paint," except that the liquid portion shall contain not less than 60% linseed oil and 20% high grade spar varnish, the balance to be thinner and drier.

or Brown Paint shall conform to Federal Specification TT-P-31, "Iron Hydroxide Paint," except that the liquid portion shall contain not less than 60% linseed oil and 20% high grade spar varnish, the balance to be thinner and drier.

or Black Paint shall conform to Federal Specification TT-P-61, "Black Paint," except that the liquid portion shall contain not less than 60% linseed oil and 20% high grade spar varnish, the balance to be thinner and drier.

(3) Third Coat, Flat, Light Tints (Lead-Zinc Paint):

White-Lead Paste
(88% dry pigment).....75-80 lb.

Zinc-Oxide Paste
(84% dry pigment).....20-25 lb.

Vehicle
Spar Varnish..... 1 qt.
Turpentine..... 2 gal.
Drier..... ½ pt.
Net weight per gal. - 20 lb. min.

or Third Coat, Flat, Light Tints (White-Lead Paint):

White-Lead Paste
(88% dry pigment).....100 lb.

Vehicle
Spar Varnish..... 1 qt.
Turpentine..... 2 gal.
Drier..... ½ pt.
Net weight per gallon - 19½ pounds minimum.

Third Coat, Dark Colors: (Factory Prepared only):

Green Paint, same as specified for "Second Coat - Green."

Brown Paint, same as specified for "Second Coat - Brown."

Black Paint, same as specified for "Second Coat - Black."

12. METAL WINDOWS (FACTORY PRIMED)

(1) First Coat, White-Lead Paint, (White or light tints):

White-Lead Paste
(88% dry pigment).....100 lb.

Vehicle
Raw Linseed Oil..... 2 gal.
Turpentine..... ¼ gal.
Drier..... 1 pt.
Net weight per gallon - 19½ pounds minimum.

or Same as specified for "First Coat - Primer - Exterior Metal Work (uncoated ferrous)."

(2) Second Coat, White-Lead Paint:

White-Lead Paste
(88% dry pigment)..... 100 lb.

Vehicle
Raw Linseed Oil.....2-3/4 gal.
Spar Varnish..... 1 qt.
Drier..... 1 pt.
Net weight per gal. - 19½ lb. min.

Second Coat, (Dark colors as Green, Brown, Black, et cetera) Shall be same as specified for "Second Coat - Exterior Metal Work (uncoated ferrous)."

13. INTERIOR METAL WORK (UNCOATED-FERROUS)

(1) First Coat - Primer: Same as specified for "First Coat - Primer - Exterior Metal Work (uncoated ferrous)."

14. INTERIOR METAL WORK (UNCOATED-FERROUS)

(1) First Coat - Primer: Same as specified for "First Coat - Primer - Exterior Metal Work (Zinc coated)."

(2) Second Coat: Same as specified for "Second Coat - Interior Metal Work (uncoated ferrous)."

(3) Third Coat: Same as specified for "Third Coat - Interior Metal Work (non-ferrous)."

15. RADIATORS

(1) First Coat specified under "Heating."

(2) Second and Third Coats: Oil Paint: Paint shall be as specified for "Interior Metal Work." Second Coat applied either before or after setting radiators in place; third coat applied after the radiators are set in place. (Walls, and other work back of radiators shall be completely finished as specified). Paint may be sprayed if local practice permits.

16. PAINT COLORS AND SAMPLES

(1) Colors shall be selected by Authority. Prepare samples (approximately 8" by 10") for approval. After approval, six record samples of each kind and color, properly identified with formula, manufacturer's name and address, shall be furnished to the Authority.

(2) For exterior work a maximum of six different colors will be required.

(3) For interior work a maximum of six different colors will be required.

(4) Before proceeding, finish one entire dwelling unit to show approved colors and materials. After approval, this dwelling unit, except for remainder of selected colors, shall serve as standard.

17. APPLICATION

(1) Spaces shall be clean and free from dust and rubbish before applying any paint.

(2) No exterior paint to be applied in damp, rainy weather, or when temperature is below 50° F. No varnish to be applied when temperature is below 70° F., nor in any place not closed and protected from draft and dust.

(3) Paint and varnish coats shall be well brushed on, evenly worked out, and allowed to dry before subsequent coat is applied.

(4) All paint shall be applied with brushes. The use of pneumatic tools or sprays will not be permitted unless specifically authorized in writing by Authority.

(5) Store materials where directed. Oily rags, waste and empty cans shall be removed from site every night, and under no circumstances left in unventilated rooms or allowed to accumulate.

(6) Furnish and lay drop cloths where necessary and protect floor and adjacent work from damage.

(7) Surfaces to be primed shall be dry, smooth and adequately protected from dampness.

(8) After priming, shellac pitch pockets, streaks and knots. Aluminum primer allowed in lieu of shellac if colored paints selected adequately conceal same.

(9) Putty nail and similar holes or defects with white lead and whiting putty. Wax or compound putty for stained woodwork shall be colored to match finished work.

(10) Sand and clean surfaces as necessary prior to application of each coat of paint.

(11) Each coat of paint shall be slightly different tints from preceding coat to prevent skipping; well brushed on and evenly worked out and allowed to dry before subsequent coat is applied.

(12) All work shall be done in a neat, workmanlike manner by skilled mechanics and shall be uniform in appearance, of approved color, smooth and free from runs, sags, defective brushing and clogging of lines and angles. Edges of paint adjoining other materials or other colors shall be sharp and clean without overlapping. Should workmanship of painted finish be found defective in any respect, the contractor shall, after proper preparatory work, apply such additional coats necessary to give a finish in accordance with the specifications and color samples.

(13) Surfaces that have been cut for fitting of other material or for other reasons shall be finished and of same color as surface immediately adjacent.

(14) Remove any paint spots, oil and stain from floors, woodwork, glass, hardware and other similar items.

(15) At completion, touch up and restore finish where damaged or defaced and leave in first-class condition.

USHA STANDARD SPECIFICATIONS

BUILDERS (FINISH) HARDWARE

(Materials Only)

1. SCOPE

(1) Except for items specified under other divisions, furnish all items of builders (finishing) hardware for all buildings as follows: (See "General Scope of Work.")

(a) Installation is provided under "CARPENTRY AND MILLWORK."

(2) Where the size or shape of members to be equipped with hardware prevents or makes unsuitable the use of exact types specified, suitable types having as nearly as practicable the same operation and quality as the type specified, shall be furnished; sizes shall be adequate for the service to which the individual item of hardware will be subjected in the course of normal usage.

(3) Should items of hardware not definitely specified be required for completion of the work, furnish such items of type and quality suitable to the service required and comparable to adjacent hardware.

(4) Hardware for metal windows, wood windows and metal screens, kitchen cabinets, rough hardware for carpentry and miscellaneous metal work, and hardware for mechanical and electrical equipment is specified in appropriate divisions of the work.

2. MATERIALS

(1) Builders' hardware shall conform to the requirements of the following Federal Specifications as amended to date and to the descriptive hardware as noted herein. Where specific requirements are modified, said modifications shall be carefully followed and strictly adhered to.

PADLOCKS-------No. FF-P-101A
LOCKS AND
LOCK TRIM-----No. FF-H-106
SHELF AND MISC. No. FF-H-111
HINGES---------No. FF-H-116A
DOOR CLOSERS...No. FF-H-121A

(a) All bolts, knobs, escutcheons, face plates, and strikes shall be bronze.

(b) All lock cases shall be iron, japanned, or wrought iron rust-proofed, as provided in the above Federal Specifications.

3. FINISH

(1) Except as otherwise specified, finish for all hardware shall be:

(a) U. S. 9 or 10 - Hardware generally.
(b) U. S. 26 - Hardware in baths and toilets.
(c) U. S. -P- Primed for painting - Hinges generally.
(d) Finish for door closers shall be statuary bronze sprayed finish or may be manufacturer's standard finish.

(2) Either finish specified under sub-paragraph (a) may be used.

4. KEYS AND KEYING

(1) All cylinder locks of different changes shall be furnished

with three keys each.

(2) Where locks are specified to be keyed alike in any one system or set, only one key shall be furnished with each lock, with a total of at least three keys for the set.

(3) Each key shall be die stamped with the number of lock change.

(4) Padlocks shall be provided with two keys each.

(5) Bit key locks shall be provided with two keys each.

(6) All cylinder locks to one dwelling unit to be keyed alike and to have three keys for the series.

(7) All cylinder locks for the project shall be master keyed except as specifically excepted elsewhere. Specific master key directions shall be obtained from the Authority. Six cylinder master keys shall be furnished for each series of the project. No grand master key system will be required. Master keys shall be delivered to the Authority by the Contractor, and after delivery the Contractor shall not be held responsible for same.

(8) In Flat buildings, door from street shall be operable by the keys to all dwelling units served by this door. All cylinder locks to or in a dwelling unit to be keyed alike with three keys for the unit.

(9) Emergency release keys shall be provided for all Bathroom door locks.

5. KEY CONTROL SYSTEM AND KEY CABINET

(1) A visible key control system, as herein described, shall be furnished to provide a central unit for the control of all keys for locks required throughout the project.

(2) Furnish for installation where directed by the Authority an approved wall-type cabinet with a sufficient number of combination hook and label pockets for all locks on this project, except locks on interior closet doors. The cabinet shall be constructed of heavy gage furniture steel and have an approved locking device; finish to be olive green enamel, baked on.

(3) The cabinet shall have approved label sheets, consecutively numbered, for insertion in the label pockets. Furnish for each hook in the cabinet, one key tag of a permanent locking type; this tag to be made of vulcanized fiber as approved by the Authority and shall be octagonal in shape, approximately 1-1/4" in diameter and red in color; these tags shall bear the legend "File Key - Must Not be Loaned," and shall also be die-stamped with consecutive numerals to correspond with the labels in the hook pockets. The cabinet shall also contain one brass receipt holder for each hook therein and a sufficient number of receipt forms for records of all current keys, together with a cross index for listing keys alphabetically, numerically, and by lock serial number.

6. PACKING AND MARKING

(1) All items of hardware and each lock set shall be packaged separately in its individual container and shall be complete with necessary screws, keys, instructions and

installation templates for spotting mortising tools.

(2) Each individual container shall be marked with an item number corresponding to number shown on schedule.

7. MANUFACTURERS' HARDWARE SCHEDULE

(1) Before fabrication of hardware, the Contractor shall submit for approval a full and complete schedule, of hardware, in triplicate, indicating the type, number, location, and finish of each item required. Approval of this schedule does not relieve the Contractor of responsibility for furnishing all necessary builders' hardware items.

8. SAMPLES

(1) One sample of each item of hardware shall be submitted for approval. No hardware shall be delivered until prior approval is obtained.

(2) Sample items will be retained by the Authority until other hardware has been applied; then turned over to the Contractor for installation on the project.

9. HINGES

(1) Hinges of any one type shall be the product of one manufacturer.

(2) Doors in exterior openings which open outward, except screen doors, shall have hinges with pins so arranged that they cannot be withdrawn when the door is in a closed position.

10. HINGE SCHEDULE

(1) Exterior Doors, except as h inafter specified, shall be Type 2014-1/2 P except that those hin shall be furnished with sherardi finish for painting and prime co ed, and provided with brass pins lieu of regular pins. All hinge shall be 4-1/2" x 4-1/2" x 1-1/2 pairs each door. For stained do hinges shall be type 2015-1/2.

(2) Interior Doors, except as h inafter specified, shall have 1- pairs of hinges, Type 2014-1/2 P for painted doors and Type 2015- for stained doors. Hinges for d 1-3/8 inch in thickness shall be 4-inch x 4-inch.

(3) Screen Doors shall have one pair of Type 203IA butts, sherar dized and prime coated for paint 3" x 3" for screen doors 1-1/8" thickness.

11. ESCUTCHEON SCHEDULE

(1) Furnish for exterior and in ior of all doors, escutcheons of type required for proper operati of locks and latches. Except as otherwise required by the lock o latch specified, escutcheons sha be type 300, 301 or 302 to suit conditions.

(a) Tubular locks and latches shall have Rose Type 330, modified as required.

(b) Cylindrical locks and latches shall have roses of the type and size recommended by the manufacturers.

(2) In lieu of the above escutcheons, designs other than shown in Federal Specifications may be used, subject to approval. Such escutcheons shall be of sizes sufficient to span the lock and of material and finish herein specified.

12. KNOBS

(1) Door knobs and spindles shall comply with requirements of Federal Specifications and shall be of the type and size hereinafter specified. Knobs of design other than shown in the Federal Specification, of approximate size specified, either wrought, forged, or plastic, may be used if approved.

(2) Knobs shall have cast bronze shanks or shanks machine turned from bar stock of bronze or wrought bronze with machined finish bearings. Outside knobs shall be pinned fast to spindles.

(3) Knobs shall be as follows:

(a) EXTERIOR DOORS, except as otherwise specified. Outside only - size 2-1/4 inches diameter - Type 210-B. Inside - size 2 inches diameter - Type 210-B.

(b) INTERIOR DOORS, except as otherwise specified. Size 2 inches, both sides - Type 210-B. Closet Doors - size 2 inches - knobs on outside - Closet spindle with thumb turn on inside.

13. CLOSERS

(1) Closers for screen doors shall be Type 3015, one each door.

14. DOOR STOPS

(1) Door stops shall be provided for all exterior and interior doors where the swing of the door will permit the knobs to strike the wall. Door stops shall be a wall type not less than 2½" long and of cast iron, plated. Tips shall be of rubber. Screw shall be provided for securing to wood and suitable expansion shields provided for materials other than wood.

15. LOCKS

(1) All cylinder locks throughout entire project shall be the product of one manufacturer and shall have the fronts secured to cases by machine screws.

(2) The hubs of cylinder knobs, locks and mortise bit key locks for exterior doors shall be of brass or bronze.

(3) All cylinders shall be supplied with cylinder rings made of wrought bronze of proper size to fit door thickness.

(4) All bit key mortise locks and mortise latches, Type 4, 17 and 28, shall have lock cases, fronts and strikes of the same external measurements to suit a standardized mortise for all interior dwelling unit doors.

(5) The lock construction of Types 4, 17-A, and 28, shall be as specified in the FF-H-106 specifications for Type 4 lock, except that it shall be of the

single compression type.

(6) Locks in the following "Lock Schedule" where noted by letter, refer to lock group scheduled herein according to function. At the option of the Contractor, mortise, tubular or cylindrical locks may be used, provided that only one type of lock, including cylinder, is used throughout the project. Locks shall be complete with escutcheons, knobs, roses and similar items as required and hereinbefore specified. Numbers in schedule are Federal Specification numbers, where two numbers are given under any one type of lock, both pieces shall be provided. In lieu of locks specified by Federal Specification Number, locks of manufacturers' stock design, similar in quality and function may be used, subject to approval.

Group	Mortise	Tubular	Cylindrical
A	136-28	*154-150	165*
B	17A	151	162
C	28	150	160
D	93	*154-150	165
E	4	*153-150	164*/
F	136-28	*154-150	165*

*Operation: Latch bolt by knob from outside. By thumb turn or knob from inside, locked or unlocked by key from outside. Thumb turn or inside knob always free.
/ Latch bolt dead-locks automatically when door is closed.

16. LOCK SCHEDULE

(1) Houses (Twin and row)

	Type
Front Entrance Doors	A
Rear Entrance Doors	F
Bathroom Doors	B
Closet Doors (one each Dwelling Unit)	E
Closet Doors (except as above)	C
Inter-communicating Doors & Bedroom Doors	C

(2) Flat Buildings:

	Type
Front Entrance Doors (from street)	A
Entrance Doors - Stairhall to Dwelling Unit	A
Rear Entrance Doors	F
Bathroom Doors	B
Closet Doors (one each Dwelling Unit)	E
Closet Doors (except as above)	C
Inter-communicating Doors & Bedroom Doors	C

(3) Locks for Miscellaneous Doors:

(a) Screen Doors - Latch 1086 Option: A type of screen door latch that provides a combination door pull and latch handle in a single unit.

17. COAT HOOKS

(1) Coat Hooks, Type 1162-B Standard Stock Finish, shall be provided for all closets, except linen closets. Provide 5 hooks for each closet.

(2) One Robe Hook, Type 1162A shall be provided (on doors) in each bathroom and toilet room.

18. CLOTHES HANGER BAR

(1) One Clothes Hanger Bar, Type A-1010 shall be provided for each closet, except linen closets; bar shall run the longest dimension of the closet and be rigidly secured.

(2) One Curtain Bar, Type A-1010 shall be provided for each closet having open front.

(3) In lieu of the above Type A-1010 Clothes and Curtain Hanger Bars, bars formed of standard galvanized iron wrought iron pipe with elliptical flanges, permitting bars to be placed in jambs of openings as near front edge of jamb as possible will be acceptable.

(a) Pipe poles for clothes hangers shall be 3/4 inch diameter, curtain hanging poles 1/2 inch.

(b) Ends of pipe holes and flanges may be threaded on smooth. Provide suitable screws for securing in place.

19. PADLOCKS AND HASPS

(1) Padlocks, Type 1a - size 2", shall be provided for coal boxes.

(2) Hasps, Type 1420 - 4½" in size, or similar type safety hasp required to suit conditions, for all padlocks, except where hasps are called for in other divisions of the specifications.

20. HANDRAIL BRACKETS (FOR WOOD HANDRAILS ONLY)

(1) Brackets similar to Type 1064-A shall be provided with wood screws for attachment to wood framing. Brackets shall be provided for all wood handrails when rails are attached to walls; they shall support ends of rails and be spaced approximately 5 feet apart.

21. BATTEN DOORS

(1) Hinges, Type 2208, size 6", 1 pair each door. Barrel Bolt, Type 1019-A - size 4".

22. ACCESS DOORS

(1) Access Doors to unexcavated or pipe spaces:

Hinges: one pair either "T" or mortise to suit conditions.

Hasp: one to suit conditions.

Padlock: one each door.

23. LETTER BOXES

(1) One sheet brass letter box of type approved shall be provided for each dwelling unit in flat buildings and for each row house. Boxes shall be complete with spring attachment for paper holder, 2 keys, and adequate attachment device for securing to wall construction.

24. LETTERING AND NUMBERING

(1) Provide for each front entrance door four 2" ceramic tile numbers (black numerals on white tile) in non-ferrous metal holder.

(2) The number shall be in accordance with the assignment as designated by the Authority.

(3) 3" non-ferrous numerals or letters will be acceptable in lieu of the above; finish shall match finish of hardware. Design and type shall be as selected.

USHA STANDARD SPECIFICATIONS

SHADES

1. SCOPE

(1) Window shades and related items necessary to complete work shown or specified are a part of contract unless specifically excepted. See "General Scope of Work."

(2) Furnish and install shades at all glazed exterior openings (windows and doors).

(a) Where multiple wood windows are shown, provide each window with a separate shade.

(3) Furnish and install brackets for curtain and drapery rods at windows where shades are required.

2. MATERIALS AND MANUFACTURE

(1) SHADE CLOTH shall conform to applicable requirements of Federal Specification CCC-C-521a and Amendment 2 for Type II - Holland, or Type III, Pyroxylin impregnated, of approved color (same both sides) to be selected from the manufacturer's standard commercial colors.

(2) SHADES, ROLLERS, SLATS, CORDS and ACCESSORIES shall conform to applicable requirements of Federal Specifications DDD-S-251, except as herein specified and equipped with crocheted ring pull.

(a) SHADE BRACKETS for doors shall be regular outside type and for windows, suitable approved design

(3) Brackets for curtain and drapery rods shall be combination type

(4) FURNISH AFFIDAVIT from manufacturer certifying that the shades installed at the Project conform to the requirements specified. Check tests of shade cloth may be required by the Local Authority at its own expense.

3. INSTALLATION

(1) Mount brackets securely with suitable screws.

(2) Hang shades square and level and in accordance with best trade practices.

(3) Leave shades in perfect working condition, free from defects.

USHA STANDARD SPECIFICATIONS

SITE IMPROVEMENTS

1. SCOPE

(1) All site improvements and related items necessary to complete work shown or specified are part of contract unless specifically excepted. See "General Scope of Work".

(a) "Site improvements", as herein specified, comprise required work not within building lines and not specified in other Divisions. Site improvements include but are not limited to the following: street and driveway paving, walks, other surfacing, curbing, spray pool, fencing, clothes line posts, and similar work as shown on the drawings.

(b) Grading, lawns and planting, and utilities (sewers, water, gas, electric, heating lines, and appurtenances) are not specified in this Division.

2. SUBGRADE FOR SITE IMPROVEMENTS

(1) Perform any grading in addition to that specified under "Clearing, Excavating and Grading" to bring subgrades, after final compaction, to required grades and sections for site improvements. Puddle and tamp traces of trenches. Remove spongy and otherwise unsuitable material and replace with approved material. Loosen exceptionally hard spots and recompact. Take every precaution to obtain a subgrade of uniform bearing power. In absence of specific requirement, compact subgrades by such means as will provide firm base and insurance against settlement of superimposed work.

(2) Jet according to standard prac tise fills over 4 feet in depth (placed under this contract) with limits of areas to be surfaced; allow fill to settle and dry out b fore final preparation of subgrad

(3) Maintain subgrades in satisfa tory condition and properly drain until surface improvement is plac

3. CONCRETE MATERIALS

(1) Except as otherwise specified, materials shall conform to A.S.T.M or Federal Specifications. Furnis samples for tests to be made by Authority, at site or source of supply, as directed.

(2) Cement shall be standard Port land or High Early Strength Portl Cement. Furnish notarized certifi cates of mill test reports in triplicate.

(3) Aggregates shall be Grade A co forming to Federal Specification SS-A-281.

(a) Coarse aggregate of concrete pavement shall be of size designated No. 4 to 2 inches, coarse aggregate for all other concrete in site improvements to be No. 4 to 1-1/2 inches.

(4) Water shall be clean and potab

(5) Reinforcing steel bars shall b of deformed section, rolled from new billet stock. Welded steel wire fabric shall be made of cold drawn steel wire. Reinforcement shall be free from excessive rust

or scale.

(6) Premoulded joint filler shall consist of cane or other suitable long fibers of cellular nature and asphalt; asphalt content shall be between 35 and 50 percent by weight. Filler shall not be susceptible to being deformed by ordinary handling during hot weather or to becoming hard and brittle in cold weather.

(7) Protect stored cement against elements on platforms off ground. Store in separate location cement for which mill test or laboratory test reports have not been received. Handle and store aggregates separately in manner to prevent intrusion of foreign matter, or segregation. Use no materials frozen or containing ice, or any hardened cement. Immediately remove from site all materials rejected.

4. PROPORTIONING AND MIXING CONCRETE

(1) Except as otherwise specified, concrete for site improvements shall be composed of one part by volume of Portland cement and six parts of aggregates, measured damp and loose, the coarse and fine aggregates to be so proportioned that a dense mix is obtained. Only sufficient water shall be used to produce a plastic, workable concrete after thorough mixing.

(2) Mix in power-operated batch mixer at least one minute after all ingredients are in mixer.

(3) Transport ready mixed concrete to site in watertight agitator or mixer trucks loaded not in excess of rated capacities. Discharge at site within 1-1/2 hours after water has been introduced into mixer.

(4) Deliver ready dry batched mixes of cement and aggregates to site in vehicles having batch compartments of proper size for rated capacity of mixer. Do not add water until batch is deposited in mixer. Deposit in mixer within 1-1/2 hours after cement is added to batch.

5. PLACING CONCRETE

(1) Place concrete only on a firm, moist subgrade, but on which are no pools of standing water. In no case place concrete on frozen subgrade, or mix and place concrete when atmospheric temperature is below freezing.

(2) Tops of forms shall be at exact finished grades. Forms shall be clean, true to line and firmly staked in place. They shall be strong enough to resist pressure of concrete without springing and sufficiently tight to prevent leakage of mortar.

(3) Spade concrete thoroughly along forms, expansion joints and separation plates; tamp and screed to dense mass. Finish surfaces as hereinafter specified.

6. CURING CONCRETE

(1) Except as otherwise specified, cure concrete by keeping surface covered with burlap, hay, sand or other approved material, covering material to be kept wet for at least 72 hours and then completely removed.

(2) Whenever atmospheric temperature is below 40 degrees F., maintain concrete at temperature of at least 50 degrees F. for period of not less than 5 days after pouring (3 days when high early strength cement is used).

7. STREET SIDEWALKS

(1) Construct concrete walks in city streets in accordance with city specifications and requirements therefor; if City Specifications for sidewalk are not available, the Specifications for "Concrete Walks" shall be followed.

8. CONCRETE WALKS

(1) These specifications apply to all concrete walks except street sidewalks.

(2) Walk thickness shall be 4 inches. Cut slab into approximately square flags by separation plates 1/8 to 3/16 inch thick, extending full depth of concrete except that:

(a) for walks 3 feet and less in width flags to be approximately 5 feet in length;

(b) for walks more than 6 feet in width, full-depth joints to be approximately 5 feet apart.

(3) Provide 1/2-inch expansion joints (with premoulded filler) not more than 50 feet apart, also at junctions with street sidewalks, at top and bottom of steps, around utility structures, where walks abut buildings, platforms and other fixed structures, and elsewhere as shown. Provide one-inch expansion joints (with filler) where walks terminate at curbs.

(4) Tamp and screed concrete true to grade and section, bringing sufficient mortar to surface for finishing and give wood or carpet float finish before concrete sets. Round all edges, including those at separation plates and expansion joints, to 1/4-inch radius. Where walks terminate at curbs, finish walk 1/4 inch above curb, providing neat bevel.

(5) Permit no pedestrian traffic on concrete walks for a period of 3 days after pouring.

(6) Walk cross slope, for sloped or crowned walks, shall be 1/4 inch per foot. Make slight adjustments in grades and cross slopes to connect with existing work and to adapt new work to drainage scheme.

(7) At points where change in rate of grade of main walks is more than two percent, introduce approved short vertical curves.

9. CONCRETE BLOCK WALKS

(1) Concrete blocks for walks and areas may be cast either flat or on edge, spading concrete to give a dense mass. Minor imperfections in the surface, edges or corners shall not be considered objectionable; no rubbing or other finishing is required.

(2) Leave forms in place at least 24 hours. Allow blocks to harden until they can be handled and laid without damage.

(3) Bed blocks firmly and evenly on well temped earth subgrade, with butt joints and/or as stepping stones if so shown.

10. CONCRETE STEPS

(1) These specifications apply only to steps shown apart from buildings.

(2) Compact subgrade thoroughly by tamping and carefully trim to required shape. Construct forms in workmanlike manner and in such way that those forming exposed surfaces can be readily removed without damage to fresh concrete.

(3) Remove face boards as promptly as practicable, correct defective places and rub down entire surface smoothly; plastering is not permitted. Finish treads with wood float. Unless otherwise shown, round edges and noses to 1/2-inch radius.

(4) Do not open steps for use for 7 days, or set hand rail (if any) for 14 days, after concrete is placed.

(5) Hand rail shall be of standard galvanized 1-1/2 inch I.D. steel pipe and galvanized malleable iron fittings, secured with through pin fastenings upset and filed flush and smooth. Set posts extending into concrete or masonry into built-in sleeves and calk with lead or cement.

11. CONCRETE GUTTER, CURB AND COMBINATION CURB AND GUTTER

(1) Construct concrete gutter, curb and combination curb and gutter in city streets to conform to City specifications; other than in City streets comply with the following specifications.

(2) Construct gutter, curb and combination curb and gutter in uniform lengths of approximately 10 feet, except at closures where lengths may be not less than 6 feet. Separate sections by 1/8-inch steel templates.

(3) Provide 1/2-inch expansion joints (with premolded filler) not more than 50 feet apart and at points of tangent of street returns and intersecting curbs.

(4) Exception to requirements in preceding paragraphs (2) and (3), with respect to joints, is made for case of curb or combination curb and gutter adjoining concrete pavements; in such case joints in curb and combination curb and gutter shall be continuations of transverse joints in slab.

(5) Remove templates and forms as promptly as practicable; correct minor defects by patching with mortar and rub to a smooth surface concrete to be exposed; plastering not permitted. Finish edges at joints with suitable tool.

12. WOOD CURBING

(1) Wood curbing shall be sound and square edge short leaf yellow pine or mixed oak, treated by one of the following wood preservatives:

(a) Coal Tar Creosote, with minimum absorption of 6 pounds per cubic foot.

(b) Zinc Chloride, with minimum retention of one pound of dry salt per cubic foot.

(c) Wolman Salts or Zinc Meta Arsenite, with minimum retention of 3/10 pound per cubic foot.

Lumber cut after treatment shall hav

cut surfaces brush coated with three hot applications of preservative used for treatment.

(2) Wood curbing shall be 2-inch, rough, of height at least equal to depth of abutting surfacing. Two thicknesses of 1-inch material may be used around curves.

(3) Unless otherwise shown, set top of wood curbing 1/4-inch below finished grade. Anchor curbing with 2-inch by 4-inch stakes (treated as specified), 2 feet long and not more than 3 feet apart, tops of stakes to be at least 1-inch below finished grade.

13. CONCRETE PAVEMENT

(1) Construct pavement in City streets in accordance with City specifications and requirements. In absence of City specifications therefor, comply with specifications here given, which apply also to all concrete pavement not in City streets.

(2) Compact subgrade uniformly by means of power roller weighing approximately 5 tons; hand tamp thoroughly areas not accessible to roller. Excavate rock 6 inches below subgrade level.

(3) Concrete pavement shall be as hereinbefore specified in this Division.

(4) Reinforce pavement with 6-inch by 6-inch wire mesh with No. 6 gage wire both ways, placed 2 inches below surface of slab and extending to line 3 inches from edge. Lap fabric sheets at least 6 inches.

(5) Dowels across expansion joints shall be 3/4 inch smooth round bars 24 inches long, spaced not more than 15 inches on centers and not more than 7-1/2 inches from edge of slab. Bond in one slab shall be prevented by painting with one coat of red lead and oil followed, when paint is dry, by thick film of heavy oil. Provide close fitting sleeve not more than 6 inches long over unbonded end of bar, with suitable flange to keep end of bar at distance, from end of sleeve, not less than thickness of expansion joint. Dowels shall be secured in position exactly parallel to surface and to center line of slab.

(6) Form expansion joints with premoulded filler. Hold filler firmly in place with suitable bulkhead so that top of filler will be 1/2 inch below finished surface. Place and strike off concrete on both sides of joint before removing bulkhead. Fill joint space to surface of pavement with poured joint filler.

(7) In addition to expansion joints shown, provide joints with filler where pavement adjoins walks, manholes, water boxes, platforms, buildings and other structures.

(8) Provide transverse contraction or "dummy" joints by forming in approved manner in surface of slab a slot not less than 1/4 inch wide and having depth equal to 1/4 of depth of pavement. When bar forming slot is removed before surface finishing is completed, fill joint space immediately with strip of premoulded filler; when bar is removed after finishing operation is completed, fill joint space with poured filler.

(9) Provide construction joint when placing of concrete is suspended for more than 30 minutes at location where expansion joint is not required, provided that if concreting is stopped within 5 feet

of a previously made transverse joint, concrete shall be removed to this joint. Form construction joint by depositing concrete against bulkhead cut to cross section of pavement. Provide dowels as required for expansion joint, with one end unbonded, except sleeves not required. Seal top of joint with poured filler.

(10) Longitudinal joints shall be of the deformed metal plate (tongue and groove) type, plate to be not lighter than 16 gage and have depth 1/2 inch less than pavement section. It shall be punched for tie bars and pins, as shown. Pins shall be of such length and so spaced as to hold plate firmly in place. Plate shall not have error in alignment of more than 1/2 inch in 50 feet. Provide 1/2-inch round tie bars of deformed section 2 feet 6 inches long spaced 2 feet 6 inches on centers. Fill top of joint with poured filler.

(11) All joints shall be cleanly formed and perpendicular to surface of the pavement. Round edges of slabs at all joints to 1/4-inch radius.

(12) Float concrete surface in approved manner and test with 10-foot straight-edge. Correct irregularities greater than 1/4 inch in 10 feet and remove laitance by belting or light screeding. Before concrete sets and edges are rounded, sweep surface at right angles to center line with coarse broom to produce uniform non-skid finish.

(13) Concrete in integral curb shall be deposited not more than 30 minutes after concrete in slab is placed.

(14) As soon as concrete has set sufficiently to prevent marring of surface, it shall be cured by following or other approved method: Cover surface completely with heavy burlap and keep same saturated with water for not less than 12 hours. Remove burlap and cover concrete completely with at least 3 pounds of hay or straw per square yard, keeping same continuously wet for not less than 6 days. Remove and dispose of covering material.

(15) Provide suitable barricades and permit no foot traffic on pavement for 3 days and no vehicular traffic for 14 days after pouring concrete.

14. BRICK SURFACING (SAND BASE)

(1) Brick shall be hard, sound, dense building brick of approved color.

(2) Lay brick flat on one-inch sand cushion spread on evenly graded, well compacted subgrade. Conform as closely as practicable to pattern shown. Where surfacing abuts lawn or planted areas, dimensions indicated may be increased or decreased by half width of brick to avoid cutting.

(3) In absence of walks or other permanent side supports, form edging 4 inches in width by 8 inches deep by means of brick placed on end. Leave in place boards supporting this edging until topsoil is placed.

(4) Compact brick in place at required grade with tamper striking a piece of 2-inch plank; correct inequalities until surface is firm and smooth. Replace broken or misshapen brick. Sweep joints full of fine dry sand and retamp, leaving slight surplus of sand on the surfa

15. CONCRETE AREAS

(1) Construct concrete areas in conformity to all applicable requirements of specifications hereinbefore given for "Concrete Walks". Provide full depth joints and marking as shown.

16. GARBAGE COLLECTION PLATFORMS

(1) Construct garbage collection platforms in conformity to all applicable requirements of specifications hereinbefore given for "Concrete Walks".

17. SAMPLES OF SURFACING

(1) Upon direction of the Authority prepare for advance inspection a specimen approximately one square yard in area of any type of surfacing, other than concrete, to be laid under this contract.

18. SPRAY POOL

(1) Comply with specifications given in this Division for concrete work, except add hydrated lime (6 percent by weight of cement) or other approved admixture to concrete mix.

(2) Rub concrete surfaces, except floor, to smooth finish. Screed floor accurately to required slope and finish smoothly and uniformly with wood float. Except as otherwise shown, round all edges to 1/4-inch radius.

(3) Piping connections are included in work covered by Division "Utilities (Sewers, Water, Gas)".

19. SPLASH BLOCKS

(1) Work concrete into forms so that exposed surface of splash blocks will have dense finish. Leave forms in place at least 48 hours and damp cure as specified.

(2) Bed blocks in final position after topsoil has been placed.

20. FLAG POLE

(1) Furnish and set standard flagpole as shown.

(2) Flag-pole shall be fabricated in sections of new standard weight copper-bearing seamless steel pipe, of diameters, thicknesses and lengths required for pole of this type. Shop joints shall be hydraulic bell die-swaged, shrunk and calked steel to steel. Field joints shall be calked steel to steel, air-tight and water-tight, joints to be made without bolts, pins, rivets, screw couplings or lead calking.

(3) Pole shall be fitted with ball of 20-ounce copper, sized proportionately to height; heavy ball bearing truck with bronze spindle; two sets of best grade Manilla rope halyards with bronze swivel flag snaps; two 9-inch cleats; a ground protector; and cast iron ornamental base as shown.

(4) Flag-pole shall be painted one shop coat of red lead and oil and at time of erection shall receive two coats of approved aluminum paint.

(5) Before shipment, submit to Authority for approval four copies of shop drawing and specification.

21. CHAIN LINK FENCES

(1) Chain link fabric shall be 2-inch mesh and comply with Federal Specification RR-F-191 for zinc coated fencing, wire to be 0.148

inch in diameter and top and bottom edges of fabric to have knuckled finish.

(2) Other fence materials shall be hot-dip galvanized after fabrication, zinc coating to weigh not less than 2.0 ounces per square foot of surface. Ferrous materials, other than malleable iron, shall be open hearth steel with not less than 0.2 per cent copper content (ladle analysis), provided that posts of rolled section may be high carbon steel.

(3) Minimum requirements for fencing having fabric 3 feet in width, unless otherwise shown on the drawings, shall be as follows:

Line Posts:	
H, I or U section	1.80 lbs.per ft.
Pipe	2-in. OD, 2.72 lbs. per ft.
End, corner and gate posts:	
H, I or U section	2.40 lbs.per ft.
Tubular square section	2-in. OD, 3.65 lbs. per ft.
Pipe	2-1/2-in., OD, 3.65 lbs.per ft.
Top rail	1-3/8-in. OD, 1.68 lbs. per ft.
Lacing	No. 7 or equiv.
Lacing spacing:	
To posts	14 inches
To top rail	24 inches
Maximum spacing of posts	10 feet
Concrete settings for line posts:	
Depth below finish grade	2 ft., 4 inches
Height above fin. grade	2-in. bevel
Diameter	10 inches
Bottom of post above bottom of setting	4 inches
Concrete settings for end, corner and gate posts:	
Depth below finish grade	3 feet
Height above fin. grade	2-in. bevel
Diameter	12 inches
Bottom of post above bottom of setting	6 inches
Depth of post settings (grouted) in masonry walls	12 inches

(4) Minimum requirements for fencing having fabric 6 feet in width, unless otherwise shown on the drawings, shall be as follows:

Line posts:	
H, I or U section	4.10 lbs. per ft.
Pipe	2-1/2 in. OD, 3.65 lbs.per ft.
End, corner and gate posts:	
H, I or U section	5.25 lbs. per ft.
Tubular square section	2-1/2-in. OD, 6.50 lbs.per ft.
Pipe	3-in. OD, 5.79 lbs. per ft.
Top rail	1-5/8-in. OD, 2.27 lbs.per ft.
Lacing	No. 7 or equiv.
Lacing spacing:	
To posts	14 inches
To top rail	24 inches
Maximum spacing of posts	10 feet
Concrete settings for line posts:	
Depth below finish grade	3 feet
Height above fin. grade	2-in. bevel
Diameter	12 inches
Bottom of post above bottom of setting	6 inches
Concrete settings for end, corner and gate posts:	

Depth below finish grade	3 ft. 6 in.
Height above fin. grade	2-in. bevel
Diameter	12 inches
Bottom of post above bottom of setting	6 inches
Depth of post settings (grouted) in masonry walls	18 inches

(5) Provide approved post tops, sleeves and other fittings for complete installation. For 6-foot fences, provide approved truss bracing for panels adjoining end, corner and gate posts.

(6) Unless otherwise shown, gates shall be 3 feet wide, frames to be at least 1-3/8-inch O.D. pipe (or equivalent), welded. Provide malleable iron hinges and approved latches. Cover with fabric specified.

(7) Fill tubular posts with concrete to level at least 4 inches above finish grade.

(8) Upon completion, posts shall be plumb and in proper alignment and fabric stretched uniformly and as tightly as practicable without pulling it out of shape.

22. CLOTHES LINE POSTS

(1) Clothes line posts shall be of approved H or I section or of extra strong pipe, material to be open hearth steel of at least 0.20 percent copper (ladle analysis) or high carbon steel. Posts shall be heavily galvanized after fabrication. For lengths of supported clothes line up to 60 feet use 4.1-lb. H or I beam or 2-inch I.D., E.S. pipe. For lengths of supported line of from 60 to 120 feet use 3-inch, 5.7 lb. I beam or 2-1/2 inch I.D., E.S. pipe.

(2) Unless otherwise shown, provide approved hook welded near top of each post, posts to be of such length that hooks will be 6-1/2 feet above finish grade. For tubular posts provide malleable iron caps.

(3) Provide concrete settings at least 12 inches in diameter and 3 feet deep below finish grade, trowel to beveled finish 2 inches above finish grade; bottom of post to be 6 inches from bottom of concrete setting. Set posts so that greater dimension is in line with maximum pull from clothes lines. Line and plumb posts accurately. Fill tubular posts with concrete to a level at least 4 inches above finished grade.

(4) Clothes line posts located in fence lines may be utilized as fence posts.

USHA STANDARD SPECIFICATIONS

UTILITIES (SEWERS, WATER AND GAS)

1. SCOPE

(1) All sewers and cold water and gas piping, appurtenances, thereto, and related items, outside of buildings, necessary to complete the work shown or specified, are a part of this contract unless specifically excepted. See "General Scope of Work".

(a) Extension of storm and sanitary sewers from building walls to points 5 feet outside thereof, also hot water and hot water circulation lines in their entirety, are specified under other Divisions.

(2) Contract provisions relative to codes and ordinances, and to inspection fees and permits, are set forth in General Conditions.

2. TRENCHING FOR INSTALLATION OF UTILITIES

(1) Excavate and backfill as necessary for all underground sewers and water and gas piping and appurtenances thereto, specified under this Division.

(2) Excavate trenches of sufficient width for proper installation of work and grade bottom of trenches evenly, providing bell holes as necessary to insure uniform bearing for pipes. Excavate rock 3 inches below bells of pipe. Refill all cuts below grade with sand or fine gravel firmly compacted.

(3) Exercise extreme care to protect roots of existing trees. Cut no root greater than one inch in diameter unless in way of finished work. Perform all trenching within spread of tree branches by methods approved by Authority.

(4) If "rock" is encountered Contract Price shall be adjusted as provided under "Changes in the Work" in General Conditions. "Rock" is defined as boulders containing over 1/2 cubic yard and all ledge rock or cemented material, which in the opinion of the Authority require the use of explosives or drills.

(5) Should latent soil conditions necessitate special supports for piping, "Contract Price" will be adjusted as provided under "Changes in the Work" in General Conditions. Perform any such work as local authority directs.

(6) Sheath and brace trenches, and remove water, as necessary to protect workmen and adjacent structures and permit proper execution of work. No pipe or masonry shall be laid under water.

(7) After piping installed has been tested and inspected, backfill excavations with approved material tamped or puddled compactly in place. Under pavements and other surfacing compact in layers not exceeding 6 inches. Observe care in backfilling not to disturb pipe. Use no rock for backfill for depth of 2 feet over top of pipe. During backfilling, remove sheeting in such manner that pipe will not be disturbed.

(8) Repair to satisfaction of the City all existing street pavement, curbs, sidewalks, etc., re-

moved or damaged, unless same are to be removed or replaced under this contract. Repair to satisfaction of the City or of utility company involved, any sub-surface improvement damaged during progress of work (unless such improvement is specified to be abandoned or removed), whether or not the improvement is shown on the drawings.

3. SEWER MATERIALS

(1) Pipe and fittings for sanitary and combined sewers shall be vitrified clay pipe complying with Federal Specification SS-P-361 and amendment thereto. Pipe may be either of standard or deep and wide socket type. For 8-inch pipe and larger, a minimum length of 3 feet per piece is preferred. With approval of the Authority, concrete pipe as specified in next paragraph may be used if local code and practice permit.

(2) Pipe and fittings for storm sewers shall be vitrified clay pipe as above specified or concrete pipe complying with Federal Specifications SS-P-371, concrete pipe 24-inch and larger to be reinforced, smaller sizes non-reinforced.

(3) Provide proper fittings for installation and connection of all lines.

(4) Cast iron soil pipe and fittings for sewers shall comply with Federal Specification WW-P-401.

(5) Brick for manholes, catch basins, inlets, etc., shall be hard-burned common brick having low absorption, or well burned No. 2 paving brick. Special radial brick or concrete blocks may be used with Authority's approval.

(6) Castings for manholes and other sewer structures in streets and drives shall conform to City Specifications. Castings for manholes in planted areas and walkways shall weigh not less than 300 pounds and conform to applicable requirements of City Specifications. Castings for drainage structures other than in streets and drives and for spray pool drain shall have approximate form and dimensions shown. Castings shall be of best quality soft grey iron, sound and true to pattern; and shall receive two coats of coal tar pitch varnish at foundry.

(7) Concrete for sewer construction shall be a 1:2:4 mix, conforming to applicable requirements of Division "Concrete Work." Joint mortar shall be a 1:2 Portland cement-sand mix, masonry mortar to be 1:3. At Contractor's option, hydrated lime may be substituted for not to exceed 10 percent of cement used in masonry mortar.

(8) Bituminous compound for tile pipe sewer joints shall be product of acceptable quality and shall have been in general use for a period of at least five years. It shall run freely at 250 degrees F., adhere tightly to pipe surface and, when set, permit slight movement of pipe without injury to joint. Compound shall form tight joint when poured in cold or wet pipe. It shall not deteriorate when submerged in water or domestic sewage and shall show no deterioration when immersed for 5 days in one percent solution of hydrochloric acid or 5 percent solution of caustic potash. Submit upon request analysis of compound proposed for use.

4. SEWER CONSTRUCTION

(1) Provide all connections to city sewers, including new manholes or other work required. Furnish proof of acceptance from city department having jurisdiction.

(2) Raise or lower existing manholes as necessary to conform to finish grades. In raising manhcles, cut down walls sufficiently to permit extending in diameter sufficient for convenient access.

(3) Construct sewers located in public rights of way, including rights of way to be dedicated within project site, to conform to City regulations and requirements. Elsewhere, perform sewer construction in compliance with specifications following.

(4) Lay sewers in straight lines and on uniform rates of grades between points where changes in alignment or grade are shown. Bed barrel of pipe firmly at required line and grade as determined from batter boards, set not over 25 feet apart. Keep stopper in mouth of pipe when pipe-laying is not in progress.

(5) In making cement joints, spread joint mortar of proper thickness in bottom one-third of circumference of bell. Force into mortar a closely twisted hemp or oakum gasket thick enough to hold spigot centered in bell and long enough to lap at top. After pipe has been "shoved home", ram gasket into place and fill remainder of joint space with mortar, bevelling same off at 45-degree angle and cleaning interior of pipe after joint is made. Observe necessary precautions to prevent sagging of mortar while fresh and cracking of joints while backfilling.

(6) In making bituminous joints, caulk tightly a twisted dry hemp or oakum gasket, free from tar or oil, so as to center spigot in bell, and place bituminous compound at single pouring in accordance with manufacturer's instruction to fill remainder of joint space. Two pipes may be jointed vertically on the bank, provided they are lowered and laid without injury to the joint. Every joint must be in perfect condition when trench is backfilled.

(7) Joints in cast iron soil pipe lines shall be as specified in Division "Plumbing".

(8) Lay brick in manholes, catch basins, inlets and other sewer structures with shove joints, completely filled with mortar. Horizontal joints shall not exceed 1/2 inch, vertical joints 1/4 inch on interior face. In circular structures lay all brick as headers, breaking joints between courses. Strike interior joints smooth with face of brick. Place steps as shown.

(9) Apply 1/2-inch plaster coat to interior of catch basins from bottom to water line. Plaster exterior of sanitary sewer manholes, minimum thickness 1/2 inch.

(10) Construct flow channels in manholes of concrete and/or brick true to plan and section.

(11) Provide drop inlets into manholes for incoming lines located 2-1/2 feet or more above inverts of outlet lines; encase drop pipes in brick masonry or concrete from

bottom of manhole over top of incoming pipe.

(12) Unless otherwise required, set tops of manhole castings at exact finish grades and depress tops of drainage openings 2 inches below finish grades.

5. UNDERGROUND WATER PIPE AND APPURTENANCES

(1) Except as otherwise shown, underground water pipe, 3 inch and larger, shall be Class B, bell and spigot, cast iron pipe, complying with A.W.W.A. specifications, or Class 150 cast iron pipe, Type I, II or III, complying with Federal Specification WW-P-421. Fittings shall be A.W.W.A. standard, Class D.

(a) If local water department (or company) and practice permit and with approval of the Authority, Universal cast iron pipe (Federal Specification WW-P-421, Amendment 2 for Type IV pipe and Class 250 fittings) or cement lined pipe may be used.

(2) Copper tubing for underground water piping smaller than 3-inch shall be Type K, complying with Federal Specification WW-T-799; fittings shall be cast bronze, or cast or wrought copper suitable for sweat joints with copper tubing, with wall thickness not less than that of tubing Tubing and fittings shall have suitable clearances for solder. Solder shall meet manufacturer's recommendations.

(a) Store tubing in protected place and take precautions to prevent tubing from being flattened.

(b) For connecting copper tubing and valves, provide adapter having female soldered end and male threaded end; for connections between tubing and cast iron pipe, provide cast copper calking connections having soldered end and beaded end.

(3) Wrought iron pipe for underground piping smaller than 3-inch shall be galvanized, Class A (standard weight), complying with Federal Specification WW-P-441; fittings shall be galvanized malleable iron complying with Federal Specification WW-P-521.

(4) At Contractor's option, 1-1/4, 1-1/2 and 2-inch underground water pipe may be cast iron of full internal diameters shown and having wall thicknesses of 0.19, 0.22 and 0.25 inch, respectively (0.03 inch permissible tolerance in nominal diameters and thicknesses.) 1-1/2 and 2-inch pipe shall be cast with at least two tapping collars per length. Each pipe shall withstand a hydrostatic test of 500 pounds and each factory-assembled section a compressed air test of 90 pounds, per square inch. In physical and chemical properties of cast iron and in requirements for coating, pipe shall comply with Federal Specification WW-P-421. Joints shall be of bell and spigot or of over-size male and female threaded type without gasket; if threaded type, provide expansion joints at intervals of not more than 108 feet.

(5) Valves for underground water piping shall meet standards and requirements of local water department (or company). In absence of such standards, they shall be iron-

body, bronze or brass mounted, double gate valves conforming to A.W.W.A. specifications for working pressure of 150 pounds. Unless otherwise shown, valves for cast iron pipe, 3-inch and larger, shall be hub end; for other piping, screw end. Furnish suitable valve key.

(a) Unless otherwise shown, each underground valve shall have approved, cast iron, adjustable shaft, valve box meeting standard of local water department (or company).

(6) Fire hydrants shall be of recognized make, complying with requirements of local water department (or company) and fire department. In absence of such requirements, they shall meet A.W.W.A. specifications, hose connections to have same thread as used throughout city.

(7) Water meters shall be recognized make meeting approval of local water department (or company).

6 INSTALLATION OF WATER PIPE AND APPURTENANCES

(1) Arrange with local water department (or company) for, and provide required connections to existing water mains.

(2) Store water pipe and fittings on sills above flood water and do not deliver for laying until trench is excavated.

(3) Lay piping true to line, without objectionable breaks in grade, and with sufficient cover as required by local code, rules or practice and approved by the Authority. Interior of pipe shall be clean when pipe is lowered in trench and joint surfaces wiped clean. Use proper fittings for junctions in lines and changes in direction.

(4) Joints in cast iron pipe 3-inch and larger, shall consist of gasket material (hemp jute or yarn), tightly driven in place, centering spigot in bell, and at least a 2-inch depth of lead, placed at one pouring and caulked to a water-tight joint without straining the pipe; thickness of lead shall be not less than 1/4 inch. Make no change in pipe alignment after joint is caulked.

(a) If local code, rules and practice permit, sulphur-bearing lead substitute may, with the Authority's approval, be employed in lieu of lead; such material to be heated without burning until it has mirror-like surface, free from scum or bubbles, and joint filled at one pouring, using metal pouring gate or clay dam at least 6 inches high. After material has cooled and hardened, cut away excess and apply water to take up small leaks.

(5) Lay copper tubing only with experienced workmen. Observe care not to scar or dent pipe. Jointing shall conform to manufacturer's specifications. In fills of cinders, rock or rubbish protect tubing on all sides with at least 6 inches of sand or suitable soil. Use proper fittings; mitered joints for elbows and notched straight runs for tees are not acceptable.

(6) For joints in threaded pipe, use thin coat of red lead on male thread only. Ream ends of pipe free from burrs and keep threads clean cut and tapered

(7) Use clamps, braces, bolted flanges or mass concrete as necessary to prevent blowing out of joints.

(8) After laying and before joints are covered, test underground water lines under supervision of Authority to hydrostatic pressure of at least 125 pounds per square inch; remedy any defects so discovered to satisfaction of Authority.

(9) Upon completion of water lines, arrange for their sterilization in manner satisfactory to local water department and Board of Health. Flush out lines after sterilizing until all traces of chemical used are removed.

(10) Unless provided by local water department (or company), construct meter vaults as shown and install therein water meters and appurtenances, subject to regulations and approval of local water department (or company). Comply with applicable requirements of Division "Concrete Work".

7. UNDERGROUND GAS PIPING

(1) Black steel pipe for underground gas piping shall be Class A (standard weight), complying with Federal Specification WW-P-403a, Type I. Fittings shall be black, malleable iron complying with Federal Specification WW-P-521.

(2) Cast iron pipe for underground gas piping shall comply with A.G.A. standards.

(3) Wrought iron pipe for underground gas piping shall be standard weight black pipe complying with Federal Specification WW-P-441.

(4) Gas piping shall have the types of joints used by local gas company for each kind of pipe. Couplings for plain-end pipe shall be of an approved standard design and shall be provided with gaskets of live rubber.

(5) Master gas meters as provided in "General Scope of Work", shall be of a recognized make meeting the approval of the local gas company.

8. INSTALLATION OF GAS PIPING AND APPURTENANCES

(1) Arrange with local gas company for gas services as shown and for all work which its rules and regulations prescribe that it perform. Install remainder of gas distribution system from points where gas company's work terminates.

(2) Install gas piping to conform to regulations and requirements of local gas company and plumbing code, piping to be installed by licensed journeymen as required by code except that in work done by gas company, company's regular employees may be used, subject to same regulations concerning wages and hours as apply to other employees on project.

(3) Provide approved cast iron drip pots at all low places in gas pipe lines. Use no gas fitter's cement except at fixture joints.

(4) Comply with regulations of local gas company regarding pipe coating. In absence of any such regulation apply one coat of hot coal tar pitch varnish to the entire surface of black pipe and fittings after installation. cleaning pipe thoroughly before

applying.

(5) Under supervision of Authority test all low pressure gas mains with an air pressure not less than 10 pounds per square inch and all intermediate and high pressure lines with an air pressure not less than 50 percent in excess of maximum working pressure.

(6) Unless provided by local gas company, install gas meters as shown, subject to regulations and approval of the company.

9. CERTIFICATES

(1) Furnish affidavits from manufacturers of all pipe, fittings, valves and fire hydrants specified under this Division, certifying that such materials delivered to project conform to requirements specified herein.

10. AS-BUILT DRAWINGS

(1) As work progresses, record on one set of utility plans all changes and deviations from contract drawings in sizes, line or grade. Record final location of sewer, water and gas lines by offset distances, in feet and tenths, to surface improvements such as buildings, curbs or edges of walks. Make sufficient measurements to locate definitely all lines. Locate underground valves and gas drip pots by offset distances from building lines only.

(2) At completion of work, transfer all such records in waterproof drawing ink to a set of white cloth prints. After checking records and obtaining signature of approval thereto of Authority's inspector, deliver prints to Authority for permanent record.

1. SCOPE

(1) All heating materials and equipment and related items necessary to complete the work specified or shown are a part of contract unless specifically excepted. See "General Scope of Work."

2. GENERAL REQUIREMENTS

(1) Layout of equipment, accessories and piping systems under this Division is generally diagrammatic unless specifically dimensioned. Check project drawings and details before installing work, for interferences as governed by structural or other conditions. The right is reserved to make any reasonable change in location of heating equipment, accessories and piping systems prior to roughing-in without involving additional expense to the Authority. Should any work installed under this Division interfere with the Architectural design as shown on the drawings, the Contractor shall at his own expense make such changes in his work as directed by the Authority to permit the Architectural design to be followed.

3. DESCRIPTION OF HEATING SYSTEM

(1) The heating system is of the two pipe down feed open-tank gravity hot water type. Water is heated in a coal hand fired cast iron sectional boiler and is piped directly from the boiler to the expansion tank; from the tank, the hot water is recirculated to the boiler through a system of supply piping radiation and return piping. An overflow is extended from the tank to the utility room. Tank and supply main are located in the attic space; return main is located underneath the floor. The system is arranged for gravity drain.

4. MATERIALS AND EQUIPMENT

IMPORTANT NOTE: WHERE SEVERAL TYPES OR QUALITIES OF MATERIALS ARE LISTED, CONTRACTOR HAS OPTION TO USE ANY OR ALL. INSOFAR AS POSSIBLE USE ONE TYPE OR QUALITY; SHOULD DELAY BE ENCOUNTERED (TO EXTENT OF DELAYING PROGRESS) IN OBTAINING THE PARTICULAR TYPE OR QUALITY SELECTED, PROVIDE SUCH OF THE OTHER SPECIFIED MATERIALS AS MAY BE APPLICABLE.

MATERIAL	KIND	FEDERAL SPECS. OR OTHER DESIGNATION
(1) PIPE	Steel,	WW-P-403a, Types I & II
	Copper Molybdenum open hearth iron;	WW-P-403a, Type III
	Wrought iron;	WW-P-441a
	All of the above standard weight, black.	

MATERIAL	KIND	FEDERAL SPECS. OR OTHER DESIGNATION
(2) FITTINGS	Cast iron, 125 pound, black.	WW-P-501
(3) UNIONS (screwed ends)	Malleable iron or steel; black, brass-seated.	WW-U-531
(4) UNIONS (flanged ends)	Cast iron, 125 pound standard, plain faced.	Dimensioned and drilled to conform to American Standards Association.

(5) NIPPLES shall be of same material and composition as pipe to which connected and shall be extra heavy where unthreaded section is less than 1 inch. Nipples shall conform to Federal Specification No. WW-N-351. Running thread nipples will not be acceptable.

(6) INSULATION for piping shall be molded sectional covering with standard canvas jacket, not less than standard thickness, 85 percent magnesia or of fibrous glass with binder; insulation for fittings shall be cement, 85 percent magnesia or fibrous glass with binder; insulation for boiler (when not furnished with insulating baked enamel steel jacket) and expansion tank shall be blocks not less than 7/8 inch thickness and cement, both 85 percent magnesia or fibrous glass with binder. Magnesia materials shall conform to Federal Specification No. HH-M-61; fibrous glass shall have thermal efficiency not less than that of magnesia.

(a) Waterproof wrapping shall be asphalt impregnated felt weighing not less than 15 pounds per square. Canvas jacket need not be furnished if waterproof wrapping is applied at factory integral with the molded covering.

(7) HANGERS shall be of the split cast ring with fastening device or of the clevis type. Hanger rods shall have machine threads.

(8) GASKETS shall be 1/16 inch thick, ring type, compressed asbestos sheet, to conform with Federal Specification No. HH-P-46.

(9) BOLTS shall be made of commercial bolt steel with square forged heads and with cold pressed semi-finished hexagon nuts. All threads shall be United States Standard.

(10) SLEEVES shall be constructed of No. 26 gage galvanized sheet metal.

(11) ESCUTCHEONS shall be heavy spun or stamped steel, chromium plated.

(12) DRAIN COCK shall be standard brass or bronze not less than 3/4-inch size and be fitted with handle and threaded end for hose connection.

(13) BOILER shall be cast iron sectional type, adapted for coal hand firing suitable for use in gravity hot water heating

systems, and shall be designed for a water working pressure of 30 pounds per square inch gage conforming to the requirements of the A.S.M.E. code for low pressure boilers; furnish Authority with certification of hydrostatic test prior to shipment. Trade name, name of manufacturer, and catalogue number shall be cast on or stamped on metal plate permanently affixed to boiler front. Boiler may be of the wet base type with ash pan or shall be set upon a dry base frame, and be equipped with an insulating baked enamel steel jacket or shall be insulated with blocks and cement.

(a) Sections, base (if dry) and other castings shall be made of the best quality heavy gray cast iron entirely free from sand holes or other defects. Connections between sections shall be metal to metal with malleable or cast iron nipples of the slip type, assembled gas and water tight with tie rods secured at ends with expansion nuts and washers. Doors shall be accurately ground and fitted gas tight to boiler. Smoke hood shall be rigidly secured gas tight to boiler and be equipped with flue clean-out, check draft and damper arranged for easy operation, and shall afford means for attaching smoke pipe. Grates shall be of heavy cast iron pattern of the rocking and dumping type arranged for operation without opening doors. Provide dampers for adjusting air supply and equip boiler with combination gage registering altitude and water temperature. Furnish shaker, poker and wire flue brush with handle for each boiler.

(b) The net rating of each size boiler shall be not less than the amount indicated on the boiler schedule on the drawings. The net boiler ratings shall be determined in accordance with the testing and rating code of the Institute of Boiler and Radiator Manufacturers. The I-B-R name plate on the boiler and I.B.R listed rating or certification from the manufacturer that the rating has been determined in accordance with the code shall constitute evidence of compliance with this requirement.

(c) Boiler shall be constructed for the smoke pipe connections shown on drawings and shall effectively operate at the ratings and conditions specified under natural draft available.

(14) SMOKE PIPE shall be constructed of not less than No. 24 gage (approximate thickness 0.025") black iron. Wall collar shall be black iron.

(15) EXPANSION TANK shall be hot dipped galvanized inside and outside after fabrication. See schedule on drawings for sizes. Tap tank for inlet, outlet and overflow connections. It shall be designed for a water working pressure of not less than 30 pounds per square inch gage and be subjected to an hydrostatic test at factory of not less than 80 pounds per square inch gage. Furnish Authority with certificate of test prior to shipment. Supports for tank shall be of approved design.

(16) RADIATORS shall be best quality gray cast iron of the narrow tube hot water pattern leg type

Connections between sections shall be metal to metal with malleable iron nipples of either screw or slip type; each radiator to be tested at factory and made tight under hydrostatic pressure of 80 pounds per square inch gage, certification for which shall be furnished Authority prior to shipment. See schedule on drawings for sizes; ratings shall be in accordance with simplified practice recommendation R174-40, "Large Tube Cast Iron Radiators" promulgated by the U. S. Department of Commerce. Ship radiators, prime coated from factory with loose wooden plugs or metal seals in all threaded openings.

(17) RADIATOR VALVES shall be packless quick opening type suitable for the service required, constructed of red brass composition of highest grade, rough body finished trimmings nickel-plated all over, and provided with either globe or multiport type seats and ball joint unions. Valves shall have mushroom wheel handles constructed of hardwood or composition secured to metal spindle with nickel-plated brass nut or equivalent countersunk on handle.

(18) UNION ELLS shall be constructed of red brass composition of the highest grade, rough body finished trimmings nickel-plated all over and provided with ball joint unions.

5. INSTALLATION

(1) SYSTEM: Install and connect the complete heating system to give proper and continuous service under all circumstances and conditions in accordance with the contract requirements and to the satisfaction of the Authority.

(a) Set boiler to permit sufficient space for firing and servicing, properly support expansion tank from building construction and set as high as is practical in attic space; protect tank supports with heavy coat of Asphaltum Varnish.

(b) Erect smoke pipe to assure minimum of friction, fit joints accurately and make smoke-tight; size shall be same as provided on boiler smoke hood. Set wall collar in place at point of entrance of smoke pipe to building flue.

(2) JOINTS on piping shall be screwed; use unions (screwed or flanged) when connecting to boiler, expansion tank or other equipment required to be installed in a manner enabling easy removal or replacement.

(3) THREADS shall be standard (Federal Specification No. GGG-P-351, clean cut and tapered. Apply lubricant on male thread only. Keep joints free of scale and dirt. Ream all piping free from burrs and remove all cuttings.

(4) PIPING: Cut accurately to measurements established at building, and work into place without springing or forcing, and out of the way of windows, doors or other openings. Make changes in direction with fittings. Bushings will not be acceptable when reducing pipe sizes.

(a) Provide for expansion and contraction; see drawings for sizes, location, arrangement and connections of piping and equipment.

(b) Pitch mains and branches in direction of flow. Supply mains in attic shall have maximum pitch available under erec

ing conditions. Take branch connections from supply mains at bottom or side. Return mains under floor shall have sufficient pitch to permit free and rapid circulation; if rise in return is necessary, such rise shall be made only in utility room at entrance to boiler return connection.

(c) Hang return piping close to underside of floor when running parallel with joists and directly underneath joists when running at right angles. Where necessary, girders may be notched at top or bottom or holes drilled approximately along mid-depth to permit passage of piping; notches or holes shall be only of sufficient size to permit free movement of piping but shall not exceed 3" x 3" or 3" diameter respectively Where notching is necessary, it shall be made directly over center of masonry pier in such manner as to provide at least 4 inches bearing for each girder. All notching and drilling shall be under supervision of Authority.

(d) Install union ell at supply end and radiator valve at return end of radiator (top and bottom opposite ends). Reducers may be used in vertical supply and return connections to bathroom riser at points directly above ceiling and under floor; size of riser shall be 2-1/2 inches

(e) Provide vent and overflow at expansion tank Extend vent line as high as is possible in attic space and overflow line to within approximately 15" over floor in utility room close to boiler; connect cold water make-up to system from valved outlet installed by Plumber; provide drain from return at boiler and install drain cock (easily accessible) at lowest point in return system in utility room.

(5) SLEEVES: Set and secure in proper position in building construction for pipes passing through partitions, floors and ceilings; they shall be of sufficient length to pass through entire thickness of building construction except that sleeves through floors shall extend not over approximately 1/4 inch above finished floor.

(6) ESCUTCHEONS: Fit securely to uncovered exposed pipes passing through partitions, floors and ceilings; they shall be of sufficient outside diameter to cover up sleeved openings.

(7) HANGERS: Support piping on hangers fastened to rods rigidly secured (screwed or bolted) to building construction. Install hangers to maintain required pitching of lines, to prevent vibration and to permit expansion and contraction. Space hangers not over 10 feet on centers for pipe 1-1/4 inches and larger and not over 8 feet on centers for pipe smaller than 1-1/4 inches. Protect hangers and hanger rods with a heavy coat of Asphaltum Varnish.

(8) OPEN ENDS: Keep all ends and openings closed with caps or plugs during construction.

6. INSULATION

(1) PIPE AND FITTINGS: Insulate all pipe and fittings in attic

space and under floor. Apply covering on pipe with sections closely butted together; extend canvas jacket (where required to be furnished as hereinbefore specified) over joints and paste in place, treating paste with one tablespoonful bluestone to each gallon. On supply pipe covering fasten canvas jacket with brass lacquered bands spaced not over 18 inches on centers and one on each side of fittings.

(a) Insulate fittings with two coats of cement, the second coat finished smooth and the overall thickness not less than the covering on the adjacent piping.

(b) Over insulated return pipe and fittings, apply waterproof wrapping lapped over joints, sealing with asphaltic compound and securing in place with wire loops (not less than No. 14 gage annealed copper) spaced not over 6 inches on centers.

(2) BOILER AND EXPANSION TANK. Insulate boiler (when not furnished with insulating baked enamel steel jacket) and expansion tank with blocks properly fitted and securely wired in place. Reinforce with chicken wire over which apply not less than 1/2-inch thickness cement finished hard and smooth; one part of Portland cement may be mixed with two parts of insulating cement. Prefabricated insulation jacket of not less than equal thermal efficiency to the blocks and cement may be applied to tank in lieu of the blocks and cement.

(3) Thoroughly clean all surfaces before insulation is applied, remove and replace damaged or mildewed insulation.

7. INSTRUCTIONS

(1) Permanently affix in Utility room where directed, explicit printed, glass protected and framed, or embossed on metal plate, instructions for operation of the system.

8. CLEANING

(1) Wash out entire system until water shows clear from drain. All exposed parts of system shall be thoroughly wiped clean and all metal surfaces shall be free from scale or rust.

9. TESTS

(1) Subject entire system to a water pressure test of not less than 25 pounds per square inch gage, make all joints tight at this pressure; no caulking will be permitted.

(2) Run an operating test for a minimum four-hour period; make all necessary alterations, additions or adjustments necessary for the proper operation of the system before final acceptance by the Authority. If upon test, noise develops, remedy piping in order to eliminate such noise or defective circulation.

(3) Furnish all equipment and instruments, labor and fuel for tests. Water and electric energy will be supplied at Authority's expense.

USHA STANDARD SPECIFICATIONS

PLUMBING

1. SCOPE

(1) All plumbing materials, equipment and related items necessary to complete the work specified or shown are part of contract unless specifically excepted. See "General Scope of Work."

(2) Drainage system within buildings.

(3) Hot and cold water supply systems within buildings.

(4) Plumbing fixtures.

(5) Water and drainage connections to equipment indicated and furnished under another Division of the Specifications or purchased separately by the Authority.

(6) Gas piping system within the building and connections to ranges and other gas appliances requiring same.

2. GENERAL REQUIREMENTS

(1) Layout of equipment, accessories and piping systems under this Division is generally diagrammatic unless specifically dimensioned. Check project drawings and details before installing work for interferences as governed by structural or other conditions. The right is reserved to make any reasonable change in location of plumbing equipment and piping system prior to roughing-in without involving additional expense to the Authority. Should any work installed under this Division interfere with the architectural design as shown on the drawings, the contractor shall, at his own expense, make such changes in his work as directed by the Authority to permit the architectural design to be followed.

(3) MATERIALS

IMPORTANT NOTE:

WHERE SEVERAL TYPES OR QUALITIES OF MATERIALS ARE LISTED, CONTRACTOR HAS OPTION TO USE ANY OR ALL. INSOFAR AS POSSIBLE, USE ONE TYPE OR QUALITY; IF PROGRESS IS LIKELY TO BE RETARDED DUE TO DELAY IN OBTAINING THE PARTICULAR TYPE OR QUALITY SELECTED, PROVIDE SUCH OF THE OTHER SPECIFIED MATERIALS AS MAY BE APPLICABLE.

(1) MATERIALS shall conform to applicable ASTM Standards or Federal Specifications as to standard of quality and type, and shall be new and of the best quality and grade.

SYSTEM	MATERIAL	FED. SPECS.
(2) DRAINAGE:		
(a) Interior pipe and fittings and to within 5'0" outside of building wall	Extra heavy cast-iron soil pipe and fittings (calked joints)	WW-P-401
(Lighter pipe and fittings of equal quality may be used, if unable to procure extra heavy in open market.)		
(b) Waste and vent piping 2" and smaller, above the ground	Galvanized "W.I." pipe	WW-P-441a
	Cast-iron threaded pipe	WW-P-356
	Lead waste pipe "D"	Lead. Ind. Assoc.
	Galvanized copper molybdenum pipe, Type III	WW-P-403a
	Galvanized copper bearing pipe, Type II	WW-P-403a
	Galvanized steel pipe, Type I	WW-P-403a
(c) Waste fittings	Galvanized or black recessed drainage fitting	WW-P-491
	Wiped joints in lead pipe	
(d) Vent fittings	Galvanized malleable,	WW-P-521
	Black cast iron	WW-P-501
	Wiped joints in lead pipe	
(3) WATER:		
(a) Piping	Copper tubing, Type 1	WW-T-799
	Copper pipe (I.P.S.)	WW-P-377
	Brass pipe (I.P.S.) "A"	WW-P-351
	Galv. cement lined pipe	WW-P-403a
	Galv. wrought iron pipe	WW-P-441a
	Galv. copper molybdenum, III	WW-P-403a
	Galv. copper bearing, II	WW-P-403a
	Galv. steel - I	WW-P-403a
	Lead service pipe A or AA or AAA	
(b) Fittings	Copper tubing	WW-T-799
	Brass or Bronze "B"	WW-P-448
	Cement lined	WW-P-403a
	Galv. malleable	WW-P-521
	Galv. cast iron	WW-P-501
	Wiped joints in lead pipe	
(c) Tanks	Galv. steel)	Hot dipped
	Galv. Copper Bearing Stud)	Heavily co
	Galv. Cement lined)	QQ-I-696
	Nickel copper alloy	
	Copper	

SYSTEM	MATERIAL	FED. SPECS.
(4) GAS:		
(a) Within buildings	Black steel pipe	WW-P-403a
	Black wrought iron	WW-P-441a
	Galv. or black malleable fittings	WW-P-521

(Protect pipe installed underground with strip of asphaltum impregnated paper wrapped tightly over its entire length or with hot asphaltum paint.)

(5) VALVES:		
	2" and smaller	WW-V-766 BNT-I
	2½" to 5"	WW-V-766 INT-I
	6" and larger	WW-V-766 INF-I

(Valves in connection with copper tubing may have soldered (sweat) type ends or appropriate adapters.)

(Checks - horizontal swing type with hinged check and ground seat.)

(6) UNIONS - 150# W.W.P.		
(a) On ferrous pipe	Malleable iron with bronze seats and ground joints	
(b) on non-ferrous pipe	Bronze body with bronze seats and ground joints	

4. MISCELLANEOUS STANDARDS	MATERIAL	FED. SPECS.
(1) Screwed fittings - American National taper pipe thread		GGG-P-351
(2) Lead - Drawn pipe of the minimum weight per lineal foot known in the trade as "D" weight.		
(3) Sheet lead - Weight not less than 4 pound per square foot (except where heavier weight is required.)		QQ-L-201
(4) Solder - For sweat fittings 95% tin, 5% antimony.		
(5) Flux - Non-corrosive type.		

	MATERIAL	FED. SPECS.
(6)	Calking lead.	QQ-L-156
(7)	Packing - for hub and spigot joints.	HH-P-117
(8)	Sheet iron - Galvanized (commercial weight).	QQ-I-695
(9)	Sheet copper - Not be lighter than 16 oz. per square foot.	QQ-B-611a
(10)	Ferrules - Solder nipples and solder brushings - Class and weight required by local plumbing code.	
(11)	Setting compound - For connecting fixtures to floor flanges.	HH-E-536
(12)	Gaskets - For connecting fixtures to floor flanges. Miscellaneous, compressed asbestos sheet.	HH-G-116 HH-P-46
(13)	Floor flanges.	WW-P-541
(14)	Sillcocks - Brass 1/2" or 3/4" with hose end and wall flange or shoulder shank where exposed connections are indicated.	WW-P-541, Fig. 70
(15)	Traps - Self-cleaning, same nominal size as the drain.	WW-P-541
(16)	Pipe cleanouts - Cast iron with brass plugs or screwed fittings with brass plugs.	WW-P-401
(17)	Floor drains.	WW-P-541
(18)	Nipples - Same material and composition as the pipe, or tubing employed on the system. Extra heavy weight, when unthreaded section is less than 1". Running thread nipples prohibited.	
(19)	Sleeves - Set vertically, constructed of No. 26 gage galvanized sheet iron. Sleeves set horizontally constructed of standard weight pipe. No sleeves required on wood floors or partitions.	
(20)	Escutcheons - spun or stamped steel.	
(21)	Chromium plating.	WW-P-541a
(22)	Brass - Composition A and B Composition A	QQ-B-611 QQ-B-621

MATERIAL	FED. SPECS.

(23) Hangers - Either split cast ring with fastening device or adjustable clevis type hanger. Hanger rods machine threaded. Brackets of approved type may be used along walls. Band iron wire or chain is prohibited.

(24) Copper tubing - May be secured with copper hangers. Design hangers to fit snugly around pipe or tubing used.

(25) Plumbing fixtures. WW-P-541a

(26) Zinc-coated (galvanized) sheet iron and steel. QQ-I-696

5. EXCAVATION AND BACKFILL

(1) Excavate trenches for underground pipes to required depths. Provide bell holes to insure uniform bearing. Refill excavation below pipe grade with sand or gravel firmly compacted. Where rock is encountered, excavate to a grade 3" below the lowermost part of the pipe and trench refilled to grade as just specified. Sheath, brace, pump or bail as necessary to protect the workmen and adjacent structures and to permit proper excavation of the work. After pipe lines have been tested, and approved, backfill trenches to grade with approved material, tamped or puddled compactly in place. Unless otherwise directed all underground piping outside of buildings shall be installed below the frost line.

6. INSTALLATION

(1) Provide labor, material and equipment required or necessary for a complete plumbing installation. Under each of the following headings is given a brief description of the work required.

7. BUILDING DRAINS

(1) Connect building drain to sewer outside of the walls as indicated. Building drain shall receive all connections from soil, waste and drainage stacks and fixtures as shown with cleanouts and traps as required.

8. SOIL, WASTE AND VENT LINES

(1) Erect soil, waste and vent stacks of sizes shown and as indicated on the drawings and extend vents above roof.

(2) Branch soil, waste and vent connection shall be run to the soil stack, waste stack, building drain or vent stacks as shown or required. Where permitted by code and if practical, two or more vent pipes may be connected together and extended as one pipe through the roof.

(3) Vent from any fixture or line of fixtures when connected to a vent line serving other fixtures shall be extended at least 6" above the topmost plane of fixtures on which the vent is to be connected to prevent the use of same as a waste.

(4) Horizontal drainage piping shall be installed in practical alinement within the building at a uniform grade of not less than 1/8" fall per foot. Piping to be installed without undue strains or stresses and provision made for expansion, contraction and structural settlement. No structural member shall be weakened or impaired by cutting, notching or otherwise, unless provision is made for carrying the structural load and approved by Authority.

(5) Changes in direction in drainage piping shall be made by the appropriate use of cast iron 45 degree wyes, half wyes, long sweep quarter bends, sixth, eighth, or sixteenth bends, or by combinations of these fittings; or by use of equivalent threaded fittings or their combinations, except that sanitary tees may be used on vertical stacks and short quarter bends may be used in drainage lines where the change in direction of flow is from the horizontal to the vertical. Tees and crosses may be used in vent pipes. No change in direction greater than 90 degrees shall be made in drainage pipes. Where different sizes of drainage pipes or pipes and fittings are to be connected, proper sizes of standard increasers and reducers shall be employed. Reduction of size of drain pipes in the direction of flow is prohibited except where code permits the use of a 3" x 4" water closet connection.

(6) Drilling and tapping of house drains, soil, waste, or vent pipes and the use of saddle hubs and bends are prohibited.

(7) Protect from breakage pipes passing under or through walls. Protect against external corros pipes passing through or under cinder concrete or other corros material.

9. JOINTS AND CONNECTIONS

(1) Joints and connections shall made permanently gas and water tight. All exposed threads on ferrous pipe shall be given a co of acid-resisting paint.

(2) Joints in vitrified clay and concrete pipe or between such p and metal shall be hot-poured asphaltum compound or cemented joints. Pack hot-poured joints with approved packing and fill approved jointing compound at or pouring. Pack cemented joints wi approved packing and secured wit Portland cement.

(3) Calked joints on cast-iron pipe shall be firmly packed and secured with well-calked lead, n less than 1" deep; and no paint varnish on joints permitted unti after tested and found tight.

(4) Screwed joints shall be made with a lubricant on the male thr only. Remove all burrs or cuttin

(5) Cast-iron joints may be eith calked or screwed.

(6) Wrought iron, steel or brass to cast-iron joints may be either screwed or calked joints.

(7) Wiped joints in lead pipe or between lead pipe and brass or copper pipes, ferrules, soldering nipples, bushings, or traps, in cases on the sewer side of the t and in concealed joints on the inlet side of the trap, shall be full-wiped joints, with an expos

surface of the solder on each side of the joint not less than 3/4" and a minimum thickness at the thickest part of the joint of not less than 3/8".

(8) Lead to cast iron, steel, or wrought iron joints shall be made by means of a calking ferrule, soldering nipple, or bushing.

(9) Copper tubing joints shall be made in accordance with approved practice and recommendations of the manufacturer of the pipe.

(10) Slip joints and unions shall be used only in trap seals or on the inlet side of the trap. Unions on the sewer side of the trap shall be ground faced and shall not be concealed or enclosed.

(11) Joints at the roof shall be made water tight by use of copper or lead flashings.

(12) Floor connections for water closets and other fixtures shall be made by means of an approved brass or cast iron floor flange soldered securely or calked to the drain pipe. The joint between the fixture and floor flange shall be made tight by means of an approved fixture setting compound or gasket.

(13) Where different sizes of drainage pipes or pipes and fittings are to be connected, proper sizes of standard increasers and reducers shall be employed. Reduction of size of drain pipes in the direction of flow is prohibited, except in the case of a 3" x 4" water closet bend.

(14) Any fitting or connection which has an enlargement, chamber or recess with a ledge, shoulder or reduction of the pipe area, that offers an obstruction to flow through the drain is prohibited.

10. TRAPS AND CLEANOUTS

(1) The minimum size (nominal inside diameter) of trap and fixture waste branch for a given fixture shall be not less than shown in the following table:

KIND OF FIXTURE	Size (in inches) trap and branch
Bathtubs	1½
Combination fixture. (sink and tray)	1½
Floor drains	2
Lavatories	1¼

(2) Trap each fixture separately and as near to the fixture as possible except that a set of not more than three lavatories or laundry trays, or a set of two laundry trays and one sink, may connect with a single trap, provided the trap for three fixtures is placed centrally.

(3) Set traps true with respect to their water seals and protected from freezing.

(4) Floor or wall connection of fixture traps bolted or screwed to the floor or wall shall be regarded as a pipe cleanout.

11. ESCUTCHEONS

(1) Fit and firmly secure escutcheons to the pipes, passing through finished floors, walls and ceilings. Escutcheons shall be of sufficient outside diameter to cover amply the sleeved openings and diameter to fit snug around pipe installed.

(2) Escutcheons for finished fix-

ture connections and fixture trimmings are specified under Plumbing fixtures.

12. OPEN ENDS

(1) Ends of pipes, including those extending above roof, drains, water and fixture outlets, shall be kept closed with caps or plugs so as to prevent dirt or building material from getting into pipes and traps.

13. HANGERS-ANCHORS-INSERTS

(1) Support piping from the building structures by means of hangers to maintain required grading and pitching of lines to prevent vibration, and secure piping in place, and arrange to provide for expansion and contraction.

(2) Paint and clean hangers and supports with one coat of black asphaltum varnish.

14. FLASHINGS

(1) Make pipes through roof water tight with sheet lead or sheet copper flashing extending not less than 8" around the pipe and terminate by turning into top of pipe as a cap or by calking into hub.

15. WATER SUPPLY

(1) Connect water service at building wall and install cold water mains, risers and branches to all fixtures, hose bibbs, hydrants and equipment as indicated on drawings.

(2) Provide stop and waste valve at entry point of service main as indicated on drawings.

(3) Provide all connections to risers or fixtures from top of mains, unless otherwise indicated, and all branches and mains arranged so that entire system can be drained at low point.

(4) Rough fixture branches from wall, centered to fixture outlets

(5) Locate sillcocks approximatel 18" from grade.

(6) Schedule of pipe sizes for water connections to fixtures:

	Cold water (minimum)	Hot water (minimum)
Water closets (low down tanks)	3/8"	-
Lavatories	3/8"	3/8"
Bathtubs	1/2"	1/2"
Sinks and combinations	1/2"	1/2"
Hose bibbs (as shown)	1/2" or 3/4"	-

(7) Furnish and erect hot water mains, risers and branches as indicated on drawings.

(8) Provide hot water supply to fixtures except for water closets

(9) Provide valve at low point for draining system.

(10) Set and connect ready for operation individual hot water equipment.

(11) Connect hot water tank and heater as shown on plans.

(12) No plumbing fixture, device or construction shall be installe which will provide a cross connection between a distributing supply for drinking and domestic purposes and a polluted supply, such as a drainage system, a soil or waste pipe, so as to permit or make possible the back flow of sewage, polluted water

or waste into the water supply system.

16. GAS SYSTEM

(1) Extend gas service piping in dwelling units as indicated on drawings.

(2) Pitch piping and provide natural drip pockets at low point.

(3) Connect gas equipment purchased and delivered to site by Authority.

(4) Provide shut-off cock, wing lock or ground key type for each piece of gas-burning equipment.

(5) Provide on the house side of all shut-off cocks a union or right and left nipple and coupling to permit disconnection of gas appliances.

17. VENT FLUES

(1) Furnish and install from opening in building flue to equipment, vent, sheet iron pipe not less than No. 24 gage with necessary elbows and wall collar.

(2) Install vents with a minimum of 2" clearance from all woodwork and provide asbestos block as shields where installed in closet space.

(3) Transite pipe in lieu of sheet iron may be used for gas-fired equipment.

(4) Gas or oil ranges need not be vented, unless required by local codes.

18. PLUMBING FIXTURES

(1) Set up at a place designated by the architect or engineer, one sample fixture of each type, completely fitted. Approved fixture samples shall be kept free of usage and protected at all times for comparison; poorer quality than the samples will be rejected; exception will be made to tolerances permitted by commercial standards.

(2) Fixtures shall be of the best quality as fabricated by a manufacturer of established reputation whose products have been in constant use for not less than six years.

19. FIXTURE TRIMMINGS

(1) Traps, faucets, escutcheons in connection with plumbing fixtures shall be chromium plated, unless otherwise stated.

(2) Air Gaps: The fixtures specified hereafter, with faucets or other supply fittings properly assembled, shall provide between the level of all supply openings and the water level at point of unrestricted external overflow, a mean vertical distance or air gap as follows:

FIXTURE	Max. Dia. of Effective Opening Inches	Min. Air Gap Inches
Lavatory supply spout	0.50	1.0
Sink and laundry tray faucets	0.75	1.5
Gooseneck bath faucets	0.75	1.5
Over-rim bath filler	1.00	2.0

(3) All fixtures requiring hot and cold water shall have cold water faucet on right side and hot water faucet on left side

of fixture.

(4) All faucets shall have metal indices and shall be of one pattern or design.

20. GROUNDS AND SUPPORTS

(1) Secure fixtures to partitions by means of toggle bolts. Install bolts to develop their full strength. Furnish four bolts for each lavatory and eight bolts for each sink and tray.

21. QUANTITIES

(1) The contractor is referred to the architectural and mechanical drawings for the quantities of fixtures to be furnished under this division of the specification and he shall include all plumbing fixtures shown of the types described hereinafter, complete with all necessary trimmings. Stops under fixtures are not specified but shall be furnished and installed when required by local plumbing code.

22. WATER CLOSETS

(1) White vitreous china, integral flush rim, wash-down type, regular front, seat post holes, pedestal base, siphon trap at front floor outlet, all moulded in the ware. Action shall be continuous without break in siphoning. Bowl shall flush and refill properly. The water surface shall not be less than 8" x 7" and water seal shall not be less than 2⅛" and trap way shall pass a solid ball not less than 1⅛" in diameter. Inlet spud shall be cast or forged brass suitable for 2-inch O.D. tubing for lowdown tank outfits.

(2) Provide closet with floor flange, brass bolts and chromium plated metal nuts, fixture to set on gasket or compound.

(3) Overall clearance dimension from wall to front of bowl shall not exceed 2'3".

23. WATER CLOSET TANK

(1) Provide for each closet a white vitreous china low type tank with flushing capacity of not less than 3½ gallons. Tank cover shall be flat top surface with slightly raised bead at edges. Cover to be arranged for fastening into tank.

(2) Supply and flush valves shall be first quality all brass with vacuum breaker. Valves shall be operated by trip lever. Tank shall have 3/8" angle supply and 2" flush pipe. The valve seats and the float valves must be above the tank overflow and be provided with a vent opening equal to the cross-sectional area of the valve seat.

(3) Secure tank to wall with brass bolts and washers.

24. WATER CLOSET SEATS

(1) Water closet seats and covers shall be smooth, polished finish ebony, closed front to conform to the rim of the bowl. Hard rubber composition with solid core and impervious to moisture or acid solutions. Composition shall contain not less than 25% rubber nor more than 5% ash. Tensile strength not less than 3000 pounds per square inch. Seat equipped with a heavy chrome-plated cast brass leaf hinge or approved hinge. Hinge attached by not less than 6 screws to seat. Seats and covers equipped with 2 elongated bumpers at bottom.

Provide seats with covers for all water closets, except water closets located in stalls for which seats without covers may be furnished.

25. LAVATORIES

(1) One piece cast iron (approximately 18" x 20" or 17" x 19") with apron and back, oval or rectangular bowl, and rim, enameled on the inside and over apron rim and back. Furnished with concealed metal support, faucets for hot and cold water, plug, chain rubber stopper, waste trap and escutcheons.

(2) Chromium-plated, arm or ball style, metal indexed handle faucets, with removable seats, shank, coupling and tail piece.

(3) Chromium-plated cast or forged brass waste plug with cross bars, 1¼" tubing tail piece, heavy ball chain and chain stay. 1¼" rubber stopper and 1¼" brass "P" trap and escutcheon.

(4) Lavatory supplies when roughed 24" or more from floor may be of same material as used for water piping. When roughed below 24", they shall be brass pipe chromium plated. I.P.S. with escutcheons.

26. BATHTUBS

(1) One piece cast iron, enameled inside, painted outside, integral rim at front, flat rim at back and both ends having water bead raised for building into wall, fitted with supply fitting of the concealed or exposed combination type and over rim spout. Valves to have not less than ½" connections, metal to metal joint union inlets or sweated connection and outlet to spout.

(2) Spout to set over rim of bath. Valve bonnets removable from front for repairs. Valves to have arm or ball style index metal handles, renewable seats and metal escutcheons. Exposed over rim fixture will be acceptable. Bathtub waste consisting of cast drain and overflow fittings, cast waste tee and 1½" connecting tubing with wall not less than 0.045" thick. Concealed waste fittings for threaded connections or sweated joints.

(3) Waste plug fitted with heavy rubber stopper, heavy ball chain securely attached to overflow grate.

27. TRANSFER VALVE FOR BATHTUB AND LAVATORY

(1) In lieu of separate controls on bath and lavatory, transfer valve may be used for both. Cast brass two valve body with center transfer valve installed between lavatory and bathtub. Transfer valve shall be indexed "tub" and "lav." Valves to have not less than ½" connections metal to metal joint unions or sweated connections when used with copper tubing. Valve seats to be of the removable type. Valves to have arm or ball style indexed metal handles and metal escutcheons. Bathtub to be provided with ½" over rim spout.

(2) Lavatory provided with spout as indicated on drawings.

28. COMBINATION KITCHEN SINK AND TRAY

(1) Acid-resisting enameled cast iron, 42" long integral back or back ledge, roll rim front and sides. One adjustable leg under tray compartment. Trimmings to consist of the following: Swing spout double sink faucet without soap dish; chromium-plated brass

plug with heavy rubber stopper in tray; chromium-plated brass open grid waste strainer in sink; No. 18 gage steel acid-resisting, interchangeable drain board porcelain enameled all over. Brass 1½" continuous waste connected to a 1½" "P" trap to wall with escutcheon.

(2) Supplies to wall roughed high under sink and material of the same type as used for the water piping in the building.

29. ALTERNATE FIXTURES

(1) Formed metal plumbing fixtures may be used, provided they conform as to type and trimmings as specified for cast-iron enameled fixtures above, if approved by Authority.

30. WATER TANK AND HEATER

(1) Furnish and install in location indicated on plans water storage tank storage capacity of 40 gallons, designed for a water working pressure of 127½ pounds per square inch and a hydrostatic factory test of 300 pounds per square inch without visible change of shape affecting any part of the tank. Certificate of test to be furnished to the Authority. Provide 3/4" boiler tappings and ½" drain connection. Provide means in tank to reduce to a minimum mixing of incoming cold water with the heated water. Tank shall be set horizontally near ceiling of utility room and as indicated on drawings and rigidly supported from building construction. Provide pressure relief valve, set to relief 25 pounds above available water pressure. Valve piped to floor at point near corner of utility room. Connect complete with water heater.

(2) Furnish and install in location indicated on plans, water heater; same shall be of the cast-iron sectional dome type, furnished complete with castings, including fire brick, grates and tools as hereinafter specified. Heaters shall be adapted for coal firing and be designed for a water working pressure of 125 pounds per square inch gage and subjected at the factory to a hydrostatic test of not less than 300 pounds per square inch gage; furnish local authority with certification of hydrostatic test prior to shipment.

(3) Heaters shall be made of best quality heavy gray cast iron entirely free from sand holes or other defects. Fire brick shall be suitable for service intended and be properly set in firepot. Doors shall be accurately ground and fitted smoke tight to heater. Dome shall be equipped with smoke hood (not less than 5" diameter) affording means for attaching smoke pipe. Provide necessary dampers to regulate the supply of air to support combustion. Grates shall be heavy pattern cast iron of the rocking and dumping type arranged for operation without opening doors and removable without disturbing heater. Furnish shaker and poker for each heater.

(4) Provide tappings for hot and cold water connections not less than 1" size.

(5) Heater shall have a capacity to heat without overfiring not less than 40 gallons of water through a minimum temperature rise of 25 degrees F per hour from inlet water temperatures. This capacity shall be based upon a six-hour firing period.

31. FIXTURE PROTECTION

(1) Protect against injury from building materials, acids, tools and equipment, all plumbing fixtures with substantial cover. Damaged fixtures by any cause shall be replaced at no cost to the Authority.

32. CLEANING UP

(1) Thoroughly clean all fixtures and trimmings, and leave every part in perfect condition ready for use.

33. TESTS

(1) Water test on roughing-in work:

Apply a water test to the entire sanitary drainage system. Test may be applied in sections. Close tightly openings of the section to be tested except the highest opening above the roof, and the system filled with water to the point of overflow above the roof. No part of the system shall be tested with less than a 10-foot head of water except the uppermost 10 feet of system. Without any further addition, the water shall remain constant during test for at least 5 minutes.

34. WATER SUPPLY SYSTEM

(1) Test entire water supply system to a hydrostatic pressure of not less than 100 pounds per square inch and prove tight at this pressure before trenches are backfilled and before fixtures are installed. Water supply piping, if in any way concealed by the structural work, shall be tested to the aforesaid pressure and proved tight before pipes are concealed.

35. GENERAL REQUIREMENTS

(1) Make repairs to piping system with new material. No calking on screwed joints, cracks, or holes will be acceptable.

(2) Test and adjust all parts of the plumbing system and associated equipment and leave in good operating condition.

(3) Make other tests required under ordinances of the local plumbing code.

(4) Notify Authority or its representative in advance of tests who shall be represented at all tests and all tests shal be conducted to his entire sati faction.

36. GAS PIPING SYSTEM

(1) Test gas piping in accordan with the rules and regulations the company or utility serving the project and in any case sha not be less than the following:

(a) Subject piping system or portions of the piping syste to be tested to an air pressure of not less than 10 pounds per square inch, equa to 20 inches of mercury.

(b) Apply pressure with a force pump and maintain for not less than 15 minutes wit out leakage. Use a mercury column gage in making the te

37. PRIOR TESTS

(1) Concealed work to remain un covered until required tests ha been completed, but in the even that the project construction schedule requires it, the contractor shall make arrangement for prior tests on portions of the plumbing work involved, sat factory to the Authority or its representative.

(2) Bathtub Test: After bathtubs are installed and prior to concealing waste connections, each bathtub shall be tested for leaks at waste and overflow connection.

USHA STANDARD SPECIFICATIONS

INTERIOR WIRING AND LIGHTING FIXTURES

1. SCOPE

(1) Interior wiring, lighting fixtures and related items necessary to complete work shown or specified are a part of contract unless specifically excepted. See "General Scope of Work."

2. SYSTEMS

(1) Electrical service to each building is specified under divisions, Overhead and Underground Distribution, as shown on drawings. From the terminating point of service at each building, extend wiring to service equipment, branch protective devices and outlets.

3. TYPES OF WIRING

IMPORTANT NOTE:

THE FOLLOWING TYPES OF WIRING ARE RECOGNIZED IN THE NATIONAL ELECTRICAL CODE. ANY ONE OR ALL OF THESE TYPES WILL BE ACCEPTABLE IN THE CONSTRUCTION OF THE WORK, PROVIDED THE TYPE IS APPLICABLE AND ACCEPTABLE UNDER THE CODE REQUIREMENTS.

(1) From point of service pick-up at each building, extend service entrance conductors to service equipment, using rigid metal conduit, electrical metallic tubing or service entrance cable.

(2) For all wiring inside building, use non-metallic sheathed cable, armored cable, flexible metal conduit, electrical metallic tubing, or rigid metal conduit. Be governed by type of construction in selecting wiring system.

4. CODES

(1) Where local laws or ordinances do not include rules and regulations governing electrical work or do not make "National Electrical" and "National Electrical Safety" codes mandatory, all electrical work as drawn and specified shall comply with the latter mentioned codes.

5. GENERAL REQUIREMENTS

IMPORTANT NOTE:

SIZES OF MATERIALS AND EQUIPMENT SHOWN OR SPECIFIED ARE MINIMUM. USE LARGER SIZES IF PROGRESS IS LIKELY TO BE RETARDED DUE TO DELAY IN OBTAINING SIZES INDICATED.

(1) Electrical system layouts indicated on drawings are generally diagrammatic; and locations of outlets and equipment are approximate; exact routing of raceways, cables and wiring, locations of outlets and equipment shall be governed by structural conditions and obstructions. Locate and install equipment requiring maintenance and operation so it will be readily accessible.

(2) The right is reserved to make any reasonable change in location of outlets and equipment prior to roughing-in, without involving additional expense

6. MATERIALS

IMPORTANT NOTE:

WHERE SEVERAL TYPES OR QUALITIES OF MATERIALS ARE LISTED, CONTRACTOR HAS OPTION TO USE ANY ONE OR ALL. INSOFAR AS POSSIBLE, USE ONE TYPE OR QUALITY IF PROGRESS IS LIKELY TO BE RETARDED DUE TO DELAY IN OBTAINING THE PARTICULAR TYPE OR QUALITY SELECTED, PROVIDE SUCH OF THE OTHER SPECIFIED MATERIALS AS MAY BE APPLICABLE TO THE CONSTRUCTION.

(1) ELECTRICAL MATERIAL AND APPLIANCES of types for which there are Underwriters' Laboratories standard requirements, listing or labels, shall have listing of Underwriters' Laboratories or shall conform to their requirements and so labeled. Use new materials and appliances.

(2) RACEWAYS AND FITTINGS:

(a) Rigid metal conduit (zinc coated)	Fed. Spec. WW-C-581a
(b) Flexible metal conduit, single strip, galvanized	Underwriters' Laboratories, Inc.
(c) Electrical metallic tubing	Fed. Spec. WW-T-806a
(d) Fittings	Fed. Spec. WF-406

(3) BOXES AND COVERS:

(a) Interior work (concealed and exposed)	Fed. Spec. WO-821a
(b) Exterior work (exposed) weatherproof galvanized or cadmium plated conduit or tube fittings with suitable covers.	

(4) WIRES AND CABLES:

(a) Performance grade, Type RP (30%) (sizes not smaller than No. 12)	ASTM
(b) Heat resistant grade, Type RH (35%) (sizes not smaller than No. 14)	ASTM or Fed. Spec. JC-106a
(c) Moisture resistant, Type RW (sizes not smaller than No. 12)	Underwriters' Laboratories, Inc.
(d) Armored bushed type cable (sizes not smaller than No. 12)	Type RP Insulation Fed. Spec. JC-71

(e) Non-metallic sheathed cable (sizes not smaller than No. 12) — Type RP Insulation

(f) All-rubber cord, heavy duty, Type S (range connection) — Underwriters' Laboratories, Inc.

(g) Heat resistant or rubber covered fixture — Underwriters' Laboratories, Inc.

(h) Provide lead covering on wires and cables where required

(5) INSERTION RECEPTACLES:

(a) Flush duplex type (15 Ampere, 125 volt) — Fed. Spec. WR-151

(b) Combination devices — Fed. Spec. WS-893

(6) LOCAL WALL SWITCHES:

(a) Flush tumbler (10 ampere, 125 volt) — Fed. Spec. WS-893

(b) Combination devices — Fed. Spec. WS-893

(7) PLATES AND FINISHES, generally, for switches, receptacles and other outlets requiring plates shall be brown molded composition. Provide corrosion resisting coating on plates for exposed raceway fittings.

(8) SERVICE EQUIPMENT shall consist of meter cabinet or receptacle and required protective equipment, weatherproofed if installed outdoors.

(a) For each dwelling unit provide three 15 ampere branch circuit protective devices. Provide, if required, service disconnecting means and overcurrent protection.

(b) METERS NOT TO BE FURNISHED UNDER THIS CONTRACT. Provide receptacle, with cover plate and sealing ring, or cabinet to receive 5 ampere, 2 wire, 120 volt meter.

(9) PROTECTIVE EQUIPMENT:

(a) Circuit breaker panel shall be of "multi-breaker" type or "individual unit" type with either thermal or magnetic overload protection. Breaker shall have standard calibration with bi-metallic thermal or magnetic trip, automatic release, overcurrent element

in each pole; inverse time delay to prevent tripping on momentary overload; quick-break on automatic release.

(b) Fuse panels shall conform to Federal Specification WP-146, dead front type, with interchangeable, non-combustible, insulating base fuse sections.

(10) FUSES:

(a) Cartridge, renewable	Fed. Spec. WF-803
(b) Cartridge, non-renewable	Fed. Spec. WF-791
(c) Plug fuses, standard	Underwriters' Laboratories
(d) Plug fuses, non-tamperable with adapters for screw base.	

(11) CABINETS shall consist of sheet steel, code gage for surface or flush mounting as shown.

(a) Interior: - Flush mounted boxes shall be (a) unpainted, galvanized steel or (b) bonderized or otherwise treated to resist rusting. Applying prime shop coat. Covers, trims and doors shall be bonderized or otherwise treated to resist rusting; apply prime shop coat, finish with one coat of baked enamel, standard finish.

(b) Exterior: - Exposed boxes, covers, trims and doors shall be bonderized or otherwise treated to resist rusting; apply prime shop coat, finish with one coat of baked enamel, standard finish. Weatherproof construction. Provide pin tumbler lock or padlock for "protective section," individually keyed, arranged for master keying (provide two individual keys for each cabinet and six master keys for Management). See Division "Hardware" for tags, keys, and padlocks.

(c) Provide seals where required; wire shall be stranded; sealer shall have die engraved with symbol as approved. Furnish one pocket type sealing tool with engraved die and 250 seals in addition to those required.

(12) TAPES:

(a) Friction	Fed. Spec. HH-T-101
(b) Rubber	Fed. Spec. HH-T-111

(13) LIGHTING FIXTURES

(a) Living rooms	All-metal fixtures, semi-indirect; standard finish; similar and equal to American Lighting Equipment Association No. USHA-4.
(b) Bed rooms	All metal fixtures, semi-indirect; standard finish; similar and equal to American Lighting Equipment Association No. USHA-11.
(c) Kitchens	Lamp receptacle, 4" fitter with white opal globe (approximately 8" diameter).
(d) Halls	Beam fixture with flared ring opening, short insulated chain and long cord.
(e) Bathrooms	Wall fixture with convenience receptacle and local control.
(f) Utility rooms	Lamp receptacle with short insulated chain and long cord.

(g) Lamp receptacles and fixtures listed under (c), (d), (e), and (f) shall be of porcelain or composition (standard finish). Where pull chain control is specified, provide snubber or stop at hole in canopy where chain emerges, to relieve strain of excessive pull on the cord.

- - - - - - -

7. INSTALLATION OF RACEWAYS

(1) Conceal raceways from view. In non-fireproof floor and roof construction, run raceways parallel to and between joists wherever practical. In crossing joists, notch underside within 2 feet of either bearing; upper side of joists may be notched, provided 10 gage steel plate is installed over raceway to prevent penetration of flooring nails. Cutting of vertical studs not permitted in outside walls. Interior partition studs may be cut or notched where absolutely necessary and then only to minimum depth.

(2) Instructural slabs, run raceways at least 1-1/2" below top and above reinforcing steel.

(3) Keep raceways clear of partitions at ends of bath tubs permitting of future cutting of partitions to remove tub without disturbing electrical systems.

(4) Raceways in floor slabs directly on ground or located directly over crawl spaces used for pipes, etc., shall not be trapped unless necessary; use bleeder boxes in trapped raceways where access to boxes is practicable.

(5) Raceway systems shall be capped during course of construction; clean inside of raceway before installing conductors.

8. INSTALLATION OF ARMORED CABLE AND NON-METALLIC SHEATHED CABLE

(1) Conceal wiring from view. In non-fireproof floor and roof construction, run parallel to and between joists wherever practical. Cutting of vertical studs not permitted in outside walls. Interior partition studs may be drilled, cut or notched where absolutely necessary and then only to a minimum.

(2) Keep wiring clear of partitions at ends of bath tubs, permitting of future cutting of partitions to remove tub without disturbing electrical systems.

9. INSTALLATION OF OUTLET BOXES AND COVERS

(1) Boxes shall be of size and type to accommodate (a) structural conditions, (b) size and number of raceways and conductors or cables entering and (c) device or fixture for which required.

(2) Mount outlets flush; provide plaster rings or covers where required on boxes when surface is plastered or otherwise finished.

(3) Install 3/8" fixture studs in outlet boxes provided for lighting fixtures; except where type of fixture specified for the particular outlet does not require stud.

(4) Center outlets in paneling or in other architectural features; clear trims and corners by 4". Locate switch outlets adjacent to door openings on strike side of door except shown otherwise; locate bathroom outlet to one side of medicine cabinet or mirror, at side opposite hinges.

(5) Height of outlets unless otherwise noted shall be as follows: (height given is from finished floor to center of outlet);

(a) Switch.	4'0"
(b) Combination switch and receptacle . . .	4'0"
(c) Insertion receptacle.	1'0"
(d) Bathroom fixture. . . (approximately). . .	5'8"
(e) Refrigerator receptacle (approx). . . .	3'6"

(Locate to one side of refrigerator permitting serving both refrigerator and table appliance. Kitchen equipment layout governs exact location, check kitchen details before installation.)

10. INSTALLATION OF WIRES AND CABLES

(1) Use lead covering over rubber insulation in underground locations; in trapped raceways not provided with bleeder boxes and in moist locations, use lead or moisture resisting rubber covering, armored cable imbedded in masonry shall be lead covered.

(2) Eliminate splices wherever possible; where necessary, splice in readily accessible pull, junction or outlet fittings.

(3) Make taps and splices in wire #8 and smaller mechanically tight by using "Western Union" or pigtail splice, properly cleaned, soldered and insulated with rubber

and friction tapes, flashover or insulation value of joints being at least 100% in excess of wire insulation. Mechanical wire splicers and joints except those using set screws bearing directly on conductor may be used.

(4) Make taps and splices in #6 and larger wire by means of brass or copper mechanical connectors applied after wire has been cleaned, make tight and fully insulate as specified in Paragraph (3).

11. SERVICE CONNECTIONS

(1) Overhead supply: The electrical system covered by this division of the specification shall commence at the overhead point of service contact on exterior of building. From this point of contact, extend wiring to meter and service equipment and thence to outlets. At service contact, leave slack cable or conductors for connecting service loop; provide and install adequate anchorage in building wall to receive service loop. Where "service drop and entrance cable" is used, the cable shall be carried without splice to the first electrical fitting at building (See Section 10 under Division titled "Overhead Distribution - Electrical.")

(2) Underground supply: The electrical system covered by this division of the specification shall commence at the point of contact with the underground system; this point of contact being a junction box or conduit fitting, either (a) immediately inside of building (if crawl space is provided) or (b) on exterior of building approximately 24" above grade (See Section 18 under Division titled "Underground Distribution - Electrical.") From this point of contact, extend wiring to meter and service equipment and thence to outlets. At service contact, leave slack cable or conductors for connecting to underground service.

12. INSTALLATION OF METER AND SERVICE EQUIPMENT

(1) Install meter and service in one of the following manners:

(a) Disconnect and protective equipment, flush mounted inside of each dwelling unit in kitchen adjacent to entrance door; meter cabinet or receptacle on outside of building, surface mounted, located as shown on drawings.

(b) Disconnect and protective equipment with meter cabinet or receptacle on outside of building, surface mounted, located as shown on drawings.

13. WIRING CONNECTIONS (GENERAL)

(1) Extend 3 branch circuits from each dwelling unit protective cabinet, controlling outlets as follows:

Circuit 1 - Receptacle outlets in kitchen and dinette space.

Circuit 2 and 3 - Remainder of general lighting and convenience receptacle outlets; balance load as close as practical.

(2) Where terminals permit, connections for wire #8 and larger to switches, panelboards, etc., shall be with soldered copper lugs or terminals of style to fit terminal and of size to handle full wire capacity; mechanical lugs, except those using set screws bearing directly on conductors, may be used.

(3) Where three wire panels are provided balance load as nearly as possible.

(4) Where service enters overhead, locate service head fitting above point of service loop attachment on building.

(5) Electrical refrigerators will be furnished, delivered in kitchens and set in place by others. This contractor shall insert the cord connection in the receptacle provided at the refrigerator location.

14. WIRING CONNECTIONS (RANGES)

(1) Electrical ranges will be furnished, delivered in kitchens and placed within 3 feet of allocated place by others. This contractor shall furnish and install cable connection as specified hereinafter.

(2) Locate range outlet in back of range and within overall dimension of range. Consider type of cable connection and location of terminal board on range in locating outlet.

(3) Range connection between wall outlet and range shall consist of four conductor #8 all-rubber cord on 3 conductor armored cable.

(4) Provide cable support or grip on range cable connection to avoid mechanical strain on splice or terminals.

(5) Connect grounding conductor or armor to range frame. Ground at outlet box or panel box.

(6) Provide slack in connecting cable permitting range being moved 3 feet from wall without disconnecting. Form conductors with lugs (if necessary) to accommodate range terminal block.

(7) Make connections to range by one of the following methods:

(a) Continuous cable (without splice) from protective device to range.

(b) Cable or individual conductors from protective device to outlet in back of range, splicing to cable for range connection.

(c) Individual conductors from protective device to outlet in back of range, with receptacle and plug and cable for extension to range.

(d) If the protective devices are located outside of dwelling unit and do not satisfy governing laws with respect to disconnecting the range, provide plug and receptacle as specified under (c) above.

15. INSTALLATION OF LIGHTING FIXTURES

(1) Provide fixture (of type specified under MATERIAL) and install for each lighting fixture outlet indicated.

16. INSTALLATION OF SEALS

(1) Seal covers at meter and ahead of meter.

17. INSTALLATION OF FUSES

(1) Quantity: All fused gaps shall be fused before final acceptance; provide the following spares:

(a) Non-renewable: One complete duplicate set of installed non-renewable fuses.

(b) Renewable links: One complete duplicate set of installed fuse links.

18. FINAL INSPECTION AND TESTS

(1) Prior to test, feeders and branches shall be continuous from service contact point to each outlet; all panels, feeders and devices connected and fuses in place. Test system free from short circuits and grounds with insulation resistances, not less than outlined in Section 3018, 1937 NEC. Provide testing equipment necessary and conduct test in presence of local authority's representative.

19. FEEDER SIZES

(1) Size feeders based on the following current carrying requirements:

(a) Feeder to EACH dwelling unit (Lighting and general appliance)	22 ampere, 2 wire
(b) Feeder to EACH dwelling unit (Lighting, general appliance and electric range)	37 ampere, 3 wire
(c) Feeder to EACH BUILDING (Lighting and general appliance)	22 ampere, 3 wire
(d) Feeder to EACH BUILDING (Lighting, general appliance and electric range)	70 ampere, 3 wire

1. SCOPE

(1) The exterior overhead electrical distribution system for lighting and power and related items necessary to complete work shown or specified are a part of contract unless specifically excepted. See "General Scope of Work."

2. SYSTEMS

(1) Light and Power: Provide a system of distribution from point of utility company's service contact as described in detail under "General Scope of Work" and as shown on drawings.

(2) Yard Lighting: Provide a system of yard lighting as described in detail under "General Scope of Work" and as shown on drawings.

3. GENERAL REQUIREMENTS

IMPORTANT NOTE:

SIZES OF MATERIALS AS SHOWN OR SPECIFIED ARE MINIMUM. USE LARGER SIZES IF PROGRESS IS LIKELY TO BE RETARDED DUE TO DELAY IN OBTAINING SIZES INDICATED.

(1) Wherever NESC or governing regulations do not establish a "standard to follow", then follow the standard practice of local electrical utility in executing the work as drawn and specified.

(2) On completion of work, prepare a one-line feeder diagram showing (a) point of service contact, (b) routing or primary feeders and sizes, (c) transformer stations, sizes, and disconnects, (d) routing of secondary feeders and sizes, (e) service loops and sizes and (f) any other pertinent information of value to an operating engineer and for permanent record. Make diagram neatly in ink on tracing cloth not less than 18" x 24"; turn over to Authority.

4. MATERIALS

IMPORTANT NOTE

WHERE SEVERAL TYPES OR QUALITIES OF MATERIALS ARE LISTED, CONTRACTOR HAS OPTION TO USE ANY ONE OR ALL. INSOFAR AS POSSIBLE, USE ONE TYPE OR QUALITY; IF PROGRESS IS LIKELY TO BE RETARDED DUE TO DELAY IN OBTAINING THE PARTICULAR TYPE OR QUALITY SELECTED, PROVIDE SUCH OF THE OTHER SPECIFIED MATERIALS AS MAY BE APPLICABLE TO THE CONSTRUCTION.

(1) ELECTRICAL MATERIALS AND APPLIANCES of types for which there are Underwriters' Laboratories standard requirements, listing or labels, shall have listing of Underwriters' Laboratories or shall conform to their requirements and so labeled.

(2) MATERIALS used for line construction shall be in accordance with ASTM, ASA and NEMA standards where applicable.

(3) POLES shall be of Southern Yellow Pine, Western Red Cedar or Northern White Cedar; they shall be reasonably free of knot holes and reasonably straight grained.

(a) Pine poles shall be treated full length by a preservative in accordance with

American Wood-Preservers Association standard specifications (Full cell or empty cell process) after pole has been rooted, drilled and gained.

(b) Cedar poles shall be treated by any process which will produce impregnation of not less than 1/2" depth or full sapwood penetration where sapwood is less than 1/2" in depth. Impregnation shall extend from at least 2' below ground to at least 1' above.

(c) Brand poles 12' from butt with following information month and year of treatment, manufacturer's trade mark or initial, and class (ASA) and height.

(4) CROSS ARMS shall be straight grained, well seasoned, selected yellow pine or fir timber. Fir arms may be stained but not painted; pine arms shall be treated as specified for pine poles. Arms shall be surfaced, roofed and drilled.

(5) PINS shall be locust, or clamp type forged steel pins.

(6) INSULATORS shall be wet process porcelain or equally suitable process as regards electrical and mechanical properties, true to shape, free from flaws, with grooves of proper size to accommodate conductor. Provide brown glaze on ungrounded conductors and white glaze on grounded conductors.

(7) HARDWARE shall be hot dipped galvanized, meeting ASTM specification.

(8) CONDUCTORS shall be of medium-hard drawn copper (ASTM specification) with triple braided weatherproof covering (ASA specification C 8.18-1936). No. 3 AWG and smaller shall be solid, larger sizes stranded.

(9) SERVICE DROP CABLE shall consist of parallel insulated conductors with concentric uninsulated neutral, conforming to ASTM Standards of 600 volt thickness--outer covering to be weather-resisting.

(10) GUY WIRE shall be steel (a) protected by welded-on exterior of copper or equivalent non-rusting material, 30% conductivity, high strength. Generally, 3 #6 strands (ultimate strength of 6835 lbs.) should suffice; for greater loads, use 7 guy strands, (b) double galvanized, Siemens-Martin.

(11) GUY ANCHORS shall be of expanding, screw, core or wedge type of sizes required; log anchors shall be pressure creosote treated as specified for yellow pine poles.

(12) ANCHOR RODS shall be copper covered steel with integral thimble eye or double-eye as required. Minimum size rod: 5/8" diameter, 6' long.

(13) GUY GUARDS shall be hot dipped galvanized metal (#18 gage minimum) not less than 8' long.

(14) GROUND RODS shall be steel, protected by welded-on exterior of copper or equivalent non-rusting material. Under ordinary conditions, use 5/8" by 8' minimum rods.

(15) GROUND ROD CLAMPS shall be copper, bronze or equivalent non-rusting material.

(16) GROUND WIRE shall be soft-drawn copper at least size of primary and not less than #6 AWG.

(17) TRANSFORMERS ("Conventional Distribution" Type or "Complete Self-protected" Type) shall conform to AIEE and NEMA standards for oil-immersed, self-cooled type, suitable for outdoor service and furnished complete with oil and of standard voltage ratings. Following paragraphs (k) to (p) inclusive apply only to the "Complete Self-protected" type.

(a) Ratings: Primary and secondary voltage ratings, frequency, whether single or three phase and number of high voltage bushings shall be as described under "General Scope of the Work."

(b) Primary voltage taps shall be in accordance with the requirements described under "General Scope of the Work."

(c) Secondary coils shall be arranged for series and multiple connections.

(d) Terminals shall be detachable cork gasketed copper stud type, insulated by porcelain bushing extending into case and clamped into position. Bushings shall permit insulation of inside winding lead to enter bushing recess and provide surge flashover at least 20% greater on inside than on outside end. Provide 3 or 4 low voltage terminals on transformers of 100 KVA and smaller. Arrange the 4 low voltage coil terminals so that (1) series 120/240 volt, 3 wire and (2) 220 volt, 2 wire connection can be made inside of tank to 3 bushing studs; securely connect terminal lugs on low voltage leads to studs of low voltage bushing with jam nuts or equal. Slot terminal lugs to facilitate making and changing connections from 3 to 2 wire or vice versa. Transformers shall withstand AIEE impulse tests.

(e) Locate high voltage terminal board in accessible position and submerged in upper part of oil. Design links or similar devices for ratio adjusting to prevent their dropping in tank during ratio adjusting operation.

(f) Tank shall be oil tight, of copper bearing steel plate (ASTM Specification A9-29) with welded joints or of cast iron construction. Cover shall form a splash proof joint and be supplied with gasket cemented to cover. Paint tanks and covers (1) with one coat of rust resisting paint and finish with two coats of weather resisting paint, OR (2) with two coats of paint, each baked-on. Paint hangers as specified for tanks or finish hot-dipped galvanized. Stencil the KVA rating in 3" white numerals on tank in location visible from ground.

(g) Furnish standard NEMA accessories with all transformers. Provide on each transformer 25 KVA and larger a thermal temperature indicator visible from ground.

(h) Have transformers shipped with proper quantity of insulating oil in tank. Oil shall be pure clear grade mineral oil, of high dielectric strength, flash-point not less than 130 degrees C. and dielectric strength at least 22,000 volts when tested between vertical surfaces 1" in diameter and 0.10" apart.

(i) Acceptance tests shall conform to latest AIEE standards and test sheets covering unit identical in design shall be submitted, including high potential test at normal frequency from primary to secondary and to core and from secondary to core. The identically designed unit shall also have withstood surge tests, using AIEE standard test sufficient to cause arc over on outside of transformer bushing without damage or arc over of any part within the case.

(j) Submit manufacturer's data as follows, guaranteeing the equipment furnished to conform therewith.

(1) Efficiencies at 25%, 50%, 75% and full load at unity power factor and 75 degrees C.

(2) No load loss.

(3) Total full-load loss.

(4) Full load regulation at 100% and 80% power factor.

(5) Exciting current (percent).

(6) Net and shipping weights.

(7) Limiting dimensions.

(8) Gallons of oil required transformer.

(9) Diagram of internal connections complete with table of connections for all voltage operations.

Sufficient tests shall have been made to insure the guarantees will be met.

(k) Transformers shall be completely self-protected without auxiliary devices of any kind. As lightning arrestors are integral with the transformers, separate arrestors are unnecessary.

(l) Provide lightning protection by arrestors mounted integral with transformer connected between H.V. leads and tank; they shall positively prevent flow of dynamic current after surge has been discharged and shall limit rise in surge voltage to value well within impulse strength of windings.

(m) Provide overload protection by circuit breakers connected in series with secondary winding normally tripping when dangerous copper temperature is approached and instantaneous tripping on heavy overloads or short circuits. Mount breaker under surface of oil; provide with operating lever mounted on outside of transformer case and connected to breaker through oil tight stuffing box; lever shall open, close or re-set breaker after tripping.

(n) Provide bullseye indicating lamp in transformer case which shall light (and remain lit until manually re-set) when temperature of winding rises to predetermined point below tripping temperature. Energize lamps from independent winding on core. (Where lamp indicators are provided, eliminate thermal indicator specified in paragraph (g)

(o) Design bushings so that flashover occurs externally rather than internally. Provide low voltage bushings with coordinating gaps so adjusted that flashover on impulse voltage occurs at about half the impulse strength of the L. V. winding.

(p) Provide high voltage winding protective links to permit disconnecting transformer from line in event of internal failure.

(18) HOT LINE CLAMPS shall be provided on transformer primary leads, facilitating direct connection to primary lines.

(19) LIGHTNING ARRESTORS shall be of type which will prevent flow of dynamic current after surge has been discharged and shall limit rise in surge voltage to a value well within impulse strength of windings. Seal arrestor to prevent entrance of moisture into any part of arrestor that might be adversely affected by moisture from standpoint of performance or life. Test requirements shall be in accordance with AIEE Standards.

(20) TRANSFORMER FUSES shall be of the expulsion, porcelain housed, indicating type with clamp hangers and fuses. If "Complete Self-protected" type transformers are used, these protective devices shall be omitted.

(21) TAPE (friction) shall conform to ASTM specifications.

(22) YARD LIGHTING FIXTURES shall consist of single scroll brackets with metal hood and glass luminaire and lamp of approximately 2500 lumens.

5. GENERAL INSTALLATION REQUIREMENTS

(1) Supporting structures, wires and other equipment shall conform as to strength, clearances, sags, etc., with N.E.S.C. Use Grade B construction except where N.E.S.C. requires Grade A construction.

(2) Use safety factor of 2 for Grade B construction and safety factor of 3 for Grade A.

(3) Stake-out pole and guy locations as soon as field conditions permit and obtain Authority's approval. Indicate finished grade and pole number on stakes. The right is reserved to make any reasonable change in locations up to time of approval of staked locations without involving additional cost.

(4) String wires from pay-out reels and protect weatherproof wire braiding against injury in pulling. Give conductors initial strength equivalent to maximum loading tension for 5 minutes, then sag to normal tension corresponding to stringing temperature.

(5) Tensions and sags shall be according to N.E.S.C., Part 2, Appendix A. Use sighting method to determine sag.

(6) Place conductors of highest voltage on upper cross arm positions, wire of same circuit shall occupy same relative pin positions on successive poles throughout project.

(7) Splice conductors with copper sleeves twisted at least 3-1/2 complete turns. Use solderless connectors in making taps. Tape joints and taps with 4 layers of friction tape, painted with weatherproof insulating compound. No span shall contain more than two splices per conductor; locate splicing sleeves at least 3 feet from conductor supports.

6. POLE INSTALLATION

(1) Poles shall be of length to provide required clearances above the ground, foreign wires and other obstructions and of strength to support load placed upon them. Do not pass wires over buildings.

(2) Fully treated poles shall be gained and bored before treatment. If additional gains are required, use metal gains. After treatment, exercise care in handling to prevent scarring and splintering of surface.

(3) In general handling of poles, use rope cants. Use pike poles or "dead man" for erection.

(4) Use pole lengths not less than (a) 30' for guy stubs, (b) 35' for standard construction and (c) 40' for joint construction, except that poles carrying secondary rack only, or secondary rack and telephone cable, shall not be less than 35'.

(5) Wherever practical before setting, frame and fit poles with cross arms, braces, pins, racks, etc., arrange in framing and placing equipment to permit ready climbing. Roof poles one way, at angle of 15 degrees to horizontal.

(6) Provide pole steps perpendicular to the line on poles carrying transformer or lighting fixtures; lowest step 8' from ground and on side away from road.

(7) Set poles so alternate cross-arm gains face in opposite direction, except at deadends where gains of last two poles shall face deadend; double arm construction at deadends.

(8) Set poles, along streets and alleys, 8" from inside edge of curb to nearest pole surface, unless local ordinances require greater distance. Protect poles, in alleys and on corner of alleys, with metal guards or butt plates to prevent injury from vehicle hubs.

(9) Determine depth of setting by holding power of earth and length of pole. For ordinary soil and rock conditions, set at depth given in Table 92, N.E.S.C. In loose and swampy ground, provide additional reinforcement to assure stability, such as increased depth, guying, concreting and rock. On sloping ground, the depth of hole shall be measured from low side of hole.

(10) Poles, subject to loads which cannot be supported by anchors and guys and when strain is sufficient to distort the line shall be reinforced by creosoted planks not

less than 3" x 4" by 4' long, or concrete (1-2-4 mix) for full depth and extended above ground line with tapered finish.

(11) Dig holes as small in diameter as practical (uniform at top and bottom), only large enough to admit tamping bar around pole. Set poles in alinement and plumb except at corners, deadends, angles and other points of strain where a slight rake against direction of strain shall be given. After pole is in position, ram dirt firmly in place around pole, bank excess dirt around pole.

(12) Avoid abrupt changes in line level; where ground contour is irregular provide poles of varying lengths to maintain as even a conductor line as practical. Where considerable change in grade elevations occur, poles should be of heights and spacing that will not create steps greater than 5' per span.

7. CROSS-ARM INSTALLATION

(1) Cross-arms shall be of size and strength to accommodate conductors and equipment. Use single cross-arms except at line terminals, line angles of 30 degrees and greater, highway crossings, or other points where there is an excessive strain, use double arms.

(2) Install all arms except top arms with metal gains.

(3) Where corner of junction poles require buck-arms, install them approximately midway between and at right angles to line arms, allowing for climbing space.

(4) If locust pins are used, dip in hot creosote, fit in pin holes and fasten in place with 4d nails driven through side of arm into pin; place pin in all pin holes.

(5) Fasten cross arms (except transformer arms) with standard flat braces, using double sets for double arms. Fasten cross-arms to pole by machine bolt; using double arming spacer bolts at ends on double arm construction. Use machine or carriage bolts in fastening braces to arms and lag screw in fastening braces to pole.

(6) Fasten transformer cross-arms with angle braces having 48" spread for 8' arm and 60" spread for 10' arm. Use machine bolt in fastening arm to pole and double arming spacer bolts at ends. Use machine or carriage bolts in fastening angle braces to arms and lag screws in fastening braces to poles.

(7) Provide washers where bolts or screws bear on wood surfaces. Bolt ends shall not extend more than 1/2" beyond nut.

8. PRIMARY LINE CONDUCTOR INSTALLATION.

(1) Use top groove of insulators for (a) No. 2 AWG and larger; (b) line voltage 5000 and over, and (c) spans 200 feet and over. Attach conductor to top groove on straight portions of line; at angles or corners, attach wire to side of insulator and always on such side that strain will come on insulator and not tie wire.

(2) Use side groove of insulators for (a) conductors smaller than No. 2 AWG, (b) line voltages less than 5000 and (c) spans less than 200 feet. On straight portions of line, attach conductors on insulator side nearest pole, except on pole pins where conductor shall be away

from pole. At angles or corners, attach wire to such side of insulator that strain will come on insulator and not tie wire.

(3) Securely tie conductors to pin insulators with tie wires. Give one complete turn around insulator and at least 4 complete turn around conductor.

(4) In deadening No. 3 conductors and smaller, use two standard pin type insulators on double arms.

(5) In deadening conductors larger than No. 3 use suspension type insulators in strain position. Form conductors either (a) by serving strands with 6 turns around line conductors or (b) clamp free end with mechanical connectors or with two guy clamps over insulation.

9. SECONDARY LINE CONDUCTOR INSTALLATION

(1) Carry secondary circuits 250 V and less on secondary racks. On straight line construction, tie conductors to spools on side toward pole; at angles or corners, tie to spools on side away from strain.

(2) Locate secondary neutral conductor in top spool of rack.

(3) Along streets and alleys, secondaries shall be on field side of pole.

(4) On straight lines, attach racks by through bolt at top and lag screw at bottom. At angles, transformer poles, deadend poles, heavy service take-offs and other points of unusual strain, use two through bolts.

(5) In deadening No. 3 conductors and smaller, wrap once around spool insulator and give one long turn and six short turns around conductor. In deadening conductors of larger size, wrap once around spool insulator and clamp free end to conductor with "wire rope guying clips" or "guy clamps" of size to fit over insulation. In using "wire rope guying clips," tighten U-bolt until it cuts through insulation making for contact with conductor.

10. SERVICE LOOP INSTALLATIONS

(1) Service drop cable:

(a) Extend "service drop" cable from secondary line on pole to building and connect to building service conductors, installed under "Interior Wiring" Division.

(b) Support cable by cable clamps (non-ferrous, non-corrosive) at the pole and at building.

(c) Fasten clamp at building to anchorage provided under "Interior Wiring" Division, using strain insulators (if local requirements demand) between clamp and anchorage.

(d) Pre-stretch service cable to remove reel kinks; string with slack tension so low part of span is below attachment point on building.

(2) Service drop and entrance cable:

(a) As outlined under Paragraph (1) except cable shall be extended without splices to first electrical service fitting on building.

(3) Individual conductors:

(a) Extend individual conductors from secondary line on pole to building and connect to building service conductors installed under "Interior Wiring" Division.

(b) Support conductors at pole and at building. Install rack (if used) and insulators at building, using anchorage provided under "Interior Wiring" Division.

(c) Pre-stretch service conductors to remove reel kinks; string with slack tension so low part of span is below attachment point on building.

11. GUY INSTALLATIONS

(1) Provide guys wherever necessary to hold cross arms and pole structure in proper position and to provide additional strength to support loads greater than structure will safely support alone. At unbalanced tensions, such as corners, angles and deadends, attach guys at center of load and in line with resultant loading.

(2) Guys shall be of strength to withstand N.E.S.C. loadings and tensions based on supporting entire load in direction in which it acts.

(3) Wherever practical, place guy anchors a distance (lead) from pole equal to height of guy attachment, to limit stresses on anchor and guy. Anchor may be placed closer to pole but not less than 3/8 the height of guy attachment. Multiply following factors by total horizontal conductor load for different ratios of "lead" divided by "height" to obtain actual guy tension.

Ration "Lead" to "Height"	Multiplier
1	1.41
3/4	1.67
1/2	2.24
3/8	2.86

(4) Side guy line angles 10 degrees and over. Angles up to 60 degrees shall have single guy, placed to split line angle. Angle greater than 60 degrees shall have guys in both directions.

(5) Install guy stub poles to provide clearance for guy wires crossing streets or obstructions.

(6) Arm guys should be approximately horizontal. Fasten guy to double arming bolts by eye bolt, eye nut or clevis. Install guy in position before line conductors are placed under tension. Where guy is attached to pole, serve twice around pole, hold in position by two guy hooks, protecting pole by three strain plates (use moulding strain plate where pole grounds occur). For light guying, use lag screws in fastening guy hook; for deadends, use machine bolts.

(7) Provide 2 strain insulators in all guys, one 4' from pole and the other at least 8' from ground.

(8) For average loading conditions, use patent anchors, with rod and thimble eye; provide twin eye rods where telephone messenger cable may be attached to poles; anchor eye not to extend 12" above ground. For heavy loading conditions, use log anchors, fully pressure creosoted 12" x 12" x 4' minimum.

(9) Securely attach pole guy at poles by means of "guy attachment hook."

(10) In make-up of guys, wire strands shall be fastened as follows:

(a) 1/4" strands - served at least 4 wrappings per strand.

(b) 5/16" and 3/8" strand - one 3-bolt standard clamp.

(c) 7/16" and larger - two 3-bolt standard clamps.

(d) Place clamps 3" from strain insulators and a distance from pole equal to twice pole diameter. Cut strand 12" beyond end of outer clamp and hold in place by copper wire wrapping.

(11) Guys shall be placed and pulled up before conductors are strung. In placing guys, the tops of poles shall be "pulled over" so that when load is applied and guys and anchors have settled, pole tops will come back in line.

(12) Install guy guards on all anchor guys.

12. TRANSFORMER INSTALLATION

(1) Place transformers in lowest practical position, maintaining minimum clearance to ground of 16 feet.

(2) Hang transformers on double cross arms with hanger irons. Use kicker arms in single transformer installations.

(3) Install cutouts with clamp hangers and fuses in all phase wires at transformers of 4 KV rating of following sizes:

Transformer KVA	Cutout Amps	Fuse Size (Amperes) 1/o2300 V 3/6 4000 V.Y	3/6 2300 V. Delta
5	50	5	10
7.5	50	8	15
10	50	10	20
25	50	30	50
37.5	50,100	40	75
50	100	60	100

The above sizes are based on 250% transformer rating; fuse transformers equipped with integral fuses, 1-1/2 times amp. sizes given above.

(4) Install cutouts in accessible location on transformer cross-arm on side away from transformer, connecting so fuse holder is dead in open position.

13. LIGHTNING ARRESTOR INSTALLATION

(1) If lightning arrestors are not furnished integral with transformers, install on each primary phase wire an arrestor at transformer and connect to transformer lead between cutout and overhead line.

Where underground primary extensions are made, provide lightning arrestors on each phase conductor.

14. GROUNDING

(1) Grounds shall be provided for (a) secondary lines, one side of 2-wire system, neutral of 3 and 4 wire systems; (b) ground terminal of each lightning arrestor; (c) operating rods of mechanically operated disconnecting switches and (d) transformer tanks.

(2) Each building service connection will have neutral grounded to water mains inside building at service switch; this connection will be made under the "Interior Wiring and Lighting Fixtures" Division. Provide at least one pole ground for each 350' of secondary line. Tie secondary and lighting arrestor grounds together on transformer poles by most direct connection and connect to common driven pole ground unless connections to water conduit can be made.

(3) Driven grounds should be of length to reach below permanent moisture level and insure low ground resistance. Where rock is encountered, obtain grounds by (a) connections to water mains, (b) connections to adjacent well-grounded secondary neutral or (c) installing counterpoise which is well grounded at both ends.

(4) Pole ground connections shall be at least as large as primary conductor and not less than No. 6 AWG wire; installed in hot creosote dipped moulding and fastened to pole with copper covered staples. Place moulding over entire length of ground wire including cross connections on underside of cross arms to ground rod connections at base of pole. Provide connection to ground rod with non-ferrous ground wire clamp.

15. YARD LIGHTING INSTALLATION

(1) A multiple lighting system shall be employed, connecting the yard lighting units to a secondary system. Provide a pilot circuit with time clocks and relays to control the lighting system.

16. FINAL TESTS

(1) At time of final inspection connections from utility company's supply to transformers and equipment shall be completed, together with all pole ground connections; transformer fuses shall be in place and circuits continuous to point of secondary contact on buildings. Prior to energizing overhead distribution system, building service switches shall be placed in open position. Voltage test on line side of all building service switches shall be made. Correct voltage errors and phase relations before placing building electrical system in service. Provide testing equipment necessary to conduct test. Notify Authority in advance before conducting tests.

1. SCOPE

(1) The exterior underground electrical distribution system for lighting and power and related items necessary to complete work shown or specified are a part of contract unless specifically excepted. See "General Scope of Work".

2. SYSTEMS

(1) Light and Power: Provide a system of distribution from point of utility company's service contact as described in detail under "General Scope of Work" and as shown on drawings.

(2) Yard Lighting: Provide a system of yard lighting as described in detail under "General Scope of Work" and as shown on drawings.

(3) Telephone: Provide a system of trenches and sleeves through walls for cable installation by telephone company.

3. GENERAL REQUIREMENTS

IMPORTANT NOTE:

SIZES OF MATERIALS AS SHOWN OR SPECIFIED ARE MINIMUM. USE LARGER SIZES IF PROGRESS IS LIKELY TO BE RETARDED DUE TO DELAY IN OBTAINING SIZES INDICATED.

(1) Wherever NESC or governing regulations do not establish a "standard to follow", then follow the standard practice of local electrical utility in executing the work as drawn and specified.

(2) On completion of work, prepare a one-line feeder diagram showing (a) point of service contact, (b) routing of primary feeders and sizes, (c) transformer stations, sizes, and disconnects, (d) routing of secondary feeders and sizes, (e) building services and sizes and (f) any other pertinent information of value to an operating engineer and for permanent record. Make diagram neatly in ink on tracing cloth not less than 18" x 24"; turn over to Authority.

4. AS-BUILT DRAWINGS

(1) As work progresses, record on one set of drawings all changes and deviations from contract drawings in locations, grades and elevations of conduits, cable runs, manholes, tap boxes, etc. Record final location of the aforementioned by offset distances, in feet and tenths, to surface improvements, such as buildings, curbs or edges of walks. Make sufficient measurements to locate definitely all lines.

(2) At completion of work, transfer all such records in waterproof drawing ink to a set of white cloth prints. After checking records and obtaining signature of approval thereto of Authority's representative, deliver to Authority for permanent record.

5. MATERIALS

IMPORTANT NOTE:

WHERE SEVERAL TYPES OR QUALITIES OF MATERIALS ARE LISTED CONTRACTOR HAS OPTION TO USE ANY ONE OR ALL. INSOFAR AS POSSIBLE, USE ONE TYPE OR

1. SCOPE

(1) The exterior underground electrical distribution system for lighting and power and related items necessary to complete work shown or specified are a part of contract unless specifically excepted. See "General Scope of Work".

2. SYSTEMS

(1) Light and Power: Provide a system of distribution from point of utility company's service contact as described in detail under "General Scope of Work" and as shown on drawings.

(2) Yard Lighting: Provide a system of yard lighting as described in detail under "General Scope of Work" and as shown on drawings.

(3) Telephone: Provide a system of trenches and sleeves through walls for cable installation by telephone company.

3. GENERAL REQUIREMENTS

IMPORTANT NOTE:

SIZES OF MATERIALS AS SHOWN OR SPECIFIED ARE MINIMUM. USE LARGER SIZES IF PROGRESS IS LIKELY TO BE RETARDED DUE TO DELAY IN OBTAINING SIZES INDICATED.

(1) Wherever NESC or governing regulations do not establish a "standard to follow", then follow the standard practice of local electrical utility in executing the work as drawn and specified.

(2) On completion of work, prepare a one-line feeder diagram showing (a) point of service contact, (b) routing of primary feeders and sizes, (c) transformer stations, sizes, and disconnects, (d) routing of secondary feeders and sizes, (e) building services and sizes and (f) any other pertinent information of value to an operating engineer and for permanent record. Make diagram neatly in ink on tracing cloth not less than 18" x 24"; turn over to Authority.

4. AS-BUILT DRAWINGS

(1) As work progresses, record on one set of drawings all changes and deviations from contract drawings in locations, grades and elevations of conduits, cable runs, manholes, tap boxes, etc. Record final location of the aforementioned by offset distances, in feet and tenths, to surface improvements, such as buildings, curbs or edges of walks. Make sufficient measurements to locate definitely all lines.

(2) At completion of work, transfer all such records in waterproof drawing ink to a set of white cloth prints. After checking records and obtaining signature of approval thereto of Authority's representative, deliver to Authority for permanent record.

5. MATERIALS

IMPORTANT NOTE:

WHERE SEVERAL TYPES OR QUALITIES OF MATERIALS ARE LISTED CONTRACTOR HAS OPTION TO USE ANY ONE OR ALL. INSOFAR AS POSSIBLE. USE ONE TYPE OR

QUALITY; IF PROGRESS IS LIKELY TO BE RETARDED DUE TO DELAY IN OBTAINING THE PARTICULAR TYPE OR QUALITY SELECTED, PROVIDE SUCH OF THE OTHER SPECIFIED MATERIALS AS MAY BE APPLICABLE TO THE CONSTRUCTION.

(1) ELECTRICAL MATERIALS AND APPLIANCES of types for which there are Underwriters' Laboratories standard requirements, listings, or labels, shall have listing of Underwriters' Laboratories, or shall conform to their requirements and so labeled.

(2) RACEWAYS AND FITTINGS:

(a) Rigid metal conduit (zinc coated) Fed. Spec. WW-C-581a

(b) Rigid metal conduit fittings. Fed. Spec. WF-406

(c) Fibre conduit (for concrete encasement) Fed. Spec. WW-C-581a Type I.

(without concrete encasement) Fed. Spec. WW-C-581a Type II

(d) Cement-asbestos conduit shall be of "standard" or "light" weight, having noncombustible mixture of cement and pure asbestos fibre, formed under pressure into dense, homogeneous, close grained, inert, nonporous tubes with smooth bore having low friction coefficient. Conduit walls shall be impervious to water on being subjected for 24 hours to hydrostatic head of 50 feet. Taper-cut conduit ends, providing tapered sleeve coupling to fit but not allowing conduit ends to butt. Lengths not less than 5' nor more than 10'.

3. WIRES AND CABLES:

(a) Duct and Vault Installation	Grade	Specs.
Moisture resistant	Type RW NEC	Underwriters Lab
Rubber covered, lead sheathed	Type RP (30%)	A.S.T.M.
	Type RH (35%)	A.S.T.M. or Fed Spec JC-106a
Varnished cambric, lead sheathed	-	IPCEA
(b) Direct Earth Installation		
Lead covered, metallic armored	30%	IPCEA
Lead and jute covered	30%	IPCEA
Lead and duck tape	30%	IPCEA
Non-metallic fibrous or rubber jacket	30%	IPCEA

(4) TAP OR JOINT BOXES (underground) used for encasing buried cable joints shall be malleable or cast iron for one or more multi-conductor service taps as required. Split box at cable

entrances, holding together with non-corrosive bolts. Provide top with filling holes and screwed plugs, where necessary

(5) MANHOLE COVERS AND FRAMES shall be heavy cast iron flanged type with at least 30" round clear opening with overall dimensions of flange approximately 45" square, rib braced. Cover shall be heavy ribbed cast steel with ventilating holes with the word "Electric" cast in approximately 2" letters.

(6) CABLE RACKS shall be hot galvanized malleable iron or steel with mounting holes for hooks.

(7) CABLE RACK HOOKS shall be hot galvanized malleable iron or steel of width and extension required.

(8) RACK INSULATORS shall be of proper radius for cable, wet process white glazed porcelain.

(9) MANHOLE LADDER shall be hot galvanized steel, having rungs spaced approximately 12" apart; length as required.

(10) PULLING EYES shall be of approximately 7/8" round galvanized steel.

(11) GROUND RODS shall be steel protected by welded-on exterior of copper or equivalent rust resisting material; 5/8" x 8' minimum length.

(12) TRANSFORMER VAULT EQUIPMENT shall be in accordance with the latest NEMA and AIEE standards. The installation shall consist of either of the following types. Interrupting capacities of protective equipment in accordance with local utility company's requirements.

(a) Factory assembled equipment made up of metal clad sections containing (1) primary protection and disconnects, (2) space for metering instruments (if any in incoming "Line Room"), (3) transformers, (4) secondary protection and disconnects.

(b) Field assembled equipment composed of potheads (if any), disconnect switches with oil breaker or oil-filled cutouts, bus supports and busses, transformers and secondary protection and disconnects.

NOTE: Listed in Paragraphs (12) to (15) inclusive are materials and equipment required in connection with the vault installation; field assembled equipment is specified, although similar equipment may be incorporated as far as applicable into "factory assembled units."

(13) PRIMARY CUTOUTS (oil filled type) shall be complete with wiping sleeves, oil fuse links, manifold and expansion pipes; arrange for gang operation.

(14) TRANSFORMERS shall conform to AIEE and NEMA standards for oil immersed, self-cooled type, suitable for indoor vault service and furnished complete with oil and of standard voltage ratings.

(a) Ratings: Primary and secondary voltage ratings, frequency, whether single or three phase and number of high voltage bushings shall be as described under "General Scope of Work."

(b) Primary voltage taps shall be in accordance with the requirements described under "General Scope of Work."

(c) Secondary coils shall be arranged for series and multiple connec-

tions.

(d) Terminals shall be detachable cork gasketed copper stud type, insulated by porcelain bushing extending into case and clamped into position. Bushings shall permit insulation of inside winding lead to enter bushing recess and provide surge flashover at least 20% greater on inside than on outside end. Provide 3 or 4 low voltage terminals on transformers of 100 KVA and smaller. Arrange the 4 low voltage coil terminals so that (1) series 120/240 volt, 3 wire and (2) 240 volt, 2 wire and (3) multiple 220 volt, 2 wire connections can be made inside of tank to 3 bushing stud; securely connect terminal lugs on low voltage leads to studs of low voltage bushing with jam nuts or equal. Slot terminal lugs to facilitate making and changing connections from 3 to 2 wire or vice versa. Transformers shall withstand AIEE impulse tests.

(e) Locate high voltage terminal board in accessible position and submerged in upper part of oil. Design links or similar devices for ratio adjusting to prevent their dropping in tank during ratio adjusting operation.

(f) Tank shall be oil tight, of copper bearing steel plate (ASTM Specification A-9-29) with welded joints or of cast iron construction. Cover shall form a splash proof joint and be supplied with gasket cemented to cover. Paint tanks and covers (1) with one coat of rust resisting paint, sub-finish with two coats of weather resisting paint, OR (2) with two coats of paint, each baked-on.

(g) Furnish standard NEMA accessories with all transformer. Provide on each transformer 25 KVA and larger a thermal temperature indicator. 5 KVA transformers and larger shall have 1/2" drain outlet and plug.

(h) Have transformer shipped with proper quantity of insulating oil in tank. Oil shall be pure clear grade mineral oil, of high dielectric strength; flashpoint not less than 130 degrees C. and dielectric strength at least 22,000 volts when tested between vertical surfaces 1" in diameter and 0.10" apart.

(i) Acceptance tests shall conform to latest AIEE standards and test sheets covering unit identical in design shall be submitted including high potential test at normal frequency from primary to secondary and to core and from secondary to core. The identically designed unit shall also have withstood surge tests, using AIEE standard test sufficient to cause arc over on outside of transformer bushing without damage or arc over of any part within the case.

(j) Submit manufacturer's data as follows, guaranteeing the equipment furnished to conform therewith:

(1) Efficiencies at 25%, 50%, 75% and full load at unity power factor and 75 degrees.

(2) No load loss.

(3) Total full-load loss.

(4) Full load regulation at 100% and 80% power factor.

(5) Exciting current (percent).

(6) Net and shipping weights

(7) Limiting dimensions.

(8) Gallons of oil required per transformer.

(9) Diagram of internal connections complete with table of connections for all voltage operations.

Sufficient tests shall have been made to insure that the guarantees will be met.

(15) SECONDARY PROTECTIVE EQUIPMENT shall be in accordance with the requirements described under "General Scope of Work."

(16) SERVICE ENTRANCE ROOM EQUIPMENT shall be in accordance with the requirements described under "General Scope of Work."

(17) YARD LIGHTING FIXTURES shall consist of metal lighting standards, (standard with the trade) giving an approximate height to light sources of 14 feet, provided with lamp base having handhole, where required, and equipped with luminaire and 2500 lumen lamp. All metal parts shall have a corrosive-resistant coating both inside and out with metallic paint.

(18) OPERATING AND SAFETY DEVICES. Warning signs shall be porcelain steel signs with "DANGER - HIGH VOLTAGE" inscribed in 2-1/2" to 3" red letters on white background. Padlocks shall be heavy bronze cylinder type 3/8" yoke with heavy galvanized chain about 15" long. Locks for similar equipment shall be keyed alike. Deliver to Authority 6 keys for each set with attached non-ferrous metal labels. Rubber insulating gloves shall be of high quality, subject to 10,000 volt test.

(19) SPARE PARTS. Furnish and deliver to Authority, suitably packed and marked "General Scope of Work."

6. GENERAL INSTALLATION REQUIREMENTS

(1) Stake out manholes, handholes, vault locations and routing of underground lines as soon as field conditions permit and obtain authority's approval. Indicate finished grade at stakes. The right is reserved to make any reasonable change in locations up to time of approval of staked locations without involving additional cost.

7. EXCAVATION

(1) Perform all excavation necessary to install work required under this division. Deposit on, or remove from, site as may be directed all excess excavation material, backfill as specifically referred to hereinafter.

8. CONSTRUCTION OF MANHOLES.

(1) Additional manholes or handholes may be installed for convenience of cable installation if contractor elects at no added cost to Authority.

(2) Particular attention is drawn to importance of establishing top elevations of manhole covers, setting top so in no case it occurs below surrounding finished grade.

(3) Manholes, and concrete, reinforcement and masonry shall conform to applicable requirements of Divisions "Utilities" and "Foundations, Concrete and Masonry," respectively.

(4) Slope floor to drain to sump pit.

(5) Install manhole cover frame, cover and ladder. Mount cable racks with expansion bolt or anchor bolt and install required cable rack hooks and insulators; install racks on each side of cable joints, otherwise spacing on 3' centers.

(6) Install pulling eyes in wall directly opposite each duct opening or group of openings.

(7) Free interior of manholes of pipes and other obstructions; leaving entire interior available for training cables and working space around cables.

(8) Drive ground rod below floor of each primary manhole, leaving 6" above floor. Ground equipment, hardware, cables, etc., to rod by 1/8" x 1" copper bus or No. 2 bare medium hard drawn, stranded copper wire. Bond lead covered cables by use of No. 6 stranded wire, wiped onto cable sheath and carry to grounding system; provide adequate slack between each cable. Perform bonding in manner conforming to standard practice of local utility company.

NOTE: Metal conduit and light weight fibre and cement asbestos raceways shall be encased in concrete. Heavy wall fibre and cement asbestos conduit may be installed without the concrete enclosure.

9. INSTALLATION OF RACEWAYS (CONCRETE)

(1) Excavate trench to proper depth. Raceway shall be at least 30" below finished grade; the pitch being at least 6" per 100' raceway radius at least 36". Do not spring the joints on fibre conduit, use 5 degree angle connector. Firmly tamp bottom of trench. Where more than one raceway is laid in same trench, place duct sections in desired formation, not less than 2" separation, using brick or precast concrete separators on 4' centers. Enclose ducts in concrete envelope, 3" on all sides. Place four 3/8" reinforcing rods, one in each corner of envelope wherever run is placed in loose or filled-in ground and where it passes under tunnel or enters manhole or vault. Extend rods into manhole or vault structure and at least 36" into duct run.

(2) Do not backfill until 24 hours after concrete has been poured; backfill dirt, soaked and tamped in one foot layers, rock and obstacles over 2" removed.

10. INSTALLATION OF RACEWAYS (WITHOUT CONCRETE)

(1) Excavate trench to proper depth. Raceway shall be at least 30" below finished grade; pitch being at least 6" per 100' raceway radius at least 36". Do not spring joints; on fibre conduit use 5 degree angle connector. Firmly tamp bottom of trench, earth to be evenly graded. Ram 1" of fine earth or sand. Where more than one raceway is laid in same trench, place duct sections in desired formation, not less than 2" separation, using brick or precast concrete separators on 4' centers. Ram fine earth or sand be-

tween ducts and for 2" above ducts. Backfill with fine earth free from stones, debris, etc., and tamp for 8". On top of tamped material, lay yellow pine plank, 1" x 12" for one duct and 1" x 18" for two ducts. Impregnate planks with creosote by vacuum and pressure system for penetration of creosote into wood fibre. Backfill dirt, soaked and tamped in one foot layers, rocks and obstacles over 2" removed.

(2) Where runs are under traffic streets, service drives or over filled-in ground that may settle, encase ducts in 3" of concrete on all sides in a manner as outlined in Section "Raceways in Concrete."

11. FITTING OF FIBRE OR CEMENT ASBESTOS CONDUIT

(1) Use conduit tooling machine in cutting conduit and tapering ends to assure proper jointing of ends and fitting of coupling. Stagger joints at least 12" where more than one conduit occurs in run. Paint each joint with waterproof insulating conduit sealing compound, wrapping with two layers of waterproof tape made up of cotton cloth, coated and filled with black asphaltum compound; tape to cover joint at least 3" on each side.

(2) Install end bells at duct openings in manholes and vaults. Use conduit adapters in connecting to steel conduit.

(3) Draw mandrel swab through ducts immediately after laying to assure clearance of water and foreign material. Plug conduits until ready to pull cables and swab again just prior to cable installations.

12. FITTING OF METAL CONDUIT

(1) Ream and remove burrs; watertight by red leading male thread only. Stagger joints at least 12" where more than one conduit occurs in run.

(2) Plug conduits until ready to pull cables and swab prior to cable installation. All exposed threads on galvanized pipes shall be given one coat of acid resisting paint.

13. INSTALLATION OF SERVICE SLEEVES

(1) Install galvanized sleeves or nipples in foundation walls of buildings for connection to underground raceways or for entrance of direct burial cable.

14. TRANSFORMER VAULT EQUIPMENT INSTALLATION

(1) Laycuts shown on drawings are diagrammatic. Before commencing installation of vault equipment, prepare working drawings showing layout equipment and connections based on equipment selected and in accordance with the local utility company's standard; obtain utility company's approval, then submit to Authority for approval.

(2) Install primary oil filled cutouts (gang operated), transformers on rails and secondary distribution panel; inter-connect the equipment and connect incoming primary and secondary feeders to the equipment. If "factory assembled units" are provided, install units complete, connecting the primary and secondary feeders to the "assembled units."

(3) In the "Line Room" (service entrance room) utility company will connect incoming primary service to the primary cutouts, the work under this contract commencing at this point, except for the metering transformer and meter panel which will be furnished by the utility company but installed by this contractor. Provide and install necessary facilities and connections between the primary cutouts and transformers to receive the metering equipment, all in accordance with utility company's rules and regulations.

15. INSTALLATION OF CABLES IN DUCTS

(1) Use feeding tube where cable passes into mouth of duct. Avoid injury to lead sheath, never subjecting the cable to bending at radius of less than 8 times overall diameter. In cable pulling to reduce friction and abrasion, apply freely a permanent and inorganic grease. If temperature is below 14 degrees F. at time of cable installation, place the reels of cable in approximately an 80 degree F. room for at least 24 hours or until cable has a temperature throughout of at least 60 degrees F.

16 INSTALLATION OF CABLE DIRECTLY IN GROUND

(1) Install at minimum of 36" below finished grade, laid so as not to obstruct known future construction or improvements. Protect primary cables, extending under driveways, streets, etc., and in crossing other utility lines by installing in cast iron pipe secondary cables by installing in galvanized conduit. Extend raceways 24" at each end beyond width of paved area under which installed.

(2) Where cables enter buildings, extend through galvanized conduit sleeves set in walls during wall construction. After cables are installed through sleeves, caulk both ends with material and in manner recommended by cable manufacturer.

(3) No splices except at handholes, manholes and vaults. Where 2 or more cables are placed in same trench, separate by at least 2".

(4) Spread bottom of trench with at least 4" deep sand. Lay cables on top of sand in snake fashion, thus allowing slack for settlement. Spread top and sides of cable with sand, covering by at least 4". Backfill dirt, soaked and tamped in one foot layers, rocks and obstacles of over 2" removed.

(5) For primary cable, lay a 2" x 12" yellow pine plank over the final layer of sand and before backfilling. Impregnate plank with creosote by vacuum and pressure system for penetration of creosote into wood fibre.

17. PRIMARY CABLE INSTALLATION

(1) Furnish certified copy of high potential and insulation resistance tests for each type cable used.

(2) Arrange cables on insulator racks to permit contraction and expansion of cables without binding at duct entrances.

(3) Fireproof exposed lead cables by wrapping asbestos listings

around cables and then coating with silicate of soda.

(4) In splicing, use materials approved by cable manufacturer and make up splice in accordance with cable manufacturer's standards and local utility company's common practice. Three-way splices shall be of "Y" joint type. If rain should delay completion of splice, wrap entire splice and 12" of the cable from each end of splice in tight rubber covering to prevent moisture absorption. Before removing covering, thoroughly dry inside of manhole or vault, all tools and material. Use filling compound for splices and potheads as recommended by cable manufacturer.

(5) Cable splices and pothead connections shall be made by mechanics qualified by experience to handle this type of work satisfactorily. Submit certified copies of employment records; applicant, if requested, shall demonstrate his ability to satisfactorily perform this specialized work.

(6) In terminating "multi-conductor" cables, install potheads of proper type, rating and shape. Insulate cap nuts with varnished cambric tape, having 1-1/2 times insulating value of cable, dress with insulating paint.

18 SECONDARY CABLE INSTALLATION

(1) Furnish certified copy of high potential and insulation resistance tests for each type cable used.

(2) Connect secondary cables from transformers to points of pick-up under "Interior Wiring and Lighting Fixtures" Division. In racking, keep secondaries at least one foot from primary conductors.

(3) Make service taps in tap or joint boxes with mechanical connectors. Insulate with varnished cambric tape having 1-1/2 times insulating value of cable, dress with insulating paint. Place cables in box and seal with low voltage insulating compound in manner recommended by manufacturer.

(4) Terminate lead covered cables with wiped sleeves and non-metallic cables with sealed cable heads.

(5) Terminate underground service cable in junction boxes on interior face of foundation wall where crawl space is provided or on exterior of wall where there is no crawl space. The junction box or conduit fitting on the exterior shall be approximately 24" above grade. The aforementioned junction boxes and conduit fittings shall be provided under this division of the specification. Connect the interior cables which will be brought to these points under another division of the specification to the underground cables, leaving same ready for operation.

19. SECONDARY DISTRIBUTION CENTERS

(1) Secondary distribution centers shall be installed in accordance with requirements described under "General Scope of Work."

20. GROUNDING

(1) Ground equipment and services in accordance with standard practice of

local utility company. In general, grounds shall be provided for (a) secondary lines, one side of 2 wire system, neutral of 3 and 4 wire systems; (b) metallic cable sheaths of primary cables; (c) metal lighting standards (on series high tension, provide driven ground; on multiple secondary circuit, use anchor bolts supporting the standard as grounds); (d) operating rods of mechanically operating disconnect switches; (e) switch frames, switch bases, instrument transformer and transformer tanks and like equipment housing or frames in line room and vaults.

(2) Each building service connection will have neutral grounded to water mains inside building at service switch; this connection will be made under "Interior Wiring and Lighting Fixtures" Division.

(3) Driven grounds shall be of lengths to reach below permanent moisture level and insure low ground resistance. Where rock is encountered, obtain grounds by (a) connections to water mains, (b) connections to adjacent well-grounded secondary neutral or (c) installing counterpoise which is well grounded at both ends.

21. YARD LIGHTING INSTALLATION

(1) Mount standards on concrete base according to manufacturer's recommendation, consisting of 1:2:4 mix with 3/4" aggregate. Set base 1" above grade with top surface troweled smooth and beveled. Install conduit elbows as required in the base terminating 6" above top. Plumb standards in 90 degree planes. After erection, apply one finish coat of paint of standard color as may be approved.

(2) Clear water plugs by at least 3'; clear sewer catch basin sufficiently so as not to interfere with basin. Local ordinances as to clearances shall govern.

(3) See "General Scope of Work" for method of control.

22. INSTALLATION OF TELEPHONE SYSTEM

(1) Trench as shown, installing galvanized conduit sleeves in foundation walls. Cable will be furnished and installed by telephone company; after installation, backfill. For exact location of sleeves, consult telephone company.

23. OPERATING AND SAFETY DEVICES

(1) Identify all equipment such as breakers, switches, transformers, etc. by attaching name plate or identification tags of permanent material.

(2) Identify cables within 6" of each duct in manholes and vaults by brass or lead tags, giving feeder number and phase designation.

(3) Install warning signs on all access doors to transformer vaults and install metal box with two pairs of insulating gloves in incoming service vault.

24. PAINTING

(1) Clean and paint with two coats of black or gray gloss enamel, as directed, metal cases, tanks and frames of electrical equipment, exclusive of specially finished or galvanized surfaces.

25. INSULATION TEST

bottom of manhole over top of incoming pipe.

(12) Unless otherwise required, set tops of manhole castings at exact finish grades and depress tops of drainage openings 2 inches below finish grades.

5. UNDERGROUND WATER PIPE AND APPURTENANCES

(1) Except as otherwise shown, underground water pipe, 3 inch and larger, shall be Class B, bell and spigot, cast iron pipe, complying with A.W.W.A. specifications, or Class 150 cast iron pipe, Type I, II or III, complying with Federal Specification WW-P-421. Fittings shall be A.W.W.A. standard, Class D.

(a) If local water department (or company) and practice permit and with approval of the Authority, Universal cast iron pipe (Federal Specification WW-P-421, Amendment 2 for Type IV pipe and Class 250 fittings) or cement lined pipe may be used.

(2) Copper tubing for underground water piping smaller than 3-inch shall be Type K, complying with Federal Specification WW-T-799; fittings shall be cast bronze, or cast or wrought copper suitable for sweat joints with copper tubing, with wall thickness not less than that of tubing Tubing and fittings shall have suitable clearances for solder. Solder shall meet manufacturer's recommendations.

(a) Store tubing in protected place and take precautions to prevent tubing from being flattened.

(b) For connecting copper tubing and valves, provide adapter having female soldered end and male threaded end; for connections between tubing and cast iron pipe, provide cast copper calking connections having soldered end and beaded end.

(3) Wrought iron pipe for underground piping smaller than 3-inch shall be galvanized, Class A (standard weight), complying with Federal Specification WW-P-441; fittings shall be galvanized malleable iron complying with Federal Specification WW-P-521.

(4) At Contractor's option, 1-1/4, 1-1/2 and 2-inch underground water pipe may be cast iron of full internal diameters shown and having wall thicknesses of 0.19, 0.22 and 0.25 inch, respectively (0.03 inch permissible tolerance in nominal diameters and thicknesses.) 1-1/2 and 2-inch pipe shall be cast with at least two tapping collars per length. Each pipe shall withstand a hydrostatic test of 500 pounds and each factory-assembled section a compressed air test of 90 pounds, per square inch. In physical and chemical properties of cast iron and in requirements for coating, pipe shall comply with Federal Specification WW-P-421. Joints shall be of bell and spigot or of over-size male and female threaded type without gasket; if threaded type, provide expansion joints at intervals of not more than 108 feet.

(5) Valves for underground water piping shall meet standards and requirements of local water department (or company). In absence of such standards, they shall be iron-

body, bronze or brass mounted, double gate valves conforming to A.W.W.A. specifications for working pressure of 150 pounds. Unless otherwise shown, valves for cast iron pipe, 3-inch and larger, shall be hub end; for other piping, screw end. Furnish suitable valve key.

(a) Unless otherwise shown, each underground valve shall have approved, cast iron, adjustable shaft, valve box meeting standard of local water department (or company).

(6) Fire hydrants shall be of recognized make, complying with requirements of local water department (or company) and fire department. In absence of such requirements, they shall meet A.W.W.A. specifications, hose connections to have same thread as used throughout city.

(7) Water meters shall be recognized make meeting approval of local water department (or company).

6 INSTALLATION OF WATER PIPE AND APPURTENANCES

(1) Arrange with local water department (or company) for, and provide required connections to existing water mains.

(2) Store water pipe and fittings on sills above flood water and do not deliver for laying until trench is excavated.

(3) Lay piping true to line, without objectionable breaks in grade, and with sufficient cover as required by local code, rules or practice and approved by the Authority. Interior of pipe shall be clean when pipe is lowered in trench and joint surfaces wiped clean. Use proper fittings for junctions in lines and changes in direction.

(4) Joints in cast iron pipe 3-inch and larger, shall consist of gasket material (hemp jute or yarn), tightly driven in place, centering spigot in bell, and at least a 2-inch depth of lead, placed at one pouring and caulked to a water-tight joint without straining the pipe; thickness of lead shall be not less than 1/4 inch. Make no change in pipe alignment after joint is caulked.

(a) If local code, rules and practice permit, sulphur-bearing lead substitute may, with the Authority's approval, be employed in lieu of lead; such material to be heated without burning until it has mirror-like surface, free from scum or bubbles, and joint filled at one pouring, using metal pouring gate or clay dam at least 6 inches high. After material has cooled and hardened, cut away excess and apply water to take up small leaks.

(5) Lay copper tubing only with experienced workmen. Observe care not to scar or dent pipe. Jointing shall conform to manufacturer's specifications. In fills of cinders, rock or rubbish protect tubing on all sides with at least 6 inches of sand or suitable soil. Use proper fittings; mitered joints for elbows and notched straight runs for tees are not acceptable.

(6) For joints in threaded pipe, use thin coat of red lead on male thread only. Ream ends of pipe free from burrs and keep threads clean cut and tapered

(7) Use clamps, braces, bolted flanges or mass concrete as necessary to prevent blowing out of joints.

(8) After laying and before joints are covered, test underground water lines under supervision of Authority to hydrostatic pressure of at least 125 pounds per square inch; remedy any defects so discovered to satisfaction of Authority.

(9) Upon completion of water lines, arrange for their sterilization in manner satisfactory to local water department and Board of Health. Flush out lines after sterilizing until all traces of chemical used are removed.

(10) Unless provided by local water department (or company), construct meter vaults as shown and install therein water meters and appurtenances, subject to regulations and approval of local water department (or company). Comply with applicable requirements of Division "Concrete Work".

7. UNDERGROUND GAS PIPING

(1) Black steel pipe for underground gas piping shall be Class A (standard weight), complying with Federal Specification WW-P-403a, Type I. Fittings shall be black, malleable iron complying with Federal Specification WW-P-521.

(2) Cast iron pipe for underground gas piping shall comply with A.G.A. standards.

(3) Wrought iron pipe for underground gas piping shall be standard weight black pipe complying with Federal Specification WW-P-441.

(4) Gas piping shall have the types of joints used by local gas company for each kind of pipe. Couplings for plain-end pipe shall be of an approved standard design and shall be provided with gaskets of live rubber.

(5) Master gas meters as provided in "General Scope of Work", shall be of a recognized make meeting the approval of the local gas company.

8. INSTALLATION OF GAS PIPING AND APPURTENANCES

(1) Arrange with local gas company for gas services as shown and for all work which its rules and regulations prescribe that it perform. Install remainder of gas distribution system from points where gas company's work terminates.

(2) Install gas piping to conform to regulations and requirements of local gas company and plumbing code, piping to be installed by licensed journeymen as required by code except that in work done by gas company, company's regular employees may be used, subject to same regulations concerning wages and hours as apply to other employees on project.

(3) Provide approved cast iron drip pots at all low places in gas pipe lines. Use no gas fitter's cement except at fixture joints.

(4) Comply with regulations of local gas company regarding pipe coating. In absence of any such regulation apply one coat of hot coal tar pitch varnish to the entire surface of black pipe and fittings after installation. cleaning pipe thoroughly before

applying.

(5) Under supervision of Authority test all low pressure gas mains with an air pressure not less than 10 pounds per square inch and all intermediate and high pressure lines with an air pressure not less than 50 percent in excess of maximum working pressure.

(6) Unless provided by local gas company, install gas meters as shown, subject to regulations and approval of the company.

9. CERTIFICATES

(1) Furnish affidavits from manufacturers of all pipe, fittings, valves and fire hydrants specified under this Division, certifying that such materials delivered to project conform to requirements specified herein.

10. AS-BUILT DRAWINGS

(1) As work progresses, record on one set of utility plans all changes and deviations from contract drawings in sizes, line or grade. Record final location of sewer, water and gas lines by offset distances, in feet and tenths, to surface improvements such as buildings, curbs or edges of walks. Make sufficient measurements to locate definitely all lines. Locate underground valves and gas drip pots by offset distances from building lines only.

(2) At completion of work, transfer all such records in waterproof drawing ink to a set of white cloth prints. After checking records and obtaining signature of approval thereto of Authority's inspector, deliver prints to Authority for permanent record.

1. SCOPE

(1) All heating materials and equipment and related items necessary to complete the work specified or shown are a part of contract unless specifically excepted. See "General Scope of Work."

2. GENERAL REQUIREMENTS

(1) Layout of equipment, accessories and piping systems under this Division is generally diagrammatic unless specifically dimensioned. Check project drawings and details before installing work, for interferences as governed by structural or other conditions. The right is reserved to make any reasonable change in location of heating equipment, accessories and piping systems prior to roughing-in without involving additional expense to the Authority. Should any work installed under this Division interfere with the Architectural design as shown on the drawings, the Contractor shall at his own expense make such changes in his work as directed by the Authority to permit the Architectural design to be followed.

3. DESCRIPTION OF HEATING SYSTEM

(1) The heating system is of the two pipe down feed open-tank gravity hot water type. Water is heated in a coal hand fired cast iron sectional boiler and is piped directly from the boiler to the expansion tank; from the tank, the hot water is recirculated to the boiler through a system of supply piping radiation and return piping. An overflow is extended from the tank to the utility room. Tank and supply main are located in the attic space; return main is located underneath the floor. The system is arranged for gravity drain.

4. MATERIALS AND EQUIPMENT

IMPORTANT NOTE: WHERE SEVERAL TYPES OR QUALITIES OF MATERIALS ARE LISTED, CONTRACTOR HAS OPTION TO USE ANY OR ALL. INSOFAR AS POSSIBLE USE ONE TYPE OR QUALITY; SHOULD DELAY BE ENCOUNTERED (TO EXTENT OF DELAYING PROGRESS) IN OBTAINING THE PARTICULAR TYPE OR QUALITY SELECTED, PROVIDE SUCH OF THE OTHER SPECIFIED MATERIALS AS MAY BE APPLICABLE.

MATERIAL	KIND	FEDERAL SPECS. OR OTHER DESIGNATION
(1) PIPE	Steel,	WW-P-403a, Types I & II
	Copper Molybdenum open hearth iron;	WW-P-403a, Type III
	Wrought iron;	WW-P-441a
	All of the above standard weight, black.	

MATERIAL	KIND	FEDERAL SPECS. OR OTHER DESIGNATION
(2) FITTINGS	Cast iron, 125 pound, black.	WW-P-501
(3) UNIONS (screwed ends)	Malleable iron or steel; black, brass-seated.	WW-U-531
(4) UNIONS (flanged ends)	Cast iron, 125 pound standard, plain faced.	Dimensioned and drilled to conform to American Standards Association.

(5) NIPPLES shall be of same material and composition as pipe to which connected and shall be extra heavy where unthreaded section is less than 1 inch. Nipples shall conform to Federal Specification No. WW-N-351. Running thread nipples will not be acceptable.

(6) INSULATION for piping shall be molded sectional covering with standard canvas jacket, not less than standard thickness, 85 percent magnesia or of fibrous glass with binder; insulation for fittings shall be cement, 85 percent magnesia or fibrous glass with binder; insulation for boiler (when not furnished with insulating baked enamel steel jacket) and expansion tank shall be blocks not less than 7/8 inch thickness and cement, both 85 percent magnesia or fibrous glass with binder. Magnesia materials shall conform to Federal Specification No. HH-M-61; fibrous glass shall have thermal efficiency not less than that of magnesia.

(a) Waterproof wrapping shall be asphalt impregnated felt weighing not less than 15 pounds per square. Canvas jacket need not be furnished if waterproof wrapping is applied at factory integral with the molded covering.

(7) HANGERS shall be of the split cast ring with fastening device or of the clevis type. Hanger rods shall have machine threads.

(8) GASKETS shall be 1/16 inch thick, ring type, compressed asbestos sheet, to conform with Federal Specification No. HH-P-46.

(9) BOLTS shall be made of commercial bolt steel with square forged heads and with cold pressed semi-finished hexagon nuts. All threads shall be United States Standard.

(10) SLEEVES shall be constructed of No. 26 gage galvanized sheet metal.

(11) ESCUTCHEONS shall be heavy spun or stamped steel, chromium plated.

(12) DRAIN COCK shall be standard brass or bronze not less than 3/4-inch size and be fitted with handle and threaded end for hose connection.

(13) BOILER shall be cast iron sectional type, adapted for coal hand firing suitable for use in gravity hot water heating

systems, and shall be designed for a water working pressure of 30 pounds per square inch gage conforming to the requirements of the A.S.M.E. code for low pressure boilers; furnish Authority with certification of hydrostatic test prior to shipment. Trade name, name of manufacturer, and catalogue number shall be cast on or stamped on metal plate permanently affixed to boiler front. Boiler may be of the wet base type with ash pan or shall be set upon a dry base frame, and be equipped with an insulating baked enamel steel jacket or shall be insulated with blocks and cement.

(a) Sections, base (if dry) and other castings shall be made of the best quality heavy gray cast iron entirely free from sand holes or other defects. Connections between sections shall be metal to metal with malleable or cast iron nipples of the slip type, assembled gas and water tight with tie rods secured at ends with expansion nuts and washers. Doors shall be accurately ground and fitted gas tight to boiler. Smoke hood shall be rigidly secured gas tight to boiler and be equipped with flue clean-out, check draft and damper arranged for easy operation, and shall afford means for attaching smoke pipe. Grates shall be of heavy cast iron pattern of the rocking and dumping type arranged for operation without opening doors. Provide dampers for adjusting air supply and equip boiler with combination gage registering altitude and water temperature. Furnish shaker, poker and wire flue brush with handle for each boiler.

(b) The net rating of each size boiler shall be not less than the amount indicated on the boiler schedule on the drawings. The net boiler ratings shall be determined in accordance with the testing and rating code of the Institute of Boiler and Radiator Manufacturers. The I-B-R name plate on the boiler and I.B.R listed rating or certification from the manufacturer that the rating has been determined in accordance with the code shall constitute evidence of compliance with this requirement.

(c) Boiler shall be constructed for the smoke pipe connections shown on drawings and shall effectively operate at the ratings and conditions specified under natural draft available.

(14) SMOKE PIPE shall be constructed of not less than No. 24 gage (approximate thickness 0.025") black iron. Wall collar shall be black iron.

(15) EXPANSION TANK shall be hot dipped galvanized inside and outside after fabrication. See schedule on drawings for sizes. Tap tank for inlet, outlet and overflow connections. It shall be designed for a water working pressure of not less than 30 pounds per square inch gage and be subjected to an hydrostatic test at factory of not less than 80 pounds per square inch gage. Furnish Authority with certificate of test prior to shipment. Supports for tank shall be of approved design.

(16) RADIATORS shall be best quality gray cast iron of the narrow tube hot water pattern leg type

Connections between sections shall be metal to metal with malleable iron nipples of either screw or slip type; each radiator to be tested at factory and made tight under hydrostatic pressure of 80 pounds per square inch gage, certification for which shall be furnished Authority prior to shipment. See schedule on drawings for sizes; ratings shall be in accordance with simplified practice recommendation R174-40, "Large Tube Cast Iron Radiators" promulgated by the U. S. Department of Commerce. Ship radiators, prime coated from factory with loose wooden plugs or metal seals in all threaded openings.

(17) RADIATOR VALVES shall be packless quick opening type suitable for the service required, constructed of red brass composition of highest grade, rough body finished trimmings nickel-plated all over, and provided with either globe or multiport type seats and ball joint unions. Valves shall have mushroom wheel handles constructed of hardwood or composition secured to metal spindle with nickel-plated brass nut or equivalent countersunk on handle.

(18) UNION ELLS shall be constructed of red brass composition of the highest grade, rough body finished trimmings nickel-plated all over and provided with ball joint unions.

5. INSTALLATION

(1) SYSTEM: Install and connect the complete heating system to give proper and continuous service under all circumstances and conditions in accordance with the contract requirements and to the satisfaction of the Authority.

(a) Set boiler to permit sufficient space for firing and servicing, properly support expansion tank from building construction and set as high as is practical in attic space; protect tank supports with heavy coat of Asphaltum Varnish.

(b) Erect smoke pipe to assure minimum of friction, fit joints accurately and make smoke-tight; size shall be same as provided on boiler smoke hood. Set wall collar in place at point of entrance of smoke pipe to building flue.

(2) JOINTS on piping shall be screwed; use unions (screwed or flanged) when connecting to boiler, expansion tank or other equipment required to be installed in a manner enabling easy removal or replacement.

(3) THREADS shall be standard (Federal Specification No. GGG-P-351, clean cut and tapered. Apply lubricant on male thread only. Keep joints free of scale and dirt. Ream all piping free from burrs and remove all cuttings.

(4) PIPING: Cut accurately to measurements established at building, and work into place without springing or forcing, and out of the way of windows, doors or other openings. Make changes in direction with fittings. Bushings will not be acceptable when reducing pipe sizes.

(a) Provide for expansion and contraction; see drawings for sizes, location, arrangement and connections of piping and equipment.

(b) Pitch mains and branches in direction of flow. Supply mains in attic shall have maximum pitch available under erec

ing conditions. Take branch connections from supply mains at bottom or side. Return mains under floor shall have sufficient pitch to permit free and rapid circulation; if rise in return is necessary, such rise shall be made only in utility room at entrance to boiler return connection.

(c) Hang return piping close to underside of floor when running parallel with joists and directly underneath joists when running at right angles. Where necessary, girders may be notched at top or bottom or holes drilled approximately along mid-depth to permit passage of piping; notches or holes shall be only of sufficient size to permit free movement of piping but shall not exceed 3" x 3" or 3" diameter respectively Where notching is necessary, it shall be made directly over center of masonry pier in such manner as to provide at least 4 inches bearing for each girder. All notching and drilling shall be under supervision of Authority.

(d) Install union ell at supply end and radiator valve at return end of radiator (top and bottom opposite ends). Reducers may be used in vertical supply and return connections to bathroom riser at points directly above ceiling and under floor; size of riser shall be 2-1/2 inches

(e) Provide vent and overflow at expansion tank Extend vent line as high as is possible in attic space and overflow line to within approximately 15" over floor in utility room close to boiler; connect cold water make-up to system from valved outlet installed by Plumber; provide drain from return at boiler and install drain cock (easily accessible) at lowest point in return system in utility room.

(5) SLEEVES: Set and secure in proper position in building construction for pipes passing through partitions, floors and ceilings; they shall be of sufficient length to pass through entire thickness of building construction except that sleeves through floors shall extend not over approximately 1/4 inch above finished floor.

(6) ESCUTCHEONS: Fit securely to uncovered exposed pipes passing through partitions, floors and ceilings; they shall be of sufficient outside diameter to cover up sleeved openings.

(7) HANGERS: Support piping on hangers fastened to rods rigidly secured (screwed or bolted) to building construction. Install hangers to maintain required pitching of lines, to prevent vibration and to permit expansion and contraction. Space hangers not over 10 feet on centers for pipe 1-1/4 inches and larger and not over 8 feet on centers for pipe smaller than 1-1/4 inches. Protect hangers and hanger rods with a heavy coat of Asphaltum Varnish.

(8) OPEN ENDS: Keep all ends and openings closed with caps or plugs during construction.

6. INSULATION

(1) PIPE AND FITTINGS: Insulate all pipe and fittings in attic

space and under floor. Apply covering on pipe with sections closely butted together; extend canvas jacket (where required to be furnished as hereinbefore specified) over joints and paste in place, treating paste with one tablespoonful bluestone to each gallon. On supply pipe covering fasten canvas jacket with brass lacquered bands spaced not over 18 inches on centers and one on each side of fittings.

(a) Insulate fittings with two coats of cement, the second coat finished smooth and the overall thickness not less than the covering on the adjacent piping.

(b) Over insulated return pipe and fittings, apply waterproof wrapping lapped over joints, sealing with asphaltic compound and securing in place with wire loops (not less than No. 14 gage annealed copper) spaced not over 6 inches on centers.

(2) BOILER AND EXPANSION TANK. Insulate boiler (when not furnished with insulating baked enamel steel jacket) and expansion tank with blocks properly fitted and securely wired in place. Reinforce with chicken wire over which apply not less than 1/2-inch thickness cement finished hard and smooth; one part of Portland cement may be mixed with two parts of insulating cement. Prefabricated insulation jacket of not less than equal thermal efficiency to the blocks and cement may be applied to tank in lieu of the blocks and cement.

(3) Thoroughly clean all surfaces before insulation is applied, remove and replace damaged or mildewed insulation.

7. INSTRUCTIONS

(1) Permanently affix in Utility room where directed, explicit printed, glass protected and framed, or embossed on metal plate, instructions for operation of the system.

8. CLEANING

(1) Wash out entire system until water shows clear from drain. All exposed parts of system shall be thoroughly wiped clean and all metal surfaces shall be free from scale or rust.

9. TESTS

(1) Subject entire system to a water pressure test of not less than 25 pounds per square inch gage, make all joints tight at this pressure; no caulking will be permitted.

(2) Run an operating test for a minimum four-hour period; make all necessary alterations, additions or adjustments necessary for the proper operation of the system before final acceptance by the Authority. If upon test, noise develops, remedy piping in order to eliminate such noise or defective circulation.

(3) Furnish all equipment and instruments, labor and fuel for tests. Water and electric energy will be supplied at Authority's expense.

USHA STANDARD SPECIFICATIONS

PLUMBING

1. SCOPE

(1) All plumbing materials, equipment and related items necessary to complete the work specified or shown are part of contract unless specifically excepted. See "General Scope of Work."

(2) Drainage system within buildings.

(3) Hot and cold water supply systems within buildings.

(4) Plumbing fixtures.

(5) Water and drainage connections to equipment indicated and furnished under another Division of the Specifications or purchased separately by the Authority.

(6) Gas piping system within the building and connections to ranges and other gas appliances requiring same.

2. GENERAL REQUIREMENTS

(1) Layout of equipment, accessories and piping systems under this Division is generally diagrammatic unless specifically dimensioned. Check project drawings and details before installing work for interferences as governed by structural or other conditions. The right is reserved to make any reasonable change in location of plumbing equipment and piping system prior to roughing-in without involving additional expense to the Authority. Should any work installed under this Division interfere with the architectural design as shown on the drawings, the contractor shall, at his own expense, make such changes in his work as directed by the Authority to permit the architectural design to be followed.

(3) MATERIALS

IMPORTANT NOTE:

WHERE SEVERAL TYPES OR QUALITIES OF MATERIALS ARE LISTED, CONTRACTOR HAS OPTION TO USE ANY OR ALL. INSOFAR AS POSSIBLE, USE ONE TYPE OR QUALITY; IF PROGRESS IS LIKELY TO BE RETARDED DUE TO DELAY IN OBTAINING THE PARTICULAR TYPE OR QUALITY SELECTED, PROVIDE SUCH OF THE OTHER SPECIFIED MATERIALS AS MAY BE APPLICABLE.

(1) MATERIALS shall conform to applicable ASTM Standards or Federal Specifications as to standard of quality and type, and shall be new and of the best quality and grade.

SYSTEM	MATERIAL	FED. SPECS.
(2) DRAINAGE:		
(a) Interior pipe and fittings and to within 5'0" outside of building wall	Extra heavy cast-iron soil pipe and fittings (calked joints)	WW-P-401
(Lighter pipe and fittings of equal quality may be used, if unable to procure extra heavy in open market.)		
(b) Waste and vent piping 2" and smaller, above the ground	Galvanized "W.I." pipe	WW-P-441a
	Cast-iron threaded pipe	WW-P-356
	Lead waste pipe "D"	Lead. Ind. Assoc.
	Galvanized copper molybdenum pipe, Type III	WW-P-403a
	Galvanized copper bearing pipe, Type II	WW-P-403a
	Galvanized steel pipe, Type I	WW-P-403a
(c) Waste fittings	Galvanized or black recessed drainage fitting	WW-P-491
	Wiped joints in lead pipe	
(d) Vent fittings	Galvanized malleable,	WW-P-521
	Black cast iron	WW-P-501
	Wiped joints in lead pipe	
(3) WATER:		
(a) Piping	Copper tubing, Type 1	WW-T-799
	Copper pipe (I.P.S.)	WW-P-377
	Brass pipe (I.P.S.) "A"	WW-P-351
	Galv. cement lined pipe	WW-P-403a
	Galv. wrought iron pipe	WW-P-441a
	Galv. copper molybdenum, III	WW-P-403a
	Galv. copper bearing, II	WW-P-403a
	Galv. steel - I	WW-P-403a
	Lead service pipe A or AA or AAA	
(b) Fittings	Copper tubing	WW-T-799
	Brass or Bronze "B"	WW-P-448
	Cement lined	WW-P-403a
	Galv. malleable	WW-P-521
	Galv. cast iron	WW-P-501
	Wiped joints in lead pipe	
(c) Tanks	Galv. steel)	Hot dipped
	Galv. Copper Bearing Stud)	Heavily co
	Galv. Cement lined)	QQ-I-696
	Nickel copper alloy	
	Copper	

SYSTEM	MATERIAL	FED. SPECS.
(4) GAS:		
(a) Within buildings	Black steel pipe	WW-P-403a
	Black wrought iron	WW-P-441a
	Galv. or black malleable fittings	WW-P-521

(Protect pipe installed underground with strip of asphaltum impregnated paper wrapped tightly over its entire length or with hot asphaltum paint.)

(5) VALVES:		
	2" and smaller	WW-V-766 BNT-I
	2½" to 5"	WW-V-766 INT-I
	6" and larger	WW-V-766 INF-I

(Valves in connection with copper tubing may have soldered (sweat) type ends or appropriate adapters.)

(Checks - horizontal swing type with hinged check and ground seat.)

(6) UNIONS - 150# W.W.P.		
(a) On ferrous pipe	Malleable iron with bronze seats and ground joints	
(b) on non-ferrous pipe	Bronze body with bronze seats and ground joints	

4. MISCELLANEOUS STANDARDS	MATERIAL	FED. SPECS.
(1) Screwed fittings - American National taper pipe thread		GGG-P-351
(2) Lead - Drawn pipe of the minimum weight per lineal foot known in the trade as "D" weight.		
(3) Sheet lead - Weight not less than 4 pound per square foot (except where heavier weight is required.)		QQ-L-201
(4) Solder - For sweat fittings 95% tin, 5% antimony.		
(5) Flux - Non-corrosive type.		

	MATERIAL	FED. SPECS.
(6)	Calking lead.	QQ-L-156
(7)	Packing - for hub and spigot joints.	HH-P-117
(8)	Sheet iron - Galvanized (commercial weight).	QQ-I-695
(9)	Sheet copper - Not be lighter than 16 oz. per square foot.	QQ-B-611a
(10)	Ferrules - Solder nipples and solder brushings - Class and weight required by local plumbing code.	
(11)	Setting compound - For connecting fixtures to floor flanges.	HH-E-536
(12)	Gaskets - For connecting fixtures to floor flanges. Miscellaneous, compressed asbestos sheet.	HH-G-116 HH-P-46
(13)	Floor flanges.	WW-P-541
(14)	Sillcocks - Brass 1/2" or 3/4" with hose end and wall flange or shoulder shank where exposed connections are indicated.	WW-P-541, Fig. 70
(15)	Traps - Self-cleaning, same nominal size as the drain.	WW-P-541
(16)	Pipe cleanouts - Cast iron with brass plugs or screwed fittings with brass plugs.	WW-P-401
(17)	Floor drains.	WW-P-541
(18)	Nipples - Same material and composition as the pipe, or tubing employed on the system. Extra heavy weight, when unthreaded section is less than 1". Running thread nipples prohibited.	
(19)	Sleeves - Set vertically, constructed of No. 26 gage galvanized sheet iron. Sleeves set horizontally constructed of standard weight pipe. No sleeves required on wood floors or partitions.	
(20)	Escutcheons - spun or stamped steel.	
(21)	Chromium plating.	WW-P-541a
(22)	Brass - Composition A and B Composition A	QQ-B-611 QQ-B-621

MATERIAL	FED. SPECS.

(23) Hangers - Either split cast ring with fastening device or adjustable clevis type hanger. Hanger rods machine threaded. Brackets of approved type may be used along walls. Band iron wire or chain is prohibited.

(24) Copper tubing - May be secured with copper hangers. Design hangers to fit snugly around pipe or tubing used.

(25) Plumbing fixtures. WW-P-541a

(26) Zinc-coated (galvanized) sheet iron and steel. QQ-I-696

5. EXCAVATION AND BACKFILL

(1) Excavate trenches for underground pipes to required depths. Provide bell holes to insure uniform bearing. Refill excavation below pipe grade with sand or gravel firmly compacted. Where rock is encountered, excavate to a grade 3" below the lowermost part of the pipe and trench refilled to grade as just specified. Sheath, brace, pump or bail as necessary to protect the workmen and adjacent structures and to permit proper excavation of the work. After pipe lines have been tested, and approved, backfill trenches to grade with approved material, tamped or puddled compactly in place. Unless otherwise directed all underground piping outside of buildings shall be installed below the frost line.

6. INSTALLATION

(1) Provide labor, material and equipment required or necessary for a complete plumbing installation. Under each of the following headings is given a brief description of the work required.

7. BUILDING DRAINS

(1) Connect building drain to sewer outside of the walls as indicated. Building drain shall receive all connections from soil, waste and drainage stacks and fixtures as shown with cleanouts and traps as required.

8. SOIL, WASTE AND VENT LINES

(1) Erect soil, waste and vent stacks of sizes shown and as indicated on the drawings and extend vents above roof.

(2) Branch soil, waste and vent connection shall be run to the soil stack, waste stack, building drain or vent stacks as shown or required. Where permitted by code and if practical, two or more vent pipes may be connected together and extended as one pipe through the roof.

(3) Vent from any fixture or line of fixtures when connected to a vent line serving other fixtures shall be extended at least 6" above the topmost plane of fixtures on which the vent is to be connected to prevent the use of same as a waste.

(4) Horizontal drainage piping shall be installed in practical alinement within the building at a uniform grade of not less than 1/8" fall per foot. Piping to be installed without undue strains or stresses and provision made for expansion, contraction and structural settlement. No structural member shall be weakened or impaired by cutting, notching or otherwise, unless provision is made for carrying the structural load and approved by Authority.

(5) Changes in direction in drainage piping shall be made by the appropriate use of cast iron 45 degree wyes, half wyes, long sweep quarter bends, sixth, eighth, or sixteenth bends, or by combinations of these fittings; or by use of equivalent threaded fittings or their combinations, except that sanitary tees may be used on vertical stacks and short quarter bends may be used in drainage lines where the change in direction of flow is from the horizontal to the vertical. Tees and crosses may be used in vent pipes. No change in direction greater than 90 degrees shall be made in drainage pipes. Where different sizes of drainage pipes or pipes and fittings are to be connected, proper sizes of standard increasers and reducers shall be employed. Reduction of size of drain pipes in the direction of flow is prohibited except where code permits the use of a 3" x 4" water closet connection.

(6) Drilling and tapping of house drains, soil, waste, or vent pipes and the use of saddle hubs and bends are prohibited.

(7) Protect from breakage pipes passing under or through walls. Protect against external corros pipes passing through or under cinder concrete or other corros material.

9. JOINTS AND CONNECTIONS

(1) Joints and connections shall made permanently gas and water tight. All exposed threads on ferrous pipe shall be given a co of acid-resisting paint.

(2) Joints in vitrified clay and concrete pipe or between such p and metal shall be hot-poured asphaltum compound or cemented joints. Pack hot-poured joints with approved packing and fill approved jointing compound at or pouring. Pack cemented joints wi approved packing and secured wit Portland cement.

(3) Calked joints on cast-iron pipe shall be firmly packed and secured with well-calked lead, n less than 1" deep; and no paint varnish on joints permitted unti after tested and found tight.

(4) Screwed joints shall be made with a lubricant on the male thr only. Remove all burrs or cuttin

(5) Cast-iron joints may be eith calked or screwed.

(6) Wrought iron, steel or brass to cast-iron joints may be either screwed or calked joints.

(7) Wiped joints in lead pipe or between lead pipe and brass or copper pipes, ferrules, soldering nipples, bushings, or traps, in cases on the sewer side of the t and in concealed joints on the inlet side of the trap, shall be full-wiped joints, with an expos

surface of the solder on each side of the joint not less than 3/4" and a minimum thickness at the thickest part of the joint of not less than 3/8".

(8) Lead to cast iron, steel, or wrought iron joints shall be made by means of a calking ferrule, soldering nipple, or bushing.

(9) Copper tubing joints shall be made in accordance with approved practice and recommendations of the manufacturer of the pipe.

(10) Slip joints and unions shall be used only in trap seals or on the inlet side of the trap. Unions on the sewer side of the trap shall be ground faced and shall not be concealed or enclosed.

(11) Joints at the roof shall be made water tight by use of copper or lead flashings.

(12) Floor connections for water closets and other fixtures shall be made by means of an approved brass or cast iron floor flange soldered securely or calked to the drain pipe. The joint between the fixture and floor flange shall be made tight by means of an approved fixture setting compound or gasket.

(13) Where different sizes of drainage pipes or pipes and fittings are to be connected, proper sizes of standard increasers and reducers shall be employed. Reduction of size of drain pipes in the direction of flow is prohibited, except in the case of a 3" x 4" water closet bend.

(14) Any fitting or connection which has an enlargement, chamber or recess with a ledge, shoulder or reduction of the pipe area, that offers an obstruction to flow through the drain is prohibited.

10. TRAPS AND CLEANOUTS

(1) The minimum size (nominal inside diameter) of trap and fixture waste branch for a given fixture shall be not less than shown in the following table:

KIND OF FIXTURE	Size (in inches) trap and branch
Bathtubs	1½
Combination fixture. (sink and tray)	1½
Floor drains	2
Lavatories	1¼

(2) Trap each fixture separately and as near to the fixture as possible except that a set of not more than three lavatories or laundry trays, or a set of two laundry trays and one sink, may connect with a single trap, provided the trap for three fixtures is placed centrally.

(3) Set traps true with respect to their water seals and protected from freezing.

(4) Floor or wall connection of fixture traps bolted or screwed to the floor or wall shall be regarded as a pipe cleanout.

11. ESCUTCHEONS

(1) Fit and firmly secure escutcheons to the pipes, passing through finished floors, walls and ceilings. Escutcheons shall be of sufficient outside diameter to cover amply the sleeved openings and diameter to fit snug around pipe installed.

(2) Escutcheons for finished fix-

ture connections and fixture trimmings are specified under Plumbing fixtures.

12. OPEN ENDS

(1) Ends of pipes, including those extending above roof, drains, water and fixture outlets, shall be kept closed with caps or plugs so as to prevent dirt or building material from getting into pipes and traps.

13. HANGERS-ANCHORS-INSERTS

(1) Support piping from the building structures by means of hangers to maintain required grading and pitching of lines to prevent vibration, and secure piping in place, and arrange to provide for expansion and contraction.

(2) Paint and clean hangers and supports with one coat of black asphaltum varnish.

14. FLASHINGS

(1) Make pipes through roof water tight with sheet lead or sheet copper flashing extending not less than 8" around the pipe and terminate by turning into top of pipe as a cap or by calking into hub.

15. WATER SUPPLY

(1) Connect water service at building wall and install cold water mains, risers and branches to all fixtures, hose bibbs, hydrants and equipment as indicated on drawings.

(2) Provide stop and waste valve at entry point of service main as indicated on drawings.

(3) Provide all connections to risers or fixtures from top of mains, unless otherwise indicated, and all branches and mains arranged so that entire system can be drained at low point.

(4) Rough fixture branches from wall, centered to fixture outlets

(5) Locate sillcocks approximatel 18" from grade.

(6) Schedule of pipe sizes for water connections to fixtures:

	Cold water (minimum)	Hot water (minimum)
Water closets (low down tanks)	3/8"	-
Lavatories	3/8"	3/8"
Bathtubs	1/2"	1/2"
Sinks and combinations	1/2"	1/2"
Hose bibbs (as shown)	1/2" or 3/4"	-

(7) Furnish and erect hot water mains, risers and branches as indicated on drawings.

(8) Provide hot water supply to fixtures except for water closets

(9) Provide valve at low point for draining system.

(10) Set and connect ready for operation individual hot water equipment.

(11) Connect hot water tank and heater as shown on plans.

(12) No plumbing fixture, device or construction shall be installe which will provide a cross connection between a distributing supply for drinking and domestic purposes and a polluted supply, such as a drainage system, a soil or waste pipe, so as to permit or make possible the back flow of sewage, polluted water

or waste into the water supply system.

16. GAS SYSTEM

(1) Extend gas service piping in dwelling units as indicated on drawings.

(2) Pitch piping and provide natural drip pockets at low point.

(3) Connect gas equipment purchased and delivered to site by Authority.

(4) Provide shut-off cock, wing lock or ground key type for each piece of gas-burning equipment.

(5) Provide on the house side of all shut-off cocks a union or right and left nipple and coupling to permit disconnection of gas appliances.

17. VENT FLUES

(1) Furnish and install from opening in building flue to equipment, vent, sheet iron pipe not less than No. 24 gage with necessary elbows and wall collar.

(2) Install vents with a minimum of 2" clearance from all woodwork and provide asbestos block as shields where installed in closet space.

(3) Transite pipe in lieu of sheet iron may be used for gas-fired equipment.

(4) Gas or oil ranges need not be vented, unless required by local codes.

18. PLUMBING FIXTURES

(1) Set up at a place designated by the architect or engineer, one sample fixture of each type, completely fitted. Approved fixture samples shall be kept free of usage and protected at all times for comparison; poorer quality than the samples will be rejected; exception will be made to tolerances permitted by commercial standards.

(2) Fixtures shall be of the best quality as fabricated by a manufacturer of established reputation whose products have been in constant use for not less than six years.

19. FIXTURE TRIMMINGS

(1) Traps, faucets, escutcheons in connection with plumbing fixtures shall be chromium plated, unless otherwise stated.

(2) Air Gaps: The fixtures specified hereafter, with faucets or other supply fittings properly assembled, shall provide between the level of all supply openings and the water level at point of unrestricted external overflow, a mean vertical distance or air gap as follows:

FIXTURE	Max. Dia. of Effective Opening Inches	Min. Air Gap Inches
Lavatory supply spout	0.50	1.0
Sink and laundry tray faucets	0.75	1.5
Gooseneck bath faucets	0.75	1.5
Over-rim bath filler	1.00	2.0

(3) All fixtures requiring hot and cold water shall have cold water faucet on right side and hot water faucet on left side

of fixture.

(4) All faucets shall have metal indices and shall be of one pattern or design.

20. GROUNDS AND SUPPORTS

(1) Secure fixtures to partitions by means of toggle bolts. Install bolts to develop their full strength. Furnish four bolts for each lavatory and eight bolts for each sink and tray.

21. QUANTITIES

(1) The contractor is referred to the architectural and mechanical drawings for the quantities of fixtures to be furnished under this division of the specification and he shall include all plumbing fixtures shown of the types described hereinafter, complete with all necessary trimmings. Stops under fixtures are not specified but shall be furnished and installed when required by local plumbing code.

22. WATER CLOSETS

(1) White vitreous china, integral flush rim, wash-down type, regular front, seat post holes, pedestal base, siphon trap at front floor outlet, all moulded in the ware. Action shall be continuous without break in siphoning. Bowl shall flush and refill properly. The water surface shall not be less than 8" x 7" and water seal shall not be less than 2⅛" and trap way shall pass a solid ball not less than 1⅛" in diameter. Inlet spud shall be cast or forged brass suitable for 2-inch O.D. tubing for lowdown tank outfits.

(2) Provide closet with floor flange, brass bolts and chromium plated metal nuts, fixture to set on gasket or compound.

(3) Overall clearance dimension from wall to front of bowl shall not exceed 2'3".

23. WATER CLOSET TANK

(1) Provide for each closet a white vitreous china low type tank with flushing capacity of not less than 3½ gallons. Tank cover shall be flat top surface with slightly raised bead at edges. Cover to be arranged for fastening into tank.

(2) Supply and flush valves shall be first quality all brass with vacuum breaker. Valves shall be operated by trip lever. Tank shall have 3/8" angle supply and 2" flush pipe. The valve seats and the float valves must be above the tank overflow and be provided with a vent opening equal to the cross-sectional area of the valve seat.

(3) Secure tank to wall with brass bolts and washers.

24. WATER CLOSET SEATS

(1) Water closet seats and covers shall be smooth, polished finish ebony, closed front to conform to the rim of the bowl. Hard rubber composition with solid core and impervious to moisture or acid solutions. Composition shall contain not less than 25% rubber nor more than 5% ash. Tensile strength not less than 3000 pounds per square inch. Seat equipped with a heavy chrome-plated cast brass leaf hinge or approved hinge. Hinge attached by not less than 6 screws to seat. Seats and covers equipped with 2 elongated bumpers at bottom.

Provide seats with covers for all water closets, except water closets located in stalls for which seats without covers may be furnished.

25. LAVATORIES

(1) One piece cast iron (approximately 18" x 20" or 17" x 19") with apron and back, oval or rectangular bowl, and rim, enameled on the inside and over apron rim and back. Furnished with concealed metal support, faucets for hot and cold water, plug, chain rubber stopper, waste trap and escutcheons.

(2) Chromium-plated, arm or ball style, metal indexed handle faucets, with removable seats, shank, coupling and tail piece.

(3) Chromium-plated cast or forged brass waste plug with cross bars, 1¼" tubing tail piece, heavy ball chain and chain stay. 1¼" rubber stopper and 1¼" brass "P" trap and escutcheon.

(4) Lavatory supplies when roughed 24" or more from floor may be of same material as used for water piping. When roughed below 24", they shall be brass pipe chromium plated. I.P.S. with escutcheons.

26. BATHTUBS

(1) One piece cast iron, enameled inside, painted outside, integral rim at front, flat rim at back and both ends having water bead raised for building into wall, fitted with supply fitting of the concealed or exposed combination type and over rim spout. Valves to have not less than ½" connections, metal to metal joint union inlets or sweated connection and outlet to spout.

(2) Spout to set over rim of bath. Valve bonnets removable from front for repairs. Valves to have arm or ball style index metal handles, renewable seats and metal escutcheons. Exposed over rim fixture will be acceptable. Bathtub waste consisting of cast drain and overflow fittings, cast waste tee and 1½" connecting tubing with wall not less than 0.045" thick. Concealed waste fittings for threaded connections or sweated joints.

(3) Waste plug fitted with heavy rubber stopper, heavy ball chain securely attached to overflow grate.

27. TRANSFER VALVE FOR BATHTUB AND LAVATORY

(1) In lieu of separate controls on bath and lavatory, transfer valve may be used for both. Cast brass two valve body with center transfer valve installed between lavatory and bathtub. Transfer valve shall be indexed "tub" and "lav." Valves to have not less than ½" connections metal to metal joint unions or sweated connections when used with copper tubing. Valve seats to be of the removable type. Valves to have arm or ball style indexed metal handles and metal escutcheons. Bathtub to be provided with ½" over rim spout.

(2) Lavatory provided with spout as indicated on drawings.

28. COMBINATION KITCHEN SINK AND TRAY

(1) Acid-resisting enameled cast iron, 42" long integral back or back ledge, roll rim front and sides. One adjustable leg under tray compartment. Trimmings to consist of the following: Swing spout double sink faucet without soap dish; chromium-plated brass

plug with heavy rubber stopper in tray; chromium-plated brass open grid waste strainer in sink; No. 18 gage steel acid-resisting, interchangeable drain board porcelain enameled all over. Brass 1½" continuous waste connected to a 1½" "P" trap to wall with escutcheon.

(2) Supplies to wall roughed high under sink and material of the same type as used for the water piping in the building.

29. ALTERNATE FIXTURES

(1) Formed metal plumbing fixtures may be used, provided they conform as to type and trimmings as specified for cast-iron enameled fixtures above, if approved by Authority.

30. WATER TANK AND HEATER

(1) Furnish and install in location indicated on plans water storage tank storage capacity of 40 gallons, designed for a water working pressure of 127½ pounds per square inch and a hydrostatic factory test of 300 pounds per square inch without visible change of shape affecting any part of the tank. Certificate of test to be furnished to the Authority. Provide 3/4" boiler tappings and ½" drain connection. Provide means in tank to reduce to a minimum mixing of incoming cold water with the heated water. Tank shall be set horizontally near ceiling of utility room and as indicated on drawings and rigidly supported from building construction. Provide pressure relief valve, set to relief 25 pounds above available water pressure. Valve piped to floor at point near corner of utility room. Connect complete with water heater.

(2) Furnish and install in location indicated on plans, water heater; same shall be of the cast-iron sectional dome type, furnished complete with castings, including fire brick, grates and tools as hereinafter specified. Heaters shall be adapted for coal firing and be designed for a water working pressure of 125 pounds per square inch gage and subjected at the factory to a hydrostatic test of not less than 300 pounds per square inch gage; furnish local authority with certification of hydrostatic test prior to shipment.

(3) Heaters shall be made of best quality heavy gray cast iron entirely free from sand holes or other defects. Fire brick shall be suitable for service intended and be properly set in firepot. Doors shall be accurately ground and fitted smoke tight to heater. Dome shall be equipped with smoke hood (not less than 5" diameter) affording means for attaching smoke pipe. Provide necessary dampers to regulate the supply of air to support combustion. Grates shall be heavy pattern cast iron of the rocking and dumping type arranged for operation without opening doors and removable without disturbing heater. Furnish shaker and poker for each heater.

(4) Provide tappings for hot and cold water connections not less than 1" size.

(5) Heater shall have a capacity to heat without overfiring not less than 40 gallons of water through a minimum temperature rise of 25 degrees F per hour from inlet water temperatures. This capacity shall be based upon a six-hour firing period.

31. FIXTURE PROTECTION

(1) Protect against injury from building materials, acids, tools and equipment, all plumbing fixtures with substantial cover. Damaged fixtures by any cause shall be replaced at no cost to the Authority.

32. CLEANING UP

(1) Thoroughly clean all fixtures and trimmings, and leave every part in perfect condition ready for use.

33. TESTS

(1) Water test on roughing-in work:

Apply a water test to the entire sanitary drainage system. Test may be applied in sections. Close tightly openings of the section to be tested except the highest opening above the roof, and the system filled with water to the point of overflow above the roof. No part of the system shall be tested with less than a 10-foot head of water except the uppermost 10 feet of system. Without any further addition, the water shall remain constant during test for at least 5 minutes.

34. WATER SUPPLY SYSTEM

(1) Test entire water supply system to a hydrostatic pressure of not less than 100 pounds per square inch and prove tight at this pressure before trenches are backfilled and before fixtures are installed. Water supply piping, if in any way concealed by the structural work, shall be tested to the aforesaid pressure and proved tight before pipes are concealed.

35. GENERAL REQUIREMENTS

(1) Make repairs to piping system with new material. No calking on screwed joints, cracks, or holes will be acceptable.

(2) Test and adjust all parts of the plumbing system and associated equipment and leave in good operating condition.

(3) Make other tests required under ordinances of the local plumbing code.

(4) Notify Authority or its representative in advance of tests who shall be represented at all tests and all tests shal be conducted to his entire sati faction.

36. GAS PIPING SYSTEM

(1) Test gas piping in accordan with the rules and regulations the company or utility serving the project and in any case sha not be less than the following:

(a) Subject piping system or portions of the piping syste to be tested to an air pressure of not less than 10 pounds per square inch, equa to 20 inches of mercury.

(b) Apply pressure with a force pump and maintain for not less than 15 minutes wit out leakage. Use a mercury column gage in making the te

37. PRIOR TESTS

(1) Concealed work to remain un covered until required tests ha been completed, but in the even that the project construction schedule requires it, the contractor shall make arrangement for prior tests on portions of the plumbing work involved, sat factory to the Authority or its representative.

(2) Bathtub Test: After bathtubs are installed and prior to concealing waste connections, each bathtub shall be tested for leaks at waste and overflow connection.

USHA STANDARD SPECIFICATIONS

INTERIOR WIRING AND LIGHTING FIXTURES

1. SCOPE

(1) Interior wiring, lighting fixtures and related items necessary to complete work shown or specified are a part of contract unless specifically excepted. See "General Scope of Work."

2. SYSTEMS

(1) Electrical service to each building is specified under divisions, Overhead and Underground Distribution, as shown on drawings. From the terminating point of service at each building, extend wiring to service equipment, branch protective devices and outlets.

3. TYPES OF WIRING

IMPORTANT NOTE:

THE FOLLOWING TYPES OF WIRING ARE RECOGNIZED IN THE NATIONAL ELECTRICAL CODE. ANY ONE OR ALL OF THESE TYPES WILL BE ACCEPTABLE IN THE CONSTRUCTION OF THE WORK, PROVIDED THE TYPE IS APPLICABLE AND ACCEPTABLE UNDER THE CODE REQUIREMENTS.

(1) From point of service pick-up at each building, extend service entrance conductors to service equipment, using rigid metal conduit, electrical metallic tubing or service entrance cable.

(2) For all wiring inside building, use non-metallic sheathed cable, armored cable, flexible metal conduit, electrical metallic tubing, or rigid metal conduit. Be governed by type of construction in selecting wiring system.

4. CODES

(1) Where local laws or ordinances do not include rules and regulations governing electrical work or do not make "National Electrical" and "National Electrical Safety" codes mandatory, all electrical work as drawn and specified shall comply with the latter mentioned codes.

5. GENERAL REQUIREMENTS

IMPORTANT NOTE:

SIZES OF MATERIALS AND EQUIPMENT SHOWN OR SPECIFIED ARE MINIMUM. USE LARGER SIZES IF PROGRESS IS LIKELY TO BE RETARDED DUE TO DELAY IN OBTAINING SIZES INDICATED.

(1) Electrical system layouts indicated on drawings are generally diagrammatic; and locations of outlets and equipment are approximate; exact routing of raceways, cables and wiring, locations of outlets and equipment shall be governed by structural conditions and obstructions. Locate and install equipment requiring maintenance and operation so it will be readily accessible.

(2) The right is reserved to make any reasonable change in location of outlets and equipment prior to roughing-in, without involving additional expense

6. MATERIALS

IMPORTANT NOTE:

WHERE SEVERAL TYPES OR QUALITIES OF MATERIALS ARE LISTED, CONTRACTOR HAS OPTION TO USE ANY ONE OR ALL. INSOFAR AS POSSIBLE, USE ONE TYPE OR QUALITY IF PROGRESS IS LIKELY TO BE RETARDED DUE TO DELAY IN OBTAINING THE PARTICULAR TYPE OR QUALITY SELECTED, PROVIDE SUCH OF THE OTHER SPECIFIED MATERIALS AS MAY BE APPLICABLE TO THE CONSTRUCTION.

(1) ELECTRICAL MATERIAL AND APPLIANCES of types for which there are Underwriters' Laboratories standard requirements, listing or labels, shall have listing of Underwriters' Laboratories or shall conform to their requirements and so labeled. Use new materials and appliances.

(2) RACEWAYS AND FITTINGS:

(a) Rigid metal conduit (zinc coated)	Fed. Spec. WW-C-581a
(b) Flexible metal conduit, single strip, galvanized	Underwriters' Laboratories, Inc.
(c) Electrical metallic tubing	Fed. Spec. WW-T-806a
(d) Fittings	Fed. Spec. WF-406

(3) BOXES AND COVERS:

(a) Interior work (concealed and exposed)	Fed. Spec. WO-821a
(b) Exterior work (exposed) weatherproof galvanized or cadmium plated conduit or tube fittings with suitable covers.	

(4) WIRES AND CABLES:

(a) Performance grade, Type RP (30%) (sizes not smaller than No. 12)	ASTM
(b) Heat resistant grade, Type RH (35%) (sizes not smaller than No. 14)	ASTM or Fed. Spec. JC-106a
(c) Moisture resistant, Type RW (sizes not smaller than No. 12)	Underwriters' Laboratories, Inc.
(d) Armored bushed type cable (sizes not smaller than No. 12)	Type RP Insulation Fed. Spec. JC-71

(e) Non-metallic sheathed cable (sizes not smaller than No. 12) — Type RP Insulation

(f) All-rubber cord, heavy duty, Type S (range connection) — Underwriters' Laboratories, Inc.

(g) Heat resistant or rubber covered fixture — Underwriters' Laboratories, Inc.

(h) Provide lead covering on wires and cables where required

(5) INSERTION RECEPTACLES:

(a) Flush duplex type (15 Ampere, 125 volt) — Fed. Spec. WR-151

(b) Combination devices — Fed. Spec. WS-893

(6) LOCAL WALL SWITCHES:

(a) Flush tumbler (10 ampere, 125 volt) — Fed. Spec. WS-893

(b) Combination devices — Fed. Spec. WS-893

(7) PLATES AND FINISHES, generally, for switches, receptacles and other outlets requiring plates shall be brown molded composition. Provide corrosion resisting coating on plates for exposed raceway fittings.

(8) SERVICE EQUIPMENT shall consist of meter cabinet or receptacle and required protective equipment, weatherproofed if installed outdoors.

(a) For each dwelling unit provide three 15 ampere branch circuit protective devices. Provide, if required, service disconnecting means and overcurrent protection.

(b) METERS NOT TO BE FURNISHED UNDER THIS CONTRACT. Provide receptacle, with cover plate and sealing ring, or cabinet to receive 5 ampere, 2 wire, 120 volt meter.

(9) PROTECTIVE EQUIPMENT:

(a) Circuit breaker panel shall be of "multi-breaker" type or "individual unit" type with either thermal or magnetic overload protection. Breaker shall have standard calibration with bi-metallic thermal or magnetic trip, automatic release, overcurrent element

in each pole; inverse time delay to prevent tripping on momentary overload; quick-break on automatic release.

(b) Fuse panels shall conform to Federal Specification WP-146, dead front type, with interchangeable, non-combustible, insulating base fuse sections.

(10) FUSES:

(a) Cartridge, renewable	Fed. Spec. WF-803
(b) Cartridge, non-renewable	Fed. Spec. WF-791
(c) Plug fuses, standard	Underwriters' Laboratories
(d) Plug fuses, non-tamperable with adapters for screw base.	

(11) CABINETS shall consist of sheet steel, code gage for surface or flush mounting as shown.

(a) Interior: - Flush mounted boxes shall be (a) unpainted, galvanized steel or (b) bonderized or otherwise treated to resist rusting. Applying prime shop coat. Covers, trims and doors shall be bonderized or otherwise treated to resist rusting; apply prime shop coat, finish with one coat of baked enamel, standard finish.

(b) Exterior: - Exposed boxes, covers, trims and doors shall be bonderized or otherwise treated to resist rusting; apply prime shop coat, finish with one coat of baked enamel, standard finish. Weatherproof construction. Provide pin tumbler lock or padlock for "protective section," individually keyed, arranged for master keying (provide two individual keys for each cabinet and six master keys for Management). See Division "Hardware" for tags, keys, and padlocks.

(c) Provide seals where required; wire shall be stranded; sealer shall have die engraved with symbol as approved. Furnish one pocket type sealing tool with engraved die and 250 seals in addition to those required.

(12) TAPES:

(a) Friction	Fed. Spec. HH-T-101
(b) Rubber	Fed. Spec. HH-T-111

(13) LIGHTING FIXTURES

(a) Living rooms	All-metal fixtures, semi-indirect; standard finish; similar and equal to American Lighting Equipment Association No. USHA-4.
(b) Bed rooms	All metal fixtures, semi-indirect; standard finish; similar and equal to American Lighting Equipment Association No. USHA-11.
(c) Kitchens	Lamp receptacle, 4" fitter with white opal globe (approximately 8" diameter).
(d) Halls	Beam fixture with flared ring opening, short insulated chain and long cord.
(e) Bathrooms	Wall fixture with convenience receptacle and local control.
(f) Utility rooms	Lamp receptacle with short insulated chain and long cord.

(g) Lamp receptacles and fixtures listed under (c), (d), (e), and (f) shall be of porcelain or composition (standard finish). Where pull chain control is specified, provide snubber or stop at hole in canopy where chain emerges, to relieve strain of excessive pull on the cord.

- - - - - - -

7. INSTALLATION OF RACEWAYS

(1) Conceal raceways from view. In non-fireproof floor and roof construction, run raceways parallel to and between joists wherever practical. In crossing joists, notch underside within 2 feet of either bearing; upper side of joists may be notched, provided 10 gage steel plate is installed over raceway to prevent penetration of flooring nails. Cutting of vertical studs not permitted in outside walls. Interior partition studs may be cut or notched where absolutely necessary and then only to minimum depth.

(2) Instructural slabs, run raceways at least 1-1/2" below top and above reinforcing steel.

(3) Keep raceways clear of partitions at ends of bath tubs permitting of future cutting of partitions to remove tub without disturbing electrical systems.

(4) Raceways in floor slabs directly on ground or located directly over crawl spaces used for pipes, etc., shall not be trapped unless necessary; use bleeder boxes in trapped raceways where access to boxes is practicable.

(5) Raceway systems shall be capped during course of construction; clean inside of raceway before installing conductors.

8. INSTALLATION OF ARMORED CABLE AND NON-METALLIC SHEATHED CABLE

(1) Conceal wiring from view. In non-fireproof floor and roof construction, run parallel to and between joists wherever practical. Cutting of vertical studs not permitted in outside walls. Interior partition studs may be drilled, cut or notched where absolutely necessary and then only to a minimum.

(2) Keep wiring clear of partitions at ends of bath tubs, permitting of future cutting of partitions to remove tub without disturbing electrical systems.

9. INSTALLATION OF OUTLET BOXES AND COVERS

(1) Boxes shall be of size and type to accommodate (a) structural conditions, (b) size and number of raceways and conductors or cables entering and (c) device or fixture for which required.

(2) Mount outlets flush; provide plaster rings or covers where required on boxes when surface is plastered or otherwise finished.

(3) Install 3/8" fixture studs in outlet boxes provided for lighting fixtures; except where type of fixture specified for the particular outlet does not require stud.

(4) Center outlets in paneling or in other architectural features; clear trims and corners by 4". Locate switch outlets adjacent to door openings on strike side of door except shown otherwise; locate bathroom outlet to one side of medicine cabinet or mirror, at side opposite hinges.

(5) Height of outlets unless otherwise noted shall be as follows: (height given is from finished floor to center of outlet);

(a) Switch.	4'0"
(b) Combination switch and receptacle . . .	4'0"
(c) Insertion receptacle.	1'0"
(d) Bathroom fixture. . . (approximately). . .	5'8"
(e) Refrigerator receptacle (approx). . . .	3'6"

(Locate to one side of refrigerator permitting serving both refrigerator and table appliance. Kitchen equipment layout governs exact location, check kitchen details before installation.)

10. INSTALLATION OF WIRES AND CABLES

(1) Use lead covering over rubber insulation in underground locations; in trapped raceways not provided with bleeder boxes and in moist locations, use lead or moisture resisting rubber covering, armored cable imbedded in masonry shall be lead covered.

(2) Eliminate splices wherever possible; where necessary, splice in readily accessible pull, junction or outlet fittings.

(3) Make taps and splices in wire #8 and smaller mechanically tight by using "Western Union" or pigtail splice, properly cleaned, soldered and insulated with rubber

and friction tapes, flashover or insulation value of joints being at least 100% in excess of wire insulation. Mechanical wire splicers and joints except those using set screws bearing directly on conductor may be used.

(4) Make taps and splices in #6 and larger wire by means of brass or copper mechanical connectors applied after wire has been cleaned, make tight and fully insulate as specified in Paragraph (3).

11. SERVICE CONNECTIONS

(1) Overhead supply: The electrical system covered by this division of the specification shall commence at the overhead point of service contact on exterior of building. From this point of contact, extend wiring to meter and service equipment and thence to outlets. At service contact, leave slack cable or conductors for connecting service loop; provide and install adequate anchorage in building wall to receive service loop. Where "service drop and entrance cable" is used, the cable shall be carried without splice to the first electrical fitting at building (See Section 10 under Division titled "Overhead Distribution - Electrical.")

(2) Underground supply: The electrical system covered by this division of the specification shall commence at the point of contact with the underground system; this point of contact being a junction box or conduit fitting, either (a) immediately inside of building (if crawl space is provided) or (b) on exterior of building approximately 24" above grade (See Section 18 under Division titled "Underground Distribution - Electrical.") From this point of contact, extend wiring to meter and service equipment and thence to outlets. At service contact, leave slack cable or conductors for connecting to underground service.

12. INSTALLATION OF METER AND SERVICE EQUIPMENT

(1) Install meter and service in one of the following manners:

(a) Disconnect and protective equipment, flush mounted inside of each dwelling unit in kitchen adjacent to entrance door; meter cabinet or receptacle on outside of building, surface mounted, located as shown on drawings.

(b) Disconnect and protective equipment with meter cabinet or receptacle on outside of building, surface mounted, located as shown on drawings.

13. WIRING CONNECTIONS (GENERAL)

(1) Extend 3 branch circuits from each dwelling unit protective cabinet, controlling outlets as follows:

Circuit 1 - Receptacle outlets in kitchen and dinette space.

Circuit 2 and 3 - Remainder of general lighting and convenience receptacle outlets; balance load as close as practical.

(2) Where terminals permit, connections for wire #8 and larger to switches, panelboards, etc., shall be with soldered copper lugs or terminals of style to fit terminal and of size to handle full wire capacity; mechanical lugs, except those using set screws bearing directly on conductors, may be used.

(3) Where three wire panels are provided balance load as nearly as possible.

(4) Where service enters overhead, locate service head fitting above point of service loop attachment on building.

(5) Electrical refrigerators will be furnished, delivered in kitchens and set in place by others. This contractor shall insert the cord connection in the receptacle provided at the refrigerator location.

14. WIRING CONNECTIONS (RANGES)

(1) Electrical ranges will be furnished, delivered in kitchens and placed within 3 feet of allocated place by others. This contractor shall furnish and install cable connection as specified hereinafter.

(2) Locate range outlet in back of range and within overall dimension of range. Consider type of cable connection and location of terminal board on range in locating outlet.

(3) Range connection between wall outlet and range shall consist of four conductor #8 all-rubber cord on 3 conductor armored cable.

(4) Provide cable support or grip on range cable connection to avoid mechanical strain on splice or terminals.

(5) Connect grounding conductor or armor to range frame. Ground at outlet box or panel box.

(6) Provide slack in connecting cable permitting range being moved 3 feet from wall without disconnecting. Form conductors with lugs (if necessary) to accommodate range terminal block.

(7) Make connections to range by one of the following methods:

(a) Continuous cable (without splice) from protective device to range.

(b) Cable or individual conductors from protective device to outlet in back of range, splicing to cable for range connection.

(c) Individual conductors from protective device to outlet in back of range, with receptacle and plug and cable for extension to range.

(d) If the protective devices are located outside of dwelling unit and do not satisfy governing laws with respect to disconnecting the range, provide plug and receptacle as specified under (c) above.

15. INSTALLATION OF LIGHTING FIXTURES

(1) Provide fixture (of type specified under MATERIAL) and install for each lighting fixture outlet indicated.

16. INSTALLATION OF SEALS

(1) Seal covers at meter and ahead of meter.

17. INSTALLATION OF FUSES

(1) Quantity: All fused gaps shall be fused before final acceptance; provide the following spares:

(a) Non-renewable: One complete duplicate set of installed non-renewable fuses.

(b) Renewable links: One complete duplicate set of installed fuse links.

18. FINAL INSPECTION AND TESTS

(1) Prior to test, feeders and branches shall be continuous from service contact point to each outlet; all panels, feeders and devices connected and fuses in place. Test system free from short circuits and grounds with insulation resistances, not less than outlined in Section 3018, 1937 NEC. Provide testing equipment necessary and conduct test in presence of local authority's representative.

19. FEEDER SIZES

(1) Size feeders based on the following current carrying requirements:

(a) Feeder to EACH dwelling unit (Lighting and general appliance)	22 ampere, 2 wire
(b) Feeder to EACH dwelling unit (Lighting, general appliance and electric range)	37 ampere, 3 wire
(c) Feeder to EACH BUILDING (Lighting and general appliance)	22 ampere, 3 wire
(d) Feeder to EACH BUILDING (Lighting, general appliance and electric range)	70 ampere, 3 wire

1. SCOPE

(1) The exterior overhead electrical distribution system for lighting and power and related items necessary to complete work shown or specified are a part of contract unless specifically excepted. See "General Scope of Work."

2. SYSTEMS

(1) Light and Power: Provide a system of distribution from point of utility company's service contact as described in detail under "General Scope of Work" and as shown on drawings.

(2) Yard Lighting: Provide a system of yard lighting as described in detail under "General Scope of Work" and as shown on drawings.

3. GENERAL REQUIREMENTS

IMPORTANT NOTE:

SIZES OF MATERIALS AS SHOWN OR SPECIFIED ARE MINIMUM. USE LARGER SIZES IF PROGRESS IS LIKELY TO BE RETARDED DUE TO DELAY IN OBTAINING SIZES INDICATED.

(1) Wherever NESC or governing regulations do not establish a "standard to follow", then follow the standard practice of local electrical utility in executing the work as drawn and specified.

(2) On completion of work, prepare a one-line feeder diagram showing (a) point of service contact, (b) routing or primary feeders and sizes, (c) transformer stations, sizes, and disconnects, (d) routing of secondary feeders and sizes, (e) service loops and sizes and (f) any other pertinent information of value to an operating engineer and for permanent record. Make diagram neatly in ink on tracing cloth not less than 18" x 24"; turn over to Authority.

4. MATERIALS

IMPORTANT NOTE

WHERE SEVERAL TYPES OR QUALITIES OF MATERIALS ARE LISTED, CONTRACTOR HAS OPTION TO USE ANY ONE OR ALL. INSOFAR AS POSSIBLE, USE ONE TYPE OR QUALITY; IF PROGRESS IS LIKELY TO BE RETARDED DUE TO DELAY IN OBTAINING THE PARTICULAR TYPE OR QUALITY SELECTED, PROVIDE SUCH OF THE OTHER SPECIFIED MATERIALS AS MAY BE APPLICABLE TO THE CONSTRUCTION.

(1) ELECTRICAL MATERIALS AND APPLIANCES of types for which there are Underwriters' Laboratories standard requirements, listing or labels, shall have listing of Underwriters' Laboratories or shall conform to their requirements and so labeled.

(2) MATERIALS used for line construction shall be in accordance with ASTM, ASA and NEMA standards where applicable.

(3) POLES shall be of Southern Yellow Pine, Western Red Cedar or Northern White Cedar; they shall be reasonably free of knot holes and reasonably straight grained.

(a) Pine poles shall be treated full length by a preservative in accordance with

American Wood-Preservers Association standard specifications (Full cell or empty cell process) after pole has been rooted, drilled and gained.

(b) Cedar poles shall be treated by any process which will produce impregnation of not less than 1/2" depth or full sapwood penetration where sapwood is less than 1/2" in depth. Impregnation shall extend from at least 2' below ground to at least 1' above.

(c) Brand poles 12' from butt with following information month and year of treatment, manufacturer's trade mark or initial, and class (ASA) and height.

(4) CROSS ARMS shall be straight grained, well seasoned, selected yellow pine or fir timber. Fir arms may be stained but not painted; pine arms shall be treated as specified for pine poles. Arms shall be surfaced, roofed and drilled.

(5) PINS shall be locust, or clamp type forged steel pins.

(6) INSULATORS shall be wet process porcelain or equally suitable process as regards electrical and mechanical properties, true to shape, free from flaws, with grooves of proper size to accommodate conductor. Provide brown glaze on ungrounded conductors and white glaze on grounded conductors.

(7) HARDWARE shall be hot dipped galvanized, meeting ASTM specification.

(8) CONDUCTORS shall be of medium-hard drawn copper (ASTM specification) with triple braided weatherproof covering (ASA specification C 8.18-1936). No. 3 AWG and smaller shall be solid, larger sizes stranded.

(9) SERVICE DROP CABLE shall consist of parallel insulated conductors with concentric uninsulated neutral, conforming to ASTM Standards of 600 volt thickness--outer covering to be weather-resisting.

(10) GUY WIRE shall be steel (a) protected by welded-on exterior of copper or equivalent non-rusting material, 30% conductivity, high strength. Generally, 3 #6 strands (ultimate strength of 6835 lbs.) should suffice; for greater loads, use 7 guy strands, (b) double galvanized, Siemens-Martin.

(11) GUY ANCHORS shall be of expanding, screw, core or wedge type of sizes required; log anchors shall be pressure creosote treated as specified for yellow pine poles.

(12) ANCHOR RODS shall be copper covered steel with integral thimble eye or double-eye as required. Minimum size rod: 5/8" diameter, 6' long.

(13) GUY GUARDS shall be hot dipped galvanized metal (#18 gage minimum) not less than 8' long.

(14) GROUND RODS shall be steel, protected by welded-on exterior of copper or equivalent non-rusting material. Under ordinary conditions, use 5/8" by 8' minimum rods.

(15) GROUND ROD CLAMPS shall be copper, bronze or equivalent non-rusting material.

(16) GROUND WIRE shall be soft-drawn copper at least size of primary and not less than #6 AWG.

(17) TRANSFORMERS ("Conventional Distribution" Type or "Complete Self-protected" Type) shall conform to AIEE and NEMA standards for oil-immersed, self-cooled type, suitable for outdoor service and furnished complete with oil and of standard voltage ratings. Following paragraphs (k) to (p) inclusive apply only to the "Complete Self-protected" type.

(a) Ratings: Primary and secondary voltage ratings, frequency, whether single or three phase and number of high voltage bushings shall be as described under "General Scope of the Work."

(b) Primary voltage taps shall be in accordance with the requirements described under "General Scope of the Work."

(c) Secondary coils shall be arranged for series and multiple connections.

(d) Terminals shall be detachable cork gasketed copper stud type, insulated by porcelain bushing extending into case and clamped into position. Bushings shall permit insulation of inside winding lead to enter bushing recess and provide surge flashover at least 20% greater on inside than on outside end. Provide 3 or 4 low voltage terminals on transformers of 100 KVA and smaller. Arrange the 4 low voltage coil terminals so that (1) series 120/240 volt, 3 wire and (2) 220 volt, 2 wire connection can be made inside of tank to 3 bushing studs; securely connect terminal lugs on low voltage leads to studs of low voltage bushing with jam nuts or equal. Slot terminal lugs to facilitate making and changing connections from 3 to 2 wire or vice versa. Transformers shall withstand AIEE impulse tests.

(e) Locate high voltage terminal board in accessible position and submerged in upper part of oil. Design links or similar devices for ratio adjusting to prevent their dropping in tank during ratio adjusting operation.

(f) Tank shall be oil tight, of copper bearing steel plate (ASTM Specification A9-29) with welded joints or of cast iron construction. Cover shall form a splash proof joint and be supplied with gasket cemented to cover. Paint tanks and covers (1) with one coat of rust resisting paint and finish with two coats of weather resisting paint, OR (2) with two coats of paint, each baked-on. Paint hangers as specified for tanks or finish hot-dipped galvanized. Stencil the KVA rating in 3" white numerals on tank in location visible from ground.

(g) Furnish standard NEMA accessories with all transformers. Provide on each transformer 25 KVA and larger a thermal temperature indicator visible from ground.

(h) Have transformers shipped with proper quantity of insulating oil in tank. Oil shall be pure clear grade mineral oil, of high dielectric strength, flash-point not less than 130 degrees C. and dielectric strength at least 22,000 volts when tested between vertical surfaces 1" in diameter and 0.10" apart.

(i) Acceptance tests shall conform to latest AIEE standards and test sheets covering unit identical in design shall be submitted, including high potential test at normal frequency from primary to secondary and to core and from secondary to core. The identically designed unit shall also have withstood surge tests, using AIEE standard test sufficient to cause arc over on outside of transformer bushing without damage or arc over of any part within the case.

(j) Submit manufacturer's data as follows, guaranteeing the equipment furnished to conform therewith.

(1) Efficiencies at 25%, 50%, 75% and full load at unity power factor and 75 degrees C.

(2) No load loss.

(3) Total full-load loss.

(4) Full load regulation at 100% and 80% power factor.

(5) Exciting current (percent).

(6) Net and shipping weights.

(7) Limiting dimensions.

(8) Gallons of oil required transformer.

(9) Diagram of internal connections complete with table of connections for all voltage operations.

Sufficient tests shall have been made to insure the guarantees will be met.

(k) Transformers shall be completely self-protected without auxiliary devices of any kind. As lightning arrestors are integral with the transformers, separate arrestors are unnecessary.

(l) Provide lightning protection by arrestors mounted integral with transformer connected between H.V. leads and tank; they shall positively prevent flow of dynamic current after surge has been discharged and shall limit rise in surge voltage to value well within impulse strength of windings.

(m) Provide overload protection by circuit breakers connected in series with secondary winding normally tripping when dangerous copper temperature is approached and instantaneous tripping on heavy overloads or short circuits. Mount breaker under surface of oil; provide with operating lever mounted on outside of transformer case and connected to breaker through oil tight stuffing box; lever shall open, close or re-set breaker after tripping.

(n) Provide bullseye indicating lamp in transformer case which shall light (and remain lit until manually re-set) when temperature of winding rises to predetermined point below tripping temperature. Energize lamps from independent winding on core. (Where lamp indicators are provided, eliminate thermal indicator specified in paragraph (g)

(o) Design bushings so that flashover occurs externally rather than internally. Provide low voltage bushings with coordinating gaps so adjusted that flashover on impulse voltage occurs at about half the impulse strength of the L. V. winding.

(p) Provide high voltage winding protective links to permit disconnecting transformer from line in event of internal failure.

(18) HOT LINE CLAMPS shall be provided on transformer primary leads, facilitating direct connection to primary lines.

(19) LIGHTNING ARRESTORS shall be of type which will prevent flow of dynamic current after surge has been discharged and shall limit rise in surge voltage to a value well within impulse strength of windings. Seal arrestor to prevent entrance of moisture into any part of arrestor that might be adversely affected by moisture from standpoint of performance or life. Test requirements shall be in accordance with AIEE Standards.

(20) TRANSFORMER FUSES shall be of the expulsion, porcelain housed, indicating type with clamp hangers and fuses. If "Complete Self-protected" type transformers are used, these protective devices shall be omitted.

(21) TAPE (friction) shall conform to ASTM specifications.

(22) YARD LIGHTING FIXTURES shall consist of single scroll brackets with metal hood and glass luminaire and lamp of approximately 2500 lumens.

5. GENERAL INSTALLATION REQUIREMENTS

(1) Supporting structures, wires and other equipment shall conform as to strength, clearances, sags, etc., with N.E.S.C. Use Grade B construction except where N.E.S.C. requires Grade A construction.

(2) Use safety factor of 2 for Grade B construction and safety factor of 3 for Grade A.

(3) Stake-out pole and guy locations as soon as field conditions permit and obtain Authority's approval. Indicate finished grade and pole number on stakes. The right is reserved to make any reasonable change in locations up to time of approval of staked locations without involving additional cost.

(4) String wires from pay-out reels and protect weatherproof wire braiding against injury in pulling. Give conductors initial strength equivalent to maximum loading tension for 5 minutes, then sag to normal tension corresponding to stringing temperature.

(5) Tensions and sags shall be according to N.E.S.C., Part 2, Appendix A. Use sighting method to determine sag.

(6) Place conductors of highest voltage on upper cross arm positions, wire of same circuit shall occupy same relative pin positions on successive poles throughout project.

(7) Splice conductors with copper sleeves twisted at least 3-1/2 complete turns. Use solderless connectors in making taps. Tape joints and taps with 4 layers of friction tape, painted with weatherproof insulating compound. No span shall contain more than two splices per conductor; locate splicing sleeves at least 3 feet from conductor supports.

6. POLE INSTALLATION

(1) Poles shall be of length to provide required clearances above the ground, foreign wires and other obstructions and of strength to support load placed upon them. Do not pass wires over buildings.

(2) Fully treated poles shall be gained and bored before treatment. If additional gains are required, use metal gains. After treatment, exercise care in handling to prevent scarring and splintering of surface.

(3) In general handling of poles, use rope cants. Use pike poles or "dead man" for erection.

(4) Use pole lengths not less than (a) 30' for guy stubs, (b) 35' for standard construction and (c) 40' for joint construction, except that poles carrying secondary rack only, or secondary rack and telephone cable, shall not be less than 35'.

(5) Wherever practical before setting, frame and fit poles with cross arms, braces, pins, racks, etc., arrange in framing and placing equipment to permit ready climbing. Roof poles one way, at angle of 15 degrees to horizontal.

(6) Provide pole steps perpendicular to the line on poles carrying transformer or lighting fixtures; lowest step 8' from ground and on side away from road.

(7) Set poles so alternate cross-arm gains face in opposite direction, except at deadends where gains of last two poles shall face deadend; double arm construction at deadends.

(8) Set poles, along streets and alleys, 8" from inside edge of curb to nearest pole surface, unless local ordinances require greater distance. Protect poles, in alleys and on corner of alleys, with metal guards or butt plates to prevent injury from vehicle hubs.

(9) Determine depth of setting by holding power of earth and length of pole. For ordinary soil and rock conditions, set at depth given in Table 92, N.E.S.C. In loose and swampy ground, provide additional reinforcement to assure stability, such as increased depth, guying, concreting and rock. On sloping ground, the depth of hole shall be measured from low side of hole.

(10) Poles, subject to loads which cannot be supported by anchors and guys and when strain is sufficient to distort the line shall be reinforced by creosoted planks not

less than 3" x 4" by 4' long, or concrete (1-2-4 mix) for full depth and extended above ground line with tapered finish.

(11) Dig holes as small in diameter as practical (uniform at top and bottom), only large enough to admit tamping bar around pole. Set poles in alinement and plumb except at corners, deadends, angles and other points of strain where a slight rake against direction of strain shall be given. After pole is in position, ram dirt firmly in place around pole, bank excess dirt around pole.

(12) Avoid abrupt changes in line level; where ground contour is irregular provide poles of varying lengths to maintain as even a conductor line as practical. Where considerable change in grade elevations occur, poles should be of heights and spacing that will not create steps greater than 5' per span.

7. CROSS-ARM INSTALLATION

(1) Cross-arms shall be of size and strength to accommodate conductors and equipment. Use single cross-arms except at line terminals, line angles of 30 degrees and greater, highway crossings, or other points where there is an excessive strain, use double arms.

(2) Install all arms except top arms with metal gains.

(3) Where corner of junction poles require buck-arms, install them approximately midway between and at right angles to line arms, allowing for climbing space.

(4) If locust pins are used, dip in hot creosote, fit in pin holes and fasten in place with 4d nails driven through side of arm into pin; place pin in all pin holes.

(5) Fasten cross arms (except transformer arms) with standard flat braces, using double sets for double arms. Fasten cross-arms to pole by machine bolt; using double arming spacer bolts at ends on double arm construction. Use machine or carriage bolts in fastening braces to arms and lag screw in fastening braces to pole.

(6) Fasten transformer cross-arms with angle braces having 48" spread for 8' arm and 60" spread for 10' arm. Use machine bolt in fastening arm to pole and double arming spacer bolts at ends. Use machine or carriage bolts in fastening angle braces to arms and lag screws in fastening braces to poles.

(7) Provide washers where bolts or screws bear on wood surfaces. Bolt ends shall not extend more than 1/2" beyond nut.

8. PRIMARY LINE CONDUCTOR INSTALLATION.

(1) Use top groove of insulators for (a) No. 2 AWG and larger; (b) line voltage 5000 and over, and (c) spans 200 feet and over. Attach conductor to top groove on straight portions of line; at angles or corners, attach wire to side of insulator and always on such side that strain will come on insulator and not tie wire.

(2) Use side groove of insulators for (a) conductors smaller than No. 2 AWG, (b) line voltages less than 5000 and (c) spans less than 200 feet. On straight portions of line, attach conductors on insulator side nearest pole, except on pole pins where conductor shall be away

from pole. At angles or corners, attach wire to such side of insulator that strain will come on insulator and not tie wire.

(3) Securely tie conductors to pin insulators with tie wires. Give one complete turn around insulator and at least 4 complete turn around conductor.

(4) In deadening No. 3 conductors and smaller, use two standard pin type insulators on double arms.

(5) In deadening conductors larger than No. 3 use suspension type insulators in strain position. Form conductors either (a) by serving strands with 6 turns around line conductors or (b) clamp free end with mechanical connectors or with two guy clamps over insulation.

9. SECONDARY LINE CONDUCTOR INSTALLATION

(1) Carry secondary circuits 250 V and less on secondary racks. On straight line construction, tie conductors to spools on side toward pole; at angles or corners, tie to spools on side away from strain.

(2) Locate secondary neutral conductor in top spool of rack.

(3) Along streets and alleys, secondaries shall be on field side of pole.

(4) On straight lines, attach racks by through bolt at top and lag screw at bottom. At angles, transformer poles, deadend poles, heavy service take-offs and other points of unusual strain, use two through bolts.

(5) In deadening No. 3 conductors and smaller, wrap once around spool insulator and give one long turn and six short turns around conductor. In deadening conductors of larger size, wrap once around spool insulator and clamp free end to conductor with "wire rope guying clips" or "guy clamps" of size to fit over insulation. In using "wire rope guying clips," tighten U-bolt until it cuts through insulation making for contact with conductor.

10. SERVICE LOOP INSTALLATIONS

(1) Service drop cable:

(a) Extend "service drop" cable from secondary line on pole to building and connect to building service conductors, installed under "Interior Wiring" Division.

(b) Support cable by cable clamps (non-ferrous, non-corrosive) at the pole and at building.

(c) Fasten clamp at building to anchorage provided under "Interior Wiring" Division, using strain insulators (if local requirements demand) between clamp and anchorage.

(d) Pre-stretch service cable to remove reel kinks; string with slack tension so low part of span is below attachment point on building.

(2) Service drop and entrance cable:

(a) As outlined under Paragraph (1) except cable shall be extended without splices to first electrical service fitting on building.

(3) Individual conductors:

(a) Extend individual conductors from secondary line on pole to building and connect to building service conductors installed under "Interior Wiring" Division.

(b) Support conductors at pole and at building. Install rack (if used) and insulators at building, using anchorage provided under "Interior Wiring" Division.

(c) Pre-stretch service conductors to remove reel kinks; string with slack tension so low part of span is below attachment point on building.

11. GUY INSTALLATIONS

(1) Provide guys wherever necessary to hold cross arms and pole structure in proper position and to provide additional strength to support loads greater than structure will safely support alone. At unbalanced tensions, such as corners, angles and deadends, attach guys at center of load and in line with resultant loading.

(2) Guys shall be of strength to withstand N.E.S.C. loadings and tensions based on supporting entire load in direction in which it acts.

(3) Wherever practical, place guy anchors a distance (lead) from pole equal to height of guy attachment, to limit stresses on anchor and guy. Anchor may be placed closer to pole but not less than 3/8 the height of guy attachment. Multiply following factors by total horizontal conductor load for different ratios of "lead" divided by "height" to obtain actual guy tension.

Ration "Lead" to "Height"	Multiplier
1	1.41
3/4	1.67
1/2	2.24
3/8	2.86

(4) Side guy line angles 10 degrees and over. Angles up to 60 degrees shall have single guy, placed to split line angle. Angle greater than 60 degrees shall have guys in both directions.

(5) Install guy stub poles to provide clearance for guy wires crossing streets or obstructions.

(6) Arm guys should be approximately horizontal. Fasten guy to double arming bolts by eye bolt, eye nut or clevis. Install guy in position before line conductors are placed under tension. Where guy is attached to pole, serve twice around pole, hold in position by two guy hooks, protecting pole by three strain plates (use moulding strain plate where pole grounds occur). For light guying, use lag screws in fastening guy hook; for deadends, use machine bolts.

(7) Provide 2 strain insulators in all guys, one 4' from pole and the other at least 8' from ground.

(8) For average loading conditions, use patent anchors, with rod and thimble eye; provide twin eye rods where telephone messenger cable may be attached to poles; anchor eye not to extend 12" above ground. For heavy loading conditions, use log anchors, fully pressure creosoted 12" x 12" x 4' minimum.

(9) Securely attach pole guy at poles by means of "guy attachment hook."

(10) In make-up of guys, wire strands shall be fastened as follows:

(a) 1/4" strands - served at least 4 wrappings per strand.

(b) 5/16" and 3/8" strand - one 3-bolt standard clamp.

(c) 7/16" and larger - two 3-bolt standard clamps.

(d) Place clamps 3" from strain insulators and a distance from pole equal to twice pole diameter. Cut strand 12" beyond end of outer clamp and hold in place by copper wire wrapping.

(11) Guys shall be placed and pulled up before conductors are strung. In placing guys, the tops of poles shall be "pulled over" so that when load is applied and guys and anchors have settled, pole tops will come back in line.

(12) Install guy guards on all anchor guys.

12. TRANSFORMER INSTALLATION

(1) Place transformers in lowest practical position, maintaining minimum clearance to ground of 16 feet.

(2) Hang transformers on double cross arms with hanger irons. Use kicker arms in single transformer installations.

(3) Install cutouts with clamp hangers and fuses in all phase wires at transformers of 4 KV rating of following sizes:

Transformer KVA	Cutout Amps	Fuse Size (Amperes) 1/o2300 V 3/6 4000 V.Y	3/6 2300 V. Delta
5	50	5	10
7.5	50	8	15
10	50	10	20
25	50	30	50
37.5	50,100	40	75
50	100	60	100

The above sizes are based on 250% transformer rating; fuse transformers equipped with integral fuses, 1-1/2 times amp. sizes given above.

(4) Install cutouts in accessible location on transformer cross-arm on side away from transformer, connecting so fuse holder is dead in open position.

13. LIGHTNING ARRESTOR INSTALLATION

(1) If lightning arrestors are not furnished integral with transformers, install on each primary phase wire an arrestor at transformer and connect to transformer lead between cutout and overhead line.

Where underground primary extensions are made, provide lightning arrestors on each phase conductor.

14. GROUNDING

(1) Grounds shall be provided for (a) secondary lines, one side of 2-wire system, neutral of 3 and 4 wire systems; (b) ground terminal of each lightning arrestor; (c) operating rods of mechanically operated disconnecting switches and (d) transformer tanks.

(2) Each building service connection will have neutral grounded to water mains inside building at service switch; this connection will be made under the "Interior Wiring and Lighting Fixtures" Division. Provide at least one pole ground for each 350' of secondary line. Tie secondary and lighting arrestor grounds together on transformer poles by most direct connection and connect to common driven pole ground unless connections to water conduit can be made.

(3) Driven grounds should be of length to reach below permanent moisture level and insure low ground resistance. Where rock is encountered, obtain grounds by (a) connections to water mains, (b) connections to adjacent well-grounded secondary neutral or (c) installing counterpoise which is well grounded at both ends.

(4) Pole ground connections shall be at least as large as primary conductor and not less than No. 6 AWG wire; installed in hot creosote dipped moulding and fastened to pole with copper covered staples. Place moulding over entire length of ground wire including cross connections on underside of cross arms to ground rod connections at base of pole. Provide connection to ground rod with non-ferrous ground wire clamp.

15. YARD LIGHTING INSTALLATION

(1) A multiple lighting system shall be employed, connecting the yard lighting units to a secondary system. Provide a pilot circuit with time clocks and relays to control the lighting system.

16. FINAL TESTS

(1) At time of final inspection connections from utility company's supply to transformers and equipment shall be completed, together with all pole ground connections; transformer fuses shall be in place and circuits continuous to point of secondary contact on buildings. Prior to energizing overhead distribution system, building service switches shall be placed in open position. Voltage test on line side of all building service switches shall be made. Correct voltage errors and phase relations before placing building electrical system in service. Provide testing equipment necessary to conduct test. Notify Authority in advance before conducting tests.

1. SCOPE

(1) The exterior underground electrical distribution system for lighting and power and related items necessary to complete work shown or specified are a part of contract unless specifically excepted. See "General Scope of Work".

2. SYSTEMS

(1) Light and Power: Provide a system of distribution from point of utility company's service contact as described in detail under "General Scope of Work" and as shown on drawings.

(2) Yard Lighting: Provide a system of yard lighting as described in detail under "General Scope of Work" and as shown on drawings.

(3) Telephone: Provide a system of trenches and sleeves through walls for cable installation by telephone company.

3. GENERAL REQUIREMENTS

IMPORTANT NOTE:

SIZES OF MATERIALS AS SHOWN OR SPECIFIED ARE MINIMUM. USE LARGER SIZES IF PROGRESS IS LIKELY TO BE RETARDED DUE TO DELAY IN OBTAINING SIZES INDICATED.

(1) Wherever NESC or governing regulations do not establish a "standard to follow", then follow the standard practice of local electrical utility in executing the work as drawn and specified.

(2) On completion of work, prepare a one-line feeder diagram showing (a) point of service contact, (b) routing of primary feeders and sizes, (c) transformer stations, sizes, and disconnects, (d) routing of secondary feeders and sizes, (e) building services and sizes and (f) any other pertinent information of value to an operating engineer and for permanent record. Make diagram neatly in ink on tracing cloth not less than 18" x 24"; turn over to Authority.

4. AS-BUILT DRAWINGS

(1) As work progresses, record on one set of drawings all changes and deviations from contract drawings in locations, grades and elevations of conduits, cable runs, manholes, tap boxes, etc. Record final location of the aforementioned by offset distances, in feet and tenths, to surface improvements, such as buildings, curbs or edges of walks. Make sufficient measurements to locate definitely all lines.

(2) At completion of work, transfer all such records in waterproof drawing ink to a set of white cloth prints. After checking records and obtaining signature of approval thereto of Authority's representative, deliver to Authority for permanent record.

5. MATERIALS

IMPORTANT NOTE:

WHERE SEVERAL TYPES OR QUALITIES OF MATERIALS ARE LISTED CONTRACTOR HAS OPTION TO USE ANY ONE OR ALL. INSOFAR AS POSSIBLE, USE ONE TYPE OR

1. SCOPE

(1) The exterior underground electrical distribution system for lighting and power and related items necessary to complete work shown or specified are a part of contract unless specifically excepted. See "General Scope of Work".

2. SYSTEMS

(1) Light and Power: Provide a system of distribution from point of utility company's service contact as described in detail under "General Scope of Work" and as shown on drawings.

(2) Yard Lighting: Provide a system of yard lighting as described in detail under "General Scope of Work" and as shown on drawings.

(3) Telephone: Provide a system of trenches and sleeves through walls for cable installation by telephone company.

3. GENERAL REQUIREMENTS

IMPORTANT NOTE:

SIZES OF MATERIALS AS SHOWN OR SPECIFIED ARE MINIMUM. USE LARGER SIZES IF PROGRESS IS LIKELY TO BE RETARDED DUE TO DELAY IN OBTAINING SIZES INDICATED.

(1) Wherever NESC or governing regulations do not establish a "standard to follow", then follow the standard practice of local electrical utility in executing the work as drawn and specified.

(2) On completion of work, prepare a one-line feeder diagram showing (a) point of service contact, (b) routing of primary feeders and sizes, (c) transformer stations, sizes, and disconnects, (d) routing of secondary feeders and sizes, (e) building services and sizes and (f) any other pertinent information of value to an operating engineer and for permanent record. Make diagram neatly in ink on tracing cloth not less than 18" x 24"; turn over to Authority.

4. AS-BUILT DRAWINGS

(1) As work progresses, record on one set of drawings all changes and deviations from contract drawings in locations, grades and elevations of conduits, cable runs, manholes, tap boxes, etc. Record final location of the aforementioned by offset distances, in feet and tenths, to surface improvements, such as buildings, curbs or edges of walks. Make sufficient measurements to locate definitely all lines.

(2) At completion of work, transfer all such records in waterproof drawing ink to a set of white cloth prints. After checking records and obtaining signature of approval thereto of Authority's representative, deliver to Authority for permanent record.

5. MATERIALS

IMPORTANT NOTE:

WHERE SEVERAL TYPES OR QUALITIES OF MATERIALS ARE LISTED CONTRACTOR HAS OPTION TO USE ANY ONE OR ALL. INSOFAR AS POSSIBLE. USE ONE TYPE OR

QUALITY; IF PROGRESS IS LIKELY TO BE RETARDED DUE TO DELAY IN OBTAINING THE PARTICULAR TYPE OR QUALITY SELECTED, PROVIDE SUCH OF THE OTHER SPECIFIED MATERIALS AS MAY BE APPLICABLE TO THE CONSTRUCTION.

(1) ELECTRICAL MATERIALS AND APPLIANCES of types for which there are Underwriters' Laboratories standard requirements, listings, or labels, shall have listing of Underwriters' Laboratories, or shall conform to their requirements and so labeled.

(2) RACEWAYS AND FITTINGS:

(a) Rigid metal conduit (zinc coated) Fed. Spec. WW-C-581a

(b) Rigid metal conduit fittings. Fed. Spec. WF-406

(c) Fibre conduit (for concrete encasement) Fed. Spec. WW-C-581a Type I.

(without concrete encasement) Fed. Spec. WW-C-581a Type II

(d) Cement-asbestos conduit shall be of "standard" or "light" weight, having noncombustible mixture of cement and pure asbestos fibre, formed under pressure into dense, homogeneous, close grained, inert, nonporous tubes with smooth bore having low friction coefficient. Conduit walls shall be impervious to water on being subjected for 24 hours to hydrostatic head of 50 feet. Taper-cut conduit ends, providing tapered sleeve coupling to fit but not allowing conduit ends to butt. Lengths not less than 5' nor more than 10'.

3. WIRES AND CABLES:

(a) Duct and Vault Installation	Grade	Specs.
Moisture resistant	Type RW NEC	Underwriters Lab
Rubber covered, lead sheathed	Type RP (30%)	A.S.T.M.
	Type RH (35%)	A.S.T.M. or Fed Spec JC-106a
Varnished cambric, lead sheathed	-	IPCEA
(b) Direct Earth Installation		
Lead covered, metallic armored	30%	IPCEA
Lead and jute covered	30%	IPCEA
Lead and duck tape	30%	IPCEA
Non-metallic fibrous or rubber jacket	30%	IPCEA

(4) TAP OR JOINT BOXES (underground) used for encasing buried cable joints shall be malleable or cast iron for one or more multi-conductor service taps as required. Split box at cable

entrances, holding together with non-corrosive bolts. Provide top with filling holes and screwed plugs, where necessary

(5) MANHOLE COVERS AND FRAMES shall be heavy cast iron flanged type with at least 30" round clear opening with overall dimensions of flange approximately 45" square, rib braced. Cover shall be heavy ribbed cast steel with ventilating holes with the word "Electric" cast in approximately 2" letters.

(6) CABLE RACKS shall be hot galvanized malleable iron or steel with mounting holes for hooks.

(7) CABLE RACK HOOKS shall be hot galvanized malleable iron or steel of width and extension required.

(8) RACK INSULATORS shall be of proper radius for cable, wet process white glazed porcelain.

(9) MANHOLE LADDER shall be hot galvanized steel, having rungs spaced approximately 12" apart; length as required.

(10) PULLING EYES shall be of approximately 7/8" round galvanized steel.

(11) GROUND RODS shall be steel protected by welded-on exterior of copper or equivalent rust resisting material; 5/8" x 8' minimum length.

(12) TRANSFORMER VAULT EQUIPMENT shall be in accordance with the latest NEMA and AIEE standards. The installation shall consist of either of the following types. Interrupting capacities of protective equipment in accordance with local utility company's requirements.

(a) Factory assembled equipment made up of metal clad sections containing (1) primary protection and disconnects, (2) space for metering instruments (if any in incoming "Line Room"), (3) transformers, (4) secondary protection and disconnects.

(b) Field assembled equipment composed of potheads (if any), disconnect switches with oil breaker or oil-filled cutouts, bus supports and busses, transformers and secondary protection and disconnects.

NOTE: Listed in Paragraphs (12) to (15) inclusive are materials and equipment required in connection with the vault installation; field assembled equipment is specified, although similar equipment may be incorporated as far as applicable into "factory assembled units."

(13) PRIMARY CUTOUTS (oil filled type) shall be complete with wiping sleeves, oil fuse links, manifold and expansion pipes; arrange for gang operation.

(14) TRANSFORMERS shall conform to AIEE and NEMA standards for oil immersed, self-cooled type, suitable for indoor vault service and furnished complete with oil and of standard voltage ratings.

(a) Ratings: Primary and secondary voltage ratings, frequency, whether single or three phase and number of high voltage bushings shall be as described under "General Scope of Work."

(b) Primary voltage taps shall be in accordance with the requirements described under "General Scope of Work."

(c) Secondary coils shall be arranged for series and multiple connec-

tions.

(d) Terminals shall be detachable cork gasketed copper stud type, insulated by porcelain bushing extending into case and clamped into position. Bushings shall permit insulation of inside winding lead to enter bushing recess and provide surge flashover at least 20% greater on inside than on outside end. Provide 3 or 4 low voltage terminals on transformers of 100 KVA and smaller. Arrange the 4 low voltage coil terminals so that (1) series 120/240 volt, 3 wire and (2) 240 volt, 2 wire and (3) multiple 220 volt, 2 wire connections can be made inside of tank to 3 bushing stud; securely connect terminal lugs on low voltage leads to studs of low voltage bushing with jam nuts or equal. Slot terminal lugs to facilitate making and changing connections from 3 to 2 wire or vice versa. Transformers shall withstand AIEE impulse tests.

(e) Locate high voltage terminal board in accessible position and submerged in upper part of oil. Design links or similar devices for ratio adjusting to prevent their dropping in tank during ratio adjusting operation.

(f) Tank shall be oil tight, of copper bearing steel plate (ASTM Specification A-9-29) with welded joints or of cast iron construction. Cover shall form a splash proof joint and be supplied with gasket cemented to cover. Paint tanks and covers (1) with one coat of rust resisting paint, sub-finish with two coats of weather resisting paint, OR (2) with two coats of paint, each baked-on.

(g) Furnish standard NEMA accessories with all transformer. Provide on each transformer 25 KVA and larger a thermal temperature indicator. 5 KVA transformers and larger shall have 1/2" drain outlet and plug.

(h) Have transformer shipped with proper quantity of insulating oil in tank. Oil shall be pure clear grade mineral oil, of high dielectric strength; flashpoint not less than 130 degrees C. and dielectric strength at least 22,000 volts when tested between vertical surfaces 1" in diameter and 0.10" apart.

(i) Acceptance tests shall conform to latest AIEE standards and test sheets covering unit identical in design shall be submitted including high potential test at normal frequency from primary to secondary and to core and from secondary to core. The identically designed unit shall also have withstood surge tests, using AIEE standard test sufficient to cause arc over on outside of transformer bushing without damage or arc over of any part within the case.

(j) Submit manufacturer's data as follows, guaranteeing the equipment furnished to conform therewith:

(1) Efficiencies at 25%, 50%, 75% and full load at unity power factor and 75 degrees.

(2) No load loss.

(3) Total full-load loss.

(4) Full load regulation at 100% and 80% power factor.

(5) Exciting current (percent).

(6) Net and shipping weights

(7) Limiting dimensions.

(8) Gallons of oil required per transformer.

(9) Diagram of internal connections complete with table of connections for all voltage operations.

Sufficient tests shall have been made to insure that the guarantees will be met.

(15) SECONDARY PROTECTIVE EQUIPMENT shall be in accordance with the requirements described under "General Scope of Work."

(16) SERVICE ENTRANCE ROOM EQUIPMENT shall be in accordance with the requirements described under "General Scope of Work."

(17) YARD LIGHTING FIXTURES shall consist of metal lighting standards, (standard with the trade) giving an approximate height to light sources of 14 feet, provided with lamp base having handhole, where required, and equipped with luminaire and 2500 lumen lamp. All metal parts shall have a corrosive-resistant coating both inside and out with metallic paint.

(18) OPERATING AND SAFETY DEVICES. Warning signs shall be porcelain steel signs with "DANGER - HIGH VOLTAGE" inscribed in 2-1/2" to 3" red letters on white background. Padlocks shall be heavy bronze cylinder type 3/8" yoke with heavy galvanized chain about 15" long. Locks for similar equipment shall be keyed alike. Deliver to Authority 6 keys for each set with attached non-ferrous metal labels. Rubber insulating gloves shall be of high quality, subject to 10,000 volt test.

(19) SPARE PARTS. Furnish and deliver to Authority, suitably packed and marked "General Scope of Work."

6. GENERAL INSTALLATION REQUIREMENTS

(1) Stake out manholes, handholes, vault locations and routing of underground lines as soon as field conditions permit and obtain authority's approval. Indicate finished grade at stakes. The right is reserved to make any reasonable change in locations up to time of approval of staked locations without involving additional cost.

7. EXCAVATION

(1) Perform all excavation necessary to install work required under this division. Deposit on, or remove from, site as may be directed all excess excavation material, backfill as specifically referred to hereinafter.

8. CONSTRUCTION OF MANHOLES.

(1) Additional manholes or handholes may be installed for convenience of cable installation if contractor elects at no added cost to Authority.

(2) Particular attention is drawn to importance of establishing top elevations of manhole covers, setting top so in no case it occurs below surrounding finished grade.

(3) Manholes, and concrete, reinforcement and masonry shall conform to applicable requirements of Divisions "Utilities" and "Foundations, Concrete and Masonry," respectively.

(4) Slope floor to drain to sump pit.

(5) Install manhole cover frame, cover and ladder. Mount cable racks with expansion bolt or anchor bolt and install required cable rack hooks and insulators; install racks on each side of cable joints, otherwise spacing on 3' centers.

(6) Install pulling eyes in wall directly opposite each duct opening or group of openings.

(7) Free interior of manholes of pipes and other obstructions; leaving entire interior available for training cables and working space around cables.

(8) Drive ground rod below floor of each primary manhole, leaving 6" above floor. Ground equipment, hardware, cables, etc., to rod by 1/8" x 1" copper bus or No. 2 bare medium hard drawn, stranded copper wire. Bond lead covered cables by use of No. 6 stranded wire, wiped onto cable sheath and carry to grounding system; provide adequate slack between each cable. Perform bonding in manner conforming to standard practice of local utility company.

NOTE: Metal conduit and light weight fibre and cement asbestos raceways shall be encased in concrete. Heavy wall fibre and cement asbestos conduit may be installed without the concrete enclosure.

9. INSTALLATION OF RACEWAYS (CONCRETE)

(1) Excavate trench to proper depth. Raceway shall be at least 30" below finished grade; the pitch being at least 6" per 100' raceway radius at least 36". Do not spring the joints on fibre conduit, use 5 degree angle connector. Firmly tamp bottom of trench. Where more than one raceway is laid in same trench, place duct sections in desired formation, not less than 2" separation, using brick or precast concrete separators on 4' centers. Enclose ducts in concrete envelope, 3" on all sides. Place four 3/8" reinforcing rods, one in each corner of envelope wherever run is placed in loose or filled-in ground and where it passes under tunnel or enters manhole or vault. Extend rods into manhole or vault structure and at least 36" into duct run.

(2) Do not backfill until 24 hours after concrete has been poured; backfill dirt, soaked and tamped in one foot layers, rock and obstacles over 2" removed.

10. INSTALLATION OF RACEWAYS (WITHOUT CONCRETE)

(1) Excavate trench to proper depth. Raceway shall be at least 30" below finished grade; pitch being at least 6" per 100' raceway radius at least 36". Do not spring joints; on fibre conduit use 5 degree angle connector. Firmly tamp bottom of trench, earth to be evenly graded. Ram 1" of fine earth or sand. Where more than one raceway is laid in same trench, place duct sections in desired formation, not less than 2" separation, using brick or precast concrete separators on 4' centers. Ram fine earth or sand be-

tween ducts and for 2" above ducts. Backfill with fine earth free from stones, debris, etc., and tamp for 8". On top of tamped material, lay yellow pine plank, 1" x 12" for one duct and 1" x 18" for two ducts. Impregnate planks with creosote by vacuum and pressure system for penetration of creosote into wood fibre. Backfill dirt, soaked and tamped in one foot layers, rocks and obstacles over 2" removed.

(2) Where runs are under traffic streets, service drives or over filled-in ground that may settle, encase ducts in 3" of concrete on all sides in a manner as outlined in Section "Raceways in Concrete."

11. FITTING OF FIBRE OR CEMENT ASBESTOS CONDUIT

(1) Use conduit tooling machine in cutting conduit and tapering ends to assure proper jointing of ends and fitting of coupling. Stagger joints at least 12" where more than one conduit occurs in run. Paint each joint with waterproof insulating conduit sealing compound, wrapping with two layers of waterproof tape made up of cotton cloth, coated and filled with black asphaltum compound; tape to cover joint at least 3" on each side.

(2) Install end bells at duct openings in manholes and vaults. Use conduit adapters in connecting to steel conduit.

(3) Draw mandrel swab through ducts immediately after laying to assure clearance of water and foreign material. Plug conduits until ready to pull cables and swab again just prior to cable installations.

12. FITTING OF METAL CONDUIT

(1) Ream and remove burrs; watertight by red leading male thread only. Stagger joints at least 12" where more than one conduit occurs in run.

(2) Plug conduits until ready to pull cables and swab prior to cable installation. All exposed threads on galvanized pipes shall be given one coat of acid resisting paint.

13. INSTALLATION OF SERVICE SLEEVES

(1) Install galvanized sleeves or nipples in foundation walls of buildings for connection to underground raceways or for entrance of direct burial cable.

14. TRANSFORMER VAULT EQUIPMENT INSTALLATION

(1) Laycuts shown on drawings are diagrammatic. Before commencing installation of vault equipment, prepare working drawings showing layout equipment and connections based on equipment selected and in accordance with the local utility company's standard; obtain utility company's approval, then submit to Authority for approval.

(2) Install primary oil filled cutouts (gang operated), transformers on rails and secondary distribution panel; inter-connect the equipment and connect incoming primary and secondary feeders to the equipment. If "factory assembled units" are provided, install units complete, connecting the primary and secondary feeders to the "assembled units."

(3) In the "Line Room" (service entrance room) utility company will connect incoming primary service to the primary cutouts, the work under this contract commencing at this point, except for the metering transformer and meter panel which will be furnished by the utility company but installed by this contractor. Provide and install necessary facilities and connections between the primary cutouts and transformers to receive the metering equipment, all in accordance with utility company's rules and regulations.

15. INSTALLATION OF CABLES IN DUCTS

(1) Use feeding tube where cable passes into mouth of duct. Avoid injury to lead sheath, never subjecting the cable to bending at radius of less than 8 times overall diameter. In cable pulling to reduce friction and abrasion, apply freely a permanent and inorganic grease. If temperature is below 14 degrees F. at time of cable installation, place the reels of cable in approximately an 80 degree F. room for at least 24 hours or until cable has a temperature throughout of at least 60 degrees F.

16 INSTALLATION OF CABLE DIRECTLY IN GROUND

(1) Install at minimum of 36" below finished grade, laid so as not to obstruct known future construction or improvements. Protect primary cables, extending under driveways, streets, etc., and in crossing other utility lines by installing in cast iron pipe secondary cables by installing in galvanized conduit. Extend raceways 24" at each end beyond width of paved area under which installed.

(2) Where cables enter buildings, extend through galvanized conduit sleeves set in walls during wall construction. After cables are installed through sleeves, caulk both ends with material and in manner recommended by cable manufacturer.

(3) No splices except at handholes, manholes and vaults. Where 2 or more cables are placed in same trench, separate by at least 2".

(4) Spread bottom of trench with at least 4" deep sand. Lay cables on top of sand in snake fashion, thus allowing slack for settlement. Spread top and sides of cable with sand, covering by at least 4". Backfill dirt, soaked and tamped in one foot layers, rocks and obstacles of over 2" removed.

(5) For primary cable, lay a 2" x 12" yellow pine plank over the final layer of sand and before backfilling. Impregnate plank with creosote by vacuum and pressure system for penetration of creosote into wood fibre.

17. PRIMARY CABLE INSTALLATION

(1) Furnish certified copy of high potential and insulation resistance tests for each type cable used.

(2) Arrange cables on insulator racks to permit contraction and expansion of cables without binding at duct entrances.

(3) Fireproof exposed lead cables by wrapping asbestos listings

around cables and then coating with silicate of soda.

(4) In splicing, use materials approved by cable manufacturer and make up splice in accordance with cable manufacturer's standards and local utility company's common practice. Three-way splices shall be of "Y" joint type. If rain should delay completion of splice, wrap entire splice and 12" of the cable from each end of splice in tight rubber covering to prevent moisture absorption. Before removing covering, thoroughly dry inside of manhole or vault, all tools and material. Use filling compound for splices and potheads as recommended by cable manufacturer.

(5) Cable splices and pothead connections shall be made by mechanics qualified by experience to handle this type of work satisfactorily. Submit certified copies of employment records; applicant, if requested, shall demonstrate his ability to satisfactorily perform this specialized work.

(6) In terminating "multi-conductor" cables, install potheads of proper type, rating and shape. Insulate cap nuts with varnished cambric tape, having 1-1/2 times insulating value of cable, dress with insulating paint.

18 SECONDARY CABLE INSTALLATION

(1) Furnish certified copy of high potential and insulation resistance tests for each type cable used.

(2) Connect secondary cables from transformers to points of pick-up under "Interior Wiring and Lighting Fixtures" Division. In racking, keep secondaries at least one foot from primary conductors.

(3) Make service taps in tap or joint boxes with mechanical connectors. Insulate with varnished cambric tape having 1-1/2 times insulating value of cable, dress with insulating paint. Place cables in box and seal with low voltage insulating compound in manner recommended by manufacturer.

(4) Terminate lead covered cables with wiped sleeves and non-metallic cables with sealed cable heads.

(5) Terminate underground service cable in junction boxes on interior face of foundation wall where crawl space is provided or on exterior of wall where there is no crawl space. The junction box or conduit fitting on the exterior shall be approximately 24" above grade. The aforementioned junction boxes and conduit fittings shall be provided under this division of the specification. Connect the interior cables which will be brought to these points under another division of the specification to the underground cables, leaving same ready for operation.

19. SECONDARY DISTRIBUTION CENTERS

(1) Secondary distribution centers shall be installed in accordance with requirements described under "General Scope of Work."

20. GROUNDING

(1) Ground equipment and services in accordance with standard practice of

local utility company. In general, grounds shall be provided for (a) secondary lines, one side of 2 wire system, neutral of 3 and 4 wire systems; (b) metallic cable sheaths of primary cables; (c) metal lighting standards (on series high tension, provide driven ground; on multiple secondary circuit, use anchor bolts supporting the standard as grounds); (d) operating rods of mechanically operating disconnect switches; (e) switch frames, switch bases, instrument transformer and transformer tanks and like equipment housing or frames in line room and vaults.

(2) Each building service connection will have neutral grounded to water mains inside building at service switch; this connection will be made under "Interior Wiring and Lighting Fixtures" Division.

(3) Driven grounds shall be of lengths to reach below permanent moisture level and insure low ground resistance. Where rock is encountered, obtain grounds by (a) connections to water mains, (b) connections to adjacent well-grounded secondary neutral or (c) installing counterpoise which is well grounded at both ends.

21. YARD LIGHTING INSTALLATION

(1) Mount standards on concrete base according to manufacturer's recommendation, consisting of 1:2:4 mix with 3/4" aggregate. Set base 1" above grade with top surface troweled smooth and beveled. Install conduit elbows as required in the base terminating 6" above top. Plumb standards in 90 degree planes. After erection, apply one finish coat of paint of standard color as may be approved.

(2) Clear water plugs by at least 3'; clear sewer catch basin sufficiently so as not to interfere with basin. Local ordinances as to clearances shall govern.

(3) See "General Scope of Work" for method of control.

22. INSTALLATION OF TELEPHONE SYSTEM

(1) Trench as shown, installing galvanized conduit sleeves in foundation walls. Cable will be furnished and installed by telephone company; after installation, backfill. For exact location of sleeves, consult telephone company.

23. OPERATING AND SAFETY DEVICES

(1) Identify all equipment such as breakers, switches, transformers, etc. by attaching name plate or identification tags of permanent material.

(2) Identify cables within 6" of each duct in manholes and vaults by brass or lead tags, giving feeder number and phase designation.

(3) Install warning signs on all access doors to transformer vaults and install metal box with two pairs of insulating gloves in incoming service vault.

24. PAINTING

(1) Clean and paint with two coats of black or gray gloss enamel, as directed, metal cases, tanks and frames of electrical equipment, exclusive of specially finished or galvanized surfaces.

25. INSULATION TEST

(1) Upon completion, subject entire primary system, exclusive of instruments and transformers to an A.C. voltage twice normal operating voltage plus 1000 volts for 5 minutes.

(2) If D.C. testing equipment is used, test voltage shall be double the A.C. test voltages stipulated above under paragraph (1) taking milli-ampere readings at 3 intervals, i.e., 15 second, one minute and five minutes.

(3) After installation and connections have been made, conduct air tightness tests on transformers and oil immersed apparatus, using at least 7 pounds air pressure.

(4) Advise Authority in advance of tests, so representative can arrange to witness tests. Submit certified copy of test report for record.

(5) Failure or defects in workmanship revealed by tests shall be promptly corrected and tests re-conducted. Submit certified copy of report on re-conducted test.