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DEFENSE HOUSING SPECIFICATION
NATIONAL HOUSING AGENCY
FEDERAL PUBLIC HOUSING AUTHORITY

Division D-0

DEMOLITION
March 1942

5-4-44. Gift. Commissioner Emmerich

NOTE TO ARCHITECT: (Do not copy)

This division should be incorporated in your specification only where slum clearance is involved. On sites which do not involve extensive demolition a paragraph describing the demolition required should be inserted in the Scope of "Excavating and Grading."

Fill in blanks with the proper name of owner, i.e., "Government," "Authority" or "Agency," etc.

Omit items not needed and specify necessary additional items. This specification for "Demolition Work" is intended for use where demolition is included in the "General Contract."

Consider possibility of salvaging old flagstones, bricks, paving block or stone walls for re-use: if salvaging is desired, the specification should so state, in "SCOPE."

Sec. 1. SCOPE

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

2. Demolish and remove completely all buildings and structures, fences, steps and other construction to the existing ground level, except as follows:

(a)

3. Remove retaining walls to the lowest adjacent ground level, except as follows:

(a)

NOTE TO ARCHITECT: (Do not copy)

Any exceptions to the above requirements, such as buildings to remain, if any, and items owned by city or utility companies, should be so noted here.

4. Remove, regardless of elevation, all floor construction over basements or cellars.

5. Remove partitions, masonry crosswalls, stairways, furnaces, piping, apparatus, and debris from within existing basements.

Sec. 2. RISK OF LOSS

1. The _____ assumes no responsibility for condition of buildings and structures on the premises, nor their continuance in the condition existing at time of Invitation for Bids. Damage or loss (whether by reason of fire, theft or other happening) shall be at risk of bidder from and after date of advertising for bids, and no such damage or loss to buildings or structures shall relieve the Contractor from any obligation under the contract.

Sec. 3. NOTICE TO PROCEED

1. On the date of opening of bids the _____ may not have acquired title to all property covered by the Specification and many buildings may be occupied. Demolish no building until vacated and title thereto has been vested in the _____. Notice to proceed with the work will advise Contractor of buildings and structures on which work may be started immediately. Notwithstanding failure of _____ to have ready all buildings or structures for demolition, Contractor shall proceed immediately with demolition and removal of buildings and structures released to him and perform the work in such order as _____ in its discretion shall require. Remaining buildings and structures will be released to the Contractor immediately upon acquisition of title to premises and removal of occupants therefrom.

2. The Contractor shall be entitled to an appropriate extension of time if the _____ fails to release any building or structure within such time as to enable the Contractor to perform the contract within the contract time. The _____ shall be under no further liability to the Contractor because of such failure except that in case of failure of the _____ to acquire all or any part of the property there shall be such equitable adjustment of the contract price as the _____ shall determine.

Sec. 4. DEMOLISHING

1. Before starting demolition, have all services, such as water, gas, steam, electricity and telephones, disconnected at the service mains in accordance with the rules and regulations governing the utility involved. Securely seal all storm and sanitary sewers leading from structures to be demolished. Preserve all active utilities traversing the project site. Disposition of utilities is specified in "Excavating and Grading."

NOTE TO ARCHITECT: (Do not copy)

Make exceptions to above paragraph 1 where existing utility service lines or connections are to be re-used or where disconnections are to be made by the city or respective utility company. Omit the last sentence if "Demolition Work" is a separate contract.

2. Demolish structures in such manner as to avoid hazard to persons and property and to prevent spread of dust and flying particles by keeping work thoroughly wetted down; provide water and necessary connections therefor. Avoid interference with the use of adjacent buildings or interruption of free passage to and from same.

3. Demolish masonry walls in small sections. Remove individually and carefully lower structural steel, cast iron and heavy timber, framing members.

4. Use no dynamite nor powder on the site and do no blasting, except on prior written permission from the _____.

5. Burn no materials or debris on the premises without specific permission.

6. Provide adequate protection of persons and property at all times.

Sec. 5. REMOVAL AND SALVAGE

1. Do not remove structures substantially as a whole, but completely demolish on the premises, and, except as otherwise specified, remove salvaged materials and demolition debris, tools and apparatus from entire project site.

2. Except as otherwise specified, salvage becomes the property of the Contractor.

(a) Upon receipt by the Contractor of notice to proceed with work on any part or all of the premises, all right, title and interest of the _____ in and to buildings, and other property to be demolished and removed by the Contractor and structures then located on said part or all of the premises described in such notice shall be deemed to be vested in the Contractor, subject to the provisions of Contract Documents. The Contractor shall accept said premises in the condition then existing and there shall be no adjustment in Contract Price because of any change in condition of said premises subsequent to date of advertisement for bids.

Any insurance protection on buildings and structures in the interest of the Contractor shall be at the expense of the Contractor.

(b) Subject to applicable provisions of Contract Documents, the Contractor shall be entitled to buildings and structures to be demolished and removed including salvaged lumber, brick, structural steel, glass, piping, miscellaneous metal and other items, but all piping, conduits, cables and other equipment belonging to public service companies shall not become the property of the Contractor unless abandoned by the various companies owning or controlling same. Personal property of third persons or tenants shall not become the property of the Contractor.

(c) It is expressly understood and agreed by the Contractor and it is only upon this condition that title to such buildings and structures is so vested in the Contractor, that no right, title, property or interest of any kind whatsoever in or to land or premises upon which such buildings and structures stand, is created, assigned, conveyed, granted or transferred to the Contractor or any other person or persons, except only the license and right of the Contractor to enter upon such land and premises to remove such buildings and structures in strict accordance with the provisions of Contract Documents.

(d) Materials left on the site after acceptance of the work by the _____ shall be deemed to have been abandoned by the Contractor to the _____ and title thereto shall thereupon revert to and vest in the _____, without prejudice, however, to any claims which the _____ may have against the Contractor arising from the action of the Contractor in so leaving such materials on the site.

Sec. 6. RODENT EXTERMINATION

1. Before commencing other work, exterminate rodents and other pests on the entire project area; employ experienced exterminators.

(a) Exercise necessary precautions. Display warning signs where necessary.

2. To prevent migration, distribute bait in each building within 24 hours after occupants vacate (where possible) and do not start demolition within 3 days thereafter.

(a) Bait used for the extermination of rats and mice shall be composed of powdered Red Squill mixed separately and thoroughly with the following foods: ground fresh lean beef and ground fresh fish in proportion of 1 part Red Squill to 10 parts food by weight.

3. In addition to the bait specified, fumigate rat burrows with calcium cyanide (using foot pump dusters).

NOTE TO ARCHITECT: (Do not copy)

If rodent extermination is deemed necessary the foregoing specification is recommended in accordance with the Department of Agriculture's Leaflet No. 65, "Red Squill Powder in Rat Control." However, rat control factors vary with the locality and it is suggested that the appropriate District Agent of the Division of Predator and Rodent Control, Fish and Wildlife Service, Department of the Interior, be consulted. List of such agents as of January 1942 follows:

DISTRICT AGENTS DIVISION OF PREDATOR AND RODENT CONTROL
(Do not copy)

Montana
Mr. Robert E. Bateman, P.O. Box 1251, (216 Federal Bldg.), Billings, Montana.

North Dakota, South Dakota and Nebraska
Mr. Lawrence M. Cheney, P.O. Box 37, Mitchell, South Dakota.

Mississippi, Arkansas, Louisiana, Alabama, Tennessee
Mr. Robert Deen, P. O. Box 395, State College, Mississippi.

Washington
Mr. John Finley, 1823 Smith Tower, Seattle, Washington.

Oklahoma, Kansas
Mr. Alwin E. Gray, 514 Federal Bldg.,Oklahoma City, Oklahoma.

California
Mr. Harold H. Haecker, P.O. Box 1317 (271 Federal Bldg.), Sacramento, California.

Wyoming
Mr. Adolph S. Hamm, P. O. Box 215 (308 Federal Bldg.), Cheyenne, Wyoming.

Nevada
Mr. G. Hammond Hansen, P. O. Box 1510 (312 P. O. Bldg.), Reno, Nevada.

Colorado
Mr. John M. Hill, 576 Custom House, Denver, Colorado.

Idaho
Mr. Geo. E. Holman, P.O. Box 1998 (State House),
Boise, Idaho.

Texas
Mr. C. R. Landon, P. O. Box 1941 (298 Federal House),
San Antonio, Texas.

New Mexico
Mr. Louis H. Laney, P.O. Box 1389 (401 Fed.Bldg.),
Albuquerque, New Mexico.

New England States, New York, Pennsylvania, Ohio,
West Virginia, Virginia, Maryland, Delaware, New Jersey
Mr. George B. Lay, 1140 Park Square Bldg., Boston, Massachusetts.

Arizona
Mr. Everett M. Mercer, 201 New Post Office Bldg.,
Phoenix, Arizona.

Indiana, Illinois, Wisconsin, Minnesota, Michigan, Iowa,
Missouri
Mr. G. C. Oderkirk, Experiment Station Annex, Purdue
University, Lafayette, Indiana.

North and South Carolina, Georgia, Florida, Kentucky
Mr. L. C. Whitehead, P. O. Box 5577, State College Station,
Raleigh, North Carolina.

Utah
Mr. R. Scott Zimmerman, 457 Federal Bldg.,
Salt Lake City, Utah.

DEFENSE HOUSING SPECIFICATION
NATIONAL HOUSING AGENCY
FEDERAL PUBLIC HOUSING AUTHORITY

Division D-2

EXCAVATING AND GRADING

March 1942

NOTE TO ARCHITECT: (Do not copy)

Delete items not needed and specify necessary additional items. Modify this text to suit local soil and site conditions.

Sec. 1. SCOPE

1. 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."

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

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

2. Excavating and backfilling for sewers, water and gas piping, plumbing, heating and electrical work are included in other divisions.

Sec. 2. BENCH MARKS AND SUBSURFACE SOIL DATA

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

2. Subsurface investigations have been made and results indicated. No responsibility is assumed for variation of subsoil quality or condition at locations other than places shown and at time exploration was made.

Sec. 3. TREES

1. Remove as directed all trees and shrubs, including stumps and major roots, from project site unless otherwise indicated. Box and protect trees and shrubs to remain.

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

3. Grade strictly as directed within the area of spread of branches of trees to remain. Do not burn or place debris within this area.

Sec. 4. STRIPPING TOPSOIL

NOTE TO ARCHITECT: (Do not copy)

Coordinate this section carefully with "Lawns and Planting." When all topsoil is to be furnished and placed under "Lawns and Planting," this section should be omitted entirely.

Following are alternate paragraphs, each subject to modification to meet local conditions.

The first is for projects on which topsoil stripping is specified under this Division, and placing is specified under "Lawns and Planting." It may be employed either when all necessary topsoil can be obtained from stripping, or when a portion of the topsoil required must be brought in.

1. Strip from site topsoil of acceptable quality to the extent required hereunder or to the extent such topsoil is available and pile where shown or directed. Strip without admixture of subsoil. Do not strip from large open unbuilt-upon areas in which no appreciable change in existing grades is required. Topsoil so stripped and stockpiled shall be free from woody plants, roots over one inch in diameter, stones over 2 inches in size, hard clods, construction debris and other deleterious matter; it shall be protected for use under "Lawns and Planting."

NOTE TO ARCHITECT: (Do not copy)

For sites where much of the project area can be left undisturbed and little grading is required, omit the preceding paragraph and use the following paragraph which provides for placing all topsoil (except in plant pits) under this Division.

1. Strip topsoil from areas to be covered by buildings or surfacing, or where cuts and fills are required, in an amount sufficient to provide a 4-inch depth of topsoil, below finished grade, on lawns and planted areas. Stockpile such topsoil, if and as necessary; place and grade as hereinafter specified. Hard-packed subgrade surfaces shall be scarified or loosened to a 3- to 4-inch depth before topsoil is placed. Topsoil stripped and placed shall be without admixture of subsoil, and shall be free from plants and their roots, stones over 2 inches in size, hard clods, construction debris and other deleterious matter.

Sec. 5. EXCAVATING

NOTE TO ARCHITECT: (Do not copy)

When site is free from "obstructions" such as old basements, cisterns, etc., delete paragraphs 1 to 3, inclusive.

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

2. In surfaced or planted areas, remove existing walls, paving and other obstructions to a depth of not less than 24 inches below finished grade.

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

4. Excavate to elevations and dimensions indicated, plus sufficient space to permit erection of forms or construction of masonry and inspection of foundation.

(a) Excavation for footings may be made to accurate sizes and side forms omitted if concrete is poured in clean-cut trenches without cavings. Obtain approval of trenches before pouring concrete. See "Masonry and Concrete."

5. If rock, as defined herein, is encountered within the limits of excavation, the "Contract Price" will be adjusted. See "General Conditions." Rock is defined as any boulders exceeding 12 cubic feet in volume, or ledge rock or stone which cannot be broken and removed by a power shovel of 1/2 cubic yard bucket capacity. The "Contract Price" is understood to include full compensation for all excavation, except that classified as rock.

6. Should latent soil conditions require changes, the "Contract Price" will be adjusted. See "General Conditions."

7. The following rules of measurement shall be used in computing changes in quantities of excavation (extra or omitted) which may be ordered, irrespective of the actual quantities involved:

(a) Excavation for buildings and structures measured as extending 2 feet outside of wall lines.

(b) Excavation for footings measured as extending 6 inches outside of concrete footing lines.

(c) Trenches for walls measured as 2 feet wider than wall thickness but in no case less than 3 feet.

(d) Quantity of hand excavation computed from level at which hand excavation starts.

(e) Quantity of rock excavation computed by (1) stripping the rock free of all earth and loose material and taking cross-sections on surface of rock before blasting, and (2) by calculating depths therefrom to elevations shown or specified for bottom of excavation, provided, that if rock does not extend to bottom of excavation, only the actual depth of rock excavated shall be allowed. With each claim for rock excavation, file a plan of the cross-sections and the depth at each point.

(f) Backfilling computed as the volume of excavation, determined according to the foregoing rules less the volume of displacement of foundation walls and footings.

(g) Where rock excavation replaces earth excavation required under the contract, deduct quantity of earth excavation omitted.

(h) Sheet piling (when directed to be left in place) measured by board measure or by weight of steel (material only less credit for cost of removal).

8. Protect bottoms of excavations from frost.

9. Shore and brace excavations, if necessary, to prevent cavings. Remove shoring before backfilling is completed, 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. Any excess cut under footings and foundations shall be filled with concrete.

12. Remove or correct insanitary conditions.

c. 6. GRADING

1. Do all cutting, filling, backfilling, and grading necessary to bring entire area outside of buildings to following subgrade levels:

(a) for paving, walks and other surfaced areas, to underside of the respective surfacing, and,

(b) for lawns and planted areas, to 4 inches below finished grade, except that,

(c) where rock, as hereinbefore defined, is encountered, excavate the same, within areas to be surfaced, to a depth of 6 inches below underside of surfacing and, for lawns and planted areas, to a depth of 12 inches below finished grade, or as otherwise directed, and backfill to subgrade level with approved subsoil from the site. The "Contract Price" will be adjusted (in accordance with Rules of Measurement set forth above) for any such rock excavation.

NOTE TO ARCHITECT: (Do not copy)

In preceding paragraph, correlate depth of topsoil specified in subparagraph (b) with depth specified under "Lawns and Planting." When grading is carried to finished grade, revise subparagraph (b) to read as follows:

"(b) for lawns and planted areas to finished grade as specified in Sec. 4 of this Division, except that".

Delete words "except that" from subparagraph (b) and all of subparagraph (c) when test borings or local conditions indicate rock will not be encountered. If subparagraph (c) is used, specified depth of rock excavation should be modified to suit local conditions.

2. Remove all debris and deleterious materials from excavations before backfilling. Do not use frozen materials for backfill. Do not backfill against foundation walls 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 thoroughly.

NOTE TO ARCHITECT: (Do not copy)

Specify method of compacting, viz, flooding, tamping, rolling, etc.

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 subgrade level of lawns and planted areas, 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. Finished grades not otherwise indicated shall be uniform levels or slopes between points where levels are given or between such points and existing finished grades, except that the surface shall be rounded at abrupt changes in slope. Should figures for finished grades conflict with finished grade contours shown, the figures shall govern.

7. Grade areas under concrete floor slabs bearing on ground to required subgrade, using acceptable material for fills and compacting thoroughly. Before depositing fill, clear surface of ground of topsoil, vegetation and other matter, also large stones, which cannot be easily compacted. For fills of one foot or more, deposit material in 6-inch layers over building area, sprinkle and roll with 5-ton roller, making 4 passes over each layer, all in advance of cutting trenches for footings and foundation walls. Later backfill space next to walls and tamp compactly.

NOTE TO ARCHITECT: (Do not copy)

Delete preceding paragraph 7 and/or the following to suit your project.

7. Grade areas under buildings to levels shown on plans. If existing grades are lower, no fill need be provided. Grade such areas to a uniform slope or level.

8. Fill to required levels any subgrades which settle.

Sec. 7. DISPOSITION OF UTILITIES

NOTE TO ARCHITECT: (Do not copy)

Delete this section unless required by site conditions.

1. Protect active utilities from damage; remove or relocate only as indicated or as specified.

2. Protect or relocate active utilities not shown on the drawings, in accordance with written instructions. "Contract Price" will be adjusted for this additional work.

3. 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. Report in writing the location of such abandoned utilities.

Sec. 8. DRAIN TILE

NOTE TO ARCHITECT: (Do not copy)

Delete this section unless drain tile shown on drawings.

1. Where so indicated, furnish and lay 4-inch agricultural drain tile, or 4-inch terra cotta bell and spigot tile, or 4-inch 3-cell terra cotta partition tile around foundation walls.

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. Connection of drain tile to sewers is included under "Utilities."

DEFENSE HOUSING SPECIFICATION
NATIONAL HOUSING AGENCY
FEDERAL PUBLIC HOUSING AUTHORITY

Division D-3

MASONRY AND CONCRETE

March 1942

NOTE TO ARCHITECT: (Do not copy) This specification is intended for use on FRAME BUILDINGS where exterior masonry above grade consists of chimneys and piers or foundations. Delete items not needed and specify any necessary additional items. Use Division D-3A for MASONRY BUILDINGS.

Sec. 1. SCOPE

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

2. Construct footings of concrete or of solid brick masonry.

3. Construct masonry walls and piers of concrete, solid brick, or of concrete-units.

4. Construct chimneys of solid brick or concrete-units, with terra cotta flue linings and concrete caps, as shown.

Sec. 2. MATERIALS

NOTE TO ARCHITECT: (Do not copy) Delete materials not required under "Scope".

1. CONCRETE AND CEMENT FINISH MATERIALS shall comply with the following Federal Specification:

(a) CEMENT - Portland, SS-C-191b; or High early strength portland SS-C-201.

(b) HYDRAULIC LIME - SS-L-361.

(c) AGGREGATES - SS-A-281, grade "A"; coarse aggregate of 3/4-inch maximum size for concrete, and of 1/8-inch minimum to 3/8-inch maximum for cement finish; fine aggregate for cement finish shall have 5 percent maximum pass a 100-mesh sieve, and 15 percent maximum pass a 50-mesh sieve. One inch or 1-1/2 inch aggregate may be used in footings and walls when approval is obtained.

2. MASONRY MORTAR MATERIALS, in addition to being suitable to produce specified mortar requirements, shall comply with the following Federal or ASTM Specifications:

(a) CEMENTITIOUS MATERIALS shall be any one, or mixtures, of:

Portland Cement, Federal SS-C-191b;
Masonry Cement, Federal SS-C-181b Type II
Natural Cement, ASTM C-10-37
Slag Cement conforming to requirements for portland cement except that soundness shall conform to requirement for masonry cement;
Puzzolanic Cement, conforming to requirements for either portland or masonry cement;
Hydrated Lime, Federal SS-L-351, soaked and aged in accordance with manufacturer's printed directions on containers, or aged 24 hours after proper soaking;
Quick Lime (either pulverized or lump), Federal SS-Q-351, slaked and aged in accordance with manufacturer's printed directions on containers or completely slaked, and aged 72 hours if pulverized or 21 days if lump; or Hydraulic Lime Federal, SS-L-361.

(b) SAND - ASTM C-144-39T, passing a No. 8 sieve.

3. WATER shall be clean and fit to drink.

4. BRICK shall be new common brick made from clay or shale and conforming to ASTM Specification C-62-41T, Grade SW.

5. CONCRETE-UNITS (Masonry) including necessary closures and fitters shall be of standard sizes and shapes, free from deleterious matters that will stain plaster and be cured by air, water or steam, in addition to meeting Federal Specification SS-C-621, Type I.

(a) Unless units have been cured in high-pressure steam, furnish test reports by an approved laboratory showing compliance with moisture content requirements for each 25,000 units.

(b) Surfaces to be plastered or stuccoed shall have a sufficiently rough surface to give good adhesion. Surfaces to be exposed, or to be coated shall be plain and of uniform texture.

6. FLUE LININGS AND THIMBLES shall be sound, hard burned, unwarped fire clay flue tile, free from cracks and spalls. The net inside areas of flue tile shall equal the areas shown in the following table:

Nominal Dimension	Net Inside Area	Nominal Diameter	Net Inside Area
4 x 8	21 sq. inches		
$7\frac{1}{2}$ x $7\frac{1}{2}$, $8\frac{1}{2}$ x $8\frac{1}{2}$	52 "	8" Diameter	50 sq. inches
8 x 12, 8 x 13	75 "		
12 x 12, 13 x 13	125 "	12" Diameter	113 "

7. CHIMNEY CAPS shall be precast or cast-in-place concrete as shown and be reinforced with two continuous 5/8-inch-round deformed steel bars.

8. STRUCTURAL STEEL shall conform to Federal Specification QQ-S-721a.

9. REINFORCING STEEL shall be deformed, either intermediate-billet, hard rail, or hard-axle grade steel, except that stirrups and ties may be plain.

10. METAL FABRIC shall be made of cold drawn steel wire.

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

Sec. 3. STORAGE OF MATERIALS

1. Handle and store aggregate separately in manner to prevent intrusion of foreign matter or segregation, and finished materials to prevent damage. Store brick and concrete-units, under cover permitting circulation of air and preventing absorption of water. Store cements and limes in watertight enclosures with floors above ground.

Sec. 4. PROPORTIONING AND MIXING CONCRETE

1. Cast-in-place concrete shall be, (1) a mix of cementitious materials, aggregates, and water of proportions established by approved testing laboratory tests in accordance with ASTM Specification C-39-39 to have compressive strength at 28 days of not less than 2,000 pounds per square inch or (2) an untested mix of any proportions using not less than 5 sacks portland cement per cubic yard of concrete.

(a) Water content per sack of cement, including free water contained in aggregates, shall not exceed 7-3/4 gallons. Slump shall not exceed 5 inches. Fine aggregates shall be not less than 1/3 or more than 1/2 of total aggregates. Consistency shall be suitable so concrete will work readily into place without free water appearing on top surfaces.

(b) Portland cement, not in excess of one 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). Thoroughly mix hydraulic lime with cement prior to adding water.

2. Ready-dry-batched mixes of cement and aggregates if used must be delivered 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 portland cement is added to batch and 1/2 hour after high early strength cement is added.

3. Mix concrete ingredients in power-operated batch mixer, not less than one minute after all ingredients are in mixer for capacity of one cubic yard or less, increased 15 seconds for each cubic yard or fraction thereof additional capacity.

4. Ready-mixed concrete must be transported 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 with portland cement and 1/2 hour when high early strength cement is used.

Sec. 5. FORMS FOR CONCRETE

1. Forms shall be of materials that will produce concrete surface finishes that are dense, free from honeycombing, and air bubbles which expose aggregate and equal in all respects to surfaces produced by clean, surfaced tight lumber forms.

2. Construct forms sufficiently tight to prevent leakage, securely brace and shore to prevent displacement, with access panels for cleaning and inspection. Where soil and workmanship permit excavation to accurate dimensional sizes of footings, forms may be omitted. See "Excavation and Grading."

3. Install sleeves, inserts, anchors, and other fastening devices required for installation and attachment of other work.

4. Maintain forms and shores in place until concrete has developed ample strength to support construction loads.

Sec. 6. DEPOSITING CONCRETE

1. 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.

2. 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. Place no concrete for foundations on earth backfilled or otherwise disturbed, or on frozen soil. All soil bottom for slabs and footings shall be approved by the Authority before placing concrete. Deposit no partially hardened concrete.

3. 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 shrinkage and voids.

NOTE TO ARCHITECT: (Do not copy)

Fill in applicable spaces such as Laundries, Play Spaces, Offices and Toilet Rooms.

4. The floors of dwelling Spaces if laid on ground shall be laid over 6 inches of stone or gravel graded from 3/4 to 1-1/2 inch. Wet, damp and roll bed until thoroughly compacted. See "Excavation and Grading" for earth fills over 1-0 inch. Lay waterproof kraft paper (Federal Specification UU-P-264) over stone or gravel to prevent concrete combining with

them. Avoid tearing paper. Seal tightly, with coal-tar-pitch, expansion joints, and spaces around pipes, bolts, anchors, etc. penetrating floors and walls in contact with the ground or gravel subgrade.

Sec. 7. CEMENT FINISHES

1. Strike off surface of concrete floor slabs, steps and platforms reasonably true at proper level for specified finish. Remove all surface water, laitance, and dirt; apply finish composed of one part cement and two parts fine aggregate thoroughly mixed without water; spread dry to a uniform thickness not exceeding 1/8 inch over the screeded wet slab; then float and steel trowel to dense smooth finish.

2. In lieu of finish specified in paragraph (1) monolithic finish may be produced by vacuum processing, utilizing approved suction mats which extract from concrete, water in excess of that needed for hydration. Apply the suction mats immediately after striking off top of slab. Maintain suction until concrete is hard enough to support a man without appreciable imprint but not too hard for proper floating. After testing with straightedge fill depressions with dry mix of one part cement and two parts fine aggregate, float and steel trowel to dense smooth finish.

3. Avoid excessive floating. 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 the minimum steel troweling possible. Outside steps and platforms shall be float finished.

Sec. 8. CURING AND PROTECTION - CONCRETE

1. Whenever atmospheric temperature is below 40°F., concrete and cement finish shall have a temperature above 70°F. when placed, and shall be maintained above 70°F. for not less than 72 hours, or above 50°F. for not less than 120 hours, if portland cement is used. Reduce maintained periods 1/3 if high early strength cement is used. Reduce respective maintained periods of either cement 1/3 if a solution of not less than 1-1/2, nor more than 2, quarts containing one-pound calcium chloride crystals per quart, is incorporated in concrete mixes as part of the mixing water per sack of cement.

2. Exposed surfaces of concrete and cement finish shall be thoroughly cured by being kept continuously wet after finishing, at least 7 days, where portland cement is used, or 3 days where high early strength cement is used. Whenever atmospheric temperature is 50°F. or higher, cover concrete slabs with two inches of wet coarse clean sand for the first 72 hours of 7-day periods or the first 47 hours of 3-day periods. When atmospheric temperature is 80°F. or higher, cover top of concrete walls with two layers of wet burlap or straw and keep entire wall continuously wet for 72 hours.

3. Remove no forms during curing period unless protection as specified is applied to surfaces from which forms are removed.

4. When cement floors are to be covered with an applied floor finish, sand covering may be omitted if the following treatment is substituted: impervious membrane curing consisting of approved liquid sealing compound applied in atomized form after surface water has disappeared but surfaces are still wet. The compound may be bituminous but must in any event be non-injurious to finish or its adhesion.

5. When the cement floors are not to be covered with an applied floor finish, the 2 inch sand covering specified shall be applied and maintained in a damp condition and evenly distributed until completion of plastering. When plastering is completed in any area remove sand and wash floors clean. When surface is dry apply emulsion floor wax (Federal Specification No. P-W-151, Type I) until surface is saturated.

Sec. 9. MASONRY MORTAR

1. Masonry mortar shall be an approved mix of 1 part cementitious materials, to not less than 2-1/2 parts nor more than 3-1/2 parts of sand, and water, having minimum compressive strength in pounds per square inch of 2-inch cube specimens, moist cured, of 400 pounds per square inch at 7 days and, after suction for 60 seconds, a flow greater than 65 percent of that measured immediately after mixing. Establish mix by approved testing laboratory tests in accordance with methods described in Federal Specification SS-C-181b.

2. Admixtures may be included in mortars provided specified requirements are complied with.

3. Retemper mortar (as used) to maintain plastic quality. Do not use mortar more than two hours after mixing.

Sec. 10. MASONRY WORK

1. Employ skilled workmen and experienced supervision, and exercise all necessary precautions to provide sound masonry walls fully complying with all specified requirements.

2. Brick and clay tile, air dried, absorbing less than 1-1/2 ounces of water per 100 square inches of face area, immersed one minute to depth of 1/8 inch in water, shall be laid dry. Other brick and tile shall be damp when laid. Do not wet concrete units.

3. Load-bearing piers, where so shown, shall be of solid unit or concrete filled, hollow unit construction, bonded to adjacent masonry.

NOTE TO ARCHITECT: (Do not copy)

Show on drawings all piers required to be of solid masonry to conform to load conditions or code requirements.

4. Build into wall all required items. Set steel lintels and bed structural bearings in mortar, to line and level. Leave 1/4-inch minimum clear space around sides, ends and tops of wood framing members resting on masonry.

5. Unless otherwise shown, end construction tile or vertical cell unit walls shall have top course of one-inch thick solid clay tile, whole bricks, or solid concrete units when supporting wood, steel or precast concrete joists and a layer of reinforced Kraft paper, when supporting poured-in-place concrete.

6. Work plumb, level and true to line, breaking 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. Do not lay masonry in freezing weather unless approved adequate means to prevent freezing are employed.

7. Lay brick, and masonry units, complete with bearing in full beds of mortar. Shove units in place. Before laying, butter sides forming vertical cross joints with sufficient mortar to fill joints except at cells of end construction tile.

8. Joints in masonry shall be 1/2-inch thick, trowel struck, filling all holes and shrinkage cracks. Compact exposed joints above grade with a round tool, after initial set. Where calking is required (See Division "CALKING"), rake joints to depth of 3/4 inch to form clean reglets.

NOTE TO ARCHITECT: (Do not copy)

Delete the following paragraph 9 when no basements are involved.

9. Parge exterior face of concrete units or brick basement walls below grade with 1/4 inch of masonry mortar before waterproofing is applied.

10. Set flue linings one section ahead of masonry full height of chimney; stagger adjacent flues. 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. Set chimney caps to line and level in full beds of mortar, filling voids between top of wall and underside. Rake exposed joints (See "CALKING.")

11. Form slots, grooves, chases, recesses, pilasters, and other required items; check requirements for other trades in advance to eliminate unnecessary cutting of masonry. Build in all required miscellaneous metal and other items.

12. Cover top of work at end of each day and protect work against soiling and damage. Remove and replace disturbed, damaged, or defective brick or concrete-units showing in finished surfaces and portions of walls showing non-conformance with requirements when so directed.

SEC. 11. CLEANING

1. Point and fill holes and cracks in exposed mortar joints with mortar.

2. If necessary, clean exposed masonry and concrete surfaces that are not to be painted and leave free from mortar and other stains at completion of work.

3. Clean masonry surfaces that are to be painted of any mortar or other accumulations that will show through the paint.

DEFENSE HOUSING SPECIFICATION
NATIONAL HOUSING AGENCY
FEDERAL PUBLIC HOUSING AUTHORITY

Division D-3A

MASONRY AND CONCRETE

March 1942

NOTE TO ARCHITECT: (Do not copy)

This specification is intended for use on MASONRY BUILDINGS. Delete items not needed and specify any necessary additional items. Use Division D-3 for FRAME BUILDINGS.

Sec. 1. SCOPE

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

2. Construct footings of concrete or of solid brick masonry.

3. Constrct masonry walls and piers below grade of concrete, solid brick or concrete-units.

NOTE TO ARCHITECT: (Do not copy)

Delete wall construction not shown on the drawings.

4. Construct exterior masonry walls above grade of concrete, concrete-units or of facing brick bonded with backup of brick, clay tile or concrete-units or, in lieu thereof, construct cavity walls with a facing of brick and a backup of brick, clay tile or concrete-units as shown. Coat the face of concrete-units and edge of concrete slab if exposed on the exterior of masonry walls above grade with cement grout as specified.

5. Construct interior masonry dividing partitions (fire walls) of brick, clay tile or concrete-units. Extend fire walls to underside of roof sheathing.

6. Construct chimneys of solid brick or concrete units with flue linings and concrete caps, as shown; except chimneys exposed to weather shall be constructed of brick.

7. Metal wall flashings are included in "Roofing and Sheet Metal Work."

Sec. 2. MATERIALS

1. CONCRETE AND CEMENT FINISH MATERIALS shall comply with the following Federal Specification:

(a) CEMENT - Portland, SS-C-191b; or High early strength Portland SS-C-201.

(b) HYDRAULIC LIME - SS-L-361.

(c) AGGREGATES - SS-A-281, grade "A"; course aggregate of 3/4-inch maximum size for concrete, and of 1/8-inch minimum to 3/8-inch maximum for cement finish; fine aggregate for cement finish shall have 5 per cent maximum pass a 100-mesh sieve, and 15 per cent maximum pass a 50-mesh sieve. One inch or 1-1/2 inch aggregate may be used in unreinforced footings and walls when approved.

2. MASONRY MORTAR MATERIALS, in addition to being suitable to produce specified mortar requirements, shall comply with the following Federal or ASTM Specifications:

(a) CEMENTITIOUS MATERIALS shall be any one, or mixtures, of:

Portland Cement, Federal SS-C-191b;
Masonry Cement, Federal SS-C-181b;
Natural Cement, ASTM C-10-37;
Slag Cement, conforming to requirements for portland cement except that soundness shall conform to requirement for masonry cement;
Puzzolanic Cement, conforming to requirements for either portland or masonry cement;
Hydrated Lime, Federal SS-L-351, soaked and aged in accordance with manufacturer's printed directions on containers, or aged 24 hours after proper soaking;
Quick Lime (Either pulverized or lump), Federal SS-Q-351, slaked and aged in accordance with manufacturer's printed directions on containers or completely slaked, and aged 72 hours if puverized or 21 days if lump; or Hydraulic Lime, Federal SS-L-361.

(b) SAND - ASTM C-144-39T, passing a No. 8 sieve.

3. WATER shall be clean and fit to drink.

NOTE TO ARCHITECT: (Do not copy)

Specify grade of brick suitable for condition of use:

Grade SW: Where exposed to freezing in presence of moisture as in northeastern United States; especially, for foundations and parapets.

Grade MW: Where exposed to freezing but unlikely to be saturated with water as exposed faces of walls other than foundations and parapets.

Grade NW: Where not exposed to freezing, or, if exposed, annual precipitation is under 15 inches.

4. BRICK shall be new common brick made from clay or shale and conform to ASTM Specification C-62-41T, Grade or equivalent grade of sand-line brick ASTM Specification C-73-39.

(a) Brick for facing shall be selected common brick of similar color and texture to samples displayed at office of the_____during bidding period.

5. CLAY TILE shall be structural clay load-bearing wall tile, including necessary closures and fitters, Grade "S" Federal Specification SS-T-341, of standard sizes and shapes.

6. CONCRETE-UNITS (masonry) including necessary closures and fitters shall be of standard sizes and shapes, free from deleterious matter that will stain plaster and be adequately cured by air, water or steam, in addition to meeting Federal Specification SS-C-621, Type I.

(a) Unless units have been cured in high-pressure steam, furnish test reports by an approved laboratory showing compliance with moisture content requirements.

(b) Surfaces to be plastered or stuccoed shall have a sufficiently rough surface to give good adhesion. Surfaces to be exposed, or to be coated shall be plain and of uniform texture.

7. FLUE LININGS AND THIMBLES shall be sound, hard burned, unwarped fire clay flue tile, free from cracks and spalls. The net inside areas of flue tile shall equal the areas shown in the following table:

Nominal Dimension	Net Inside Area	Nominal Diameter	Net Inside Area
4 x 8	21 sq. inches		
7½ x 7½, 8½ x 8½	52 "	8" Diameter	50 sq. inches
8 x 12, 8 x 13	75 "		
12 x 12, 13 x 13	125 "	12" Diameter	113 "

8. SLATE FOR DAMP-COURSES shall be full width of walls, and of uniform thickness not less than 3/16 inch.

9. CHIMNEY CAPS shall be precast or cast-in-place concrete as shown and be reinforced with two continuous 5/8-inch-round deformed steel bars.

10. STRUCTURAL STEEL shall conform to Federal Specification QQ-S-721a.

11. REINFORCING STEEL shall be deformed, either intermediate-billet, hard rail, or hard-axle grade steel, except that stirrups and ties may be plain. Federal Specification QQ-B-71a.

12. METAL FABRIC 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. FURNISH MILL CERTIFICATES or approved test reports showing that steel and cement meet specified requirements.

Sec. 3. STORAGE OF MATERIALS

1. Handle and store aggregate separately in manner to prevent intrusion of foreign matter or segregation, and finished materials to prevent damage. Store concrete-units, under cover permitting circulation of air and preventing absorption of water in excess of specified moisture content. Store cements and limes in watertight enclosures with floors above ground.

Sec. 4. PROPORTIONING AND MIXING CONCRETE

1. Cast-in-place concrete shall be (1) a mix of cement, aggregates, and water of proportions established by approved testing laboratory tests in accordance with ASTM Specification C-39-39 to have compressive strength at 28 days of not less than 2000 pounds per square inch or (2) an untested mix of any proportions using not less than 5 sacks cement per cubic yard of concrete.

(a) Water content per sack of cement, including free water contained in aggregates, shall not exceed 7-3/4 gallons. Slump shall not exceed 5 inches. Fine aggregates shall be not less than 1/3 nor more than 1/2 of total aggregates. Consistency shall be suitable so concrete will work readily into place without water free appearing on top surfaces.

(b) Portland cement, not in excess of one 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). Thoroughly mix hydraulic lime with cement prior to adding water.

2. Mix concrete ingredients in power-operated batch mixer, not less than one minute after all ingredients are in mixer for capacity of one cubic yard or less, increased 15 seconds for each cubic yard or fraction thereof additional capacity.

3. Ready-mixed concrete if used shall be transported 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 (1/2 hour if high early strength cement is used).

4. Ready-dry-batched mixes of cement and aggregates shall be delivered 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 (1/2 hour if high early strength cement is used).

Sec. 5. FORMS FOR CONCRETE

1. Forms shall be of materials that will produce concrete surface finishes that are dense, free from honeycombing, and air-bubbles which expose aggregate and equal in all respects to surfaces produced by clean, surfaced lumber forms.

2. Construct forms sufficiently tight to prevent leakage, securely brace and shore to prevent displacement, with access panels for cleaning and inspection. Where soil and workmanship permit excavation to accurate dimensional sizes of footings, forms may be omitted. See "Excavating and Grading."

3. Provide for installation of sleeves, inserts, anchors, and other fastening devices required for installation and attachment of other work.

4. Maintain forms or shores in place until concrete has developed ample strength to support construction loads.

Sec. 6. DEPOSITING CONCRETE

1. Remove water and foreign matter from forms and excavations, and unless otherwise directed, thoroughly wet forms, sand and sandy loam just prior to placing concrete.

2. Transport concrete from mixer to place of final deposit as rapidly as practical by methods which prevent segregation of ingredients and displacement of reinforcement and which avoid rehandling. Place no concrete for foundations on earth backfilled or otherwise disturbed, or on frozen soil. All soil bottom for slabs and footings shall be approved by the Authority before placing concrete. Deposit no partially hardened concrete.

3. 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 compace concrete and eliminate subsequent shrinkage and voids.

NOTE TO ARCHITECT: (Do not copy)

Fill in applicable spaces such as Laundries, Play Spaces, Offices and Toilet Rooms.

4. The floors of Dwelling Spaces, if laid on ground, shall be laid over 6 inches stone, gravel or slag graded from 3/4 to 1-1/2 inch. Wet, tamp and roll bed until thoroughly compacted. See "Excavation and Grading" for fills over one foot. Lay waterproof kraft paper (Federal Specification UU-P-264) over stone or gravel to prevent concrete combining with them. Avoid tearing paper. Seal tightly, with coal tar pitch, expansion joints, and spaces around pipes, bolts, anchors, etc. penetrating floors and walls in contact with the ground or gravel subgrade.

Sec. 7. CEMENT FLOOR FINISHES

1. Strike off surface of concrete floor slabs, steps, and platforms, reasonably true at proper level for specified finish. Remove all surface water, laitance, and dirt; apply finish composed of one part cement and two parts fine aggregate thoroughly mixed without water; spread dry to a uniform thickness not exceeding 1/8 inch over the screeded wet slab; then float and steel trowel to dense smooth finish.

2. In lieu of finish specified in paragraph (1) monolithic finish may be produced by vacuum processing, utilizing approved suction mats which extract from concrete, water in excess of that needed for hydration. Apply the suction mats immediately after striking off top of slab. Maintain suction until concrete is hard enough to support a man without appreciable imprint but not too hard for proper floating. After testing with straightedge fill depressions with dry mix of one part cement and two parts fine aggregate, float and steel trowel to a dense smooth finish.

3. Avoid excessive floating. 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 the minimum steel troweling possible. Float finish outside steps and platforms.

Sec. 8. CURING AND PROTECTION - CONCRETE

1. Whenever atmospheric temperature is below 40°F., concrete and cement finish shall have a temperature above 70°F. when placed, and shall be maintained above 70°F. for not less than 72 hours, or above 50°F. for not less than 120 hours, if

(b) Grade N - for interior non-load-bearing walls or partitions, and interior or exterior load-bearing walls built of solid masonry units, except cavity walls.

(c) Grade H - for cavity walls, walls below grade retaining walls, exterior garden walls, and reinforced brickwork.

4. Minimum compressive strength in pounds per square inch of 2-inch-cube specimens of each mortar, cured moist, shall be as follows:

	At 7 days	At 28 days if 7-day strengths are not obtained
Grade M	400	700
Grade N	200	350
Grade H	1500	2500

5. Each mortar, after suction for 60 seconds, shall have a flow greater than 65 percent of that measured immediately after mixing.

6. Mortars shall be accurately proportioned in strict accordance with approved tested mixtures and after tests have established mortar mixtures conforming to specified requirements, the mixture shall not be changed without written consent of both parties to the contract.

(a) Maintain original plastic quality by retempering prior to use, which must be within two hours after leaving mixer.

Sec. 10. MASONRY WORK

1. Employ skilled workmen and experienced supervision, and exercise all necessary precautions to provide sound masonry walls fully complying with all specified requirements.

2. Work plumb, level, and true to line, breaking 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.

3. Brick and clay tile, air dried, absorbing less than 1-1/2 ounces of water per 100 square inches of face area when immersed one minute to depth of 1/8 inch in water, shall be laid dry. Other brick and tile shall be damp when laid. Do not wet concrete units.

4. Lay out facing before setting; minimize cutting closures or jumping of bond.

5. Lay brick, clay tile and masonry units with complete bearing in full beds of mortar. Shove units in place. Before laying, butter sides forming vertical cross joints with sufficient mortar to fill joints except at cells of end construction tile. Rock closures into mortar spread on sides of adjacent units.

6. Load bearing piers, where so shown, shall be of solid units, or concrete filled hollow unit construction bonded to adjacent masonry.

7. Fill with mortar around jambs and heads of window and door frames; frames braced to maintain plumb position. Fill spaces under and behind metal casings and stools solid with mortar; metal casings braced to prevent distortion. Leave 1/4-inch minimum clear space around sides and ends of wood framing members resting on masonry.

8. Form slots, grooves, chases, recesses, pilasters, and other required items; check requirements for other trades in advance to eliminate cutting of masonry.

9. Do all necessary cutting of masonry for installation of items not otherwise provided for; patch wall properly and maintain structural stability, appearance and weather-resistance of walls.

10. Build in all required miscellaneous metal and other items. Set steel lintels and bed structural bearings in mortar, to line and level.

11. Remove and replace disturbed, damaged, or defective brick or masonry units showing in finished surfaces and portions of walls showing non-conformance with requirements when so directed.

Sec. 11. JOINTS

1. Except as otherwise required, joints shall be not less than 7/16 inch nor more than 9/16 inch thick; of uniform thickness, except vertical joints, which may vary from 3/8 inch to 9/16 inch to adjust bond and eliminate cutting.

2. Cut joints flush. After initial set of mortar, joints exposed to weather shall be tooled and compressed with round-faced tool, vertical joints first, thoroughly compacting mortar to close cracks. Remove weep hole forms, nails, loose particles and unwarranted projections. Neatly point nail holes and voids leaving weep holes clear.

3. Where calking is required (see Division "CALKING") rake joints to depth of 3/4 inch to form clean reglets.

Sec. 12. SAMPLE WALLS

1. Prior to starting exterior masonry walls, build and maintain where directed not less than two sample walls (4 x 5 feet) for approval. Approved sample wall shall be representative of proposed materials and methods of laying, incorporating specified range of color, texture and quality of masonry units, joint finish and workmanship. After approval, sample shall be preserved until completion of the project and serve as the standard.

Sec. 13. CONSTRUCTION - WALLS

NOTE TO ARCHITECT: (Do not copy)

Delete portions not applicable to your project.

1. Exterior walls with brick facing bonded with masonry backup shall have facing brick laid running bond, with full header bonding courses every sixth course. Provide weep holes as shown.

2. Exterior walls of concrete-units shall be constructed with units the full thickness of wall. Leave joints open (free from mortar) for at least 2-inch space at center of wall.

3. Cavity walls shall have masonry facing separated from masonry backup by continuous air space. Bond solid stretcher facing units to similar backup units with 3/16 -inch cement-coated, steel rod anchors, with 2-inch lugs at each end, completely embedded in mortar of horizontal joints of each face of wall. For hollow masonry units, ties shall be one of the following: (1) Cement-coated bars bent to shape of a rectangle, ends butted (not welded) on one side lying in mortar bed of wythe; each end of tie lying over at least one web of units. (2) Cement-coated welded steel wire in strips of 2 longitudinal wires lying in mortar beds of both wythes, and cross wires equivalent to ties specified below.

(a) Install at least one 3/16-inch anchor for each 3 sq. feet of wall. Nearest row of anchors to be not more than 8 inches from any opening. No pier to have less than 2 anchors every 18 inches.

(b) Keep cavity space between units free from mortar and debris. Provide weep holes and vents as shown. Test by running water into cavity of completed wall, and drill plugged weep holes until free flow of water is established.

4. End construction tile or vertical cell units shall have a top course of one-inch thick solid clay tile, whole bricks, or solid concrete units when supporting wood plates or joists, and a layer of insect screen mesh or metal lath, when supporting poured-in-place concrete, unless otherwise shown.

Sec. 14. MISCELLANEOUS CONSTRUCTION

1. Slate damp courses shall be laid in two layers, breaking joints, in full beds of mortar, as shown.

2. Sills and cement caps shall be set to line and level in full beds of mortar, filling voids between top of wall and underside. Rake exposed joints. (See "CALKING")

3. Flue linings shall be set from one foot below lowest opening to top of chimney, one section ahead of masonry; stagger joints of adjacent flues. Bed in mortar and strike joints flush on inside. Build in thimbles to neat completely filled joints, struck flush. Keep flues clean.

4. Parge exterior face of concrete unit or brick basement walls below grade with 1/4 inch of masonry mortar, Grade M, before waterproofing is applied.

Sec. 15. PROTECTION

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

2. Do not lay masonry in freezing weather unless approved adequate means to prevent freezing are employed.

Sec. 16. POINTING AND CLEANING

1. Point and fill with mortar, holes and cracks in exposed masonry. Cut out defective mortar joints, refill solidly with mortar and tool as specified. After pointing, remove device used for forming weep holes and repoint around holes as necessary.

2. If necessary clean exposed masonry surfaces that are not to be painted. Leave surfaces free from mortar and stains at completion of work.

3. Clean walls that are to be painted of any mortar or other accumulations that will show through paint.

Sec. 17. COATING - CONCRETE-UNITS

1. After pointing and cleaning concrete-units exposed on exterior of masonry walls above grade, dampen surfaces and apply two heavy coats of thick cement grout composed of equal parts of volume, of water, white or gray portland cement and clean, sharp white or bank sand passing a No. 8 mesh screen. Use gray portland cement in first coat and white in second coat.

2. Scrub grout on with stiff-bristle scrubbing brushes. Allow 48 hours between coats. Keep surfaces moist for 48 hours after each application.

3. Before application, prepare samples for approval. Vary color of cement and type of sand as directed.

DEFENSE HOUSING SPECIFICATION
NATIONAL HOUSING AGENCY
FEDERAL PUBLIC HOUSING AUTHORITY

Division D-3B

STONE WORK

March 1942

NOTE TO ARCHITECT: (Do not copy)

This division supersedes Division 8, Stone Work, dated March 1940, of the USHA Suggested Specification.

Omit items not needed and specify necessary additional items. On projects involving only a very limited amount of stone work such as sills or a few items of trim it is suggested that this division be omitted and one or two paragraphs inserted in Division "Masonry."

Sec. 1. SCOPE

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

2. See drawings for extent and locations of stone.

Sec. 2. MATERIALS

1. STONE shall be sound, standard buff or gray, limestone, sawed or smooth machine finish, without stains or defects impairing its strength or durability, or,

NOTE TO ARCHITECT: (Do not copy)

Include here any acceptable local or other competitive stone desired. If cast stone is preferred, substitute the following paragraph 1 in lieu of paragraph 1 above.

(a) Color and texture shall be within the range of samples, identified and on display in the office of the Authority during the period of bidding.

1. CAST STONE shall be of uniform color and finish; true to dimensions with sharp, straight edges; reinforced with bars or mesh adequate to resist structural stresses, strains and temperature changes; properly cured and seasoned; and at 28 days

have a compressive strength of at least 5000 pounds per square inch and an absorption of not more than 7 per cent nor less than 3 per cent when tested in accordance with American Concrete Institute Tentative Specification P-3-A-29T.

(a) Color and texture shall be within the range of samples, identified and on display in the office of the _____ during the period of bidding.

2. DOWELS and ANCHORS shall be cement-coated steel or iron.

3. MORTAR shall be non-staining; mix as specified for "Masonry Work."

4. CALKING COMPOUND shall be as specified for "Calking."

Sec. 3. SHOP DRAWINGS

1. Submit shop drawings, showing dimensions, profiles, jointing and anchorage of stone, and obtain approval before fabrication.

Sec. 4. CUTTING AND JOINTING

1. Cut and joint stone with level horizontal beds, with finish surfaces true and in the same plane and with sharp and clean cut mouldings.

2. Vertical joints shall be 1/4 inch wide and horizontal joints shall be as indicated.

3. Provide drip moulds for projecting members such as sills and copings.

Sec. 5. SETTING AND ANCHORAGE

1. Protect stone from damage in delivery, storage or handling. Patching will not be permitted. Do not use stone chipped or stained on the face. Do not redress stone to less than thickness indicated on approved shop drawings.

2. Build dowels or anchors of proper shape and size into masonry as work progresses. Except for window and door sills, each piece of stone shall have at least one anchor or dowel, grouted solidly in place.

3. Clean stone and drench with clean water just prior to setting. Set stone in full beds of mortar and true to lines and levels. Bed sills in mortar at ends only and point bed joints when cleaning down. Rake out end joints of slip sills 3/4" for calking.

NOTE TO ARCHITECT: (Do not copy)

If cast stone is used, omit the following paragraph 4. If no coping is included, omit the following paragraph 5.

4. Parge back of stone with non-staining mortar.

5. Clean joints between coping stones to a depth of 1 inch and point with calking compound. (See "Calking.")

Sec. 6. CLEANING AND PROTECTION

1. After setting, clean stone by scrubbing with stiff brushes, using a solution made with non-staining soap powder in clean, hot water. After washing, thoroughly rinse stonework.

2. Protect stone from damage.

3. Replace stone if damaged, and leave stonework sound, clean and free from stains.

DEFENSE HOUSING SPECIFICATION
NATIONAL HOUSING AGENCY
FEDERAL PUBLIC HOUSING AUTHORITY

Division D-4

WATERPROOFING

March 1942

> NOTE TO ARCHITECT: (Do not copy)
>
> Omit items not needed and specify necessary additional items.

Sec. 1. SCOPE

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

> NOTE TO ARCHITECT: (Do not copy)
>
> Local soil conditions determine whether or not dampproofing or waterproofing of basement walls is necessary. Correlate with "Masonry and Concrete" to be sure that pargeting under waterproofing is specified when necessary.

2. Waterproof exterior surfaces of walls enclosing basements from top of footings up to 2 inches below finish grades with asphalt or coal-tar-pitch applied either hot or cold.

> NOTE TO ARCHITECT: (Do not copy)
>
> Under water conditions of hydrostatic head, the waterproofing specified in the following paragraph 2 should be used instead of paragraph 2 above.

2. Waterproof basement floors and interior surfaces of walls enclosing basements up to 6 inches above finish grades with metallic water-proofing.

(a) Where metallic waterproofing is used, bond and finish coats specified hereinafter will not be required except in

> NOTE TO ARCHITECT: (Do not copy)
>
> Insert locations where bond and finish coats are necessary. Correlate with "Lathing and Plastering."

Sec. 2. MATERIALS

NOTE TO ARCHITECT: (Do not copy)

Correlate with the preceding "Scope" section and omit such of the following materials as are not required thereunder.

1. BASIC ASPHALT AND PRIMER shall comply with Federal Specification SS-A-666, Type III.

(a) Cut-back asphalt shall contain a minimum of 60% of basic asphalt and not more than 40% of mineral spirits.

(b) Emulsified asphalt shall contain a minimum of 60% of basic asphalt and not more than 40% of a liquid containing a stabilizing agent not exceeding 3% (by volume) to keep the mixture in solution and to prevent settling.

2. COAL-TAR-PITCH shall comply with Federal Specification R-P-381, Type II.

(a) Cut-back-pitch shall contain a minimum of 60% of coal-tar-pitch and not more than 40% of mineral spirits.

(b) Creosote oil used as a primer for cut-back-pitch shall be a pure distillate of coal-gas-tar or coke-oven-tar.

3. PLASTIC CEMENT shall be a smooth, uniform mixture not thickened or livered, composed of an inorganic filler, solvent and non-volatile binder mainly bitumen.

4. METALLIC WATERPROOFING shall comply with the following requirements:

(a) Iron filings shall be finely ground from clean iron castings, mixed with 5 to 7 per cent (by volume) of a chemical oxidizing agent; all shall pass a No. 35 sieve; at least 90 per cent shall pass a No. 40 sieve; not less than 45 per cent nor more than 60 per cent shall pass a No. 100 sieve; and not more than 20 per cent shall pass a No. 200 sieve. Filings shall not contain more than 1 per cent (by weight) of non-ferrous metal and shall contain no foreign substance other than non-ferrous metal in excess of 0.10 per cent (by weight). Deliver materials to the project in sealed containers bearing manufacturer's brand and name.

(b) Plastering Materials shall comply with applicable requirements of "Lathing and Plastering."

5. FURNISH AFFIDAVITS from the manufacturers, certifying that the materials delivered to the project conform to the requirements hereinbefore specified.

Sec. 3. PREPARATION OF SURFACES

1. Remove fins, loose materials and foreign matter. Fill holes with mortar and clean down as necessary to provide proper surfaces for waterproofing.

2. Surfaces must be dry and the temperature above 45 degrees F. when waterproofing is applied.

Sec. 4. APPLICATION

NOTE TO ARCHITECT: (Do not copy)

Correlate the following methods of application with the preceding "Scope" section and omit such methods as are not required thereunder.

1. Employ only workmen skilled in the application of this type of waterproofing.

2. Make water-tight all openings where anchors, dowels, pipes and other such items penetrate waterproofing by calking with plastic cement or by other approved methods as necessary.

3. Apply asphalt waterproofing either hot or cold by mopping, spraying or other approved method.

(a) Before applying hot asphalt, spray or brush on a primer of cut-back asphalt, using not less than one gallon to each 200 square feet of surface. Allow primer to dry and mop on a uniform coat of not less than 20 pounds of hot asphalt to each 100 square feet of surface; or,

(b) If asphalt is applied cold, spray or brush on two uniform coats of not less than one gallon each, of cut-back asphalt, or not less than two gallons each of emulsified asphalt, to each 100 square feet of surface.

4. Apply coal-tar-pitch waterproofing either hot or cold by mopping, spraying or other approved method.

(a) Before applying hot coal-tar-pitch, spray or brush on a prime coat of creosote oil, using not less than one gallon to each 200 square feet of surface, and, when sufficiently dry, mop on a uniform coat of not less than 20 pounds of hot coal-tar-pitch to each 100 square feet of surface; or,

(b) If coal-tar-pitch is applied cold, spray or brush on two uniform coats, of not less than one gallon each, of cut-back-pitch, to each 100 square feet of surface.

5. Finished asphalt or coal-tar-pitch waterproofing shall provide a lustrous surface, impervious to water. Correct dull or porous spots by applying additional material.

6. Apply metallic waterproofing on walls in the following manner:

(a) Cut out as necessary, and point up joints, holes and cracks with cement mortar composed of 1 part portland cement to 2 parts sand by volume, and not less than 10 pounds of iron filings to each bag of cement.

(b) Brush Coats: chip and roughen surfaces, wet with water and coat with two heavily brushed-on coats of metallic waterproofing mixed with water, using for each coat not less than 10 pounds of metallic waterproofing to each 100 square feet of wall surface.

(c) Slush Coat: when surfaces show a dense coating of rust and within 24 hours after application of final brush coat, wet surfaces and brush on a slush coat of thick cement grout composed of 1 part portland cement to 2 parts sand by volume and 15 pounds of metallic waterproofing per sack of cement.

NOTE TO ARCHITECT: (Do not copy)

Delete bond and finish coats of plaster except when required in "Scope".

(d) Bond Coat: before slush coat has set, apply bond coat composed of 1 part portland cement and 2 parts sand by volume. Float with wood trowel and scratch surfaces to provide key for finish coat.

(e) Finish Coat: after bond coat has set, apply a finish coat composed of 1 part portland cement and 3 parts sand by volume. Finish with a cork float to an even smooth finish.

(f) Total thickness of all coats shall be not less than 3/4 inch.

7. Apply metallic waterproofing on floors in the following manner:

(a) Chip and roughen both horizontal and vertical concrete surfaces against which floor slabs are to abut, and within the 24 hours preceding the pouring of floor slabs apply two brush and one slush coat as specified on walls.

(b) Within 48 hours after the rough floor slab has been poured, remove all laitance and foreign matter and apply 2 brush coats and one slush coat as specified on walls.

(c) Before slush coat has set, spread over floor areas a topping of thick grout, not less than 1 inch thick, composed of 1 part portland cement to 2 parts sand by volume, floated and troweled to true, even surfaces.

(d) Metallic waterproofing of floors and walls shall form a continuous unbroken water-tight seal.

NATIONAL HOUSING AGENCY
FEDERAL PUBLIC HOUSING AUTHORITY

Division D-5

MISCELLANEOUS METAL

March 1942

NOTE TO ARCHITECT: (Do not copy)

Omit items not needed and specify necessary additional items. During the emergency, design with substitutes and eliminate all metal items not absolutely essential.

Where only a few items of metal work such as loose lintels, etc. are involved, it is suggested that this division be omitted and such items specified in "Masonry and Concrete."

Sec. 1. SCOPE

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

2. See drawings for location, extent, and details.

Sec. 2. MATERIALS

1. Stock materials, patterns, products, and standard methods of fabrication will be approved provided they conform to the specified requirements and in general, to details on the contract drawings. Metals and accessories shall conform to Federal Specifications.

Sec. 3. SHOP DRAWINGS

1. Submit shop drawings showing dimensions and details. Indicate all necessary accessory items. Verify dimensions and correlate metal work with adjoining work. Obtain approval of shop drawings before fabrication.

Sec. 4. DESIGN AND FABRICATION

1. Bolt, weld, or rivet connections; provide necessary rebates, lugs and brackets for anchorage.

2. Detail metal work for ample size, strength and stiffness, and as indicated.

(a) Detail items subject to live loads such as trench covers, area and other gratings, hatchway doors, stairways and platforms, and similar items to sustain test loads of not less than 250 pounds per square foot of treads.

3. Detail metal work to receive hardware and show proper clearances or bevels.

(a) Countersink and provide reinforcement where necessary.

(b) Drill or punch holes for bolts and screws.

4. At the proper time furnish necessary templates, patterns and items of miscellaneous metal, such as sleeves, inserts and similar items to be built into adjoining work.

5. Fabricate metal work with sharp lines and angles, with smooth, true surfaces and clean edges. Form exposed joints to exclude water. Conceal fastenings where possible.

Sec. 5. PAINTING

1. Paint ferrous surfaces one shop coat of red lead and one field coat gray paint (see "PAINTING").

Sec. 6. INSTALLATION

1. At the proper time, deliver and set in place items of metal work to be built into adjoining construction.

2. Cut, fit and drill as necessary; erect metal work plumb and true to lines and levels and securely fasten so that no part may be removed without special tools.

Sec. 7. ITEMS OF METAL WORK

1. Coal holes - cast iron, of roadway type approximately 24 inches in diameter with frame and non-slip cover weighing not less than 450 pounds. Equip each cover with two flush drop handles and approved inside locking device.

NOTE TO ARCHITECT: (Do not copy)

Omit clean-out doors when oil or gas is used for fuel.

2. Clean-out doors - cast iron, with flange type frames and four anchors each, to be built into the wall construction. Equip each door with two heavy pin hinges, suitable latch and hook or knob on face.

3. Pipe railings - standard 1-1/2 inches inside diameter steel pipe and malleable iron fittings secured with through pin fastenings upset and filed flush and smooth. Flush joints may be pinned or welded and ground smooth. Secure posts and rails to metal work with flanged fittings secured with approved metallic fastenings. Set posts extending into concrete or masonry into built-in sleeves and grout with cement.

DEFENSE HOUSING SPECIFICATION
NATIONAL HOUSING AGENCY
FEDERAL PUBLIC HOUSING AUTHORITY

Division D-6

INCINERATORS

March 1942

NOTE TO ARCHITECT: (Do not copy) Omit items not needed and specify necessary additional items. Show details, sections and table of sizes on drawings.

Sec. 1 SCOPE

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

2. See "Drawings" for location, size and number required.

Sec. 2. INCINERATORS

1. Incinerators shall be an approved flue-fed, built-in type, with draft regulators in the ash pit and fire doors, guaranteed to produce thorough incineration of combustible waste products normal to residential buildings; equipped with the following:

(a) GRATES of heavy cast iron, either stationary or dumping type, with supporting ends of sufficient lap on supports to prevent sections of grate dropping should they warp.

(b) FIRING DOOR of not less than 190 square inches clear opening, with suitable handle, latch and baffle plate, and heavy cast iron frame with lugs for anchoring.

(c) HOPPER DOORS of cast iron, self-closing type, of not less than 100 square inches clear opening, with sheet iron hopper forming baffle when door is open, together with approved heavy cast iron handles and heavy steel or cast iron frames, with anchoring lugs.

(d) SPARK ARRESTOR of an approved basket type, of No. 14 gage, wire, 1/2 inch mesh, secured to top of incinerator shaft.

(e) FIRING TOOLS - one complete set for each incinerator.

2. MASONRY MATERIALS shall conform to applicable requirements for "Masonry Work."

3. PRIME metal work with a shop coat of manufacturer's standard priming paint, except:

(a) Prime ash pit and firing doors and frames, with heat resisting paint. Do not prime grates.

NOTE TO ARCHITECT: (Do not copy)

Correlate with "Masonry Work" to be sure that requirements for fire-clay brick and terra cotta flue lining are specified.

Sec. 3. SHOP DRAWINGS

1. Submit shop drawings showing design and data, and obtain approval before delivery. Include photographs or cuts, and detailed description of proposed incinerators.

Sec. 4. INSTALLATION AND TEST

1. Installation shall be directed by manufacturer's representative.

2. Install all equipment items according to approved shop drawings.

3. Combustion chamber size shall be in accordance with the manufacturer's printed schedules. Line with fire-clay brick at least 4-1/2 inches thick, laid in fire-clay. Lining shall not be considered as having structural value.

4. Line flues with fire-clay flue lining not less than 16"x16". Extend flue from top of combustion chamber to 2 inches above the top of the masonry shaft. Provide connections to all openings. Shaft shall be free and independent of flood construction.

5. Conduct tests and show compliance with specified performance requirements.

DEFENSE HOUSING SPECIFICATION
NATIONAL HOUSING AGENCY
FEDERAL PUBLIC HOUSING AUTHORITY

Division D-8

INSULATION

March 1942

NOTE TO ARCHITECT: (Do not copy)

Specifying a total thermal conductance of .083 B.t.u. (Paragraph 3 under "Scope") requires approximately 3-5/8 inches of insulation which will reduce heat transmission through plastered wood ceiling construction over 90%.

Omit items not needed and specify necessary additional items. Do not specify loose-fill insulation in walls or under flat roofs of wood construction. For rigid insulation over concrete roofs see "Roofing and Sheet Metal." Vapor seal membrane vapor barrier may be omitted in Regions south of the normal January 35 degree isotherm.

In general, except in temperate climates such as the Pacific Coast, 3-5/8 inches of insulation in top story ceilings can be justified by economy in fuel consumption where average temperatures are relatively low in winter or for comfort where summer temperatures are high.

Sec. 1. SCOPE

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

2. See drawings for extent and for details of work.

3. Insulate top story ceilings with loose-fill, bat, or blanket type insulation, in sufficient thickness to limit the total thermal conductance through insulating media only (exclusive of air spaces) to not more than .083 B.t.u. per hour per square foot per degree F. temperature difference between the two surfaces of insulation.

4. Provide a continuous vapor barrier on warm or underside of insulation; either as an integral part of the insulation or as a separate membrane nailed or stapled directly to the under side of ceiling joists.

Sec. 2. MATERIALS

1. INSULATION shall be moisture repellant, resistant to vermin and

decay, sufficiently fire-resistant to meet test in Cotton Insulation Specification 6, and shall comply with the following:

(a) Vegetable or wood fiber, Federal Specification HH-I-571;
(b) Bat, strip, or loose-fill type, Federal Specification HH-I-521b; **or,**
(c) Cotton, U. S. Department of Agriculture, Cotton Insulation Specification 6.

2. VAPOR SEAL MEMBRANE shall be asphalt impregnated, glossy surfaced, sheathing paper weighing not less than 50 pounds per 500 square feet of which at least 20 pounds is asphalt; laminated paper made of two or more sheets of kraft paper cemented together with asphalt, 30-60-30-grade; or other material providing equally effective vapor barrier if prior approval is obtained.

(a) Water vapor permeability of vapor barrier shall not exceed 2.5 grains per hour per square foot per pound per square inch vapor pressure difference when tested by methods established by the National Bureau of Standards or the Forest Products Laboratory.

3. FURNISH AFFIDAVIT from manufacturer, certifying that materials conform to specified requirements.

Sec. 3. INSTALLATION

1. Install insulation between ceiling joists in accordance with manufacturer's specific directions.

(a) Attach edges of insulation having nailing flanges and edges of vapor barrier to ceiling joists in such a manner as to form a tight, continuous contact. Effectively seal end joints and joints around electric outlets and pipes penetrating vapor barrier.

DEFENSE HOUSING SPECIFICATION
NATIONAL HOUSING AGENCY
FEDERAL PUBLIC HOUSING AUTHORITY

Division D-9

CALKING

March 1942

NOTE TO ARCHITECT: (Do not copy)

Delete items not needed and specify necessary additional items. Indicate and correlate all calking requirements.

Sec. 1. SCOPE

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

2. Completely seal with calking compound, joints around frames of doors, windows, other openings in exterior masonry walls, where masonry abuts other exterior surface finishes,and other joints indicated to be calked or pointed.

3. Calk exposed part of joints at ends of slip sills.

4. Calk joints in chimney caps.

5. Calk joint between front edge of bathtubs and finish floors of concrete.

6. Calking of stone coping is included in "Stone Work."

7. Setting of wood thresholds under exterior doors in calking compound is included in "Carpentry and Millwork."

Sec. 2. MATERIAL

1. CALKING COMPOUND shall be of such plastic composition that it will adhere to adjacent materials and remain sufficiently plastic, adhesive and cohesive to maintain water-tight joints when exposed to weather and subject to ordinary structural movements. It shall not shrink excessively, crack, flow or stain. Within seven days it shall form a tough surface film, suitable for painting and light in color, or colored to match adjacent work as directed.

(a) SHRINKAGE: a layer of compound 1/8 inch thick on limestone for 15 days shall not shrink more than 17% in volume.

(b) BOND: a layer of compound 1/8 inch thick on limestone for 15 days shall adhere so firmly that it cannot be peeled off without leaving a film of material in contact with the stone.

(c) TENACITY: a layer of compound 1/8 inch thick, after contact with limestone for 15 days, shall not break or crack when a portion is loosened and folded back and forth 6 times through an angle of 180°.

(d) RATE OF HARDENING: compound shall not harden more than 45% in a joint 3/8 inch wide and 1-1/2 inch deep between limestone slabs for 15 days by penetrometer test (A.S.T.M. D-5-25 except with 12.5 g. weight).

(e) OIL RETENTION: compound shall not stain masonry or other building materials for a distance greater than 1/16 inch either side of joint.

(f) CONSISTENCY shall be such that the plastic in a joint 3/8 inch wide and 1-1/2 inch deep between limestone slabs will not flow or slump more than 3/16 inch when the joint is placed in a vertical position for 24 hours at 70° ±2° F., then heated to 120° ±2° F. for 24 hours.

2. FURNISH AFFIDAVIT from manufacturer certifying that material delivered to the project conforms to specified requirements.

Sec. 3. APPLICATION

1. Joints and spaces to be calked shall be clean, free from dust and dry.

2. Pack joints, that are more than 3/4 inch deep, with oakum to within 3/4 inch of surface. See "Masonry and Concrete".

3. Calk joints before final coat of paint is applied to adjacent work.

4. Apply compound with a pressure gun having a nozzle of proper size to fit into joint.

5. Joints shall be filled solidly. Remove any excess compound and leave surfaces neat and clean.

6. All calked joints shall be watertight.

DEFENSE HOUSING SPECIFICATION
NATIONAL HOUSING AGENCY
FEDERAL PUBLIC HOUSING AUTHORITY

Division D-10

GLASS AND GLAZING

March 1942

NOTE TO ARCHITECT: (Do not copy)

Omit items not needed and specify any necessary additional items.

Sec. 1. SCOPE

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

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

(a) Glaze windows having no muntins with "DS-B" clear window glass.

(b) Glaze windows in.

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

4. Mirrors in medicine cabinets are included in "Carpentry and Millwork."

Sec. 2. MATERIALS

1. GLASS shall conform to Federal Specification DD-G-451 for CLEAR WINDOW GLASS, Type B; OBSCURE GLASS, Type D, ribbon or otherwise cast-figured on one surface; PLATE GLASS, Type A glazing quality; WIRE GLASS, Type E, one smooth surface.

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

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

3. FURNISH AFFIDAVITS from manufacturers, certifying that materials delivered to the project conform to requirements herein specified.

Sec. 3. GLAZING

1. Rebates shall be clean and dry before glazing. Do no outside glazing in damp or dusty weather, or when temperature is lower than 40°F.

2. In wood windows, prime sash before setting glass (See "Painting"). Bed glass in putty, sprig, and apply putty as hereinafter specified.

3. In wood exterior doors, prime rebates before setting glass (See "Painting"). Bed glass in putty and secure with wood beads fastened with brads.

4. Use putty as it comes from the container, without adulteration.

5. 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.

Sec. 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 on both sides.

DEFENSE HOUSING SPECIFICATION
NATIONAL HOUSING AGENCY
FEDERAL PUBLIC HOUSING AUTHORITY

Division D-13

LATHING AND PLASTERING

March 1942

NOTE TO ARCHITECT: (Do not copy)

Omit items not needed and specify necessary additional items. Correlate this division with the drawings and specify any additional locations where lath and plaster may be required.

Sec. 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."

2. Lath ceilings, interior of exterior walls, and both sides of partitions with gypsum lath; and plaster with gypsum plaster not less than 1/2 inch thick, except:

(a) as otherwise noted on the drawings; and,

(b) where cavity wall construction is used for exterior walls and on interior masonry partitions to be plastered, omit lath, and plaster directly on masonry surfaces with gypsum plaster not less than 5/8 inch thick. See "Masonry and Concrete Work."

3. Wood furring on interior of exterior masonry walls (except on cavity walls) is included in "Carpentry and Millwork."

NOTE TO ARCHITECT: (Do not copy)

Specify plaster on gypsum and insulating lath 1/2 inch thick; on metal lath, 3/4 inch thick; and on masonry, 5/8 inch thick.

The use of metal lath must be limited to fire-resisting partitions, ceilings, and soffits, and where gypsum lath and gypsum plaster is not permitted. Corner beads may be zinc-coated only where exposed to moisture or extreme conditions of humidity. Modify and increase weight of lath when spacing of studs, joists or furring is more than 16 inches o.c.

Delete metal and insulating lath (materials and application thereof) when not included under "Scope".

Sec. 2. MATERIALS

1. GYPSUM LATH shall comply with Federal Specification SS-P-431a, stock sizes 3/8 inch thick, perforated.

2. INSULATING LATH shall comply with Federal Specification LLL-F-321a, Class B, stock sizes 1/2 inch thick. Provide approved joint reinforcement for joints not over solid bearings.

3. METAL LATH shall comply with Federal Specification QQ-B-101C, Type F, flat base of steel, coated with rust inhibitive paint after fabrication. Lath for walls shall weigh not less than 2.5# per square yard; for ceilings not less than 3.4#.

4. CORNER BEADS shall be 6 feet long, small nose bead, wing type, 26 gage steel with perforated or expanded flanges not less than 2 inches wide, coated with rust inhibitive paint after fabrication.

5. CORNERITES shall be strips of 2.5# flat expanded metal lath bent at right angles, to form 2-1/2 inch legs to each side.

6. GYPSUM PLASTER shall comply with Federal Specification SS-P-401, Type N.

7. GAGING PLASTER shall comply with Federal Specification SS-G-901, Grade 1.

8. HYDRATED LIME shall comply with Federal Specification SS-L-351, Type F.

NOTE TO ARCHITECT: (Do not copy)

Delete the following subparagraph (a) on defense housing projects.

(a) The total free (unhydrated) calcium oxide (CaO) and magnesium oxide (MgO) in the hydrated product of hydrated or quicklime shall not exceed 8 per cent by weight of the dry hydrated lime.

9. QUICKLIME shall comply with Federal Specification SS-Q-351.

10. KEENE'S CEMENT shall comply with Federal Specification SS-C-161, Type II.

(a) In lieu of Keene's Cement, Gypsum Cement, having the following physical characteristics, may be used in accordance with manufacturer's printed directions:

Normal mortar consistency	42 cc. max.
Tensile strength p.s.i.	
3 hours after set	150
Dry	450
Compressive strength p.s.i.	
3 hours after set	1,500
Dry	3,500

11. SAND for plaster shall consist of fine granular material composed of hard, durable, uncoated particles uniformly graded from fine to coarse, and free from injurious amounts of saline, alkaline, organic, or other deleterious substances.

12. WATER shall be clean and free from oil, acids and other injurious substances.

13. FURNISH AFFIDAVITS from manufacturers, certifying that materials delivered to project conform to specified requirements. Deliver packaged materials in unopened containers bearing manufacturer's name and brand.

Sec. 3. APPLICATION OF GYPSUM LATH

1. Apply gypsum lath with long dimension at right angles to supports and with joints open 1/8 inch to 1/4 inch. Stagger end joints, cut and neatly fit at angles, corners, around pipes and outlet boxes.

2. Nail to wood supports with 1-1/4 inch, (13 gage), 5/16 inch head blued nails spaced approximately 4 inches on centers, 1/2 inch from edges; or secure with clips as recommended by lath manufacturer. Do not crush lath when nailing; drive underside of nail head flush with face of lath.

(a) Where so indicated for sound deadening of partitions between dwelling units secure gypsum lath only with clips as detailed and in accordance with the manufacturer's directions.

Sec. 4. APPLICATION OF INSULATING LATH

1. Stagger end joints. Joints shall be approximately 1/8 inch wide; the interlocking of overlapping joints shall be brought to moderate contact. In no case shall lath be forced or sprung into place.

2. Nail at all bearings with 1-1/2 inch blued nails or 4d box nails spaced approximately 4-1/2 inches on centers, 1/2 inch from edges.

Sec. 5. APPLICATION OF METAL LATH

1. Stagger end joints over supports. Secure side joints to supports and tie between supports at intervals not to exceed 9 inches with 14 gage wire. Lap flat expanded lath 1/2 inch at sides and 1 inch at ends.

2. Secure lath to horizontal wood supports with 1-1/4 inch roofer's nails, or 14 gage wire staples. On vertical wood supports 1-inch roofer's nails will be permitted.

Sec. 6. INSTALLATION OF CORNER BEADS

1. Install corner beads 6 feet long on vertical external angles to be plastered. Set corner beads plumb and form true arrises. Secure at ends and not more than 12 inches apart.

Sec. 7. INSTALLATION OF CORNERITES

1. Install cornerites on horizontal and vertical interior angles. Secure along one edge at not more than 6-inch intervals.

(a) Metal lath continued from one surface to form an angle at least 4 inches on adjacent surface will be accepted as one cornerite.

2. Provide strips of metal lath 5 inches wide across flush joints between two different materials to be plastered.

Sec. 8. GYPSUM PLASTER MIX

1. Scratch coat on lath, shall be 1 part "neat" gypsum plaster (for insulating lath, quick-setting gypsum) and 1-1/2 parts sand, by volume.

2. Brown coat on lath, and scratch and brown coats on masonry shall be 1 part "neat" gypsum plaster and 2-1/4 parts sand, by volume.

3. Finish coat shall be 3 parts lime putty and approximately 1 part gaging plaster, by volume.

(a) Lime putty shall be a stiff mixture of lime and water, thoroughly slaked and allowed to cool.

(b) Putty made from pulverized quick or hydrated lime shall soak at least 24 hours after cooling. Keep moist until used.

(c) Putty made from lump lime shall be completely slaked and stored for at least 3 weeks. Keep moist. Before using strain through a No. 10 sieve.

Sec. 9. KEENE'S CEMENT PLASTER MIX

1. Scratch and brown coats shall be as specified for gypsum plaster mix.

2. Keene's Cement finish shall be 1 part lime putty to 3 parts of Keene's cement, by volume.

Sec. 10. APPLICATION OF PLASTER

1. Maintain a minimum temperature of 50°F. in spaces being plastered. Maintain adequate continuous ventilation in plastered spaces until plaster is dry. Protect plaster from freezing and too rapid drying. Do not plaster on rusted metal materials.

2. Dampen masonry surfaces. Do not wet insulating or gypsum lath.

3. Apply scratch coat with sufficient pressure to provide an adequate bond with and to secure adherence to plaster base. Scratch surface to provide bond. After scratch coat has set sufficiently, apply brown coat. Screed brown coat and straighten in both directions with a straight edge or floating rule (darby) to true planes within 1/16 to 1/8 inch of finish surface and broom to roughen surface as bond for finish coat.

(a) Allow scratch coat on insulating lath to become dry before applying brown coat.

4. After brown coat is set and dry, apply finish coat, 1/16 to 1/8 inch thick and trowel to a hard, smooth and polished finish surface without waves, depressions or cat faces. Cracked, blistered, pitted and discolored plaster will not be acceptable.

Sec. 11. PATCHING

1. Point up around trim and other set work. Cut out and patch defective and damaged plaster. Patching of plaster shall match and finish level with adjoining plaster.

DEFENSE HOUSING SPECIFICATION
NATIONAL HOUSING AGENCY
FEDERAL PUBLIC HOUSING AUTHORITY

Division D-14

LINOLEUM

March 1942

NOTE TO ARCHITECT: (Do not copy) Omit items not needed and specify necessary additional items. Do not use linoleum on concrete slabs resting on ground.

Sec. 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."

2. Cover kitchen and bathroom floors (except on concrete slabs on ground) with linoleum. See drawings for areas.

Sec. 2. MATERIALS

1. LINOLEUM shall conform to Federal Specification LLL-L-361. Furnish "JASPE" in 1/8 inch thickness, of color selected from manufacturer's standard shades. Linoleum shall be delivered in full rolls, or be factory cut to room lengths, each piece labeled with manufacturer's name, brand and gage.

2. PASTE shall be water resistant, of a type recommended by manufacturer of linoleum. Deliver in sealed containers, and use without adulteration.

3. EDGING STRIPS to protect free edges of linoleum shall be plastic (tough, hard, and wear, heat and water resistant) or hardwood of a type approved before installation.

4. FURNISH AFFIDAVITS from manufacturers, certifying that materials delivered to the project conform to specified requirements.

Sec. 3. LAYING

1. Maintain temperature of 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. Cut and fit accurately at ends, edges and jointings with other materials.

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

4. Install edging strips where edge of linoleum is exposed. Securely fasten strips to sub-floor. Edging strips will not be required where adjoining floor finish is at the same level or where wood threshold is included in "Carpentry and Millwork."

5. Finish surfaces shall be smooth and free from waves, buckles and projecting edges. Remove any spots and stains. Polish by waxing and machine buffing.

DEFENSE HOUSING SPECIFICATION
NATIONAL HOUSING AGENCY
FEDERAL PUBLIC HOUSING AUTHORITY

Division D-15

ASPHALT TILE

March 1942

NOTE TO ARCHITECT: (Do not copy)

Asphalt tile is not recommended in kitchens and bathrooms or over rough board subfloors.

On concrete slabs resting on ground, slabs must be coated with cut-back asphalt primer.

Sec. 1. SCOPE

1. Asphalt tile flooring and related items necessary to complete work shown or specified are a part of Contract unless specifically excepted. See "General Scope."

2. See "Schedule of Interior Finish" for locations, and "Drawings" for areas included.

Sec. 2. MATERIALS

1. ASPHALT TILE shall conform to Federal Specification SS-T-306. Furnish in 3/16 inch thickness, 9 x 9 inches square in marbleized colors as selected from manufacturer's lowest price range with border with border tile in strips 18 inches or more in length and in same colors as field tile. Only one color will be required in any one building and only 6 colors throughout the project.

2. ADHESIVE for tile shall be waterproof asphalt cement as recommended by the manufacturer of the asphalt tile. Deliver in sealed containers, and use without adulteration.

3. EDGING STRIPS to protect free edges of tile shall be plastic (tough, hard, and wear, heat and water resistant) or hardwood of a type approved before installation.

4. FURNISH AFFIDAVITS from manufacturers certifying that materials delivered to the project conform to requirements specified.

Sec. 3. LAYING

1. Maintain temperature at least 70 degrees F. in tile storage spaces. In rooms where tile is to be laid, maintain temperature at least 70 degrees F. for 48 hours before, and after, tile is laid.

2. Employ only workmen skilled in laying asphalt tile.

3. Clean and remove grease and other foreign matter from surfaces to be covered with tile. Lay tile only after slabs are sufficiently free from moisture and otherwise in proper condition to insure complete adhesion and acceptable results.

4. Spread adhesive evenly in strict accordance with recommendations of the manufacturer. Completely embed each tile in adhesive with closely fitted, straight, inconspicuous joints.

5. Lay field tile alternately, with grain reversed. Lay tile symmetrically about center lines of rooms, or spaces, with not less than 4 inch borders as nearly equal as possible. Cut tile only for borders.

6. Finished floors must be smooth and free from buckles, cracks, breaks, waves, and projecting edges and fit neatly at pipes and projections.

7. Install edging strips where edge of tile is exposed. Securely fasten strips to sub-floor. Edging strips will not be required where adjoining floor finish is at the same level or where wood threshold is included in "Carpentry and Millwork."

Sec. 4. CLEANING AND BUFFING

1. Remove adhesive from face of tile, and machine buff to a clean, dull-gloss finish.

DEFENSE HOUSING SPECIFICATION
NATIONAL HOUSING AGENCY
FEDERAL PUBLIC HOUSING AUTHORITY

Division D-16

PAINTING

March 1942

NOTE TO ARCHITECT: (Do not copy)

Omit items not needed and specify necessary additional items. Delete from this specification such materials (and formulas therefor) as may not be required or suitable for the project.

Sec. 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."

2. STAIN EXTERIOR WOODWORK with two coats of stain as specified, except as follows:

(a) PAINT WOOD WINDOWS AND TRIM, EXTERIOR DOORS, and wood window and door screens with three coats (both sides) of lead-in-oil or prepared paint as specified for exterior woodwork. Apply priming coat of paint to sash and doors before glazing. Paint putty. See "Carpentry and Millwork."

(b) PAINT TOP, BOTTOM AND EDGES OF EXTERIOR DOORS, wood window and door screens, and top and bottom of wood sash after fitting. Before installing permanently in place, apply at least two complete coats of paint.

(c) COAT PULLEY STILES and sides of wood sash with boiled linseed oil; neither is to be painted.

(d) PAINT WOOD GUTTERS on inside surface with four coats of paint specified for exterior woodwork.

NOTE TO ARCHITECT: (Do not copy)

Delete the preceding paragraph 2 or the succeeding paragraph 2 to suit the requirements of your project.

2. PAINT EXTERIOR WOODWORK three coats of lead-in-oil or prepared paint, as specified.

(a) APPLY PRIMING COAT of paint to sash and doors before glazing. Paint putty. See "Carpentry and Millwork."

(b) PAINT TOP, BOTTOM AND EDGES OF EXTERIOR DOORS, wood window and door screens, and top and bottom of wood sash after fitting. Before installing permanently in place, apply at least two complete coats of paint.

(c) COAT PULLEY STILES and sides of wood sash with boiled linseed oil; neither is to be painted.

(d) PAINT WOOD GUTTERS on inside surface an additional coat of paint as specified for exterior woodwork.

3. PAINT INTERIOR WOODWORK with three coats of lead-in-oil or prepared paint, or STAIN AND VARNISH INTERIOR WOODWORK with one coat of stain and one coat of varnish, except as follows:

(a) NO BACK-PAINTING will be required on interior woodwork.

(b) PAINT SHELVING in kitchens completely and paint hook strips, front edge and underside of other shelving. Paint shelving with prime coat specified for interior woodwork and two finishing coats of paint specified to be applied on adjoining wall. Stain and varnish wood clothes poles. Oil top of closet shelves 1 coat boiled linseed oil.

(c) WOOD HANDRAILS, stain and varnish.

4. FINISH WOOD FLOORS, wood stair treads, platforms and risers as specified.

(a) WAX CEMENT FLOORS as specified.

5. PAINT PLASTER surfaces with two coats of resin-emulsion paint as specified, except that:

(a) Painting of plaster ceilings may be omitted provided they are uniform in color and texture and are left clean upon completion of the project.

6. PAINT EXTERIOR METALWORK three coats as specified.

(a) PAINT FUEL TANKS the same color as the body of walls.

(b) PAINT GALVANIZED SHEET METAL FLASHINGS, gravel stops, gutters and downspouts.

NOTE TO ARCHITECT: (Do not copy)

Delete the preceding paragraph 6 except when required. Correlate with other divisions, particularly "Roofing and Sheet Metal." Specify painting of prime coated hardware, which is to be painted, under the following paragraph:

7. PAINT INTERIOR METALWORK three coats as specified, except as follows:

(a) PAINT RADIATORS AND REGISTERS with two finishing coats.

(b) PAINT DUCT WORK where exposed to view in spaces having painted walls with priming coat specified for interior metal work and two finishing coats of paint specified to be applied on adjoining wall.

(c) PAINT SUPPLIES AND WASTE under lavatories and under combination sink and trays, supply under watercloset tanks, and other piping where exposed in spaces having painted walls with priming coat specified for interior metal work and two finishing coats of paint specified to be applied on adjoining wall.

(d) PAINT PLUMBING FIXTURES where unglazed and exposed to view with two finishing coats. See "Plumbing" for optional fixtures.

8. PAINT COVERING on pipe, fittings, expansion tank, and 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.

9. PRIME COATS herein specified will not be required on items delivered to Project with prime or shop coat already applied.

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

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

Sec. 2. MATERIALS - GENERALLY

1. BASIC COMPONENT MATERIALS entering into manufacture of paints, etc., herein specified shall conform to applicable Federal Specifications; white lead, TT-W-251a, Type B.

2. PRIMERS, UNDERCOATS, etc., herein specified, may be either mixed on the Project or delivered factory-mixed.

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

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

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

(d) 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 1/4 gallon.

(e) Volatile mineral spirits, or a mixture of turpentine and volatile mineral spirits, may be substituted for turpentine except in primer coats.

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

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

4. COLOR PIGMENTS shall be color stable, finely ground substances.

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

5. 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.

Sec. 3. STAIN - EXTERIOR WOODWORK

1. Stain for exterior woodwork shall consist of creosote or preservative oil stain, factory prepared and delivered to the Project in factory sealed containers bearing the manufacturer's name and brand, and:

(a) Stain shall be a standard product (equal to Cabot's, Creodipt or Permastain) that has been in commercial use giving satisfactory service more than 5 years.

(b) The material shall be applied in saturating coats in strict accordance with manufacturer's printed directions.

(c) Submit sample and obtain approval before proceeding.

Sec. 4. PAINT - EXTERIOR WOODWORK

1. Lead-in-oil paint for exterior woodwork shall be thoroughly mixed in the following proportions:

(a) Priming coat - 16 pounds minimum net weight per gallon: To each 100 pounds of white-lead paste (88% dry pigment), add vehicle consisting of 4 gallons of raw linseed oil, 1-3/4 gallons of turpentine, and 1 pint of drier.

(b) Second coat - 21 pounds minimum net weight per gallon: To each 100 pounds of white-lead paste (88% dry pigment), add vehicle consisting of 1-1/2 gallons of raw linseed oil, 1-1/4 gallons of turpentine, and 1 pint of drier.

(c) Third coat - 20 pounds minimum net weight per gallon: To each 100 pounds of white-lead paste (88% dry pigment), add vehicle consisting of 3 gallons of raw linseed oil, and 1 pint of drier.

2. Prepared paint shall be factory mixed only, and as follows:

(a) Priming, second and third coats shall comply with Federal Specification TT-P-101a.

Sec. 5. STAIN AND VARNISH - INTERIOR WOODWORK

1. First coat: Stain shall be a standard manufactured commercial brand, clear toned, pigmented, non-fading material that will not cloud nor obscure grain of wood. Stains shall be free from dyes that would bleed through subsequent coats of wax, paint or varnish, or:

(a) Stain may be mixed 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: Varnish (For interior woodwork other than window stools) shall comply with Federal Specification TT-V-71a and dry to a dull gloss, except:

(a) Second coat on wood window stools in spaces where woodwork is stained and varnished shall be one coat of spar varnish complying with Federal Specification TT-V-121a.

Sec. 6. PAINT - INTERIOR WOODWORK

1. Lead-in-oil paint for interior woodwork shall be thoroughly mixed in the following proportions:

(a) Priming coat - 17 pounds minimum net weight per gallon: To each 100 pounds of white-lead paste (88% dry pigment), add vehicle consisting of 2-1/2 gallons of raw linseed oil, 2 gallons of turpentine, and 1 pint of drier.

(b) Second coat - 18-1/2 pounds minimum net weight per gallon: To each 100 pounds of white-lead paste (88% dry pigment), add vehicle consisting of 1-1/2 gallons of raw linseed oil, 2 gallons of turpentine, and 1 pint of drier.

(c) Third coat, semi-gloss finish - 21 pounds minimum net weight per gallon: To each 100 pounds of white-lead paste (88% dry pigment), add vehicle consisting of 1-1/4 gallons of interior varnish, 1 gallon of turpentine and 1/2 pint of drier.

2. Prepared paint shall be factory mixed only, and as follows:

(a) Priming coat shall comply with 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-71a).

(c) Third coat, semi-gloss, shall be mixed, equal parts, of paints conforming to Federal Specifications TT-P-51a and TT-E-506a, Type A. Reduce TT-P-51a and increase TT-E-506a, Type A, as directed.

Sec. 7. WOOD FLOORS

1. First Coat, Filler (Oak floors only): Filler shall comply with Federal Specification TT-F-336 and be thinned to obtain proper consistency; applied with a brush or mop and worked into surface by rubbing across grain with mops or rags. After filler has "set", rub across grain until surplus material is removed.

2. Second Coat, Sealer: Sealer shall conform to Federal Specification TT-S-176 applied uniformly with a lamb's wool mop; allow to dry hard and buff. 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: Allow to dry hard and buff.

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 and buff.

Sec. 8. CEMENT FLOORS

1. After completion of all other work, apply paste wax (Federal Specification P-W-141, Type 2) to cement floors in dwelling spaces and buff to a smooth glossy finish.

Sec. 9. PLASTER SURFACES

1. First and second coats shall be factory prepared only and comply with Federal Specification TT-P-88. Mixing and application shall be in accordance with manufacturer's printed directions.

Sec. 10. EXTERIOR METALWORK

1. Preparation: Before priming, thoroughly wash zinc-coated metal surfaces with turpentine or mineral spirits, remove all grease and oil, and wipe dry.

2. Lead-in-oil paint for exterior metalwork shall be thoroughly mixed in the following proportions:

(a) Priming coat - 24-1/2 pounds minimum net weight per gallon: To each 100 pounds of red-lead paste pigment (95% grade), add vehicle consisting of 1-7/8 gallons raw linseed oil, 2-1/2 pints of turpentine and 2-1/2 pints of resin-free drier.

(b) Second coat - 22 pounds minimum net weight per gallon: To each 100 pounds of white-lead paste (88% dry pigment), add vehicle consisting of 3 pints of varnish (Federal Specification TT-V-121a), 1-1/2 gallons of turpentine and 1 pint of drier.

(c) Third coat - 19-1/2 pounds minimum net weight per gallon: To each 100 pounds of white-lead paste (88% dry pigment), add vehicle consisting of 1 quart of spar varnish, 2 gallons of turpentine and 1/2 pint of drier.

NOTE TO ARCHITECT: (Do not copy)

The foregoing lead-in-oil paint is intended for use only where light tints are essential. Delete either the preceding or the following paragraph 2. Edit the following where dark colors are to be used.

2. Paint for exterior metalwork shall be factory mixed only and as follows:

(a) Priming coat - 24-1/2 pounds minimum net weight per gallon: To each 100 pounds of red-lead paste pigment (95% grade), add vehicle consisting of 1-7/8 gallons raw linseed oil, 2-1/2 pints of turpentine and 2-1/2 pints of resin-free drier.

(b) Second and third coats shall comply with Federal Specification TT-P-71a - Green Paint, Federal Specification TT-P-31 - Iron Hydroxide Paint, Federal Specification TT-P-61 - Black Paint, or Federal Specification TT-P-86.

Sec. 11. INTERIOR METALWORK

NOTE TO ARCHITECT: (Do not copy)

Delete paints not required under your project.

1. Preparation: Before priming, thoroughly wash zinc-coated metal surfaces with turpentine or mineral spirits, remove all grease and oil, and wipe dry.

2. Priming Coat: Same as specified for "Priming Coat - Exterior Metalwork."

3. Second Coat: Same as specified for "Second Coat - Exterior Metalwork" (or) Paint shall consist of two parts of paint conforming to Federal Specification TT-P-51a and one gallon of varnish TT-V-71a.

4. Third Coat: Same as specified for "Third Coat - Exterior Metalwork" (or) Third Coat (Light Tints - Flat): Shall conform to Federal Specification TT-P-51a (or) Third Coat (Light Tints - Semigloss): Shall consist of equal parts of paints conforming to Federal Specification TT-P-51a and TT-E-506a, Type A.

Sec. 12. RADIATORS

1. First Coat is included under "Heating."

2. Second and Third Coats: Oil Paints. Paint shall be as specified for "Interior Metalwork"; 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.

Sec. 13. PAINT COLORS AND SAMPLES

NOTE TO ARCHITECT: (Do not copy)

It is recommended strongly that the "Munsell Book of Color" (1929 edition) and the system of notation therein be used in selecting and establishing colors.

1. Colors shall be as selected. Prepare samples (approximately 8 inches by 10 inches) for approval. After approval, furnish six record samples of each kind and color, properly identified with numbers, formula, manufacturer's name and address.

2. For exterior work a maximum of eight different finish colors will be required.

3. For interior work a maximum of eight different finish colors will be required.

4. Before proceeding finish one entire dwelling unit to show selected colors, materials and workmanship. After approval, this dwelling unit shall serve as a standard.

Sec. 14. APPLICATION

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

2. Apply no exterior paint in damp, rainy weather, or when temperature is below 50° F. Apply no varnish when temperature is below 70° F., nor in any place not closed and protected from draft and dust.

3. Furnish and lay drop cloths where necessary and protect floor and adjacent work from damage.

4. Surfaces to be stained or primed shall be clean, dry, smooth and adequately protected from dampness.

5. After priming, shellac pitch pockets, streaks and knots. Putty nail and similar holes or defects in interior finish with white lead and whiting putty colored as necessary. Putty stop all nail holes in exterior trim and finish and putty stop all voids in top and bottom of screens, exterior doors, screen doors, and storm doors with putty same color as finish paint or stain.

6. Sand and clean surfaces prior to application of each coat of paint.

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

8. Finished work shall be uniform, 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. Stain finish shall produce good, clear, transparent surfaces. Buff wax finished surfaces to highest sheen possible, smooth and free of excess wax.

9. Remove any paint spots, oil and stain from floors, woodwork, glass, hardware and other items.

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

DEFENSE HOUSING SPECIFICATION
NATIONAL HOUSING AGENCY
FEDERAL PUBLIC HOUSING AUTHORITY

Division D-17

HARDWARE
(Builders' and Cabinet)

March 1942

NOTE TO ARCHITECT: (Do not copy)

List in detail other hardware items for buildings throughout the project. All necessary items of Builders' Hardware may not be included herein; therefore check with the drawings carefully.

Sec. 1. SCOPE

1. Builders' and cabinet hardware and related items necessary to complete the work shown or specified are a part of contract unless specifically excepted. See "General Scope."

(a) Installation is included in "CARPENTRY AND MILLWORK."

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

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 kitchen cabinets, rough hardware for carpentry and miscellaneous metal work, and hardware for mechanical and electrical equipment is included in other divisions.

Sec. 2. MATERIALS

1. Builders' and cabinet hardware shall conform to requirements of the following Federal Specifications as amended to date and as modified herein. The type numbers specified shall govern form and function but the materials used shall conform to the following specifications and to the current Defense Housing Critical List.

Padlocks	No. FF-P-101a
Locks and Lock Trim.	No. FF-H-106
Shelf and Misc.	No. FF-H-111
Hinges	No. FF-H-116b
Door Closers	No. FF-H-121a

2. FINISHES shall conform to schedules in Federal Specifications and shall be as follows:

Exterior	US 18A	
Interior	US 18A	
Cylinders	Exterior only	US3 or US4 lacquered

All hardware noted to be painted shall be finished in US18A when adjacent wood work is to be stained.

NOTE TO ARCHITECT: (Do not copy)

Exterior Finish may be US2S when used with 50 miles of the Great Salt Lake or bodies of salt water on Eastern or Western Seaboard and when used within 100 miles from the Gulf of Mexico or 30 miles from the Great Lakes. US2G is not recommended and US2H is not permitted.

3. BUILDERS' AND CABINET HARDWARE shall have parts of steel or iron only, except as follows:

(a) Cylinders, pin tumbler assemblies and keys for cylinders shall be brass.

(b) Push plates, kick plates, drawer and other pulls shall be of annealed glass, plastic of approved composition, or other non-metallic material, subject to approval by the Authority.

(c) Die castings for tubular lock cases. Die castings shall meet all requirements on die castings in the effective issue of Emergency Alternate Federal Specifications E-FF-G-106.

Sec. 3. MANUFACTURERS' HARDWARE SCHEDULE

1. Before fabrication of hardware, Contractor shall submit for approval a full and complete schedule, of hardware, in triplicate, indicating 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.

Sec. 4. SAMPLES

1. Submit one sample of each item of hardware for approval. No hardware shall be delivered until prior approval of samples is obtained.

2. Sample items will be retained until other hardware has been applied; then turned over to the Contractor for installation.

Sec. 5. 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 template for spotting mortising tools.

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

Sec. 6. LOCKS

1. Cylinder locks throughout entire project shall be the product of one manufacturer and shall have fronts secured to cases by machine screws.

2. Cylinders shall be supplied with cylinder rings or proper size to fit door thickness.

3. Locks in the following "Lock Schedule" where noted by letter, refer to lock group scheduled herein according to function. Locks shall be complete with escutcheons, knobs, roses and similar items as required and hereinbefore specified. Numbers in schedule are Federal Specification numbers. 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.

Type	A	136 with either 28 or 150 or 161
	B	28 or 150, or 161 all with stop inside and emergency entrance from outside.
	C	28 or 150 or 161
	D	88

Sec. 7. LOCK SCHEDULE

1. Apartment Buildings:

Front Entrance Doors (from street)	Type D
Public Stairhalls or Corridors to Apartments . . .	" A
Bathroom Doors	" B
Closet Doors	" C
Bedroom Doors	" C
Exterior Doors, not otherwise specified.	" A
Interior Doors, not otherwise specified.	" A

Exterior Basement Doors	Type	A
Service Rooms, such as, Storage Rooms, Machine Rooms, Pump Rooms, Equipment Rooms, Tool Rooms, Workshops, Incinerator Rooms, and the like	"	A
Administration Rooms, such as, Offices, Auditoriums, Assembly, Play, Craft, Recreational, and the like	"	A
Penthouse Doors	"	C
Single toilet rooms in Administration and Public Spaces	"	B
Toilet Rooms with multiple fixtures	"	C

2. Houses (Twin and Row):

Front Entrance Doors	"	A
Rear Entrance Doors	"	A
Bathroom Doors	"	B
Closet Doors	"	C
Bedroom Doors	"	C

3. Flat Buildings:

Front Entrance Doors (from street)	"	A
Entrance Doors - Stairhall to Dwelling Unit.	"	A
Rear Entrance Doors	"	A
Bathroom Doors	"	B
Closet Doors	"	C
Bedroom Doors	"	C

4. Locks for Miscellaneous Doors:

NOTE TO ARCHITECTS: (Do not copy)

List location and type of lock for all other doors throughout the project. If panic bolt hardware is required on Assembly Room Doors, specify as follows:

Lock	Type 800
Exit Bolt	Type 830 (inactive door of double door)
Exit Bolt	Type 831 (active doors or single door)

Sec. 8. ESCUTCHEONS

1. Furnish for exterior and interior of all doors, escutcheons of type required for proper operation of locks and latches. Except as otherwise required by lock or latch specified, escutcheons shall be either Type 300, 301 or 302 to suit conditions.

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

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

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.

Sec. 9. KNOBS

1. Door knobs and spindles shall comply with requirements of Federal Specification and shall be of type and size herein specified. Knobs of design other than shown in the Federal Specification, of approximate size specified may be used if approved.

2. Outside knobs shall be pinned fast to spindles.

3. Knobs shall be as follows: Steel on exterior. Annealed glass, plastic or steel on interior. Wrought steel shank on glass knobs.

(a) EXTERIOR DOORS, except as otherwise specified, size 2 inches diameter - Type 210-B.

(b) INTERIOR DOORS, except as otherwise specified, size 2 inches, both sides Type 210-B. Closet doors shall have spindle with thumb turn on inside.

Sec. 10. KEYS AND KEYING

1. Cylinder locks of different changes shall be furnished with two keys each.

2. Where locks are specified to be keyed alike in any one system or set, only one key need 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. Cylinder locks shall be master keyed unless specifically excepted. Obtain specific master key directions from the Authority. Furnish six master keys for each series of cylinder locks. No grand master keys 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.

6. Cylinder locks to each individual dwelling unit shall be keyed alike (with three keys per dwelling unit); but on separate key change, different from other dwelling units.

7. In Flat Buildings, entrance door from street shall be operable by the keys to doors of individual dwelling units served by this entrance door.

8. Emergency release keys shall be provided for all Bath Room door locks.

Sec. 11. KEY CONTROL SYSTEM AND KEY CABINET

1. Furnish as herein described a visible key control system providing a central unit for control of all keys for locks required throughout the project.

2. Furnish, for installation where directed by the Authority, an approved wall-type cabinet having a sufficient number of combination hook and label pockets for all locks except locks on interior closet doors. Construct cabinet of hardwood, stained and varnished. Provide an approved locking device.

3. The cabinet shall have approved label sheets, consecutively numbered, for insertion in label pockets. Furnish for each hook in 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. Tags shall bear the legend "File Key - Must Not be Loaned," and be die-stamped with consecutive numerals to correspond with labels in hook pockets. Cabinet shall also contain one metal or fibre receipt holder for each hook therein and a sufficient number of receipt form for records of all current keys together with a cross index for listing keys alphabetically, numerically, and by lock serial number.

Sec. 12. DOOR BOLTS

1. Provide bolt Type 1060A, 6" in length and foot bolt, Type 1049B, 6" in length for the inactive leaf of pairs of doors, except panic exit doors.

Sec. 13. KICK PLATES

1. Provide kick plates - size not less than 8 inches high, by 3 inches less than width of door, for the following doors:

(a) Apartment Buildings - Front Entrance Door from street, both sides.
(b) Public Assembly Rooms, both sides.
(c) Public Toilets, one side.
(d) Play Rooms, both sides.

Sec. 14. CLOSERS

1. Except as otherwise specified, door closers shall be Type 3002 or Type 3005, one each door for the following openings:

(a)
(b)
(c)

Sec. 15. DOOR STOPS

1. Door stops shall be provided for all exterior and interior doors (except screen doors) where swing of door will permit knobs to strike wall. Door stops shall be Type A1336. Provide screws for securing to wood, and suitable expansion shields, to materials other than wood.

Sec. 16. PADLOCKS AND HASPS

1. Provide Padlocks, Type 1a or Type 1b - size 1-1/2" to unexcavated or pipe spaces.

2. Provide Hasps, Type 1420 - 4-1/2" in size, or similar type safety hasp required to suit conditions where padlocks are used and for coal boxes.

Sec. 17. SCREEN DOORS

1. Provide each screen door with 3" hook and eye Type 1601C on the inside; 4-7/8" japanned door pull Type 1269B with two 1-inch screws on the outside; common japanned screen door coil spring and screw hooks; and 22" steel transom chain so placed that door will not strike jamb.

Sec. 18. HINGES

1. 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.

2. Door hinges, except as hereinafter specified, shall be Type 2014½P except that these hinges shall be furnished prime coated at the factory for painting.

3. Hinges for 1-3/4 inch thick doors shall be 4" x 4" and for 1-3/8" thick doors 3-1/2" x 3-1/2"; provide one pair for each door.

4. Screen doors shall have one pair of 3" x 3" butts 2014½P.

Sec. 19. WOOD CASEMENT SASH

1. Hinges shall be extension type prime coated with loose pin allowing a space of 4" between sash and frame for cleaning when windows open 90 degrees. When pairs of casements are used hinges shall be 3" x 3" - 2014½P.

2. Surface bolts (for pairs of windows only) 1060H - 4"

3. Adjustors type 1000 but steel (one to each sash)

4. Fasteners shall be tee formed lever handle projecting 1-1/2" with wrought or cast base approximately 1-3/8" x 1-17/16".

Sec. 20. WOOD DOUBLE-HUNG SASH

1. Sash Fasteners, Type 1139A - 1 each window.

Sec. 21. WOOD WINDOW SCREENS - (FULL LENGTH)

1. Hangers, Type 1825 or 1825-B as required - 1 pair each screen. Hook and Eye, Type 1601-C, size 1-1/2" - 2 each screen.

Sec. 22. CABINETS (OTHER THAN KITCHEN CABINETS) AND COUNTERS

1. Butts, Type 2018½P, size 2-1/2 inches by 2-1/2 inches, 1 pair each door. Door Locks - 1-1/8 inch thick - Type 701-B-2. Drawer Locks - Front 7/8 inch thick - Type 656A. Cupboard Turns, Type 1082-C. Fasteners-friction type. Drawer Pulls Type 1296 or glass or plastic knobs. 1 each - drawers less than 20 inches wide; 2 each - drawers over 20 inches wide. Furnish locks for cash drawers and where shown on plans.

Sec. 23. HANDRAIL BRACKETS (WOOD HANDRAILS)

1. Provide 3 brackets similar to Type 1064-A for each wood handrail.

Sec. 24. COAT HOOKS

1. Provide 6 Coat Hooks, Type A1162 standard Stock Finish, for each closet, except linen closets.

Sec. 25. LETTER BOXES

1. Provide one letter box complete with adequate attachment device for securing to wall construction, and spring or other device to hold newspapers and magazines, for each dwelling unit in flat buildings and for each house.

2. Letter boxes shall be of glass with steel or cast iron fittings; of steel or iron, vitreous enameled or bonderized and enameled 2 coats (each coat separately baked on); or as detailed of all heart cypress, clear white pine, or exterior grade plywood, painted 3 coats, color as selected and as specified for exterior woodwork.

Sec. 26. MAIL BOXES FOR APARTMENTS

1. Provide gang type mail boxes in first floor stair halls of apartment buildings. Mail boxes shall be approved by the U. S. Post Office Department and so stamped on face. Submit sample for approval.

2. All parts of the box shall be of sheet steel at least 30 gage 2 coat baked enamel finish. Doors shall be equipped with locks and keys and keys shall be furnished in such number, type and manner as the Post Office Department requires.

3. Paint numbers on outside and inside of all mail compartments in a manner to be plainly visible. Equip each box with approved card holders.

4. Doors of boxes to be of glass or be perforated so that mail is visible through door.

Sec. 27. LETTERING AND NUMBERING

1. Provide at each front entrance door house street numbers consisting of up to four ceramic tile numbers (2" black numerals on white tile) arranged for attachment with screws or provide painted 3" numerals on glass or on white painted wood plaque erected beside door.

2. Numbers shall be in accordance with the assignment designated by the Authority.

DEFENSE HOUSING SPECIFICATION
NATIONAL HOUSING AGENCY
FEDERAL PUBLIC HOUSING AUTHORITY

Division D-19

SITE IMPROVEMENTS

March 1942

NOTE TO ENGINEER: (Do not copy)

Omit items not needed and specify necessary additional items.

Keep specifications brief by showing construction details, so far as practicable, on drawings.

Sec. 1. SCOPE

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

2. Site improvements include but are not limited to the following: street and driveway paving, walks, other surfacing, curbing, spray pool, fencing, clothes line posts, flagpole, _____, _____, and similar work as shown or specified.

3. Grading, lawns and planting, and utilities (sewers, water, gas, electric and appurtenances) are included in other divisions.

Sec. 2. CITY AND STATE SPECIFICATIONS

1. The terms "City Specifications" and "State Specifications" as used herein refer to city of _____ standard specifications and to specifications of _____ State Highway Department, dated _____ and _____, respectively.

(a) Reference to either City or State specifications is solely for the purpose of specifying quality of materials and methods of construction as therein set forth. The Contractor is not required to take out or pay any charge or fees for inspection in connection with such work.

NOTE TO ENGINEER: (Do not copy)

Omit or revise foregoing if reference is not made to City and/or State standards.

In referring to City or State specifications, mention the particular sections and titles thereof, with which compliance is required.

Sec. 3. SUBGRADE FOR SITE IMPROVEMENTS

1. Perform any grading in addition to that specified under "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 practise fills over 3 feet in depth (placed under this contract) within limits of areas to be surfaced; allow fill to settle and dry out before final preparation of subgrade.

3. Maintain subgrades in satisfactory condition and properly drained until surface improvement is placed.

Sec. 4. CONCRETE MATERIALS

1. Cement shall comply with Federal Specifications SS-C-191b or (for High Early Strength Portland Cement) with Federal Specification SS-C-201a. Furnish notarized certificates of mill test reports in triplicate.

2. Aggregates shall be Grade A conforming to Federal Specification SS-A-281. Coarse aggregate for 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.

3. Water shall be clean and potable.

4. Reinforcing steel bars shall be deformed, either intermediate-billet, hard-rail or hard-axle grade steel. Welded steel wire fabric shall be made of cold drawn steel wire. Reinforcement shall be free from excessive rust or scale.

5. 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.

6. 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.

Sec. 5. PROPORTIONING AND MIXING CONCRETE

1. Except as otherwise specified, use one part by volume of cement to six parts of aggregates, measured separately and damp and loose, the coarse and fine aggregates to be so proportioned that a dense mix is obtained. Use only sufficient water to produce a plastic, workable concrete after thorough mixing.

2. Mix concrete ingredients in power-operated batch mixer at least one minute after all ingredients are in mixer, for capacity of one cubic yard or less; increase mixing time 15 seconds for each cubic yard or fraction thereof additional capacity.

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.

Sec. 6. 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. When temperature is below or may be expected to drop to 40° F. within 24 hours after placing concrete, mix shall be brought to temperature of at least 50° F.

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.

Sec. 7. 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 be completely removed.

2. Whenever atmospheric temperature falls below 40° F., maintain concrete at temperature of at least 50° F. for period of not less than 5 days after pouring (3 days when high early strength cement is used).

Sec. 8. STREET SIDEWALKS

1. In quality of materials and methods of construction, construct concrete walks in city streets in accordance with city specifications therefor, which are in part as follows:

(a) .....

(b) .....

NOTE TO ENGINEER: (Do not copy)

Insert here mix of concrete, thickness of slab, type of finish and description of base (if any).

City specifications should be checked to ascertain whether clarification is necessary or whether exemption from any requirements should be requested from city.

Limits to which city specifications apply may require definition, particularly if walks are to be constructed on project streets or drives later to be dedicated to city.

Sec. 9. CONCRETE WALKS

1. This section of the specification applies to all concrete walks except street sidewalks.

2. Walks shall be of one-course construction, 4 inches in thickness. Cut slab into flags approximately 5 feet in length by removable separation plates extending full depth of concrete.

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. Where walks terminate at curbs, provide one-inch expansion joints (with filler); where walks parallel and adjoin curbs, provide sand-filled joint approximately 3/16 inch wide, except along curb returns where bituminous joint as just specified shall be provided.

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.

5. Permit no pedestrian traffic on concrete walks for a period of 3 days after pouring.

6. 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.

NOTE TO ENGINEER: (Do not copy)

If sub-base is required, specifications or drawings should provide for means of escape of water at low points. Cinder or gravel sub-base is recommended for concrete walks only on unstable or decidedly impervious soils.

Sec. 10. CONCRETE BLOCK WALKS

1. Concrete blocks for walks and areas shall be 2 inches in thickness; they 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 tamped earth subgrade, with butt joints and/or as stepping stones as shown.

Sec. 11. CONCRETE STEPS

1. This section of the specification applies 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. Work concrete as placed to obtain dense mass and smooth faces next to forms.

3. Remove face boards as promptly as practicable, correct defective places and rub down entire surface smoothly; plastering is not permitted. Finish treads and risers 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 handrail (if any) for 14 days, after concrete is placed.

Sec. 12. CONCRETE GUTTER, CURB AND COMBINATION CURB AND GUTTER

1. In quality of materials and methods of construction, construct concrete gutter, curb and combination curb and gutter in city streets to conform to city specifications and requirements therefor; 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 pavement; 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 is not permitted. Finish edges at joints with suitable tool.

NOTE TO ENGINEER: (Do not copy)

Of the items covered in preceding section, delete reference to any not occurring in your project.

Sec. 13. 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; or (c) Wolman Salts or Zinc Meta Arsenite, with minimum retention of 3/10 pound per cubic foot. Lumber cut after treatment shall have 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 (below finished grade) and not more than 3 feet apart, tops of stakes to be at least 1 inch below finished grade.

Sec. 14. CONCRETE PAVEMENT

NOTE TO ENGINEER: (Do not copy)

Plans should show cross section of pavement, details of joints, layout of joints at roadway intersections, etc. Insert required joint spacing in specification following. (Spacing of 3/4-inch expansion joints and of contraction joints should generally not exceed 100 feet and 25 feet, respectively.)

For work in city streets (present or to be dedicated), it may be desirable to specify City or State standards. Such specifications should be examined and specific exception taken to requirements not applicable or adding unnecessarily to cost.

1. Compact subgrade uniformly by means of a 3-wheel power roller weighing not less than 10 tons; roll subgrade one foot beyond edge of slab; tamp thoroughly areas not accessible to roller.

2. Concrete for concrete pavement shall be as hereinbefore specified in this division, except that water-cement ratio and proportions of coarse and fine aggregates, established in accordance with A.S.T.M. Specification C-29-33, shall be such as will produce concrete having 28-day crushing strength of 3500 pounds per square inch.

3. Dowels across expansion joints shall be 3/4-inch smooth round bars 24 inches long for slabs less than 6 inches in thickness, and 1-inch by 24 inches for slabs 6 inches and more in thickness. They shall be spaced not more than 12 inches on centers and not more than 6 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 by means of approved devices in position exactly parallel to surface and to center line of slab. In roadway tangents, space expansion joints not more than __ feet apart. In curves, in concrete-paved parking spaces, and at roadway intersections, provide expansion joints as shown or directed.

4. Form expansion joints with premoulded filler of width 1/2 inch less than depth of slab. 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.

5. In addition to expansion joints above specified provide joints with filler where pavement adjoins walks, manholes, water boxes, platforms, buildings and other structures.

6. Provide transverse contraction or "dummy" joints by forming 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. In general, provide transverse contraction joints at uniform intervals of approximately __ feet between expansion joints, and at roadway intersections and in concrete-paved parking areas as shown or directed.

7. 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. Provide construction joints as shown or as directed in concrete-paved parking areas and at roadway intersections.

8. Longitudinal joints shall be of approved tongue-and-groove type or of dummy type as hereinbefore specified, provided that 1/2-inch round tie bars of deformed section 2 feet 6 inches long shall be spaced 2 feet 6 inches on centers along such joints. Fill top of joint with poured filler.

9. 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.

10. 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.

11. Concrete in integral curb shall be deposited not more than 30 minutes after concrete in slab is placed.

12. 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.

13. Provide suitable barricades and permit no foot traffic on pavement for 3 days and no vehicular traffic for 14 days after pouring concrete.

Sec. 15. BITUMINOUS PAVEMENT

NOTE TO ENGINEER: (Do not copy)

Bituminous paving materials and construction methods vary so widely that it is impossible to suggest a specification that would be suitable for housing projects in all localities. Best results will generally be attained by selecting a pavement which local contractors are equipped to construct and are experienced in laying; this is quite certain to be a type suited to local soil and climatic conditions and for which materials are available at lowest cost.

A State (or City) specification can often be referred to with respect to types and quality of materials and to methods of construction, taking exception to requirements which are inapplicable or would add unnecessarily to cost. If preferred, all applicable requirements of such State (or City) specifications may be set forth, preferably in condensed form, if references to State (or City) inspection, etc., are deleted.

The class of pavement selected must be adapted to the character of the project and to cost limitations.

Sec. 16. BITUMINOUS SURFACING FOR RECREATION AREAS

NOTE TO ENGINEER: (Do not copy)

It is likewise impossible to suggest a specification for bituminous surfacing for recreation areas, which would be adapted to climatic conditions, available materials and construction practise in all localities. A fine-grained surface is essential. In cities where there are asphalt plants, sheet asphalt (wearing course only) on "black base" may be considered. If possible, the type specified should be one which local contractors are experienced in laying. Costly surfacing such as "cork-asphalt" should not be specified.

Sec. 17. GRADED SOIL SURFACING

NOTE TO ENGINEER: (Do not copy)

Where a supply of "sand-clay," "clay-gravel" or similar material is available locally, consideration may be given to its use for play area surfacing. For minimum maintenance and best results from the standpoint of use, specifications should be based on an analysis of the material and a determination of the admixture, if any, needed to obtain a stable and well bound surface. Specifications should cover required grading of surface material, method of mixing (if any material to be added) and compaction.

It is not possible to suggest a general specification which would be adapted to materials locally available in different sections of the country.

Sec. 18. BRICK SURFACING (SAND BASE)

1. Brick shall be hard, sound, dense building brick of approved color.

2. Lay brick flat on 1-inch sand cushion spread on evenly graded, well-compacted subgrade. Conform as closely as practicable to pattern shown. Lay bricks with tight joints. 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 means of brick placed on end. Leave in place the 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 surface.

Sec. 19. CONCRETE AREAS

1. Construct concrete areas in conformity with all applicable requirements of specifications hereinbefore given for "Concrete Walks." Provide full depth joints and marking as shown.

Sec. 20. GARBAGE COLLECTION PLATFORMS

1. Construct garbage collection platforms in conformity with all applicable requirements of specifications hereinbefore given for "Concrete Walks."

Sec. 21. 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 slab, to smooth finish. Screed slab 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 not specified in this division.

Sec. 22. 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.

Sec. 23. FLAG POLE

1. Furnish and set standard wood flagpole as shown.

2. Pole shall be of northern white cedar, spruce, yellow pine, Douglas fir or other approved species and shall be free from large or unsound knots, ring knots, knot clusters, pitch seams or other defects which might render it unfit for use as a flagpole.

3. Pole shall be carefully rounded and sand-papered, and thereafter painted with 3 coats of lead and oil as specified under "Painting."

4. Pole shall be fitted with wood ball, _____ inches in diameter; heavy ball-bearing truck with spindle; 2 sets of best grade Manila rope halyards with bronze swivel flag snaps; and 9-inch cleats.

5. Before shipment, submit for approval 4 copies of shop drawings and specification.

Sec. 24. CLOTHES LINE POSTS

1. Clothes line posts shall be No. 1 timbers of all heart Western Red cedar, Tidewater Red cypress or California redwood, or they may be No. 1 timbers of Southern Yellow pine, Douglas fir or hemlock providing the unexposed part of the post be dipped in hot creosote for sufficient time to obtain a penetration of 1/8 inch. Posts shall be 6-inch by 6-inch, 10 feet long, with 4 sides dressed and exposed edges chamfered.

NOTE TO ENGINEER: (Do not copy)

Posts to support not over about 50 feet of line may be 4-inch by 4-inch.

In the preceding and the following paragraph delete mention of species not available in your locality and include additional suitable species which are available locally.

2. At Contractor's option, clothes line posts may be live cedar, cypress, redwood, fir, pine or locust poles, sound and free from shakes, loose or hollow knots, and season checks more than ¼ inch wide. Such poles shall be peeled for their entire length, removing all inner and outer bark and leathery fibre by shaving the surface. Knots shall be closely trimmed. Bottom of poles shall be sawed square and top rounded to conical shape. Poles shall be of size sufficient to develop no less strength than that of the sawn posts specified. The part of the poles not to be exposed shall be immersed in hot creosote until a penetration of 1/8 inch is obtained.

3. Provide tight-fitting, hardwood pin held in place by finishing nail, or metallic coated steel hook or hooks as shown, 6-½ feet above finish grade.

NOTE TO ENGINEER: (Do not copy)

Revise preceding paragraph as necessary for posts having cross-arms.

In lieu of concrete setting required under paragraph 4 following, 2-inch by 6-inch cross piece may be provided below subgrade level, to provide horizontal bearing.

4. Provide concrete setting 3-½ feet deep below finish grade and at least 4 inches thick around the post, bottom of post to be approximately 6 inches above bottom of concrete. Finish concrete with a bevel extending 2 inches above finished grade. Line and plumb posts accurately.

5. Paint posts 3 coats as specified for exterior wood work in "Painting."

Sec. 25. WOOD FENCES, GARBAGE SCREENS, AND HANDRAILS

1. Wood fences, garbage screens, and handrails shall be 100 percent heart wood, of No. 1 common, Western Red cedar, Tidewater Red cypress or California redwood, or they may be of No. 1 common Southern pine, Douglas fir, or hemlock, provided the unexposed part is dipped in hot creosote for sufficient time to obtain a penetration of 1/8 inch.

2. Fabricate and firmly erect wood fences, garbage screens, and handrails as detailed and paint 3 coats as specified for exterior wood work in "Painting."

DEFENSE HOUSING SPECIFICATION
NATIONAL HOUSING AGENCY
FEDERAL PUBLIC HOUSING AUTHORITY

Division D-20

UTILITIES (SEWERS, WATER AND GAS)

March 1942

NOTE TO ENGINEER: (Do not copy)

Omit items not needed and specify necessary additional items. Coordinate with specifications for "Plumbing."

Sec. 1. SCOPE

1. Sewers and cold water and gas mains and branch lines, appurtenances thereto, and related items, necessary to complete the work shown or specified, are a part of contract, unless specifically excepted. See "General Scope."

2. Provide line fittings or taps, as specified, for connection of water services, gas services and house sewers to buildings and other installations.

3. Service connections from water lines, gas lines and sewers to buildings and to and including other installations such as drinking fountains and street washers, are included in "Plumbing."

4. Line fittings or taps required on existing water and gas mains for service connections to buildings and on existing sewers for house connections, are included in "Plumbing."

NOTE TO ENGINEER: (Do not copy)

Drawings should contain typical layouts of water service, gas service and sewer house connection, showing division of work between "Utilities" and "Plumbing."

Unless clearly shown or elsewhere specified, set forth in another subparagraph extent of utility work to be performed outside of project property lines and limits of work, if any, to be performed by others.

Sec. 2. TRENCHING FOR INSTALLATION OF UTILITIES

1. Excavate and backfill as necessary for work specified in 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 to uniform grade 3 inches below lowermost part of pipe or pipe joints. Refill all cuts below grade with sand or fine gravel firmly compacted.

(a) For additions to or omissions of work specified in this division, due to authorized changes, compute volume of earth excavation involved on basis of trench width 18 inches greater than nominal diameter of pipe and 18 inches greater than exterior width of appurtenances at location of same.

3. Exercise extreme care to protect roots of trees to remain. Cut no root greater than one inch in diameter unless in way of finished work. Perform all trenching by hand within spread of tree branches or within a distance of 15 feet from the tree trunk, whichever is shorter.

4. If "rock" is encountered "Contract Price" will be adjusted as provided under "Changes in the Work" in General Conditions. "Rock" is defined as any boulder containing over 12 cubic feet, and ledge rock or stone, which in opinion of the Contracting Officer require the use of explosives for most economical removal. Where rock is encountered in trenches, uncover fully surface of rock and, before blasting, measure depths thereto at intervals of not more than 25 feet. After excavating, measure depths at same points to bottom of rock actually removed but not to depth greater than 3 inches below lowermost part of pipe or pipe joints. The quantity of rock excavation for which adjustment will be made in "Contract Price," shall be based on depth of rock so determined and on trench width 18 inches greater than nominal diameter of pipe and 18 inches greater than exterior width of appurtenances at locations of same.

NOTE TO ENGINEER: (Do not copy)

Delete the preceding paragraph if no rock is shown to exist and use the following paragraph. Otherwise, delete following paragraph.

4. The "Contract Price" is understood to cover full compensation for excavation for work specified in this division, whatever material be encountered in such excavation.

5. When blasting is necessary the Contractor shall first obtain permission therefor and approval of method from the Authority. When near buildings cover blast with heavy timbers or mat. Set off no blast within 25 feet of end of pipe laid in trench. Protect by earth backfill pipe already laid.

6. 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 directed.

7. Sheath and brace trenches, and remove water, as necessary to protect workmen and adjacent structures and permit proper execution of work. Lay no pipe or masonry under water.

8. After piping installed has been tested and inspected, backfill excavations with approved material tamped or puddled compactly in place so as to secure a stable surface. 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 and

exclude cinders and rubbish around metal pipes. During backfilling, remove sheeting in such manner that pipe will not be disturbed.

9. Restore to its condition at time of award of contract (a) any existing street pavement, curbs, sidewalks, etc., removed or damaged, unless same are to be removed or replaced under this contract, and (b) any subsurface 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.

Sec. 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.

NOTE TO ENGINEER: (Do not copy)

Under special conditions, local practise permitting, concrete pipe as specified below may be used for sanitary and combined sewers as well as for storm sewers.

2. Pipe and fittings for storm sewers shall be vitrified clay pipe as above specified or concrete pipe complying with Federal Specification SS-P-371.

3. Provide proper fittings for installation and connection of all lines.

4. Cast iron soil pipe and fittings where shown 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.

6. Castings for manholes and other sewer structures shall have the approximate form and dimensions shown and shall be of best soft grey iron, sound and true to pattern. Manhole lids shall not be perforated. Castings shall receive 2 coats of coal tar pitch varnish at foundry.

NOTE TO ENGINEER: (Do not copy)

Drawings should show general dimensions and weights of casting required. It is generally desirable to employ local standards, so far as they are adapted to project uses.

7. Concrete for sewer construction shall be a 1:2:4 mix, conforming to applicable requirements of "Masonry and Concrete." Masonry mortar shall be a 1:3 portland cement-sand mix. At Contractor's option, hydrated lime may be substituted for not to exceed 10 percent of cement used in masonry mortar.

8. Material for pipe joints shall be:

(a) For all sanitary sewers and for combined sewers, 15 inches or less in diameter, bituminous joint compound.

(b) For all storm sewers and for combined sewers over 15 inches in diameter, 1:2 portland cement-sand mix or bituminous joint compound.

9. Bituminous compound for sewer pipe joints shall be a product which has been in successful use for at least 5 years. It shall adhere tightly to glazed pipe surface and when set shall have sufficient elasticity to permit slight movement of the pipe without injury to joint. Compound shall form tight joint under all conditions of trench and weather. Compound shall not deteriorate when submerged in water or domestic sewage and shall show no deterioration when immersed for 5 days in 1 percent solution of caustic potash. Before commencing sewer pipe laying, Contractor shall submit for approval sample, analysis and manufacturer's specifications and recommendations for use of compound which he proposes to employ.

Sec. 4. SEWER CONSTRUCTION

1. Provide requisite connection to city sewers. Furnish proof of acceptance from city department having jurisdiction.

2. Raise or lower existing manholes as necessary to conform to finish grades. In raising manholes, cut down walls far enough to permit extending in diameter sufficient for convenient access.

3. In quality of materials and methods of construction, 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.

NOTE TO ENGINEER: (Do not copy)

Sewers in public rights of way should be designed to conform to local requirements.

Delete paragraph 3 if requirements for laying public sewers are not at variance with detailed specifications following. Show on plans or describe herein the rights of way (if any) to be dedicated.

4. Lay sewers in straight lines and on uniform rates of grade 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. Make cement mortar joints in sewers as follows: 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° 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. Make joints in sewers with bituminous compound to comply fully with specifications and recommendations of manufacturer of compound. Spigots shall be fully entered and accurately centered in bells. Gasket material (if used) shall be twisted dry hemp or jute, free from tar and oil, tightly calked in place. Use primer on spigots and bells when and as necessary to insure tight joints. Two pieces of pipe 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. Before commencing pipe-laying, form specimen joints on the bank to demonstrate, to satisfaction of the Contracting Officer, that material and methods to be employed will result in watertight joints.

7. Set temporary stoppers in Y-branches and other openings provided for house connections, unless such connections are laid at time of sewer construction.

8. Joints in cast iron soil pipe lines shall be as specified in "Plumbing."

9. 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.

10. Apply 1/2-inch plaster coat to interior of catch basins from bottom to water line. Plaster exterior of sanitary sewer manholes a minimum thickness of 1/2 inch.

11. Construct flow channels in manholes of concrete and/or brick true to plan and section.

12. 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 to and over top of incoming pipe.

13. Unless otherwise required, set tops of manhole castings at exact finish grades and depress tops of drainage openings 2 inches below finish grades.

14. If foundation drains are required, connect same to sewers at points indicated or as directed.

15. Flush sanitary sewers with water to obtain free flow through all lines. Remove any obstructions and correct any defects discovered. No pressure test on sewers is required.

Sec. 5. UNDERGROUND WATER PIPE AND APPURTENANCES

1. Except as otherwise shown or specified, 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 in 4-inch size and larger, Class 150, bell and spigot, cast iron pipe, complying with Federal Specification WW-P-421. Fittings shall be A.W.W.A. standard, Class D.

NOTE TO ENGINEER: (Do not copy)

If cement-lined pipe is to be used, specify that lining comply with Federal Specification WW-P-421.

If pressure at project exceeds 85 pounds, specify Class C pipe.

Materials which, if locally employed, may be specified as optional for 3-inch pipe and larger, are (a) Class 150 bolted-joint cast iron pipe, complying with Federal Specification WW-P-421, Amendment 3, with Class 250 fittings; and (b) cement-asbestos pipe complying with Federal Specification SS-P-351, with fittings as specified for cast iron pipe, cast iron adapters to be furnished as necessary.

2. Underground piping 2-inch and smaller shall be galvanized Class A (standard weight) wrought iron pipe, complying with Federal Specification WW-P-441a; fittings shall be galvanized malleable iron complying with Federal Specification WW-P-521a.

3. Underground water pipe in 1-1/4-, 1-1/2- and 2-inch sizes 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 2 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 oversize male and female threaded type without gasket; if threaded type, provide expansion joints at intervals of not more than 108 feet.

NOTE TO ENGINEER: (Do not copy)

Materials which, if approved, may also be specified as optional for 2-inch pipe and smaller are (a) galvanized steel pipe, Class A (standard weight), complying with Federal Specification WW-P-403a, with malleable iron fittings complying with Federal Specification WW-P-521a; and (b) galvanized cement-lined steel pipe, Class A (standard weight), complying with Federal Specification WW-P-403a, with cement-lined galvanized malleable iron fittings complying with Federal Specification WW-P-521a.

If and as locally employed for water distribution, black steel pipe, lined or unlined, and wrapped or coated, may also be specified for 2-1/2-inch and smaller pipe.

4. Lead for calking shall comply with Federal Specification QQ-L-156.

NOTE TO ENGINEER: (Do not copy)

Specifications following for valves, valve boxes, fire hydrants and meters may be modified, if deemed advisable, to conform to equipment used locally, but detailed requirements should be set forth in full in this specification.

5. Valves for underground water piping 3-inch and larger shall be iron body, bronze- or brass-mounted double-disc gate valves conforming to A.W.W.A. specifications. Valves for 2-inch and 2-1/2-inch piping shall be of similar design, with ends suited to type of pipe joints employed. Valve stems shall have 2-inch square nuts. Furnish at least two suitable valve keys.

(a) Unless otherwise shown, each underground valve 2-inch and larger, shall have an approved standard cast iron, adjustable shaft, valve box with lid marked "Water" or "W", in raised letters.

6. Valves for underground water piping, 1-1/2-inch and smaller, shall be standard brass round-way, ground-key curb stops, threaded for pipe used and with tee head. Furnish at least two suitable keys.

(a) Unless otherwise shown, each such underground stop shall have standard 2-1/2-inch adjustable curb box of ample length, with lid marked "Water" or "W", in raised letters.

7. Check valves shall be iron body with brass or brass-faced swing disc and brass seat of horizontal pattern designed for 150 pounds per square inch working pressure.

8. Fire hydrants shall be A.W.W.A. standard, designed for 150 pounds per square inch working pressure. Each hydrant shall have one steamer and two 2-1/2-inch hose connections and not less than 5-inch valve. Nozzles shall have same thread as on hydrants locally installed. Hydrants shall be of proper length for specified cover of water mains (in no case less than 3 feet below finished grade).

9. Water meters shall be of recognized make and shall meet A.W.W.A. specifications for cold water meters.

NOTE TO ENGINEER: (Do not copy)

Supplement preceding paragraph as necessary with statement as to type, sizes and number of meters required, if they are to be furnished by Contractor; otherwise, state what meters are to be installed with or without cost to Contractor, as case may be.

Sec. 6. INSTALLATION OF WATER PIPE AND APPURTENANCES

1. Arrange with local water department (or company) for, and provide required connections to existing water mains, paying all costs in connection therewith.

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 cover of not less than _____ feet over top of pipe. 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 bell and spigot 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 calked to a watertight joint without straining the pipe; thickness of lead shall be not less than 1/4 inch at any point. Joints in cast iron pipe, 2-inch and smaller, shall conform to manufacturer's instructions. Make no change in pipe alignment after joints are calked.

(a) Sulphur-bearing lead substitute may 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.

NOTE TO ENGINEER: (Do not copy)

If use of bolted-joint cast iron pipe is made optional, specify that it be laid in accordance with manufacturer's directions.

5. 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.

6. Provide proper fittings for interconnections as shown of all water lines. Taps, in lieu of fittings, may be used for branch connections provided that:

(a) Taps on 3-inch and larger cast iron mains shall not be larger than 1/4 the diameter of the main.

(b) Taps on asbestos-cement mains shall not be larger than 1 inch on 8-inch and larger mains, nor larger than 3/4-inch on smaller mains.

(c) Taps on 2-inch and smaller cast iron pipe shall be made only at tapping collars and in accordance with pipe manufacturer's recommendations.

(d) Branch connections to 2-inch and smaller screw pipe shall be made only with fittings.

NOTE TO ENGINEER: (Do not copy)

Show on drawings service connection details indicating required position of taps and/or fittings on mains.

7. On new water mains and branches provide openings of required size for all service connections. Provide plugs in such openings if services are not to be installed at time main or branch is laid. Observe requirements of preceding section with respect to use of taps in lieu of fittings.

8. Use clamps, braces, bolted flanges or mass concrete as necessary to prevent blowing out of joints at fire hydrants, bends and plugged ends.

9. After laying and before joints are covered, test underground water lines to hydrostatic pressure of at least 125 pounds per square inch; remedy any defects so discovered and obtain approval.

(a) For lines with joints of sulphur-bearing lead substitute, such test shall be made at normal operating pressure, and second test, with pressure of at least 125 pounds per square inch, applied not less than 30 days thereafter, upon which test leakage shall not exceed a rate of 1/4 gallon per 24 hours per inch of pipe diameter per joint.

10. Set each fire hydrant on a concrete block or stone slab with top of hydrant at proper elevation for finished grade. Place at least 2 cubic feet of crushed stone or gravel around the drip of each hydrant.

11. Construct meter vault or vaults as shown and install therein required meter or meters and appurtenances. Comply with applicable requirements of "Masonry and Concrete."

NOTE TO ENGINEER: (Do not copy)

Revise preceding paragraph as necessary to fit conditions. If any or all of such work will be performed by local water department, so state.

12. Upon completion of water distribution system flush out thoroughly and sterilize by introducing chlorine or a solution of a calcium hypochlorite mixture. Fill lines with water slowly, applying sterilizing agent proportionately at a rate giving 50 p.p.m. of chlorine. After lines have thus been filled for at least 3 hours, test for residual chlorine at extremities of lines. If less than 5 p.p.m. is indicated, drain system and repeat sterilization treatment. When tests show at least 5 p.p.m. of residual chlorine, flush out system until all traces of chemical used are removed.

NOTE TO ENGINEER: (Do not copy)

The detailed requirements, if any, of the local health authority for sterilizing mains may be substituted for the preceding section.

Sec. 7. UNDERGROUND GAS PIPING

NOTE TO ENGINEER: (Do not copy)

Specifications must be suited to soil conditions and to kind of gas to be distributed. Practise of local gas company or department should generally be followed in selecting materials for piping, fittings and accessories. Revise this section accordingly.

1. Underground gas piping shall be Class A (standard weight) black steel pipe, complying with Federal Specification WW-P-403a. Joints for 3-inch and smaller pipe shall be standard screw type. Joints in pipe larger than 3-inch shall be approved bolted-sleeve type couplings with rubber rings or gaskets; provided that field joints in steel pipe 2-inch and larger may be welded, with welding fittings, and that piping 4-inch and larger may be A.G.A. standard cast iron with approved mechanical joints.

2. Valves for underground gas piping 2-inch and larger shall be standard 125-pound, iron body, brass- or bronze-mounted, gate valves (either double disc or solid wedge). Each valve stem shall have 2-inch square nut. Furnish suitable key.

(a) Each such valve shall have an approved standard cast iron, adjustable shaft valve box with lid marked "Gas" or "G", in raised letters.

3. Valves for underground gas piping 1-1/2-inch and smaller shall be standard straight-way, iron body, brass plug gas stops with check and tee head. Furnish suitable key.

(a) Each such valve shall have an approved standard, cast iron adjustable curb box with lid marked "Gas" or "G", in raised letters.

4. Drips shall be standard cast iron pots or shall be formed of short sections of line pipe of equal capacity. One-inch suction shall extend from near bottom of drip to surface, as directed, and shall terminate with sleeve and brass plug, enclosed in cast iron box with cover marked "Gas Drip", in raised letters.

5. Gas meters and pressure regulators will be furnished and installed by local gas company.

NOTE TO ENGINEER: (Do not copy)

If meters and pressure regulators are <u>not</u> to be furnished by local gas company, revise preceding paragraph accordingly, stating number, type and capacity of meters and other appliances to be furnished by the Contractor.

Sec. 8. INSTALLATION OF GAS PIPING AND APPURTENANCES

1. Arrange with local gas company for gas services as shown and for all work which it is to perform. Install remainder of gas distribution system from points where gas company's work terminates. Service connections are included in "Plumbing."

2. Install underground gas piping as follows:

(a) .....

(b) .....

(c) If welded joints are used, Contractor shall (1) employ competent qualified welders, (2) have all workmanship and methods comply with requirements of latest "Specifications and Standards Covering Welding of Steel and Wrought Iron Pipe" of the Heating and Piping Contractors

National Association, and (3) install a sleeve coupling on each branch (except services) near the connection to the main and on all lines at intervals not to exceed 400 feet between couplings, also not more than 200 feet from each bend greater than 45°.

NOTE TO ENGINEER: (Do not copy)

Extend preceding paragraph in adequate detail to cover installation of lines to suit kind or kinds of pipe to be installed and in accordance, so far as deemed advisable, with practise of local gas company, including joint making, method of making service connections, and coating of pipe.

Steel pipe delivered uncoated should receive one coat of hot coal tar pitch varnish after installation, cleaning pipe thoroughly before applying. An excessive number of coatings or wrappings should be avoided.

4. For manufactured gas, install drip pots at all low points in lines, minimum pitch for drainage to be one inch in 50 feet and minimum cover at upper ends of lines to be 18 inches.

5. 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. Meters and manifolds will be furnished and installed by the local gas company without cost to the Contractor.

NOTE TO ENGINEER: (Do not copy)

If preceding stipulation does not fit your project, revise as necessary. Note any requirements, which should appear in this division, concerning provision of meter housing.

Sec. 9. CERTIFICATES

1. Furnish affidavits from manufacturers of all pipe, fittings, valves, meters and fire hydrants delivered under this division of the Specification, certifying that such materials delivered to project conform to requirements specified herein.

Sec. 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 bends, valves, gas drips, ends of sewers, etc., by offset distances from building lines.

. At completion of work, transfer accurately all such records in waterproof drawing ink to a set of white cloth prints of block plans, and deliver to Contracting Officer.

DEFENSE HOUSING SPECIFICATION
NATIONAL HOUSING AGENCY
FEDERAL PUBLIC HOUSING AUTHORITY

Division D-22

PLUMBING

March 1942

NOTE TO ENGINEER: (Do not copy)

Questions relative to interpretation of the Emergency Plumbing Standards should be referred to the Technical Division, Federal Public Housing Authority, Washington, D. C.

Omit items not needed and specify any necessary additional items.

Sec. 1. SCOPE

1. Plumbing and related items necessary to provide a complete installation as specified or shown are a part of contract unless specifically excepted. See "General Scope."

2. In general, plumbing includes but is not limited to the following:

(a) Drainage system within buildings including house sewer to lateral branch.

(b) Hot and cold water supply system within buildings including cold water service pipe from branch main.

(c) Gas piping system within buildings including service pipe from branch main.

(d) Water, drainage and gas connections to all equipment and fixtures.

(e) Dwelling unit plumbing fixtures, as hereinafter specified, will be furnished by the Government and shall be set and connected by the Contractor. Fixtures for non-dwelling unit buildings shall be furnished, set and connected by the Contractor.

3. Connect house sewers, water service pipes and gas service pipes to line fittings in mains or laterals. Line fittings in mains and laterals for connecting building (house) sewer, water service pipe, and gas service pipe are included in "Utilities (Sewers, Water and Gas)." See drawings for locations.

Sec. 2. GENERAL REQUIREMENTS

1. Eligible materials and quantities are limited to those necessary to

meet minimum requirements of the "Emergency Plumbing Standards for Defense Housing."

2. Layout of equipment, accessories and piping systems under this division is generally diagrammatic unless specifically dimensioned. Check project drawings and details for interferences as governed by structural or other conditions before installing work. The right is reserved to make any reasonable change in location of the plumbing equipment and piping system shown on drawings prior to roughing-in without involving additional expense with the architectural design as shown on drawings; the contractor shall, at his own expense, make such changes in his work as directed to permit the architectural design to be followed.

Sec. 3. MATERIALS

IMPORTANT NOTE

THE "DEFENSE HOUSING CRITICAL LIST" ISSUED BY FEDERAL AGENCY CONTROLLING PRIORITIES AND REVISED AT PERIODIC INTERVALS CONTAINING A LIST OF CRITICAL MATERIALS, GIVING LIMITATIONS OF THEIR USE, SHOULD GUIDE CONTRACTOR IN SELECTION OF MATERIALS. PRIORITY AID WILL BE CONSIDERED ONLY ON MATERIALS WHICH APPEAR ON THE "DEFENSE HOUSING CRITICAL LIST."

1. Materials used in any plumbing system or part thereof, shall meet the requirements of this specification and shall be free from defects.

Sec. 4. DRAINAGE

1. Interior pipe and fittings and to not less than 5'-0" outside of building wall, cast iron soil pipe.

2. Cast iron soil pipe and fittings (calked joints) for building (house) drain. Standard weight cast iron soil pipe and fittings (calked joints) for soil, waste and vent piping 2" and over in diameter and installed above the ground. Vitrified tile pipe for building (house) sewer - SS-P-361.

3. Cast iron soil pipe and fittings may be coated or uncoated.

4. Waste and vent piping 2 inches and smaller - above ground.
Galvanized steel pipe - - - - - - - - - - WW-P-403a
Galvanized W.I. pipe - - - - - - - - - - WW-P-441a
Lead waste pipe "D" - - - - - - - - - - - C.S. 95-41

5. Waste fittings WW-P-491 - black recessed drainage fittings; lead pipe.

6. Vent fittings
   Galvanized malleable - - - - - - - - - - - WW-P-521a
   Black cast iron, threaded fittings - - - WW-P-501a

Any of the above materials that may be available shall be used on the drainage system.

Sec. 5. WATER

1. Piping
   Galvanized W.I. pipe - - - - - - - - - - - WW-P-441a
   Galvanized steel - - - - - - - - - - - - - WW-P-403a
   Cement lined pipe - - - - - - - - - - - - WW-P-403a

Cement lined pipe shall be cut in a manner that does not impair the protectiveness of the lining. All joints shall be made with corrosion resisting compound.

Lead service pipe - - - - - - - - - - - - C.S. 95-41

For pressures up to 50 lb./sq.in. - - - "A" or "S"
For pressures between 50 & 75 lb./sq.in. "AA" or "XS"
For pressures between 75 & 100 lb./sq.in. "AAA" or "XXS"

2. Fittings - cement lines malleable or cast iron fittings.
   For cement lined pipe - - - - - - - - - - WW-P-403a

Wiped joints in lead pipe

Galvanized malleable fittings for unlined ferrous piping) WW-P-521a

Galvanized cast iron for unlined ferrous piping) WW-P-501a

Sec. 6. GAS

1. Within buildings:
   Black steel pipe - - - - - - - - - - - - - WW-P-403a
   Black wrought iron - - - - - - - - - - - - WW-P-441a
   Galvanized malleable fittings - - - - - - WW-P-521a

Sec. 7. VALVES

1. Iron body, brass gate, stem and seat - 2" and larger. Brass body, brass gate, stem and seat - 1-1/2" and smaller.

2. Service valve or main control to be provided with integral waste or separate drip.

Sec. 8. UNIONS

1. Malleable iron - commercial 125 pounds per square inch.

Sec. 9. MISCELLANEOUS STANDARDS

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 for drainage — C.S. 95-41

3. Sheet lead - weight 4 lb./sq.ft. for flashings at roof. Other flashings 3 lb./sq.ft. — QQ-L-201

4. Calking lead — QQ-L-156

5. Packing - for hub and spigot joints, or packing of hemp or Oakum — HH-P-117 Commercial

6. Sheet iron - galvanized (commercial weight)

7. Calking ferrules 2" - 1 lb. 3" - 1 lb. 12 oz. 4". 2 lbs. 8 oz. to be used in connection with wiped joints on lead.

8. Soldering bushing - commercial weight.

9. Soldering nipples 1-1/4" - 6 oz. - commercial weight.
1-1/2" - 8 oz. 2" - 14 oz.

10. Setting compound - for connecting fixtures to floor flanges - HH-C-563.

11. Gaskets - for connecting fixtures to floor flanges - HH-G-116.

12. Miscellaneous, compressed asbestos sheet - HH-P-46.

13. Floor flanges (cast iron preferred) brass - commercial weight.

14. Sillcocks - brass 1/2" with 3/4" hose end, wall flange or shoulder shank.

15. Traps - "P" or drum type - 20 gage tubular "P" trap, cast iron "P" trap or lead.

16. Pipe cleanouts - cast iron with C.I. plugs or screwed fittings with C.I. plugs. Commercial weight.

17. Floor drains (no chromium plating, use iron body) shower drains, brass strainer iron body, other drains galvanized strainer.

18. Nipples - same material and composition as the pipe employed on the system. Extra heavy weight, when unthreaded section is less than 1". Running thread nipples prohibited.

19. Sleeves - constructed of No. 28 gage black sheet iron. Sleeves in foundation walls constructed of standard weight pipe made water tight with calking compound. No sleeves required on wood floors or partitions.

20. Chromium plating - none permitted. Use non-metallic coating. Either gun metal or emery finish for painting or lacquering is suggested.

21. 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. Commercial type.

Sec. 10. EXCAVATION AND BACKFILL

1. Excavate trenches for underground pipes to required depths. Provide bell holes to insure uniform bearing. Where rock is encountered, excavate to a grade 3" below the lowermost part of the pipe. Refill excavation below pipe grade with sand or gravel. Sheath, brace, pump or bail as necessary. After pipe lines have been tested and approved, backfill trenches to grade with approved material, tamped or puddled compactly in place. Unless otherwise directed, install all underground piping below frost line.

Sec. 11. 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.

Sec. 12. BUILDING DRAINS

1. Connect building (house) drain and building (house) sewer to lateral sewer paralleling building. Included in specifications for "outside plumbing" is the provision in branch and lateral sewer of the necessary fittings for the contractor's connection.

Sec. 13. SOIL, WASTE AND VENT LINES

1. Erect soil, waste and vent stacks of sizes as shown and extend above roof.

2. Branch soil, waste and vent connections shall be run to the soil stack, waste stack, building drain or vent stacks as shown or required.

3. Vent from any fixture 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.

4. Installation of Piping: Horizontal drainage piping shall be

run in practical alinement and shall be supported at intervals not exceeding ten feet. The minimum slopes shall be as follows: not less than 1/4 inch fall per foot for 1-1/2 inch diameters inclusive; not less than 1/8 inch fall per foot for 2-1/2 to 6 inch diameters; inclusive. Stacks shall be supported at their bases, and shall be rigidly secured. Piping shall be installed without undue stresses or strains and provision made for expansion, contraction and structural settlement. No structural member shall be weakened or impaired beyond a safe limit by cutting, notching or otherwise, unless provision is made for carrying the structural load.

5. Changes in Direction: Changes in direction of drainage piping shall be made by the appropriate use of 45 degree wyes, half wyes, long sweep quarter bends, sixth, eighth, or sixteenth bends, or by combination of these fittings, or by use of equivalent fittings, or their combinations; except that sanitary tees may be used in vertical sections of drains or 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 and in water distributing pipes. No change in direction greater than 90 degrees in a single turn shall be made in drainage pipes.

6. Prohibited Fittings: No double hub, or double tee branch, shall be used on soil or waste lines. The drilling and tapping of building drains, soil, waste, or vent pipes, and the use of saddle hubs or bands are prohibited. 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, except for the use of 4" x 3" water closet connection.

7. Prohibited Connections: No fixture, device or construction shall be installed which will provide a backflow connection between a distributing system of water for drinking and domestic purposes and a drainage system, soil or waste pipe so as to permit or make possible the backflow of sewage or waste into water supply system.

8. Protection of Pipes: Pipes passing under or through walls shall be protected from breakage. Pipes passing through or under cinder, concrete or any other corrosive material shall be protected against external corrosion. No soil or waste stack shall be installed or permitted outside of a building or in an exterior wall unless adequate provision is made to protect it from freezing.

9. Protection of Electrical Machinery: No water or drainage piping shall be located over electrical machinery or equipment unless adequate protection is provided against drip caused by condensation on the piping.

10. Protection of Water Tanks and Food Supply: Drainage pipe

shall not pass over water supply tanks or reservoirs, unless such tanks or reservoirs are water tight; nor shall drainage piping pass directly over food processing or food storage areas.

Sec. 14. JOINTS AND CONNECTIONS

1. Tightness: All joints and connections shall be made gas and water tight. All exposed threads on ferrous pipe shall be given a coat of acid resisting paint.

2. Calked Joints: All calked joints shall be firmly packed with oakum or hemp and shall be secured only with molten calking lead, not less than 1" deep, well calked. No paint, varnish or putty shall be permitted on the jointing material, until after the joint has been tested.

3. Screw Joints: All screw joints shall be American Standard. All burrs or cuttings shall be removed. Pipe shall be reamed or filed out to the original bore.

4. Wiped Joints: Wiped joints in lead pipe or between lead pipe and brass or copper pipes, ferrules, soldering nipples, or traps, in all cases on the sewer side of the trap and in concealed joints in the inlet side of the trap, shall be full wiped joints, with an exposed surface of the solder on each side of the joint not less than 3/4 inch and a minimum thickness at thickest part of joints of not less than 3/8 inch, where a round joint is made. An exposed surface of not less than 3/8 inch for bushings and flange joints shall be provided.

5. Joints in Lead Pipe: Lead burned joints between lead pipes and between lead pipe and fittings are permitted.

6. Hot Poured Joints: Material for hot poured joints (concrete or tile pipe) shall not soften sufficiently to destroy the effectiveness of the joint when subjected to a temperature of 150 degrees, nor be soluble in any of the wastes carried by drainage system.

7. Slip Joints and Unions: Slip joints, other than expansion joints, may be used only in trap seal, or on inlet side of trap. Unions on sewer side of a trap shall be ground faced and shall not be concealed or enclosed. Running thread nipples are prohibited.

8. Joints in vitrified clay and concrete pipe, or between such pipe and metals, shall be hot poured or cemented joints. Hot poured joints shall be packed with approved packing and filled with an approved jointing compound at one pouring.

9. Cast iron pipe joints shall be calked.

10. Joints between wrought iron, steel pipe, and cast iron pipe shall be either calked or screwed joints.

11. Joints between lead and cast iron, wrought iron or steel pipe shall be made by means of calking ferrules, soldering nipples or bushings.

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 pipe or pipes and fittings are to be connected, proper sizes of standard increasers and reducers shall be employed. Reduction of sizes of drain pipes in the direction of flow is prohibited, except for a 3 x 4 water closet bend and a 3 x 4 TY for water closets.

Sec. 15. TRAPS AND CLEANOUTS

1. Every trap shall be self cleaning, shall be of the same nominal size as the drain to which it is connected, and shall conform to accepted standards. Only "P" or drum traps are permitted. The diameter of the drum trap shall not exceed 4 inches.

2. The minimum size (nominal inside diameter) of trap and fixture drain for a given fixture shall be not less than shown on the following table:

Fixtures	Size of Trap and Fixture Drain (Inches)
Bath tubs	1-1/2
Combination fixtures	1-1/2
Drinking fountains	1
Floor drains	2 or 3
Laundry trays	1-1/2
Lavatories	1-1/4
Shower stalls	2
Sinks, kitchen	1-1/2
Sinks, service	2 or 3
Wall hung urinals	2

3. For water closets and other fixtures with integral traps, fixture drains shall be not smaller than fixture trap outlet.

4. Each fixture shall be separately trapped by an approved trap placed as near to the fixture as possible or integral therewith, except that a set of not more than three fixtures, such as lavatories, or laundry trays, or a set of two laundry trays and one sink may connect with a single trap provided they are not more than 3" apart, for three fixtures, trap to be centrally located.

Sec. 16. 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 amply cover the sleeved openings and inside diameter to fit snug around pipe installed.

2. Escutcheons for finished fixtures, connections and fixture trimmings are specified under plumbing fixtures.

Sec. 17. OPEN ENDS

1. Ends of pipes, including those extending above roof, drains, water and fixture outlets, shall be kept closed during construction.

Sec. 18. HANGERS, INSERTS, ANCHORS

1. Support piping installed above the ground from the building structures by means of hangers to maintain required grading and pitching of lines to prevent vibration.

2. Clean and paint hangers, inserts and supports with one coat of black asphaltum varnish.

Sec. 19. FLASHINGS

1. Joints at the roof shall be made water tight by use of 4 pound lead, flashing or cast iron plates. Lead flashing shall extend about 10" above roof and lead shall be turned over and down into the pipe.

Sec. 20. WATER SUPPLY

1. Connect water service main from point of connection with lateral or branch main to building and then to risers and branches, all fixtures, hose bibbs, hydrants and to all equipment requiring water supply and as indicated on drawings.

2. Provide stop and waste valve as shown on drawings.

3. Provide all connections to risers or fixtures from top of mains unless otherwise indicated, with all branches and mains arranged so that entire system can be drained at low point or points. Provide accessible plug for draining at each low point.

4. Rough fixture branches from wall, centered to fixture outlets.

5. Locate sill cocks approximately 12" from grade and arrange piping to drain three sill cocks.

6. Water piping in ground shall be below frost line.

7. Water supply exposed below first floor in crawl space shall be installed in a wood box, which shall be painted inside and outside with creosote. Inside of box shall have sufficient clearance to be solidly packed hair felt or mineral wool to provide protection against freezing.

8. Water meter of size and make approved shall be installed on each service main or in dwelling unit as shown on drawings.

9. Schedule of pipe sizes for water connections to fixtures:

	Cold Water (Minimum)	Hot Water (Minimum)
Water closets (low down tank)	3/8"	-
Lavatories	3/8"	3/8"
Bath tubs	1/2"	1/2"
Sinks and combinations	1/2"	1/2"
Hose bibbs (as shown)	1/2"	-

10. Provide hot water supply to fixtures except for water closets.

11. Set and connect individual hot water equipment ready for operation.

12. Equipment, such as ranges and water heaters, will be delivered f.o.b. cars in city where project is located. Contractor shall include hauling, uncrating and placing in dwelling units and connecting complete.

13. No plumbing fixture, device or construction shall be installed 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 backflow of sewage, polluted water or waste into the water supply system.

Sec. 21. INSULATION

1. Insulate water piping under first floor with 1 inch thick layer of hair felt and protected outside with asphaltum impregnated felt secured with wire.

2. Insulate exposed traps in crawl space with 1 inch thick layer of hair felt and protect with asphaltum impregnated felt secured with wire.

3. Insulate water piping exposed in attic space with 3/4 inch sectional wool felt canvas jacket wired on.

4. Treat paste with one tablespoon of bluestone per gallon of paste.

Sec. 22. GAS SYSTEM

1. Extend gas service piping in dwelling units as indicated on drawings and connect gas service main to branch main paralleling building. Included in specification for "outside plumbing" is the provision in mains and laterals of the necessary fittings for connecting gas service pipe.

2. Pitch piping and provide natural drip pockets at low points.

3. Connect gas fired equipment purchased by the Government.

4. Provide shut off cock, wing lock or ground key type, for each piece of gas burning equipment.

5. Provide on house side of all shut-off cocks a union or right and left nipple and coupling to permit disconnection of gas appliances.

6. Provide means in gas piping for future installation of check meters for each dwelling unit. Locate as indicated or directed. Gas piping as provided by contractor shall permit of operation without check meters in place.

Sec. 23. SMOKE PIPE

1. Furnish and install from opening in building flue to equipment sheet iron pipe not less than 28 gage with necessary elbows and wall collar. With oil or coal, connect to equipment with tee fitting and cleanout at bottom.

2. Sheet iron pipe shall clear combustible material by 18" or 9" if protected.

3. Cement asbestos pipe may be used for gas burning appliances and shall clear combustible material by one inch.

Sec. 24. PLUMBING FIXTURES

1. Water closets, lavatories, bath tubs and kitchen sinks for dwelling units will be furnished and delivered f.o.b. siding or terminal most convenient to project by the Government. Contractor shall haul to project, distribute, set and connect complete.

2. The following represents the type of fixtures and trimmings to be furnished by the Government. One of each type for each dwelling unit.

(a) Water closet - wash down low tank water closet combination, each with flushing trimmings, flush pipe and seat. Contractor shall connect tank and bowl, install flushing mechanism and set in place, with seat. Contractor shall furnish and install floor flange with closet bolts and compound and make

outlet connection complete. Also furnish and install 3/8" water supply without stop.

(b) Lavatory - wall hung lavatory approximately 20" x 18", each with combination supply fitting, chain and stopper; waste with plug tail piece P-trap and wall escutcheon, less nipple, concealed wall hanger. Contractor shall install the necessary battens for hanging lavatory, install hanger with wood screws and hang lavatory. Set supply fittings and connect with 3/8" hot and cold water supplies. Set waste fittings and connect with 1-1/4" waste pipe to roughings.

(c) Bathtubs - recess pattern 60" tub, each with combination over rim supply fitting, 1/2" hot and cold water connections, and with a combined concealed waste and overflow provided with washers at tub and with chain and stopper. Outlet tee 1-1/2" threaded. Contractor shall set tub and fittings. Supply fittings shall be securely set at end of tub above rim of tub. Make 1/2" hot and cold water connections without stops to supply fitting. Set and connect the combined overflow and waste and make 1-1/2" drain connection complete.

(d) Combination Sink and Tray - 42" long with supporting leg, each provided with wall hanger; drainboard; a combination hot and cold water supply faucet with swing spout, tray plug with stopper and 1-1/2" tail piece; sink strainer with 1-1/2" tail piece; 1-1/2" connected waste with P-trap having 1-1/2" threaded outlet, less nipple. Contractor shall set the fixtures with above fittings; make 1/2" hot and cold water connections to faucet, without stops; make 1-1/2" waste connections to roughings. Install suitable wood battens and set wall hangers with screws.

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.

Sec. 25. GROUNDS AND SUPPORTS

1. Secure fixtures to partitions by means of wood or metal supports. Secure hangers by means of wood screws or bolts.

Sec. 26. QUANTITIES

1. Contractor is referred to architectural and mechanical drawings for the quantities of fixtures to be roughed and set complete. Contractor shall prepare and furnish the Government a complete list of the type of fixture required and date of delivery to project.

2. The following fixtures will be furnished by the Government for non-dwelling buildings:

(a) Water closets - same as dwelling unit.

(b) Lavatories ---- same as dwelling unit.

(c) Kitchen sinks - same as dwelling unit.

3. The following fixtures shall be furnished, set and connected complete by the contractor when indicated on drawings.

(a) Service sinks - furnish and install 24 inch by 20 inch rectangular service sink with hanger, 1/2 inch hot and cold water, compression supply faucets and strainer. Sink shall be cast iron or form metal steel, with roll run and integral back, and with space behind back for supplies. Sink shall be not less than 12 inches deep and shall be enameled inside and over run and back. Contractor shall furnish waste (size as shown on drawings) if 3 inch with adjustable trap standard, if 2 inch "P" trap to wall and with cleanout plug.

Sec. 27. URINALS

1. Furnish and install in toilet room where indicated, wall type urinal outfit. Bowl shall be vitreous earthenware, flushing rim, siphon jet, with trap molded in ware. Bowl shall have 2 inch outlet and exposed inlet for flushing valve. Bowls shall be properly supported on an approved hanger. All urinal outfits shall have 3/4 inch flushing valves with back flow preventer.

2. Furnish and install in toilet room where indicated, pedestal type urinal outfit constructed of vitreous china with integral flush rim, siphon jet, top inlet and pedestal base with siphon trap all molded in the ware. Fixture shall have 4 inch outlet, cast iron floor flange. Inlet shall have spud with a 1 inch flush valve with backflow preventer.

Sec. 28. SHOWER FIXTURE

1. Contractor shall furnish and install receptor shower where shown on drawings. Shower shall be the product of a reputable manufacturer and shall be complete with receptor, enclosure, curtain, drain, shower head, hot and cold water control valves, and soap dish. Concrete receptors and enclosures made on job will not be accepted.

2. Receptor shall be of waterproof concrete of white cement and crushed stone aggregate, with carborundum acid treated slipproof surface thoroughly water proofed, not less than 36" by 36" outside by about 4" deep inside, reinforced with heavy diamond mesh fabric and with a metal plate for attachment of enclosure and a drain outlet for 2 inch pipe cast into the receptor. Receptor shall be white inside and finished black outside.

3. Means shall be provided for mechanically attaching enclosure to receptor. Receptor shall be enclosed, 3 sides to be solid and the fourth side to have an opening 24 inches wide by 72 inches high with heavy cross brace at top. Enclosure shall be not less than 6 feet 8 inches high above floor and shall be made of smooth surfaced sheet steel No. 16 gage, free from warp and finished inside and out in baked on enamel, white or light green. Enclosure shall be of the type to be erected on the job. Corners shall be made with continuous leak proof joints and enclosure shall be secured to the receptor with a leak proof joint. Opening shall be provided with a suitable metal curtain rod. The complete assembly shall be free from sharp projections, highly finished, perfectly rigid and permanently leak proof. Each shower shall be provided with the following - removable strainer, shower head with individual hot and cold water supply valves with handles and escutcheons, soap dish, pre-shrunk 10-1/4 ounce white duck curtain not less than 36" x 78" complete with eyelets and curtain hook rings.

4. Shower fixtures shall be located on side of enclosure and connections shall be exposed on outside of shower. Drain from shower shall be provided with a 2" "P" trap. Supplies shall be 1/2" hot and cold water connections from ceilings.

5. In erecting showers, any wall surface in contact with the shower enclosure shall be painted not less than two coats of waterproof bitumastic paint and the metal of the enclosure facing these wall surfaces shall be similarly painted. The floor under shower and the bottom of receptor must be similarly painted.

Sec. 28. LAUNDRY TRAYS-CEMENT (Where required)

1. Trays shall be two compartment 24" by 48" long constructed with dense concrete. The concrete shall consist of portland cement, fine and coarse mineral aggregate and water. Fine aggregate shall consist of sand, stone or slag screenings or other inert material with similar characteristics, shall be well graded and shall pass a 1/4" screen. Coarse aggregate shall consist of crushed stone, gravel, slag or other inert materials with similar characteristics and shall pass a 3/8" screen but be retained on a 1/8" screen. Bottom and sides of tub shall be reinforced with galvanized steel reinforcing rods or wire mesh reinforcement. The minimum size of reinforcing shall be not less than #14 gage wire or its equivalent. The maximum spacing of reinforcement shall be 4" on centers in either direction and the minimum area of openings shall be not less than 2 square inches. The total quantity of water in the concrete mix, including the surface water carried by the aggregate shall not exceed 5-1/2 gallons per sack of cement. The mix shall be placed in steel molds and vibrated for maximum strength and smooth stone like finish. The tub shall be molded in one piece with rounded corners inside and outside and the top shall have rounded, cornered nonferrous metallic rim.

2. The supply fixture shall be 1/2" quick compression double

faucet with swing spout, hose connection, unions and necessary clamps for fastening faucet to tub. Tub shall be equipped with twin waste, strainers, chains, chain stays, tail piece, coupling nuts, rubber stoppers and cast iron "P" patter trap with cleanout.

3. The supports shall be constructed of wood and shall be continuous under the compartment and shall be braced to provide rigidity.

Sec. 29. DRINKING FOUNTAINS-OUTDOOR (Where required)

1. Drinking fountains shall be cast iron enameled, wall hung type, supported on cast iron wall bracket, fitted with brass strainer, self-closing stop with cross handle, loose key regulator and union connections for 3/8" supply, two stream mount building projector and automatic steam control. The approximate size of receptor shall be 12" diameter by 3" deep with front of receptor not less than 15" from wall. Fixture to be set at approved height. Fountain to have union connections in supply and waste so that fountain can be readily removed in the winter. Fixture shall be attached to building walls by expansion bolts. Provide trap located on basement walls for drinking fountain wastes and valve and drain valve for water supply.

OR

Anti-freeze pedestal type. Plain design, neat in appearance. Bubbler offset angle stream. Enamel cast iron base receptor and shaft. Supply fitted with automatic volume regulator. Stop and waste valve complete.

Sec. 30. PROTECTION OF FIXTURES

1. Contractor shall be responsible for protecting against injury from building materials, acids, tools and equipment, all plumbing fixtures. The cost of replacing and repairing plumbing fixtures made necessary by failure of contractor to provide suitable protection shall be paid by contractor.

Sec. 31. CLEANING UP

1. After all fixtures have been set and ready for use, contractor shall thoroughly clean all fixtures, removing all plaster, stickers, rust stains, and other foreign matter or discoloration on fixtures, leaving every part in acceptable condition and ready for use.

Sec. 31. PRIOR TESTS

1. Concealed work to remain uncovered until required tests have been completed, but in the event that the project construction schedule requires it, contractor shall make arrangement for prior tests on portions of the plumbing work involved.

2. Bath tub test: After bath tubs have been installed and prior to concealing waste connections, each bath tub shall be tested for leaks at waste and overflow connection.

Sec. 32. LABOR AND EQUIPMENT FOR TESTS

1. Equipment, material, power and labor necessary for the inspection and test shall be furnished by plumber.

Sec. 33. TESTS OF DRAINAGE SYSTEM

1. A water test shall be applied to the system in its entirety or in sections. If applied to the entire system, all openings in the piping shall be tightly closed, except the highest opening and the system filled with water to the point of overflow. The water level shall remain constant without any further addition for sufficient time to inspect the entire section under test but in no case less than 15 minutes.

2. When there is danger of water freezing, an air test may be applied in lieu of water test as follows: With all openings tightly closed, air shall be forced into the system until there is a uniform pressure sufficient to balance a column of mercury 10 inches in height (or 5 pounds per square inch) on the entire system or section under test. The air pressure shall be maintained on the system or section without any further addition of air for a sufficient time to determine tightness but in no case for less than 15 minutes.

Sec. 34. TESTS OF WATER SUPPLY SYSTEM

1. Water supply system shall be tested in its entirety by filling entire system with water under a pressure of at least 100 pounds per square inch or (where there is danger of water freezing) by applying air pressure of at least 35 pounds per square inch (70 inches of mercury column). The test in either case shall be applied for sufficient time to determine tightness.

Sec. 35. TEST OF GAS SYSTEM

1. Apply an air pressure test of not less than 10 pounds per square inch, equal to 20 inches of mercury.

2. Apply pressure with a force pump and maintain for not less than 15 minutes without leakage. Use a mercury column gage in making the test.

Sec. 36. DEFECTIVE WORK

1. If inspection or test shows defects, such defective work or material shall be replaced and inspection and the tests required.

2. All repairs to piping shall be made with new material, no calking of screwed joints, cracks or holes will be acceptable.

Sec. 37. EQUIPMENT FURNISHED BY GOVERNMENT

1. The following equipment will be furnished and delivered f.o.b. siding or terminal most convenient to project by the Government. The contractor shall haul to project, distribute, uncrate, assemble and connect complete the following equipment.

NOTE TO ENGINEER (do not copy)

Delete such equipment not required for the particular project.

(a) Gas range. Contractor shall set ranges where shown on drawings and shall make 3/4" gas connections, each fitted with a gas cock, having a union between gas cock and range. Vent pipe will not be required.

(b) Kerosene range. Each to be provided with a fuel tank. Contractor shall set ranges where shown on drawings and must level same so that the oil supply to burners will operate satisfactorily. Smoke pipe will not be required.

(c) Coal burning range. Each equipped with water front, lid holder, shaker and soot scraper. Contractor shall set ranges where shown and shall furnish and install a smoke pipe of same areas as outlet of range constructed of No. 28 gage sheet steel and fit same with damper; connect as indicated on drawings.

(d) Range boilers. Make 3/4" circulating connections between water front of each range and range boiler.

(e) Water heaters (automatic-gas). Each equipped with automatic temperature control and gas cock. A draft hood, relief valve, will also be provided. Contractor shall install draft hoods, relief valves and drain plug. Contractor shall furnish and install vent pipes as indicated on drawings and previously specified. Make hot and cold water connections without stop. Make gas connection.

(f) Water heater (oil fired). Each equipped with oil reservoir and automatic controls. A draft regulator, relief valve will also be provided. Contractor shall set water heater and install relief valve and drain plug. Contractor shall also furnish and install a smoke pipe of No. 28 gage sheet steel connected as indicated on drawings and shall install draft regulator on the smoke pipe. Make 1/2" hot and cold water connections without stops.

(g) Water heater (coal burning). The water heaters and range boilers will be furnished by Government. Heaters will be shipped assembled with exception of feed door, ash pit door and shaker handle. Contractor shall set water heater where shown and install above mentioned doors and handle. Contractor shall furnish and install smoke pipe with damper and connect smoke pipe as shown on drawings. Smoke pipe shall be of No. 28 gage sheet steel. Contractor shall furnish suitable brackets for range boilers and set where shown. Make 1" circulating pipe connections between heaters and range boiler. Install 1/2" drain plug at low point. Make hot and cold water connections to range boilers. Install a 1/2" AGA pressure furnished by the Government. Extend outlet of relief valve to outside of building with 3/8" black iron pipe as shown on drawings.

(h) Water heaters (electric). Automatic storage type. Heater will be shipped assembled. Contractor shall set and connect complete.

(i) Pressure relief valves. Each heater will be provided with a pressure relief valve. Contractor shall install this valve on the system as shown on drawings.

(j) Gas refrigerator. Contractor shall set refrigerators where shown on drawings and shall make 1/2" gas connections, each fitted with a gas cock, having a union between gas cock and refrigerator.

2. The contractor shall place in operation gas or oil fired equipment furnished by the Government under this division of the specifications. Adjustments shall be made in accordance with recommendations of the manufacturer of such equipment and/or the local utility company.

DEFENSE HOUSING SPECIFICATION
NATIONAL HOUSING AGENCY
FEDERAL PUBLIC HOUSING AUTHORITY

Division D-23

HEATING (FORCED WARM AIR)

March 1942

NOTE TO ENGINEER (do not copy)

This specification is intended for use in connection with forced warm air systems. Use Division D-23A for installation of space heaters. Combine these two Divisions when both types of equipment are required. Delete items not needed and specify any necessary additional items.

Sec. 1. SCOPE

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

NOTE TO ENGINEER (do not copy)

Revise scope outlined if not applicable to particular project.

Sec. 2. EQUIPMENT FURNISHED BY GOVERNMENT

1. The following equipment will be furnished by Government, delivered to railhead or transportation point nearest to project:

NOTE TO ENGINEER (do not copy)

Following is a list of equipment available through Government purchase. Select type applicable to specific project.

Furnaces (Pressure type blowers - 60,000 Btu output)

1. Coal fired - Separately encased blowers - with bonnet controls.
2. Coal fired - Blower in base, integral with furnace - with bonnet controls.
3. Draft control - Mechanical high limit control for coal fired furnaces listed under 1 and 2.

4. Gas fired - With controls, including room thermostat and 25 feet of conductor.
For natural, manufactured or mixed gases; specify kind and pressure.

5. Oil fired - Gravity type burner with controls, including room thermostat and 25 feet of conductor.
For No. 2 oil.

6. Oil fired - Pressure type burner - with controls, including room thermostat and 25 feet of conductor.
For No. 3 oil.

All of above furnaces furnished with knock down plenum chamber, sufficiently high to extend the overall height of the furnace and plenum chamber to 7 feet, 2 inches.

Oil tank

7. Tank - 110 gallon with tappings only.

2. The contractor shall receive and transport all equipment furnished by the Government from the freight receiving point to the project site, and shall uncrate, assemble, install in allocated position, connect and adjust all such equipment as hereinafter specified.

3. Contractor shall be responsible for requisitioning the proper number and types of furnaces required for the project and for establishing delivery schedule for this equipment.

Sec. 3. GENERAL REQUIREMENTS

1. Layout of equipment, accessories and duct system under this division is generally diagrammatic unless specifically dimensioned. Check project drawings and details for interferences as governed by structural or other conditions before installing work. The right is reserved to make any reasonable change in location of heating equipment, accessories and duct system prior to roughing-in without involving additional expense to Government. Should any work installed under this division interfere with the architectural design as shown on drawings, contractor shall at his own expense make such changes in his work under the supervision of, and as directed by, the Government to permit architectural design to be followed.

2. Perform all necessary cutting of structural work only where approved by Government and as directed.

Sec. 4. DESCRIPTION OF HEATING SYSTEM

1. System is of the forced warm air, "blow through" type. Air is heated in _____ fired furnace. The heated air is directed from furnace to a plenum, distributed to the various rooms and returned to furnace, as indicated on drawings.

NOTE TO ENGINEER (do not copy)

In the above paragraph, insert fuel to be used.

SEC. 5. EQUIPMENT AND MATERIALS

IMPORTANT NOTE

THE "DEFENSE HOUSING CRITICAL LIST" ISSUED BY FEDERAL AGENCY CONTROLLING PRIORITIES AND REVISED AT PERIODIC INTERVALS CONTAINING A LIST OF CRITICAL MATERIALS, GIVING LIMITATIONS OF THEIR USE, SHOULD GUIDE CONTRACTOR IN SELECTION OF MATERIALS. PRIORITY AID WILL BE CONSIDERED ONLY ON MATERIALS WHICH APPEAR ON THE "DEFENSE HOUSING CRITICAL LIST."

1. SUPPLY DUCTS, unless otherwise specified or shown, shall be constructed of black iron, and shall be (1) standard prefabricated type, or (2) sheet metal shop manufactured type, or (3) combination of both types. Sizes indicated on drawings are approximate and shapes shown may be changed provided they fit construction. Thicknesses shall be as follows:

(a) All trunk ducts - No. 26 U. S. Standard Gage. Ducts shall be considered as trunks when they supply more than one air outlet.

(b) All branch ducts and stacks - No. 30 U. S. Standard Gage. Ducts shall be considered as branches when they supply one air outlet only. Vertical ducts concealed in building construction shall be considered as stacks.

Materials other than sheet iron may be proposed for the air distribution system provided the material is fireproof, impervious to moisture, can be installed in the allotted space, and results in an equivalent installation.

2. METAL RETURN DUCTS shall be of same material and thickness as specified hereinabove for trunk supply ducts.

3. DAMPERS, unless otherwise specified or shown, shall be black iron, at least one gauge heavier than ducts in which they are installed.

4. SUPPORTS for ducts to building construction shall be by means of braces, ties, angles or approved equivalent, all suitable for the service intended.

5. SUPPLY REGISTERS for living rooms, bedrooms and kitchens shall be of steel and have suitable shut-off valve for completely closing off air supply; shall have provision for adjustment of air flow for right or left deflection or combination of both by means of adjustable vertical bars, and shall also have provision for downward adjustment of air deflection by means of adjustable horizontal louvers or bars. The closing of shut-off valve noted above may be accomplished by movement of the adjustable horizontal louvers. All adjustment of air deflection shall be made from face of register and without removing same. Adjustment may be by key operation or torsional movement of bars by special tool. Equip each register with gasket for proper sealing.

6. SUPPLY GRILLES for bathrooms shall be of steel and non-adjustable horizontal bar type fixed for downward deflection. Equip each grille with gasket for proper sealing.

7. FRAMES for securing supply register or supply grille to building construction shall be of steel.

(a) If construction is masonry or 2" plaster partition, frame shall be of type set inside duct opening or stack head, with duct or stack head flanges secured to frame by means of rivets or sheet metal screws. Frames shall have suitable tapped lugs for fastening registers.

(b) If construction is of wood, frame shall be of such type and length to permit securing to wood studs, and proper connection to duct or stack head between studs. Frame shall have means to permit duct or stack head flanges to be bent backward over it, and tapped lugs for fastening register.

8. RETURN REGISTERS shall be of steel, outside-of-the-wall baseboard type, complete with head, and except for living room equipped with shut-off valve. Register shall have provision for directing return air into joist space.

9. RETURN GRILLES shall be flat stamped steel at least 60% free open area, and of not less than No. 16 U. S. Standard gage.

NOTE TO ENGINEER (do not copy)

Select return registers or grilles as required and mofify paragraphs as necessary. Where return register or grille is connected directly to metal or fibre duct shapes, use same frame specified for supply registers and supply grilles. Use following paragraph 10 when system is oil-fired.

10. PIPE AND FITTINGS: Fill connection and vent extensions shall be wrought iron or steel with fittings of malleable iron. Supply pipe to burner shall be wrought iron or steel with malleable iron screwed fittings or shall be steel tubing with compression fittings.

(a) Shut-off valve on burner supply line shall be suitable for service intended. Equip each tank with standard type vent hood and fill connection.

(b) Oil gage shall be of the float type suitable for insertion in top tapping of tank. Gage shall have visible means for indicating oil quantity or oil level in tank.

11. SMOKE PIPE shall be constructed of not less than No. 26 U. S. Standard gage black iron. Wall collar shall be black iron.

NOTE TO ENGINEER (do not copy)

Use the following paragraph 12 for coal fired system only.

12. INSULATION for supply ducts shall be one thickness of asbestos paper wrapping weighing not less than 12 pounds per 100 square feet or non-combustible air cell covering not less than 1/4-inch thick.

Sec. 6. INSTALLATION

1. Install and connect, except as otherwise noted, the complete heating system and controls, ready for operation, to give proper and continuous service under normal circumstances and conditions. Installation instructions for furnace, blower-motor unit and controls will be provided by the Government.

NOTE TO ENGINEER (do not copy)

For coal-fired systems add the following sub-paragraphs a, b, and c:

(a) Set and assemble furnace and blower-motor unit where and as shown on drawings, making all air-tight joints and connections for return air in blower-motor and furnace casings. Rigidly secure blower-motor to building construction.

(b) Blower will be controlled by a bonnet thermostat furnished to Contractor. Provide hole in plenum where directed by Government or where indicated on drawings, for insertion of thermal element.

(c) Draft and check dampers will be controlled by a mechanical type self-contained limit regulator furnished to Contractor; it will be equipped with the necessary arrangements and fittings including chain for both automatic and manual operation. Mount

regulator body on the side of the furnace, near the top. The exact location and detailed manner of mounting shall be in accordance with detailed installation instructions furnished by the manufacturer. Regulator may be mounted with sheet metal screws, on either the right or left side of the furnace, as directed by Government or shown. Inner liner of the furnace shall be cut away, or drawn tight across the outer casing by means of toggle bolts. Assemble regulator, lever, weight, pulley, chains, etc. Arrange equipment so that draft at the ash pit and check draft will be completely opened and closed in a properly graduated manner, one door opening while the other is closing, and set so that the draft door is completely closed and check draft open when bonnet temperature reaches 175 degrees F. It shall also be arranged for manual operation. Such manual operation shall not in any way disturb or change control setting of the device or in any way interfere with manual operation of the control. Mountings for bell cranks and pulleys shall be by means of 1" x 3" wood strips securely attached to ceiling joists.

NOTE TO ENGINEER (do not copy)

For gas or gravity oil-fired system, use the following sub-paragraphs a, d and e. Use sub-paragraphs b and c for gas-fired systems only. For oil-fired systems, substitute the following sub-paragraph in lieu of paragraphs b and c:

b. "Provide metal clad insulating board or approved equivalent material under each furnace. Board shall extend a minimum of 10 inches beyond casing of furnace or shall extend to partition."

(a) Set and assemble complete furnace unit where and as shown on drawings, making all air-tight joints and connections for return air in casings.

(b) Gas connection between furnace and distribution system will be provided for under the "Plumbing" division of the specifications.

(c) Provide metal clad insulating board or approved equivalent material under each furnace, when furnace is set on combustible floor.

(d) Blower will be controlled by a bonnet thermostat furnished to Contractor. Provide hole in plenum where directed by Government or where indicated on drawings, if necessary, for insertion of thermal element.

(e) Burner will be controlled by both a room thermostat and high limit control furnished to Contractor. Room thermostat will be

equipped with 25 feet of conductor wire. Mount room thermostat where directed by Government, or where indicated on drawings. Mount high limit control as recommended by manufacturer, providing necessary openings therefor.

2. Assemble and erect plenum furnished by Government; cut necessary openings therein and connect supply ducts thereto as indicated. Rigidly secure supports for metal duct to building construction, spacing not over 60 inches apart. Nails for securing ducts to supports or building construction will not be permitted. Make all joints air tight, with slip joints where used, arranged in the direction of air flow.

(a) Submit shop drawings of supply ducts for each type dwelling unit showing dimensions and details. Include all necessary accessory items such as supports and dampers. Verify dimensions and correlate with adjoining work. Obtain approval of shop drawings before proceeding.

3. Construct return air ducts under wood floors where indicated on drawings and according to details shown. Ducts may utilize joists, floors or beams as one or more surfaces; cap joist spaces with 1/4" exterior grade plywood or 1/4" tempered hard board. For any ducts not utilizing joists, floor or beam surfaces, use nominal one inch #1 yellow pine or fir boards for the sides, and 1/4" exterior grade plywood or 1/4" tempered hard board for tops and bottoms. Reinforce all joints and corners with 3/4" x 1-5/8" wood strips and nail 8" on center through strips with 6 penny common nails. Turns and special shapes where shown in the construction of these return ducts shall be of No. 26 U. S. standard gage black iron or of approved prefabricated hard fibre. Ducts within six feet of furnace shall be constructed of noncombustible materials.

4. Rigidly install all registers and grilles of sizes indicated and properly seal to preclude air leakage.

NOTE TO ENGINEER (do not copy)

Use the following paragraph 5 for coal fired systems only.

5. When supply ducts are enclosed in combustible partitions, walls or concealed spaces or pierce a wall or partition of combustible construction, wrap with insulation specified hereinbefore. Covering shall be securely tied in place. When asbestos paper is used, same shall clear combustible material by 5/16".

6. Provide adjustable volume dampers in each branch duct where shown and as necessary to properly balance system to deliver air quantities indicated. Each damper shall be equipped with locking device easily

accessible for making required adjustments. Dampers in main trunks (as hereinbefore defined) shall be of the quadrant or splitter type. Damper in each branch duct shall be of the quadrant type.

NOTE TO ENGINEER (do not copy)

If system is oil-fired, insert the following: (Detail supports for tank and coordinate with architectural design for this work).

"Set and secure fuel tanks as indicated on drawings, insuring a minimum of 8" between bottom of tank and control valve for gravity burners. Pipe all connections from tank to furnace, and install fill cap, vent extension and vent hood. Include shut-off valve and dirt pocket at tank; include clean-out plug or sludge trap at furnace. Install oil gauge in tank connection provided therefor. Where screw joints are used, apply compound suitable for service intended to male threads only. See drawings for details.

7. Erect smoke pipe to insure minimum friction, fit joints accurately and make smoke and gas tight. Secure each joint with minimum of two sheet metal screws. Extend smoke pipe to inner face of flue. Annular space between smoke pipe and wall or thimble shall be completely filled with heat resisting cement. Size of smoke pipe shall be as indicated on the drawings, or if not indicated, shall be same as flue outlet on furnace. Smoke pipe shall not be installed within 6 inches of a combustible material. Provide a cement asbestos board baffle, mounted 1 inch from face of partition extending 12 inches beyond extremities of smoke pipe, when smoke pipe is installed within 6 to 18 inches of combustible material

(a) Set wall collar in place.

NOTE TO ENGINEER (do not copy)

If system is gravity oil-fired, insert the following in the above sub-paragraph: "Set draft regulator furnished by Government in smoke pipe within 3 feet of furnace, if not provided integral with furnace."

If system is pressure oil-fired, insert the following in the above sub-paragraph: "Set stack switch furnished by Government as recommended by furnace manufacturer."

8. Electrical wiring and connections to furnace is provided for under the "Interior Wiring-Electrical" division of the Specification. Temperature control wiring shall be installed and connected under this

division. Method of installation and connections shall comply with applicable requirements stipulated in the "Interior Wiring-Electrical" Division.

NOTE TO ENGINEER (do not copy)

Coordinate with electrical design for the above work.

9. Prime coat and all registers and grilles at the factory.

NOTE TO ENGINEER (do not copy)

If system is oil-fired add the following to the above paragraph: "Paint tank and other iron work around tank including all ferrous piping with a heavy coat of rust resisting paint."

Coordinate with "Painting" Division of Specifications to paint registers, grilles and exposed duct work in color to match surrounding areas.

10. Complete installation shall comply with applicable regulations of the National Board of Fire Underwriters.

Sec. 7. SAMPLES

1. Submit samples and obtain approval of registers, grilles and frames; insulating board and hard fabric duct shapes if used in connection with return ducts as hereinbefore specified.

SEC. 8. ADJUSTMENT AND TESTS

1. Set all controls requiring adjustment in accordance with recommendations of manufacturers. Adjust vertical deflecting bars of supply registers as indicated on drawings; adjust register bars for horizontal deflection as recommended by manufacturer for proper air distribution within room.

2. Adjust pulley at each blower-motor unit to deliver total quantity of air indicated at supply outlets, with all dampers wide open.

3. Adjust each damper in each system to deliver air quantity indicated at supply outlets, and lock in place.

4. One unit of each type selected by the Government shall be heated about 35° above outside temperature, but not less than 70° inside, and air distribution shall be so adjusted that temperature of rooms,

DEFENSE HOUSING SPECIFICATION
NATIONAL HOUSING AGENCY
FEDERAL PUBLIC HOUSING AUTHORITY

Division D-23A

HEATING (SPACE HEATERS)

March 1942

NOTE TO ENGINEER (do not copy)

This specification is intended for use in connection with the installation of space heaters. Use Division D-23 for forced warm air system. Combine these two divisions when both types of equipment are required on one project. Delete items not needed and specify any necessary additional items.

Sec. 1. SCOPE

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

NOTE TO ENGINEER (do not copy)

Revise scope outlined if not applicable to particular project.

Sec. 2. EQUIPMENT FURNISHED BY GOVERNMENT

1. Space heater, stove board (for setting heater thereon, when required) and controls will be furnished by the Government, delivered to railhead or transportation point nearest to project.

2. Contractor shall receive and transport all equipment furnished by Government from the freight receiving point to the project site and shall uncrate, assemble, install in allocated position, connect and adjust all such equipment as hereinafter specified.

3. Contractor shall be responsible for requisitioning the proper number and types of heaters required for the project and for establishing delivery schedule for this equipment.

Sec. 3. GENERAL REQUIREMENTS

1. Layout of equipment and accessories under this division is generally diagrammatic unless specifically dimensioned. Check project drawings and details for interferences as governed by structural or other conditions before installing work. The right is reserved to make any reasonable change in location of heating equipment and accessories prior to roughing-in without involving additional expense to the Government. Should any work

installed under this division interfere with the architectural design as shown on drawings, the contractor shall at his own expense make such changes in his work as directed by, and under the supervision of, the Government to permit architectural design to be followed.

2. Perform all necessary cutting of structural work only where approved by the Government and as directed.

Sec. 4. DESCRIPTION

1. Heater is of the vented, air circulation, _____ fired type.

NOTE TO ENGINEER (do not copy)

In the above paragraph, insert fuel to be used.

If a simple duct arrangement is to be used for two story row houses, add the following, coordinating with architectural design to provide necessary bulkhead: "Partial distribution of heated air to the bed rooms will be by means of a grille, metal duct and register arrangement as indicated on drawings."

If heater is oil fired, add the following additional paragraph: "2. Burner will be of the vaporizing pot type. Supply of oil to burner from tank (mounted on heater) will be automatically regulated. Draft will be controlled by means of a balanced draft regulator."

Sec. 5. EQUIPMENT AND MATERIALS

IMPORTANT NOTE

"THE DEFENSE HOUSING CRITICAL LIST" ISSUED BY FEDERAL AGENCY CONTROLLING PRIORITIES AND REVISED AT PERIODIC INTERVALS CONTAINING A LIST OF CRITICAL MATERIALS, GIVING LIMITATIONS OF THEIR USE, SHOULD GUIDE CONTRACTOR IN SELECTION OF MATERIALS. PRIORITY AID WILL BE CONSIDERED ONLY ON MATERIALS WHICH APPEAR ON "THE DEFENSE HOUSING CRITICAL LIST."

1. SMOKE PIPE shall be constructed of not less than No. 26 U.S. gage, black iron. Wall collar shall be black iron.

NOTE TO ENGINEER (do not copy)

If a simple duct arrangement is used for two story row houses, add the following paragraphs (2), (3), (4) and (5).

2. DUCT shall be constructed of No. 26 U. S. standard gage black iron and shall be of the shape and size indicated on drawings.

3. REGISTERS shall have plain stamped steel face of at least 60% free area and have suitable shut-off valve for completely closing off air supply. Equip each register with gasket. Prime coat register at factory.

(a) Submit sample and obtain approval before proceeding.

4. GRILLES shall be flat stamped steel of at least 60% free area and constructed of not less than No. 16 U. S. standard gage. Equip each grille with gasket. Prime coat grille at factory.

(a) Submit sample and obtain approval before proceeding.

5. FRAME for securing register or grille to building construction shall be of steel. Frame shall be of such type and length to permit securing to wood joists or studs, and proper connection to duct or stack heads between joists or studs. Frame shall have means to permit duct to be bent backward over it, and tapped lugs for fastening register or grille.

(a) Submit sample and obtain approval before proceeding.

NOTE TO ENGINEER (do not copy)

If heater is oil fired, add the following paragraph: "6. Storage drum shall be of approximately 55 gallon capacity, constructed in accordance with requirements for I.C.C.-5 drums and shall be so marked. Drums shall be fitted with a suitable hand operated barrel pump. Pump discharge shall be high enough to fill a 5 gallon container set on top of the drum. Pump shall screw into drum and extend to within 3 inches of bottom of drum when set vertically."

Sec. 6. INSTALLATION

1. Install and connect (except as otherwise noted) heaters, ready for operation. Installation instructions for heater will be provided by Government.

NOTE TO ENGINEERS (do not copy)

If heater is gas fired, add the following to the above paragraph: "Gas connection between furnace and distribution system will be provided for under the "Plumbing" division of the specification."

When duct arrangement as previously described is used, include following paragraph: "Install and connect duct arrangement, rigidly securing registers and grilles of sizes shown, and properly seal to preclude air leakage. Submit shop drawings showing dimensions and details. Indicate all necessary accessory items. Verify dimensions and correlate with adjoining work. Obtain approval of drawings before fabrication."

2. Erect smoke pipe to insure minimum friction, fit joints accurately and make smoke and gas tight. Secure each joint with a minimum of two sheet metal screws. Extend smoke pipe to inner face of flue. Annular space between smoke pipe and wall or thimble shall be completely filled with heat resisting cement.

Size of smoke pipe shall be as indicated on drawings, or if not indicated, shall be same as flue outlet on heater. Smoke pipe shall not be installed within six inches of combustible materials. Provide a cement asbestos board baffle mounted one inch from face of partition extending twelve inches beyond extremities of smoke pipe, when smoke pipe is installed within 6 to 18 inches of a combustible material.

(a) Set wall collar in place.

NOTE TO ENGINEER (do not copy)

If heater is coal fired, add the following to subparagraph (a): "Equip smoke pipe with choke damper fitted for easy operation and with ample opening for passage of gases."

If heater is oil fired, add the following to subparagraph (a): "Set draft regulator furnished by Government in smoke pipe, within 3 feet of furnace if not provided integral with furnace."

Also add the following paragraph: "Set storage drum and pump where indicated on drawings. Paint tank and other iron work with a heavy coat of rust resisting paint."

3. Complete installation shall comply with applicable regulations of the National Board of Fire Underwriters.

NOTE TO ENGINEER (do not copy)

If heater is oil fired, include the following: "Place each heater in operation. Make all necessary adjustments as recommended by heater manufacturer. Provide everything necessary for such adjustments. Use No. 1 fuel oil as defined in the latest edition of Commercial Standards titled "Fuel Oils."

If heater is gas fired, include the following: "Place each heater in operation. Make all necessary adjustments as recommended by heater manufacturer and/or local gas company. Furnish everything necessary for such adjustments."

Sec. 7. INSTRUCTIONS

1. Permanently affix in each dwelling unit where directed by the Government, operation instructions furnished by Government.

DEFENSE HOUSING SPECIFICATION
NATIONAL HOUSING AGENCY
FEDERAL PUBLIC HOUSING AUTHORITY

Division D-24

INTERIOR WIRING (ELECTRICAL)

March 1942

NOTE TO ENGINEER (do not copy)

Specification as written is assumed to be part of the general contract.

Omit items not needed and specify any additional items.

Sec. 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".

NOTE TO ENGINEER (do not copy)

Revise scope outlined if not applicable to particular project.

If communication systems or raceways for such systems are to be provided, specify under "Scope" and add a section under "METHODS OF INSTALLATION."

Sec. 2. EQUIPMENT FURNISHED BY GOVERNMENT

1. Following equipment will be furnished by Government, delivered to nearest railhead or transportation point to project.

(a) Lighting fixtures for following spaces:

1. Living room.
2. Bedroom.
3. Kitchen.
4. Halls, public stairs and vestibules.
5. Bath rooms.
6. Utility rooms.
7. Exterior bracket (dwelling unit entrance)

(b) Electric refrigerators.

(c) Electric ranges.

NOTE TO ENGINEER (do not copy)

Delete reference to items (b) and (c) if not applicable.

2. The above listed equipment shall be received by contractor, hauled to site, unpacked, installed and connected. Contractor shall be responsible for requisitioning proper number and types of lighting fixtures, electric ranges (if any) and electric refrigerators (if any) required for the project, and for establishing delivery schedule for this equipment.

3. Lighting fixtures for spaces other than listed above, which are indicated on drawings or hereinafter specified shall be furnished and installed by the contractor.

Sec. 3. SYSTEMS

1. Electrical service to each building is specified under exterior distribution division and shown on drawings. From the terminating point of service at each building, extend wiring to service equipment, branch protective devices and outlets.

NOTE TO ENGINEER (do not copy)

Paragraph 1 is based on purchase of electrical energy through master meter with service being brought to each building under another division of the specification. If energy is purchased by each tenant and service extend to each building by utility company, delete this paragraph, substituting a new paragraph covering local utility company's requirements.

Add paragraphs giving current characteristics of service supplied to (a) each building and (b) each dwelling unit.

Sec. 4. TYPES OF WIRING

IMPORTANT NOTE

THE FOLLOWING TYPES OF WIRING ARE RECOGNIZED IN 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. IN THE INTEREST OF CONSERVATION OF CRITICAL MATERIALS, INSTALL WHEREVER PRACTICAL A SYSTEM OF WIRING USING THE LEAST AMOUNT OF METALS.

1. From point of service pickup at each building, extend service entrance conductors to service equipment, using service entrance cable.

2. For all wiring inside building, use knob and tube wiring, covered neutral cable, 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.

NOTE TO ENGINEER (do not copy)

When the type of construction, such as may be used in tropical climates, will not permit concealed wiring, non-metallic type cable and non-metallic type surface outlets should be used. Wiring devices of the integral enclosed type intended for surface wiring and of molded plastic or porcelain should be specified. Modify specifications accordingly.

Sec. 5. CODES

1. Comply with rules and regulations of the latest edition of National Electrical Code bearing on the conduct of the work as drawn and specified. If the contractor observes that drawings and specifications are at variance therewith, he shall promptly notify the Authority, in writing. If the contractor performs work contrary to above referred to rules and regulations and without such notice to the Authority, he shall bear all costs arising therefrom.

Sec. 6. 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.

Sec. 7. MATERIALS

IMPORTANT NOTES

THE "DEFENSE HOUSING CRITICAL LIST" ISSUED BY FEDERAL AGENCY CONTROLLING PRIORITIES AND REVISED AT PERIODIC INTERVALS CONTAINING A LIST OF CRITICAL MATERIALS,

GIVING LIMITATIONS OF THEIR USE, SHOULD GUIDE CONTRACTOR IN SELECTION OF MATERIALS. PRIORITY AID WILL BE CONSIDERED ONLY ON MATERIALS WHICH APPEAR ON THE "DEFENSE HOUSING CRITICAL LIST."

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 and be so labeled, or shall conform to their requirements in which case certified statements to that effect shall be furnished, if requested. Use new materials and appliances. The latest amendments to Federal Specifications and the latest issues of Underwriters' Laboratories Standards shall apply.

2. RACEWAYS AND FITTINGS:

(a) Rigid metal conduit (zinc coated)	*Fed.Spec.E-WW-C-581a June 30, 1941
(b) Flexible metal conduit, single strip, galvanized	*Fed.Spec.E-WW-C-566 December 9, 1941
(c) Electrical metallic tubing	*Fed.Spec.E-WW-T-806a June 30, 1941
(d) Fittings	*Fed.Spec.E-WF-406 May 23, 1941
(e) Rigid metal conduit (enameled)	Fed.Spec. WW-C-571

3. BOXES AND COVERS:

(a) Interior Work:

Cadmium or zinc coated	*Fed.Spec. E-WO-821a May 23, 1941
Enameled	Underwriters' Lab.
Non-metallic	Underwriters' Lab.

*Emergency alternate specifications have been issued to the Federal Specifications in the interest of conservation of strategic materials. Copies of these "emergency alternate specifications" may be obtained upon request.

(b) Exterior work:

Exposed - weatherproof (galvanized or cadmium plated) conduit or tube fittings with suitable covers.

4. WIRES AND CABLES:

(a) Code grade, Type R	Underwriters' Lab. (June 1940) or *Fed.Spec.E-JC-103 (12-24-41)
(b) Moisture resistant, Type RW	Underwriters' Lab. (June 1940) or *Fed.Spec.E-JC-103 (12-24-41)
(c) Covered neutral cable - permitted by Trial Procedure of National Fire Protective Association.	Underwriters' Lab.
(d) Non-metallic sheathed cable	Type R Insulation Underwriters' Lab.
(e) Armored bushed type cable	Type R Insulation *Fed.Spec.E-JC-71 July 29, 1941
(f) All rubber cord, heavy duty Type S (range connection)	Underwriters Lab.
(g) Heat resistant or rubber covered fixture	Underwriters' Lab.

Provide lead covering on wires and cables where required.

5. WIRING DEVICES:

(a) Flush duplex receptacles (15 ampere, 125 volt).

(b) Flush tumbler switches ("T" rating - not less than 5 ampere, 125 volts).

(c) Combination of devices shall be in single gang mounting wherever practical. Compliance with Federal Specifications WR-151, WS-893 or WS-896, except use of plaster ears optional.

6. PLATES AND FINISHES for switches receptacles and other outlets requiring plates shall be non-metallic material. Provide corrosion resisting coating on plates for exposed raceway fittings.

*Emergency alternate specifications have been issued to the Federal Specifications in the interest of conservation of strategic materials. Copies of these "emergency alternate specifications" may be obtained upon request.

7. SERVICE EQUIPMENT shall comply with regulations of local utility company. Universal meter socket receptacle, if furnished, shall be provided with cover plate and sealing ring; meter pans or encasing cabinets shall be provided with covers and seals. METERS NOT TO BE FURNISHED UNDER THIS CONTRACT.

NOTE TO ENGINEER (do not copy)

Defense Housing - Although energy may be purchased at wholesale through a master meter, it is considered advisable to install individual dwelling unit metering facilities in accordance with regulations of local utility company because of the likelihood of retail purchase if dwelling units are sold individually or in groups after the emergency.

8. FEEDER PANELS AND BRANCH CIRCUIT PANELS shall consist of required number of protective devices. Provide disconnects where required.

9. PROTECTIVE EQUIPMENT:

(a) Circuit breaker panel shall conform to Federal Specification *E-W-P-131a (Class 2) December 17, 1941.

(b) Fuse panels shall conform to Federal Specification *E-W-P-146, May 23, 1941, dead front type, with interchangeable, noncombustible, insulating base fuse section.

10. CABINETS shall consist of sheet steel, code gage; for surface or flush mounting as indicated.

(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 - Cabinets shall be of weatherproof construction. 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. Provide pin tumbler lock or padlock for "protective section," arranged for master keying. (Provide six master keys).

* Emergency alternate specifications to the Federal Specifications have been issued in the interest of conservation of strategic materials. Copies of these "emergency alternate specifications" may be obtained upon request.

11. FUSES:

(a)	Cartridge, non-renewable	Fed.Spec. WF-791
(b)	Plug fuses, standard	Underwriters' Lab.
(c)	Plug fuses, Type S, non-tamperable with adapters for screw base	Underwriters' Lab.

12. TIME CLOCKS shall be of the synchronous motor, detachable socket type.

13. WIRE SEALS shall be stranded; sealer shall have die engraved with symbol as approved.

14. TAPES:

(a)	Friction	*Fed.Spec.E-HH-T-101a January 30, 1942
(b)	Rubber	*Fed.Spec.E-HH-T-111a January 30, 1942

15. LIGHTING FIXTURES required and which are not included in the list of materials furnished by the Government (see Section 2) shall be as hereinafter specified:

NOTE TO ENGINEER (do not copy)

List and specify all fixtures other than those furnished by the Government.

16. LAMP BULBS - INCANDESCENT *Fed.Spec.E-W-L-101d January 17, 1942

METHODS OF INSTALLATION

IMPORTANT NOTES

MATERIALS AND WORKMANSHIP SHALL RESULT IN AN INSTALLATION FREE FROM DEFECTS AND WHICH WILL RENDER SATISFACTORY PERFORMANCE. CONTRACTOR SHALL REPAIR OR REPLACE ANY MATERIAL, PARTS OR EQUIPMENT WHICH DEVELOP DEFECTS WITHIN A PERIOD OF ONE YEAR AT NO EXPENSE TO THE GOVERNMENT. ALL LABOR NECESSARY TO MAKE REPAIRS OR REPLACEMENTS SHALL BE PROVIDED. IN THE EVENT THAT A REPETITION OF ANY ONE DEFECT OCCURS, INDICATING THE PROBABILITY OF FURTHER FAILURES WHICH CAN BE TRACED TO FAULTY DESIGN, MATERIAL OR METHOD OF INSTALLATION, CONTRACTOR SHALL NOT CONTINUE TO REPLACE WITH SAME MATERIAL OR PART BUT SHALL TAKE STEPS TO REMEDY THE FAULT THROUGH REDESIGN.

* Emergency alternate specifications to the Federal Specifications have been issued in the interest of conservation of strategic materials. Copies of these "emergency alternate specifications" may be obtained upon request.

Sec. 8. 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. In structural 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; if trapped, use bleeder boxes, locating so access to boxes is practicable.

5. Raceway systems shall be capped during course of construction; clean inside of raceway before installing conductors.

6. All threaded and slip joints shall be made up tight. Wherever threads are left exposed or where protective coatings have been removed in handling, such places shall be painted with one coat of lead and oil of color to match raceway finish.

Sec. 9. 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.

Sec. 10. INSTALLATION OF COVERED NEUTRAL CABLE

1. Installation shall comply with the "Trial Installation Resolution" of the National Fire Protective Association.

Sec. 11. INSTALLATION OF OUTLET BOXES, COVERS, DEVICES AND PLATES

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.

3. Install 3/8" fixture studs in lighting fixture outlet boxes where shop drawings of lighting fixtures furnished by Government require studs and elsewhere as may be required.

4. Center outlets in paneling or in other architectural features; clear trims and corners by 4 inches. Locate switch outlets adjacent to door openings on strike side of door except where shown otherwise.

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	Above medicine cabinet
(e)	Receptacle adjacent to refrigerator (locate 1'8" from center line of refrigerator to the side which will permit serving work space and table appliances. Kitchen equipment layout governs exact height; check kitchen details before installation.	3'6" to 4'4"

6. If contractor elects to use wiring devices without plaster ears, care should be exercised in pulling "wiring devices" up for alignment on plates.

Sec. 12. 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 No. 3.

Sec. 13. SERVICE CONNECTIONS

NOTE TO ENGINEER (do not copy)

Reference is made in paragraphs Nos. 1 and 2 following, to "overhead" and "underground" supply respectively. Select applicable paragraph. Coordinate with "Distribution" Division of the Specifications.

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 cabinet 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 Sec. 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 Sec. 18 under division titled "Underground Distribution-Electrical"). From this point of contact, extend wiring to meter cabinet and service equipment and thence to outlets. At service contact, leave slack cable or conductors for connecting to underground service.

Sec. 14. INSTALLATION OF METER CABINET AND SERVICE EQUIPMENT

1. Install service equipment (grounded as required by NEC), branch circuit protective devices and metering facilities for individual dwelling units as indicated.

2. Circuits shall be closed at meter outlets to permit operation without meters.

3. Install time clock, disconnect and protective devices to control outlets in public stair halls. The disconnect shall be accessible for blackout control.

Sec. 15. INSTALLATION OF DWELLING UNIT LOAD CENTERS

1. Load centers for dwelling units shall have the number of branch circuit breakers or switch and fuses indicated on drawings.

2. If contractor elects to use circuit breaker load centers, such equipment shall also be used in feeder protection; likewise, with respect to fuses. The protective devices in a circuit shall be so coordinated as to cause the protective device nearest the load to open first in case of fault.

Sec. 16. WIRING CONNECTIONS (GENERAL)

1. Provide required number of branch circuits with one circuit for receptacle outlets in kitchen and dining space and additional circuits for remainder of general lighting and receptacle outlets. Balance loads as closely as practical.

2. Where terminals permit, connections for wire #8 and larger to switches, panel boards, 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.

Sec. 17. WIRING CONNECTIONS (RANGES)

1. Locate range outlet in back of range and within overall dimension of range. Consider type of cable connection and location of connections on range in locating outlet.

2. Provide range connection, between wall outlet and range, consisting of four conductor #8 all-rubber cord or three conductor armored cable.

3. Provide cable support or grip on range cable connection to avoid mechanical strain on splice or terminals.

4. Connect grounding conductor or armor to range frame. Ground at outlet box or panel box.

5. Provide slack in connecting cable permitting range being moved three feet from wall without disconnecting. Form conductors with lugs (if necessary) to accommodate range terminals.

6. Make connections to range by one of the following methods:

(a) Continuous cable (without splices) 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 extention to range.

(d) If the protective devices are located outside of dwelling unit and do not satisfy NEC with respect to disconnecting the range, provide plug and receptacle as specified under (c).

Sec. 18. INSTALLATION OF LIGHTING FIXTURES AND LAMP BULBS

1. Install all fixtures furnished by the Government and other fixtures as hereinbefore specified. Provide lamp bulbs in sockets of fixtures in spaces other than in dwelling unit fixtures. (Fixtures controlled by circuits from dwelling unit load centers).

Sec. 19. INSTALLATION OF SEALS

1. Seal covers at individual dwelling unit meter cabinets and at main service disconnect. Furnish one pocket type sealing tool with engraved die, and 250 seals in addition to those required.

Sec. 20. INSTALLATION OF FUSES

1. All branch lighting and appliance circuits, unless otherwise specified, shall be fused at 15 ampere.

2. Furnish and install at the completion of the work, after all testing has been done, one complete set of fuses for all switches and cutouts requiring same. Furnish one complete duplicate set in original carton to Authority.

Sec. 21. ELECTRICAL CONNECTION OF EQUIPMENT

1. Overcurrent protection and disconnecting means as required by the NEC shall be provided for motors. Motor driven equipment specified under "Plumbing" and "Heating" divisions may be factory wired complete with controllers and motor disconnects, therefore, contractor should check equipment purchased under those divisions so as to avoid duplication of protective and disconnecting means.

2. Connect ready for operation, motors and control apparatus specified under other divisions unless specifically mentioned as being connected under such divisions.

3. All electrically operated equipment shall be connected, ready for operation, except as hereinafter specifically omitted and if specifically mentioned as being connected under "Heating" and "Plumbing" divisions of the specifications.

4. The electrical supply wiring for furnaces equipped with blowers shall be provided under this division of specification. All temperature control wiring is included under the "Heating" division.

5. The supply wiring shall consist of a circuit from the load center to a 20 ampere, 125 volt, single pole, snap switch mounted 6'6" above floor, on wall adjacent to furance; extend wiring to furnace and connect. The disconnect switch shall have a legible indication that its purpose is for "emergency use only."

Sec. 21. GROUNDING

1. Where knob and tube wiring and/or non-metallic sheathed cable is used in conjunction with armored cable and/or metallic raceway, the grounding requirements are of special importance. Runs of armored cable or metallic raceway less than 25 feet need not be grounded, provided "they are free from probable contact with ground or grounded metal and which, if within reach from grounded surfaces, are guarded against contact by persons." Runs of greater length should be grounded.

Sec. 23. 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, NEC 1940. Provide testing equipment necessary and conduct test in presence of Government's authorized representative.

DEFENSE HOUSING SPECIFICATION
NATIONAL HOUSING AGENCY
FEDERAL PUBLIC HOUSING AUTHORITY

Division D-25

OVERHEAD DISTRIBUTION (ELECTRICAL)

March 1942

NOTE TO ENGINEER (do not copy)

Specification as written is assumed to be part of the general contract.

Omit items not needed and specify any necessary additional items.

Sec. 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."

NOTE TO ENGINEER (do not copy)

Revise scope outlined if not applicable to particular project.

Sec. 2. SYSTEMS

1. Light and Power:

2. Street Lighting:

3. Other Systems:

NOTE TO ENGINEER (do not copy)

Under paragraph 1 describe light and power system in general, stating (a) exact pickup point of service, (b) current characteristics at point of delivery, (c) current characteristics of project primary and secondary distribution, (d) extent of contractor's work at metering station and (e) terminating point at building of work under this division.

In paragraph 2 describe the street lighting system in general if required.

In paragraph 3 describe any other systems required.

Sec. 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. Comply with rules and regulations of the latest editions of the National Electrical Code and the National Electrical Safety Code bearing on the conduct of the work as shown and specified. Wherever such codes do not establish a "standard to follow", then follow the standard practice of the local electrical utility company in executing the work as drawn and specified. If the contractor observes that the drawings and specifications are at variance with aforementioned rules, regulations and standards, he shall promptly notify the Authority, in writing. If the contractor performs work contrary to the above referred to rules, regulations and standards, and without such notice to the Authority, he shall bear all costs arising therefrom.

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) 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.

Sec. 4. MATERIALS:

NOTE TO ENGINEER (do not copy)

The various materials enumerated are based on voltages not exceeding 6600. Consult with local utility company as to standards if this voltage is exceeded.

IMPORTANT NOTES

THE "DEFENSE HOUSING CRITICAL LIST" ISSUED BY FEDERAL AGENCY CONTROLLING PRIORITIES AND REVISED AT PERIODIC INTERVALS CONTAINING A LIST OF CRITICAL MATERIALS, GIVING LIMITATIONS OF THEIR USE, SHOULD GUIDE CONTRACTOR IN SELECTION OF MATERIALS. PRIORITY AID WILL BE CONSIDERED ONLY ON MATERIALS WHICH APPEAR ON THE "DEFENSE HOUSING CRITICAL LIST."

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 and be so labeled, or shall conform to their requirements in which case, certified statements to that effect shall be furnished, if requested. Use new materials and appliances.

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 roofed, 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, manufacturers trade mark or initial, and class (ASA) and height.

(d) All angle and transformer poles shall be Class 4 and all line poles shall be Class 5 unless otherwise indicated.

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. All insulators shall be treated for radio interference.

7. HARDWARE shall be of ferrous metal, protected by galvanizing or non-metallic coating.

8. PRIMARY CONDUCTORS shall be bare, medium hard drawn, solid copper (ASTM specifications) No. 4 AWG.

9. SECONDARY CONDUCTORS shall be of medium hard drawn copper (ASTM specifications) with triple braided weatherproof covering (ASA specification C 8.18-1936). No. 3 AWG and smaller shall be solid, larger sizes stranded.

10. 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.

11. GUY WIRE shall be steel, seven strand, (unless otherwise indicated) Siemens-Martin, double galvanized, or protected against rusting by non-metallic coating.

12. GUY ANCHORS shall be expanding, screw, cone or wedge type of sizes required; log anchors shall be pressure creosote treated as specified for yellow pine poles.

13. ANCHOR RODS shall be galvanized steel or otherwise treated to resist rusting, with integral thimble eye or double eye as required. Minimum length - 6 feet; guaranteed minimum strength - 18,500 pounds.

14. GUY GUARDS shall be ferrous metal protected by galvanizing or non-metallic coating (#18 gage minimum) not less than 8 feet long.

15. GROUND RODS shall be steel (stiff high carbon) galvanized or otherwise treated to resist rusting. Under ordinary conditions, use 5/8" x 8' minimum rods (diameter over threads). Rod shall have stamped into surface of rod near top ends, name of manufacturer and figure denoting length of rod.

16. GROUND ROD CLAMPS shall be steel with corrosive resistant finish.

17. GROUND WIRE shall be soft drawn copper at least size of primary and not less than #6 AWG.

18. TRANSFORMERS (conventional or complete self-protected types) shall conform to ASA and NEMA standards for oil immersed self-cooled type, suitable for outdoor service and furnished complete with oil and of standard voltage ratings, construction, performance and test.

(a) Ratings:

(b) Primary voltage taps:

NOTE TO ENGINEER (do not copy)

In (a) above describe primary and secondary voltage ratings, frequency, whether single or three phase. In (b) above, only if local conditions warrant, specify four 2.5% full capacity taps below normal, as standard transformers (2400 to 4160 volts) 1.5 to 50 KVA, single phase, are not equipped with taps.

(c) Secondary coils shall be arranged for series and multiple or 3-wire connections.

(d) Terminals shall be detachable cork gasketed copper stud type, insulated by porcelain bushing extending into case and clamped into position. High voltage insulated leads from the high voltage bushings to the terminal board or coils shall enter a bushing so designed that under 60 cycle or standard impulse tests, the flashover of the bushing shall be on the outside of the tank.

(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. Cover shall form a splash proof joint. Tanks and covers shall be furnished with one priming coat and one finishing coat or equivalent, of dark gray weather-resisting material. Hangers shall be galvanized or painted and if painted shall take the same finish as tank.

(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; flashpoint not less than 130 degrees C and dielectric strength at least 26,000 volts when tested between vertical surfaces 1" in diameter and 0.10" apart.

(i) Acceptance tests shall conform to the latest revision of the proposed American Standards for Transformers and the proposed American Recommended Practice, Test Code for Transformers, ASA Publication C57.1, .2 and .3 and NEMA Standards for Transformers, Publication 32-12.

(j) Manufacturer shall, through contractor, submit evidence based on previous tests made on approximately the same size and voltage class of transformer that the design to be furnished will meet the impulse requirements. In addition, submit data as follows, guaranteeing the equipment furnished to conform therewith.

1. No load loss.
2. Full load loss.
3. Full load regulation at 100% and 80% power factor.
4. Approximate net and shipping weights.
5. Approximate overall dimensions.
6. Gallons of oil required per transformer.

Following paragraphs (k) to (p) apply only to completely self-protected type transformers.

(k) Transformers shall be completely self-protected without auxiliary devices of any kind. As lightning arrestors are integral with 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 breaker connected in series with secondary winding, normally tripping when dangerous copper temperature is approached and instantaneously 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 reset breaker of tripping.

(n) Provide bullseye indicating lamp in transformer case which shall light (and remain lit until manually reset) 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 with protecting links.

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. STREET LIGHTING FIXTURES shall consist of 16" porcelain enameled steel flat cone reflector with weatherproof hood or cap, tapped for 3/4" conduit and suitable porcelain medium screw base socket with lamp (2500 lumen) suspended from pole by gooseneck bracket of 3/4" galvanized conduit securely fastened to pole by cast flange with tapped hub. Center of reflector shall hang approximately 2' from near side of pole. Wiring to reflector concealed.

23. STREET LIGHTING RELAY OR CONTRACTOR shall be of pole mounted weatherproof type of capacity as herein specified or as indicated on drawings.

24. TIME SWITCH shall be of the synchronous motor type, single pole, 125 volt, 60 cycle, of capacity indicated on drawings with circuit protection consisting of 30 ampere fused cutout. Time switch and cutout shall be enclosed in weatherproof rust resisting steel cabinet with hinged cover and screw latch.

METHODS OF INSTALLATION

IMPORTANT NOTES

MATERIALS AND WORKMANSHIP SHALL RESULT IN AN INSTALLATION FREE FROM DEFECTS AND WHICH WILL RENDER SATISFACTORY PERFORMANCE. CONTRACTOR SHALL REPAIR OR REPLACE ANY MATERIAL, PARTS OR EQUIPMENT WHICH DEVELOP DEFECTS WITHIN A PERIOD OF ONE YEAR AT NO EXPENSE TO THE GOVERNMENT. ALL LABOR NECESSARY TO MAKE REPAIRS OR REPLACEMENTS SHALL BE PROVIDED. IN THE EVENT THAT A REPETITION OF ANY ONE DEFECT OCCURS, INDICATING THE PROBABILITY OF FURTHER FAILURES WHICH CAN BE TRACED TO FAULTY DESIGN, MATERIAL OR METHOD OF INSTALLATION, CONTRACTOR SHALL NOT CONTINUE TO REPLACE WITH SAME MATERIAL OR PART BUT SHALL TAKE STEPS TO REMEDY THE FAULT THROUGH REDESIGN.

Sec. 5. GENERAL INSTALLATION REQUIREMENTS

1. Supporting structures, wires and other equipment shall conform as to strength, clearances, sags, etc., with NESC. Use Grade B construction except where NESC 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 stretch equivalent to maximum loading tension for five minutes, then sag to normal tension corresponding to stringing temperatures.

5. Tensions and sags shall be according to NESC, 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 four 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.

Sec. 6. POLE INSTALLATION

1. Poles shall be of length to provide required clearances above 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 feet for guy stubs, (b) 35 feet for standard construction, and (c) 40 feet for joint construction, except that poles carrying secondary rack only, or secondary rack and telephone cable, shall not be less than 35 feet.

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 feet from ground and one side away from road.

7. Set poles so alternate cross arm gains face in opposite direction, except at dead ends where gains of last two poles shall face dead end; double arm construction at dead ends.

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, NESC. 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" x 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, dead ends, 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.

Sec. 7. CROSS ARM INSTALLATION

1. Cross arms shall be of size and strength to accommodate conductors and equipment. Use single cross arms except in 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 pins 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 screws 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.

Sec. 8. PRIMARY LINE CONDUCTOR INSTALLATION

1. Use top groove of insulators for (a) No. 2 AWG and larger, and (b) line voltage 5000 and over. Attach conductor to top groove on straight portions of lines, 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 and (b) line voltages less than 5,000. 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 four complete turns around conductor.

4. In dead ending No. 3 conductors and smaller, use two standard pin type insulators on double arms.

5. In dead ending 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.

Sec. 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.

NOTE TO ENGINEER (do not copy)

Check with local utility company as to using a common neutral for primary and secondary systems. If permissible, add paragraph to that effect.

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 screws at bottom. At angles, transformer poles, dead end poles, heavy service take-offs and other points of unusual strain use two through bolts.

5. In dead-ending No. 3 conductors and smaller, wrap once around spool insulator and give one long turn and six short turns around conductor. In dead-ending 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.

Sec. 10. SERVICE LOOP INSTALLATION

NOTE TO ENGINEER (do not copy)

Check as to clearance of overhead loops in 1-story buildings. Underground service may be necessary under certain conditions. Coordinate with "Interior Wiring" Division of the Specification.

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 at the pole and at building.

(c) Fasten clamp at building to anchorage provided under "Interior Wiring", using strain insulators 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.

Sec. 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 dead ends, attach guys at center of load and in line with resultant loading.

2. Guys shall be of strength to withstand NESC 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.

Ratio "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 molding strain plate where pole grounds occur). For light

guying, use lag screws in fastening guy hook; for dead ends, use machine bolts.

7. Provide two strain insulators in all guys, one 4 feet from pole and the other at least 8 feet from ground.

NOTE TO ENGINEER (do not copy)

Paragraph 7 above provides insulators in guys. If the grounding of guys is a prevailing practice with local utility company, modify paragraph.

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 more than 12" above ground. For heavy loading conditions, use log anchors, fully pressure creosoted 12" x 12" x 4' minimum. Log anchors may be used in lieu of patent anchors for average loading conditions.

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 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.

Sec. 12. TRANSFORMER INSTALLATION

1. Stencil the KVA rating in 3" white numerals on tank in location visible from ground.

2. Place transformers in lowest practical position, maintaining minimum clearance to ground of 16'.

3. Mount single transformer directly on pole by use of standard support lugs. Where two or more transformers are required, mount on cross arm with conventional hanger iron.

4. For conventional type transformers, 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) 1ø 2300 V 3ø 4000 V Wye	3ø 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 ampere sizes given above.

5. For conventional type transformers, install cutouts in accessible location on transformer cross arm on side away from transformer, connecting so fuse holder is dead in open position.

6. Connect primary leads to primary lines by means of hot line clamps facilitating placing transformer in and out of service.

Sec. 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.

2. Where underground extensions are made, provide lightning arrestors on each phase conductor.

Sec. 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" division. Provide at least one pole ground for each 350 feet of secondary line. Tie secondary and lightning arrestor grounds together to transformer poles by most direct connection and connect to common driven pole ground unless connections to water conduit can be made.

3. Driven ground 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 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 ground wire clamp.

Sec. 15. STREET LIGHTING INSTALLATION

NOTE TO ENGINEER (do not copy)

It is generally expected that street lighting for the project will be an extension of the existing municipal street lighting system, using same type of equipment now in use. Even though the project street lighting system may be independent of the municipal street lighting system, the design of the system and the equipment should be in accordance with the existing system in the immediate vicinity of the project.

In remote locations where municipal street lighting service is not available, the street lighting installation should be included under this specification. The following paragraph and Paragraphs 22, 23 and 24 under Section 4 may be used.

1. A multiple lighting system shall be employed, connecting the street lighting units to a secondary system. Provide a pilot circuit controlled by a time clock. The time clock is to actuate a number of relays which in turn will control the power lines supplying the lighting units. Time clock to have on load side a manually operated switch for blackout use; switch should be located where conveniently accessible during night period.

Sec. 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 tests. Notify Authority in advance before conducting tests.

Sec. 17. TELEPHONE CABLE AND WIRE INSTALLATION

1. No labor or material shall be furnished in connection with the telephone installation unless specifically called for. The contractor shall place and space conductors, protective devices, transformers, lighting fixtures, etc., on poles so as to give clearances, in accordance with NESC, for the future installation of project telephone cables or wires.

Sec. 18. FIRE ALARM SYSTEMS

NOTE TO ENGINEER (do not copy)

It is generally expected that fire alarm system for the project will be supplied by the local municipality at its expense and that it will be an extension of the existing municipal fire alarm system, using the same type of equipment now in use. Even though the project fire alarm system may be independent of the municipal fire alarm system, the design of the system and the equipment should be in accordance with the existing system in the immediate vicinity of the project.

In remote locations where municipal fire alarm service is not available, the fire alarm installation should be included under this specification. Select one of the following types.

A - MUNICIPAL SERVICE

1. The contractor shall make all necessary arrangements with the local fire department authorities for the connection of fire alarm stations, as specified herein, and indicated on drawings. He shall obtain an assignment of box code numbers from the local fire department, make connections to the municipal system as directed by them, and make the entire installation in accordance with the rules and practice of the municipal fire department.

2. Overhead Wiring: The fire alarm box loop and fire alarm boxes shall be installed on poles, at locations indicated on the drawings. Furnish and install all necessary wire racks, wire, insulators, box lights, alarm boxes, etc., as may be required, to provide a complete extension of the fire alarm system. The system shall be connected complete, placed in operation, and tested as required by the fire department authorities. Wire shall be not smaller than No. 8 B. and S. gauge, hard drawn copper, with triple braid weatherproof insulation.

3. Alarm Box Lights: At each box location and approximately ten feet above grade, install a 25 watt vapor proof screw type conduit fitting, complete with porcelain medium base socket, lamp, and ruby globe. Lamps shall be connected to the street lighting system. If street lighting system is series, a 6.6 ampere series isolating transformer and lamp shall be installed at each location. Wires

from lamp to street lighting circuit shall be No. 12 wire, type RW, and be installed in galvanized iron conduit, terminated with suitable weather hood.

B - ADJACENT TO ARMY OR NAVY RESERVATIONS

1. The contractor shall make all necessary arrangements with the Officer in charge of the adjacent army or navy reservation for the connection of fire alarm stations, as specified herein, and indicated on drawings. He shall make connections to the Army or Navy reservation system, as directed by the Commanding Officer, and make the entire installation in accordance with the rules and practice of the governing department.

2. Overhead Wiring: The fire alarm box circuits shall be installed on poles, at locations indicated on drawings. Furnish and install all necessary wire racks, wire, insulators, box lights, alarm boxes, to provide a complete extension of the reservation fire alarm system. The new stations shall be connected complete, placed in operation, and tested as required by the governing department. Wires shall be of type and size required by the governing department.

3. Alarm Box Lights: At each box location, and approximately 10 feet above grade, install a 25 watt vapor proof screw type conduit fitting, complete with porcelain medium base socket, lamp, and ruby globe. Lamps shall be connected to the street lighting system. If street lighting system is in series, a 6.6 ampere isolating transformer and lamp shall be installed at each location. Wires from lamp to street lighting circuit shall be No. 12 (type RW) wire and be installed in galvanized iron conduit, terminated with suitable weatherhood.

4. Fire Alarm Boxes shall consist of a mine type, fire reporting telephone for operation on an electrically supervised telephone type fire alarm system developed by the Government Department.

5. The operation of the system is as follows: - The various telephones are connected by individual circuits which normally carry a low supervisory circuit to give warnings of opens or grounds on the circuit, and which connect to special facilities located in the reservation fire station. The removal of a receiver of a fire reporting telephone from its hook, causes the sounding of an alarm bell, and the operation of an annunciator, the numbered lights of which remain lighted until reset by the fireman on watch at the central fire station. These lights indicate the location of the telephone from which an alarm is being transmitted, and the voice transmission facilities are available for additional information. A special electrically supervised alarm circuit is provided, connecting a main line register and a tapper in each fire station and a manual transmitter in the central fire station. There will also be a direct telephone line from the central fire station to each other fire station.

6. Central station equipment described above is in place and is not to be included in this specification.

C - SYSTEM FOR 50 DWELLING UNITS OR LESS (One and two stations)

1. SCOPE: The contractor shall furnish and install a complete fire alarm system consisting of an electric motor driven siren, one fire alarm box, one alarm box light, and all necessary wiring as hereinafter described. This equipment shall be installed near the top of a wood distribution pole centrally located on the site, as directed by the Government representative in charge of construction.

2. Siren shall be single or double projector type, electric motor driven, having a range up to a radius of 2000 feet. Siren and motor shall be direct connected and enclosed in a weather and moisture proof housing, with openings screened to prevent entrance of insects and foreign matter. Provision shall be made for a weatherproof conduit connection. The unit shall have a swivel bracket to permit mounting at any angle. Motor shall operate on 115 volts, 60 cycle, single phase alternating current.

3. Fire alarm box shall be pull lever type. The act of pulling the lever closes a switch which energizes an interrupter relay supplying energy to the motor. Interrupter shall continue to supply energy to the siren until released by the operation of a push button on the box which disengages the pull lever switch. Suitable fuse protection for the motor and interrupter shall be provided. Mechanism shall be enclosed in a suitable weatherproof metal box painted vermillion red, with operating instructions in raised letters stamped or cast integral with the box.

4. Wiring between the alarm box, overhead service and siren motor shall consist of No. 12 (type RW) wires in conduit, terminated at the point of service connection with a suitable conduit fitting with composition bushing and gasket. A conduit fitting shall be installed at the motor location with a flexible weatherproof connection to the motor. Service connection shall be made to the neutral and one of the secondary wires.

5. Service connection shall be made from the alarm box to the load center indicated. Wiring shall consist of a 2-conductor No. 8, non-metallic sheathed lead covered parkway cable run 18 inches below grade. Cable shall be encased in galvanized conduit at the following points: - from the fire alarm box to a point 18 inches below grade and from the load center to a point 12 inches beyond the building wall where load center is located.

6. Alarm Box Light: Above the fire alarm box, and approximately 10 feet above grade, install a 25 watt vapor proof screw type conduit fitting, complete with porcelain medium base socket, lamp,

and ruby globe. Box lights shall be connected to street lighting circuit, and in the event that the street lighting circuit is series, provide at each lamp location a 6.6 ampere series isolating transformer and lamp. Wiring from lamp to street lighting circuit shall be No. 12 (type RW) wire, installed in galvanized iron conduit terminated in suitable weatherhood.

D - SYSTEM FOR THREE OR MORE STATIONS

1. The contractor shall furnish and install a complete fire alarm system, including fire alarm call boxes, central station equipment, air compressing equipment, air storage tank and piping electrically operated valve, wiring outdoor pneumatic horn, and indoor alarm gong. The system shall include all relays, timing devices, lightning arrestors, storage battery, rectifiers, etc. necessary for full automatic operation, and shall be completely wired and ready for operation.

2. The outdoor fire alarm boxes specified herein shall be mounted on wood electrical distribution poles as shown on drawings. Central station equipment shall be installed where directed by the Government representative in charge of construction.

3. The available power supply will be single phase, 3 wire, 115/230 volts, with grounded neutral. Electrical connections shall be made to a 50 ampere circuit as indicated on drawings. The presence or operation of the equipment proposed shall not cause interference on the paralleling telephone lines on the same poles, nor shall it cause radio interference. It shall not operate through inductance from the other lines on same poles.

4. Central station equipment shall make provision for a single circuit. The following shall be included:

(a) Equipment for transmitting the box signals automatically to the alarm equipment.

(b) A manually operated fire alarm signal transmitter capable of transmitting any code, repeated four times. The transmitter shall be equipped so that it may transmit all of the box numbers selected and four additional signals to be determined and designated. The transmitter shall be designed so that it may be installed at some point remote from the central station. If code wheels are used, a cabinet shall be provided for not less than 50 wheels.

(c) A test switch capable of making all ground and battery voltage readings. This shall operate in conjunction with a voltmeter of suitable scale, scale length approximately 2-3/8 inches long and accuracy within 2 percent. Voltmeter shall have a sensitivity of not less than 1000 ohms per volt.

(d) Audible and visual signals to indicate continuity of circuit. Line trouble bell shall not ring because of signals but only

in the event of a prolonged open on failure of fire alarm line current.

(e) A light to indicate telephone calls. An audible signal differing from the line trouble signal shall also indicate telephone calls.

(f) Necessary switches to silence the telephone alarm and to silence the trouble alarm. The telephone light and trouble light shall not be reset until conditions causing these alarms are restored and until the silencing switches are reset to normal.

(g) The necessary storage battery, which shall be of the standard fire alarm glass cell type. It shall be not less than 48 volts and 15 ampere hours capacity.

(h) A hydrometer for testing the specific gravity of the cells. A dry disc trickle charger to keep the batteries fully charged. The rectifier shall have sufficient capacity to charge the batteries at a 1/2 ampere rate if desired.

(i) Flush mounted instruments, scale length not less than 2-3/8 inches, accuracy within 2 percent, shall be provided to indicate line current and rectifier output.

(j) All necessary protective equipment as specified by the National Board of Fire Underwriters.

5. All the operating and supervising equipment shall be mounted in or on a suitable wall cabinet located as indicated on drawings. All wiring shall be color coded, flame retarding, neatly cabled and shall be complete, ready for installation. All connections shall be soldered, or if screw connections, shall be held in place by wire retaining ears or cup washers. Provision shall be made for mounting of batteries, such mounting shall be properly ventilated.

6. The cabinet shall be furnished with not less than two coats of enamel, baked on a properly cleaned surface.

7. A portable telephone set equipped with a plug to fit jack in the fire alarm boxes shall be provided. A hand cradle type set shall be provided for the central office.

8. The fire alarm box described under this specification shall be of the positive non-interfering type arranged to be connected in series with similar fire alarm boxes on a normally closed metallic signalling circuit having a normal direct current flow of 0.100 amperes and to transmit signals over this circuit in accordance with its code number or the operation of the manual telegraph key.

9. The coding mechanism of the box shall transmit four full rounds of its code number for one operation of the starting lever. Each box shall transmit a distinctive code.

10. The pull or starting lever shall be arranged to automatically disengage itself from the mechanism when the box is operated and shall not engage until the mechanism has completed transmission of its signal.

11. The box shall be so arranged that should the coding mechanism of two or more such boxes be operated so as to open the signalling circuit simultaneously one will be automatically selected to transmit its correct signal for four rounds; likewise if operated at such time as another box is transmitting its signal it will not interfere in any way with the signals of the first box. Boxes shall be of the succession type. The non-interfering devices shall be magnet operated.

12. The coding mechanism and the terminal block shall be enclosed in a cast weatherproof case. The outer door of the case to be provided with a substantial lock. The case shall be furnished for connection to 1/2 inch conduit, and shall be finished with two coats of over baked red enamel.

13. On the front of the case there shall be a door or guard of the quick action type completely covering and protecting the pull lever from snow, rain and dirt. The pull lever mounted on the inside of the door, and by means of which the signalling mechanism release is actuated, shall extend through the door directly behind the guard. The guard is held normally closed by a self-restoring, spring actuated hinge so that the guard cannot be left open thereby exposing the pull lever unnecessarily. Operating instructions shall be clearly shown in sharply raised lettering.

14. A terminal and test block shall be provided by means of which the box may be cut out of circuit, the circuit grounded for testing purposes, or for connection of a portable telephone set for communication with headquarters. The terminal block will also include a tap key for manually formulating signals. The terminal block will be of non-combustible material.

15. All metallic parts with which a person testing or operating the box may come in contact shall be effectively grounded to the outer case and all parts electrically connected to the circuit be protected to prevent accidental contact.

16. The materials used shall be of first quality and the methods of fabrication and finish the best for the purposes intended. All parts of the box shall be of precision manufacture and be interchangeable with corresponding parts of other boxes of this type.

17. All steel parts used in the box shall be of stainless steel. The non-interference magnet structure to be of the best grade

magnet iron rust-proofed by parkerizing or other approved method. All contacts of silver mounted in suitable springs. All insulating material shall be of bakelite.

18. The box shall perform all its functions over a current range of from 0.065 to 0.300 amperes and with the ground point of the terminal block disconnected, withstand a potential of 1250 volts (R.M.S.) at 60 cycles between all current carrying parts and the outer case.

19. The box shall be timed for one blow in 1-1/2 seconds. The box shall be easily adjustable for other timing.

20. COMPRESSED AIR EQUIPMENT: The apparatus shall consist essentially of a compressed air storage plant, a sound producing horn operated by compressed air and an operating valve, so that a coded signal may be sounded on the horn.

21. The air storage capacity of the plant shall be such that the system shall be capable of sounding approximately 100 blasts of one second each duration.

22. COMPRESSOR AIR EQUIPMENT: The equipment to be furnished and installed shall consist of the following:

1 motor driven air compressor.
1 main switch (safety enclosed type).
1 magnetic line starter with thermal overload protection.
1 main storage reservoir.
1 auxiliary reservoir.
1 pressure reducing valve.
1 operating valve.
1 air horn.

23. Necessary pipe, wiring, fittings, check valves, shut off cocks, safety valves, gauges, etc., shall be furnished and installed.

24. The compressor shall be of such size to restore normal pressure within 30 minutes after 100 one second blasts of the horn. The compressor shall be suitably and reliably powered, arranged to automatically maintain storage pressure within 15 percent of normal and shall be capable of operating continuously for not less than six hours. Motor shall be for operating on 230 volts, 60 cycle, single phase.

25. The compressor shall require no external piping for the cooling system and if water cooled shall be designed that all water will drain from the cooling system when compressor shuts down.

26. The compressor and driving motor shall be mounted on a common sub-base which in turn shall be mounted on a receiving tank of not less than 60 gallon capacity. Tank shall be built in accordance with ASME requirements.

27. The intake of the compressor shall be equipped with an air filter and muffler.

28. Air Storage Tanks: Shall be of rolled steel plate made to the specifications of the A.S.M.E.

29. Pressure reducing valve: A suitable bronze body pressure reducing valve shall be provided for reducing the pressure of the supply air to the blowing pressure of the horn.

30. Electrically operated valve: In order to convert the electrical impulses from the transmitter or boxes into air blasts, an electrically operated full automatic valve shall be provided. The valve shall function properly over a wide range of pressure. The valve shall cause the coded box signals to be accurately reproduced on the outdoor audible alarm or horn. Provision shall be made for operating this valve manually.

31. Air horn: The air operated horn shall receive the air from the electrically operated valve and shall produce a coded audible alarm that will carry at least one and one half miles in a still atmosphere over a level area. This horn shall have a pitch and tone which is distinct from normal or ordinary city noises and will carry well over these noises without being confused with them. The horn shall be substantial enough to resist the effects of vibration and corrosion. The entire horn assembly shall be dust tight and weatherproof.

32. Miscellaneous Equipment and Fittings: The necessary pipe, shut off cocks, safety valves, fittings, etc., shall be furnished. The pipe and fittings shall be nonferrous. All shut off cocks and safety valves shall be of heavy cast bronze design especially tested for this service.

33. Two air gages shall be supplied, one for the main reservoir as part of the compressor unit, and one for connecting to the horn to ascertain the blowing pressure. The gage shall be of the Bourdon tube type with scale of 200 pounds by 5 pounds. The face of the gage shall be 3-1/2 inches in diameter.

34. A fusible plug shall be supplied so that in case of fire the air pressure will be relieved thereby preventing an explosion of the tank.

35. The compressed air plant shall be completely installed ready for operation.

36. 10 Inch Turtle Gong: The gong described under this specification shall be of the electromechanical type, the striking energy being obtained from a spring driven mechanism controlled by an electromagnet. The gong shall be arranged to be connected in a

normally closed metallic signalling circuit having a direct current flow of 0,100 ampere and to sound in accordance with signalling impulses formulated by the interruption of the current.

37. The materials used shall be of first quality and the methods of fabrication and finish shall be the best for the purpose intended.

38. The gong shall operate over a current range of from 0.065 to 0.300 amperes and respond to signals at a rate of three impulses or less per second. The main spring shall have capacity when fully wound, to sound at least 250 strikes bringing out the full tone of the bell at each stroke.

39. Bell: The bell shall be cast from the best grade of bell bronze and be turned and finished on the outside. The bell will be 10 inches in diameter and so designed as to give a pure and clear tone when struck. The outer surface of the bell shall be secured to the cover of the case by a large hexagonal bronze nut.

40. Case: The operating mechanism shall be enclosed in a round case with close fitting cover.

41. The case shall be cast free from cracks and other imperfections. The case to be finished all over with one coat of oven baked black enamel and all exposed surfaces will have crystalline finish.

42. Striking mechanism: The operating mechanism shall be a substantially constructed spring driven train work. The mechanism shall be of the manually pre-wound type, released to strike one blow for each impulse to the control magnet.

43. The striking hammer shall be of cast bronze rigidly secured to the operating shaft. The hammer to be released by the magnet and to drop by gravity to unlatch the main wheel which will then engage the hammer pawl and positively drive the hammer against the bell.

44. The dropping of the hammer shall mechanically restore the tripping mechanism.

45. The main wheel and shaft shall extend through a cylindrical hole in the bell mounting and bell fastening nut. The main spring shall be wound by a tee handle winding key.

46. The main wheel, mechanism mounting piece and levers, shall be of cast bronze, all shafts will be of steel set in bronze bearings. The electromagnet shall be wound of double silk covered copper wire to a resistance not exceeding 20 ohms on insulating spools. A non-magnetic separator between the armature and core ends shall prevent adhesion from residual magnetism.

All parts except the armature tension spring which is adjustable shall be permanently secured in proper relationship.

47. Terminals: Two sets of terminals are to be provided, one set on the outside of the case at the top and the other inside under the hand plate for concealed wiring connection.

48. Alarm Box Lights: At each fire alarm box, and approximately 10 feet above grade, install a 25 watt vapor proof screw type conduit fitting, complete with porcelain medium base socket, lamp, and ruby globe. Box lights shall be connected to street lighting circuit. If street lighting system is in series, a 6.6 ampere series isolating transformer and lamp shall be installed at each location. Wiring from lamp to street lighting circuits, shall be No. 12 (type RW) wire, enclosed in galvanized conduit, terminated in suitable weatherhood.

49. Wiring: The series fire alarm box loop shall be run on poles. Furnish and install all necessary wire racks, wire and insulators. Wire shall be No. 8, hard drawn, B. and S. gauge, triple braid weatherproof. Wires shall be run to alarm boxes in galvanized conduit, and shall be No. 12 (type RW) wire. End of conduit shall terminate in an approved weatherhood.

50. Box cases shall be permanently and effectively grounded by No. 8 AWG copper wire and suitable driven ground.

OPTIONAL FIRE ALARM SYSTEM: A fire alarm system equal to the system above specified and which will perform all the functions specified and using shunt non-interfering type fire alarm boxes with a gong of the electromagnetic solenoid type, will be acceptable.

DEFENSE HOUSING SPECIFICATION
NATIONAL HOUSING AGENCY
FEDERAL PUBLIC HOUSING AUTHORITY

Division D-25A

UNDERGROUND DISTRIBUTION (ELECTRICAL)

March 1942

> NOTE TO ENGINEER (do not copy)
>
> Specification as written is assumed to be part of the general contract.
>
> Omit items not needed and specify any necessary additional items.

Sec. 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."

> NOTE TO ENGINEER (do not copy)
>
> Revise scope outlined if not applicable to particular project.

Sec. 2. SYSTEMS

1. Light and Power:

> NOTE TO ENGINEER (do not copy)
>
> Describe light and power system in general, stating (a) exact pick-up point of service, (b) current characteristics at point of delivery, (c) current characteristics of project primary and secondary distribution, (d) extent of contractor's work at metering station, and (e) terminating point at building of work under this division.

2. Street lighting:

> NOTE TO ENGINEER (do not copy)
>
> Describe the street lighting system in general.

3. Telephone: Provide a system of trenches and sleeves through walls for cable installation by telephone company.

NOTE TO ENGINEER (do not copy)

Delete paragraph 3, substituting another if work to be done differs from that specified.

Describe any other systems required in additional paragraphs.

Sec. 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. Comply with rules and regulations of the latest editions of National Electrical Code and National Electrical Safety Code bearing on conduct of work as shown and specified. Wherever such codes do not establish a "standard to follow", then follow the standard practice of local electrical utility company in executing the work as drawn and specified. If the contractor observes that drawings and specifications are at variance with aforementioned rules, regulations and standards, he shall promptly notify the Authority, in writing. If the contractor performs work contrary to the above referred to rules, regulations and standards, and without such notice to the Authority, he shall bear all costs arising therefrom.

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 the Authority.

Sec. 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

Sec. 5. MATERIALS

NOTE TO ENGINEER (do not copy)

The various materials enumerated are based on voltage not exceeding 6600. Consult with local utility company as to standard if this voltage is exceeded.

IMPORTANT NOTES

THE "DEFENSE HOUSING CRITICAL LIST" ISSUED BY FEDERAL AGENCY CONTROLLING PRIORITIES AND REVISED AT PERIODIC INTERVALS CONTAINING A LIST OF CRITICAL MATERIALS, GIVING LIMITATIONS OF THEIR USE, SHOULD GUIDE CONTRACTOR IN SELECTION OF MATERIALS. PRIORITY AID WILL BE CONSIDERED ONLY ON MATERIALS WHICH APPEAR ON THE "DEFENSE HOUSING CRITICAL LIST."

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 OF 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 and be so labeled, or shall conform to their requirements, in which case certified statements to that effect shall be furnished. Use new materials and appliances.

2. RACEWAYS AND FITTINGS:

(a) Rigid metal conduit (zinc coated)	*Fed.Spec.E-WW-C-581a June 30, 1941
(b) Rigid metal conduit (enameled)	Fed. Spec. WW-C-571
(c) Rigid metal conduit fittings	*Fed.Spec.E-WF-406 May 23, 1941
(d) Fibre conduit (for concrete encasement)	Fed. Spec. W-C-581 Type I
Without concrete encasement	Fed. Spec. W-C-581 Type II

* Emergency alternate specifications to the Federal Specifications have been issued in the interest of conservation of strategic materials. Copies of these "emergency alternate specifications" may be obtained upon request.

(e) Cement asbestos conduit shall be of "standard" or "light" weight, having noncombustible mixture of cement and pure asbestos fibre, formed under pressure into dense, homogenous, close grained, inert, non-porous 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 feet nor more than 10 feet.

3. WIRES AND CABLES

(a) Duct and Vault Installation	Grade	Specifications
Moisture resistant	Type RW	*Fed.Spec.E-J-C-103 December 24, 1941
Rubber covered, lead sheathed	Type R	A.S.T.M. or *Fed.Spec.E-J-C-103 December 24, 1941
Varnished cambric, lead sheathed	--	IPCEA

(b) Direct Earth Installation	Grade	Specifications
Lead covered, metallic armored		IPCEA
Lead and jute covered		IPCEA
Lead and duck tape		IPCEA
Non-metallic fibrous or rubber jacket		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 close grained gray iron flanged type with at least 30" round clear opening with overall dimensions of flanges approximately 45" square, rib braced. Cover shall be heavy ribbed cast steel with

* Emergency alternate specifications to the Federal Specifications have been issued in the interest of conservation of strategic materials. Copies of these "emergency alternate specifications" may be obtained upon request.

ventilating holes with the word "Electric" cast in approximately 2" letters. Deliver to project unpainted; after inspection and approval, apply two coats of asphalt paint.

6. CABLE RACKS shall be malleable iron or steel, galvanized or non-metallic coating, with mounting holes or hooks.

7. CABLE RACK HOOKS shall be malleable iron or steel, galvanized or non-metallic coated, 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 steel, galvanized or non-metallic coated, having rungs spaced approximately 12" apart; length as required.

10. PULLING EYES shall be of approximately 7/8" round steel, galvanized or non-metallic coated.

11. GROUND RODS shall be steel, galvanized or otherwise treated to resist rusting, 5/8" x 8' minimum length (diameter over threads).

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 buses, transformers and secondary protection and disconnects.

NOTE: Listed in Paragraphs Nos. 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.

NOTE TO ENGINEER (do not copy)

Give the ampere rating, voltage and interrupting capacities of primary cutouts or breakers. Consult with local utility company.

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.

NOTE TO ENGINEER (do not copy)

Paragraph 14 is based on standard disbribution type transformers. Delete if equipment will be subjected to submersion incorporating paragraph covering subway type equipment.

(a) Ratings:

(b) Primary voltage taps:

NOTE TO ENGINEER (do not copy)

In (a) above describe primary and secondary voltage ratings, frequency, whether single or three phase.

In (b) above, only if local conditions warrant, specify four 2.5% full capacity taps below normal, as standard transformers (2400 to 4160 volts) 1.5 to 50 KVA, single phase, are not equipped with taps.

(c) Secondary coils shall be arranged for series and multiple or 3-wire connections.

(d) Terminals shall be detachable cork gasketed copper stud type, insulated by porcelain bushing extending into case and clamped into position. High voltage insulated leads from the high voltage bushings to the terminal board or coils shall enter a bushing so designed that under 60 cycle or standard impulse tests the flashover of the bushing shall be on the outside of the tank.

(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. Cover shall form a splash proof joint. Tanks and covers shall be furnished with one priming coat and one finishing coat, or equivalent, or weather resisting material.

(g) Furnish standard NEMA accessories with all transformers. Provide on each transformer 25 KVA and larger a thermal temperature indicator.

(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 26,000 volts when tested between vertical surfaces 1" in diameter and 0.10" apart.

(i) Acceptance tests shall conform to latest revision of the proposed American Standards for Transformers and the proposed American Recommended Practice, Test Code for Transformers, ASA Publication C57.1, .2 and .3 and the NEMA Standards for Transformers, Publication 32-12.

(j) Name plate of corrosion resisting material and finish, giving rating, impedance data and connection diagram.

(k) Manufacturer shall, through contractor, submit evidence based on previous tests made on approximately the same size and voltage class of transformer that the design to be furnished will meet the impulse requirements. In addition, submit data as follows, guaranteeing the equipment furnished to conform therewith:

1. No load loss.
2. Full load loss.
3. Full load regulation at 100% and 80% power factor.
4. Approximate net and shipping weights.
5. Approximate overall dimensions.
6. Gallons of oil required per transformer.

15. SECONDARY PROTECTIVE EQUIPMENT:

16. SERVICE ENTRANCE ROOM EQUIPMENT:

NOTE TO ENGINEER (do not copy)

Describe the secondary protective and service entrance equipment in the paragraphs above.

17. STREETLIGHTING FIXTURES shall consist of concrete lighting standards supporting lighting units (equipped with 2500 lumen lamp). The aggregate employed shall consist of crushed granite or marble and the cement shall conform to current ASTM specifications and tests. Cement shall be one part by weight to three parts by weight of mixed aggregate. Steel reinforcing bars shall conform to ASTM specifications for rail or billet steel. The finish shall be smooth polished surface, all surface cement having been removed revealing the aggregate used.

(a) Approximate height to light source shall be 14 feet; exposed metal parts to have corrosive resistant coating both inside and outside.

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 cylinder type 3/8" yoke with heavy chain, galvanized or otherwise treated to resist corrosion, about 15" long. Locks for similar equipment shall be keyed alike. Deliver six keys for each set with attached metal labels. Rubber insulating gloves shall be of high quality, subject to 1,000 volt test.

19. SPARE PARTS: Furnish and deliver, suitably packed and marked, spare and duplicate parts as follows:

NOTE TO ENGINEER (do not copy) List parts required.

METHOD OF INSTALLATION

IMPORTANT NOTES

MATERIALS AND WORKMANSHIP SHALL RESULT IN AN INSTALLATION FREE FROM DEFECTS AND WHICH WILL RENDER SATISFACTORY PERFORMANCE. CONTRACTOR SHALL REPAIR OR REPLACE ANY MATERIAL, PARTS OR EQUIPMENT WHICH DEVELOP DEFECTS WITHIN A PERIOD OF ONE YEAR AT NO EXPENSE TO THE GOVERNMENT. ALL LABOR NECESSARY TO MAKE REPAIRS OR REPLACEMENTS SHALL BE PROVIDED. IN THE EVENT THAT A REPETITION OF ANY ONE DEFECT OCCURS, INDICATING THE PROBABILITY OF FURTHER FAILURES WHICH CAN BE TRACED TO FAULTY DESIGN, MATERIAL OR METHOD OF INSTALLATION, CONTRACTOR SHALL NOT CONTINUE TO REPLACE WITH SAME MATERIAL OR PART BUT SHALL TAKE STEPS TO REMEDY THE FAULT THROUGH REDESIGN.

Sec. 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 on locations. 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.

Sec. 7. 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.

Sec. 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-Sewers, Water and Gas" and "Concrete and Masonry" respectively.

NOTE TO ENGINEER (do not copy)

Check in individual specification make up this reference to other divisions of specifications.

4. Slope floor to drain to sump pit.

NOTE TO ENGINEER (do not copy)

Method of draining manholes depends on local drainage conditions and local utility company's practice. Describe method required.

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. Group 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.

ec. 9. INSTALLATION OF RACEWAYS (CONCRETE)

1. Excavate trench to proper depth. Raceway shall be at least 30" below final finished grade; the 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. 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.

Sec. 10. INSTALLATION OF RACEWAYS (WITHOUT CONCRETE)

1. Excavate trench to proper depth. Raceway shall be at least 30" below final 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 between 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" or concrete on all sides in a manner as outlined in section "Raceways in Concrete.".

Sec. 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.

Sec. 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 conduits shall be given one coat of acid resisting paint.

Sec. 13. INSTALLATION OF SERVICE SLEEVES

1. Install metal conduit sleeves or nipples in foundation walls of buildings for connection to underground raceways or for entrance of direct burial cable.

Sec. 14. TRANSFORMER VAULT EQUIPMENT INSTALLATION

1. Layouts 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; interconnect 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."

NOTE TO ENGINEER (do not copy)
Delete above paragraph if equipment varying from that specified is proposed and substitute a paragraph covering equipment to be furnished.

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 the contractor. Provide and install necessary facilities and connections between primary cutouts and transformers to receive the metering equipment, all in accordance with utility company's rules and regulations.

NOTE TO ENGINEER (do not copy)

If the extent to which the local utility company will extend service connections varies, or if equipment to be furnished differs from that called for in above paragraph, revise the paragraph to describe the extent of the utility company's work and the point of pick-up by the contractor as well as the equipment to be furnished.

Sec. 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.

Sec. 16. INSTALLATION OF CABLE DIRECTLY IN GROUND

1. Install at minimum of 36" below final finished grade, laid so as not to obstruct known future construction or improvements. Protect cables, extending under driveways, streets, etc., and in crossing other utility lines by installing in cast iron pipe or metal conduit. Extend raceways 24" at each end beyond width of paved area under which installed.

2. Where cables enter buildings, extend through metal conduit sleeves set in walls during wall construction. After cables are installed through sleeves, calk 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.

Sec. 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.

Sec. 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" division. In racking, keep secondaries at least 1' 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. Junction box or conduit fitting on 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.

Sec. 19. SECONDARY DISTRIBUTION CENTERS

NOTE TO ENGINEER (do not copy)

Describe the installation of secondary distribution centers, if any.

Sec. 20. GROUNDING

1. Ground equipment and service 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) operating rods of mechanically operating disconnect switches, (d) switch frames, switch bases, instruments 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" 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.

Sec. 21. STREET LIGHTING INSTALLATION

NOTE TO ENGINEER (do not copy)

It is generally expected that street lighting for the project will be an extension of the existing municipal street lighting system, using same type of equipment now in use. Even though the project street lighting system may be independent of the municipal street lighting system, the design of the system and the equipment should be in accordance with the existing system in the immediate vicinity of the project.

In remote locations where municipal street lighting service is not available, the street lighting installation should be included under this specification. The following paragraphs and Paragraph 17 under Section 5 may be used.

1. Plumb street lighting posts in 90 degree planes.

2. Clear water plugs by at least 3'; clear sewer catch basin sufficiently so as not to interfere with basin.

3. Method of control;

NOTE TO ENGINEER (do not copy)

Describe under Paragraph 3 method of control. Generally, the street lighting should be controlled from one time switch actuating relays through pilot wires. Relays may operate one or more lighting units. Time clock to have on load side a manually operated switch for blackout use, switch should be located where conveniently accessible during night period.

Sec. 22. INSTALLATION OF TELEPHONE SYSTEM

1. Trench as shown, installing metal 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.

NOTE TO ENGINEER (do not copy)

Delete the above paragraph substituting another if the work to be done differs from that specified.

Sec. 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.

Sec. 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.

Sec. 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 reconducted. Submit certified copy of report on reconducted test.

Sec. 26. FIRE ALARM SYSTEMS

NOTE TO ENGINEER (do not copy)

It is generally expected that the fire alarm system for the project will be supplied by the local municipality at its expense and that it will be an extension of the existing municipal fire alarm system, using the same type of equipment now in use. Even though the project fire alarm system may be individual of the municipal fire alarm system, the design of the system and the equipment should be in accordance with the existing system in the immediate vicinity of the project.

In remote locations where municipal fire alarm service is not available, the fire alarm installation should be included under this specification. In the division of the specification titled "Overhead Distribution - Electrical", under Section 17, four different types of systems are listed. These systems are based on overhead pole line construction. In adopting one of these systems where underground distribution is contemplated, the wording of the section should be modified to accommodate an underground system.

DEFENSE HOUSING SPECIFICATION
NATIONAL HOUSING AGENCY
FEDERAL PUBLIC HOUSING AUTHORITY

Division D-50A

COAL CIRCULATING SPACE HEATERS

June 25, 1942

Sec. 1. DESCRIPTION

1. Heaters shall be of the surface or magazine feed, flue connected combination radiant and circulating type, adaptable for burning anthracite and bituminous coals and coke. Minimum output capacities in Btu per hour shall be as indicated on the drawings.

2. Heaters shall meet the operating and test requirements set forth in the latest Tentative Draft of Commercial Standards for Coal Burning Space Heaters. Documentary evidence shall be submitted to the Government, prior to shipment, indicating that a heater of each size and model has been tested and has complied with the requirements specified therein.

Sec. 2. CONSTRUCTION

1. Outer casing shall be constructed of sheet steel, cast iron or a combination of both. The casing shall enclose a substantial portion of the heater or may enclose the entire unit, shall be rigidly secured and be properly reinforced or braced for adequate strength and to prevent warping. It shall be provided with openings for air circulation; supply openings shall be in the form of grilles, louvers, or a combination of both. The casing shall be equipped with suitable means to permit easy access to the ash pit and the fire pot or combustion chamber without removing casing or any part thereof. Casing enclosing entire unit shall be supplemented with means for providing radiant heat through openings similar to supply, or doors properly fitted in casing. Outer surfaces of casing shall be finished with a high quality porcelain or vitreous enamel, or baked enamel if casing is properly protected with insulation or baffle. Outer surfaces of heater not enclosed by casing shall be protected to resist color deterioration under normal operating conditions.

2. Combustion chamber including ash pit and fire pot sections shall be constructed of steel or cast iron or a combination of both. Steel parts shall be adequately protected with high grade refractory or cast iron liner properly inserted and supported. Combustion chamber shall be equipped with means to effect the combustion of the volatile matter in the fuel and reduce the emission of smoke from the chimney to a minimum. Means shall also be included to prevent the emission of smoke within the room when opening firing door during servicing. Fire pot of surface feed heaters shall have capacity to hold sufficient coal for a minimum period of 8 hours of continuous operation in coldest weather. Chamber of magazine feed heaters shall have a capacity to hold not less than 100 pounds of fuel at one loading. Smoke outlet or smoke hood shall be fitted with a cast iron choke damper having ample opening for passage of gases and arranged for convenient manual operation. Checking damper shall be provided and be suitable for installation in the smoke pipe, or may be furnished as an integral part of the heater or smoke hood

(over)

between choke damper and building flue. Necessary draft openings shall be provided to permit manual regulation of air to support combustion.

3. Ash pit section shall be of such height as to provide ample room for ash pan extending under entire grate surface and to permit circulation of sufficient air to support combustion. Ash pan shall be constructed of black steel of thickness not less than No. 26. U. S. Standard Gage equipped with handle and bale for easy removal and lifting. Pan shall be of sufficient width to catch all the ashes falling from the grates and have sufficient capacity to hold ashes resulting from not less than 24 hours continuous operation in coldest weather.

4. Doors directly attached to heater shall be cast iron, accurately ground and fitted reasonably tight, and be equipped with means for comfortable handling. Doors extending through casing shall be finished as specified for casing. Doors may be of pressed steel provided such doors are not subjected to direct heat from fire.

5. Grates shall be of heavy cast iron of shaking and dumping type, arranged for operation with opening doors. Poker and shaker bar shall be furnished with each heater.

6. Heater shall be supported on cast iron or steel base arranged to permit a minimum of 3 inch space under ash pit.

7. Stove board shall be furnished with each heater and be constructed of insulated sheet steel of sufficient size to extend on all sides of heater.

8. Draft regulator or barometric control shall be durably constructed of material protected to retard corrosion. It may be furnished as an integral part of heater or shall be suitable for installation in the smoke pipe and be so located and locked at a setting to limit burning rate to maximum rated output of heater. Regulator or control may have means incorporated thereon to permit its operation as a checking damper in which case the separate check damper specified hereinbefore can be eliminated. Space heaters equipped with self-contained thermostatic device to insure means of controlling banked fire conditions, as well as limiting burning rate as referred to hereinbefore, need not be equipped with choke damper nor regulator as stipulated. Draft regulator not equipped integral with heater shall be installed in smoke pipe not more than one foot above top of smoke collar; damper shall not be in path of flue gas stream.

Sec. 3. GUARANTEE

1. Guarantee set forth in the General Conditions shall apply, except as to extraneous damage to porcelain or vitreous enamel.

Sec. 4. INSTRUCTIONS

1. With each unit there shall be furnished installation instructions, operating instructions, and list of repair parts.

DEFENSE HOUSING SPECIFICATION
NATIONAL HOUSING AGENCY
FEDERAL PUBLIC HOUSING AUTHORITY

Division D-50B

OIL BURNING CIRCULATING SPACE HEATERS

June 25, 1942

Sec. 1. DESCRIPTION

1. Heaters shall be of the flue connected combination radiant and circulating type, adaptable for burning at least fuel oil No. 1 as defined in the latest Commercial Standards for Fuel Oils. Minimum output capacities in Btu per hour shall be as indicated on the drawings.

Sec. 2. CONSTRUCTION

1. Heater shall have oil control valve and be equipped with fuel tank minimum 3-gallon capacity as an integral part of the unit. Otherwise, heater including accessories and fittings, shall conform to the general design and construction, performance and test requirements set forth in the Commercial Standards CS101-43, "Flue Connected Oil-Burning Space Heaters Equipped with Vaporizing Pot-Type Burners."

2. Supply of fuel shall be automatically regulated and controlled by means of a constant level valve or by a barometric feed device.

3. Outer casing shall be of the solid flue type constructed of sheet steel, cast iron or a combination of both. The casing shall enclose the entire unit except tank and controls and shall be rigidly secured and be properly reinforced or braced for adequate strength and to prevent warping. It shall be provided with openings for air circulation; supply openings shall be in the form of grilles, louvers, or a combination of both. The casing shall be equipped with suitable means to permit easy access to the inside parts of the combustion chamber through the sides or front without removing the casing or any part thereof. Casing shall be supplemented with means for providing radiant heat through openings similar to supply, or doors properly fitted in casing, Casing meshed over the entire length or a substantial portion thereof will not be acceptable. Outer surface of casing shall be finished with a high quality porcelain or vitreous enamel, or baked enamel.

4. Stove board shall be furnished with each heater and be constructed of insulated sheet steel of sufficient size to extend on all sides of unit.

Sec.3. SPECIAL NOTE

1. Informative labeling as set forth in Commercial Standards CS101-43 will not be required prior to January 1, 1943. However, documentary evidence shall be submitted to the Government prior to shipment that heaters comply with all requirements including construction and rating set forth in these Commercial Standards.

Sec. 4. INSTRUCTIONS

1. With each unit, there shall be furnished installation instructions, operating instructions and list of repair parts.

DEFENSE HOUSING SPECIFICATION
NATIONAL HOUSING AGENCY
FEDERAL PUBLIC HOUSING AUTHORITY

Division D-50C

GAS FIRED CIRCULATING SPACE HEATER

June 25, 1942

Sec. 1. DESCRIPTION

1. Heaters shall be of the vented, circulating type, cabinet style designed for burning gas, and shall have minimum AGA input ratings as shown on the drawings.

2. Heater shall have the current listing of the AGA or conform to its requirements and be so labeled.

Sec. 2. DESIGN, CAPACITY, ETC.

1. The outer casing shall be of steel, cast iron or a combination of both. The casing shall be rigidly secured and shall be properly reinforced or braced for maximum strength and to prevent warping. It shall be provided with openings for air distribution, both supply and return. Supply openings shall be either in the form of grilles or louvers or a combination of both, and be equipped with means such as door or panel for easy access to the gas manifold. Outside of casing shall be protected with a finish coat of heat proof porcelain enamel, or baked enamel.

2. Burner shall be of heavy cast iron or steel, shall operate on the Bunsen principle and be suitable for operation with the type and pressure of the gas available at the project.

3. An easily accessible control valve shall be provided at the burner manifold for manually regulating the supply of gas to the burner.

4. Combustion chamber (heat exchanger) shall be of steel, cast iron or a combination of both, so formed that air will flow freely over the surfaces. Steel parts shall be not less than No. 20 U. S. Standard Gage (approximate thickness 0.037 inches).

5. Back draft diverter shall be integral with heater or mounted on rear of heater. Diverter shall not protrude above top of heater cabinet.

6. Suitable provision shall be made to effect the repairing or replacement of burners, etc. Means shall be provided to easily observe the burner as well as to easily light the pilot.

7. Pilot shall be manual for natural, mixed or manufactured gas, and shall be automatic for liquefied petroleum gases.

8. Automatic pilot control shall be self-contained type designed to automatically cut off the supply of gas to the main burner and pilot burner upon flame failure, and remain off until pilot is relighted.

(over)

Sec. 3. INSTRUCTIONS

1. With each unit there shall be furnished installation instructions, operating instructions, and list of repair parts.

DEFENSE HOUSING SPECIFICATION
NATIONAL HOUSING AGENCY
FEDERAL PUBLIC HOUSING AUTHORITY

Division D-51A

GAS FIRED FURNACE WITH PRESSURE TYPE BLOWER AND CONTROLS

June 25, 1942

Sec. 1. FURNACE DESIGN, CAPACITY, ETC.

1. The furnace shall be complete with burner, blower, draft hood, motor, controls, and plenum. The furnace design shall be what is generally known as the "high boy" type having the blower mounted in the base, and provided with mounting on top of furnace for a plenum.

2. The furnace shall be a direct fired forced warm air unit of "blow through" type designed for automatic firing with gas and shall be capable of generating sufficient heat to deliver 60,000 Btu per hour at the bonnet when provided with a blower of 600 CFM capacity and with incoming air temperature of 70 degrees F. Furnace shall have the current listing of the American Gas Association or shall conform to its requirements and be so labeled.

3. The overall dimensions of casing shall be not more than 26 inches wide by 26 inches deep. Manifold and controls shall be inside casing.

4. Provision shall be made so return air ducts can be connected on either side, back or bottom of furnace. Furnace shall be furnished with a knock-down plenum chamber made of No. 26 U. S. standard gage steel finished in baked enamel to match the furnace casing; shall be sufficiently high to extend the overall height of the furnace and plenum chamber to 7 feet 2 inches.

5. Combustion chamber (heat exchanger) shall be constructed of steel, cast iron or a combination of both, with seams or joints so constructed as to prevent the combustion gases from reaching the circulating air stream. Primary heating surface, when constructed of steel, shall be of thickness not less than No. 18 U. S. standard gage (approximate thickness 0.049 inch) and secondary heating surface shall be not more than one gage lighter. Cast iron shall be not less than 3/8 inch thickness.

Sec. 2. BURNER

1. The burner constructed of heavy cast iron or steel shall operate on the Bunsen principle.

2. The burner shall be of such design as to permit ample supply of secondary air between the ports of jets and shall be capable of functioning so that flashback will not occur with the operation of the burner on and off. The burner shall be suitable for use with the type and pressure of gas available at the project.

Sec. 3. BLOWER-MOTOR UNIT

1. Blower shall be standard catalog product of a reputable manufacturer and shall be a capacity to deliver 600 CFM against a static pressure of 1/4 inch of water operating at a speed not exceeding 650 RPM. Blower shall be rated and constructed in accordance with the National Association of Fan Manufacturers and the ASHVE Standard Test Code for Centrifugal and Axial Fans. The impeller wheel shall be of the multi-blade type and shall be statically balanced.

2. Motor shall be in accordance with AIEE and NEMA standards; selected for quiet operation; shall be of sufficient capacity to operate the blower at its rated capacity without undue heating and sparking; shall be an approved induction type, long hour duty; wound for 115 volt, single phase, 60 cycle, alternating current; with thermal overload protection and automatic reset and arranged for controls hereinafter specified.

3. Blower and motor shall be provided with vibration damping media.

4. The blower unit shall be connected to the driving motor by means of an adjustable pulley "V" belt drive that will permit a variation in the speed of the fan. Means shall be provided for tightening the belt.

Sec. 4. FURNACE, BLOWER AND MOTOR CASING

1. The casing shall enclose the entire unit, furnace, blower, etc. including transformers (if any), wiring, gas pressure regulator, pilot connections and piping and automatic gas valve.

2. The casing shall be colored baked enamel of approved tint, smooth or wrinkle finish, rigidly secured from the inside, constructed of thickness not less than No. 24 U. S. standard gage.

3. That portion of the casing enclosing the furnace heating surface shall be equipped with a steel inner liner, not less than No. 26 U. S. standard gage. The liner shall be secured to the casing to provide a minimum one inch air space between casing and liner and in such a manner to permit a positive air flow therein. Liner shall be so arranged that temperature of outside of casing will not exceed 100 degrees F. above the air inlet temperature, but in no case shall it exceed 170 degrees F.

4. Removable panels or doors shall be provided in front side for easy access to furnace, blower-motor unit, and controls, and provision shall be made for plenum connection and blower air inlet. Necessary openings shall be provided for air to support combustion.

Sec. 5. CONTROLS

1. Controls shall consist of a gas pressure regulator, automatic gas valve, safety pilot, blower control, high limit control, and room thermostat.

2. Automatic gas valve shall be of the electrically actuated type depending upon outside source of current or of the type operated by means of multiple thermocouple energized by the pilot flame. Valve and mechanism shall be constructed of corrosion resisting materials.

3. The safety pilot control shall be connected electrically to the automatic gas valve or may be of the self-contained thermostatic type requiring no outside electrical source, designed and arranged to automatically cut off the supply of gas to the main burner or burners upon pilot flame failure and to remain off until pilot is relighted. When burning liquefied petroleum gas, this control shall automatically shut-off the supply of gas to the main burner and pilot burner upon flame failure, and remain off until pilot is relighted. All neeeessary pilot tubing, pilot shut off cock and pilot head shall be provided. All parts including tubing shall be constructed of corrosion resisting materials.

4. Blower shall be controlled by an immersion type bonnet thermostat designed to operate the blower motor on and off when the bonnet temperature rises above or falls below the predetermined settings. The settings ahall be adjustable over a scale range of approximately 90 to 180 degrees F. with a minimum adjustable differential of approximately 25 degrees.

5. High limit control shall also be an immersion type bonnet thermostat, designed to close the automatic gas valve when the temperature rises above, and to open the valve when the temperature falls below predetermined control settings. Control shall have a non-adjustable differential of approximately 25 degrees F. Means shall be provided to limit the maximum setting at 200 degrees F., at which point it shall be fixed at the factory for operation. Separate "high limit" and fan switches or a combination control incorporating both will be acceptable.

6. The room thermostat shall be designed to close and open the automatic gas valve when the temperature rises above or falls below predetermined settings. The thermostat shall be equipped with a thermometer, operating on a differential of 2 degrees F. over a scale range of approximately 55 to 85 degrees F.

7. If control elements are set in bonnet of furnace, baffles shall be provided so that elements are in direct path of the circulating air.

8. All electrical controls shall be of sufficient capacity to operate without the use of a relay or starter. Transformers shall be included if required.

Sec. 6. INSTRUCTIONS

1. With each unit there shall be furnished installation instructions,

operating instructions, and list of repair parts. Permanently affix such instructions in each dwelling unit where directed by Government.

DEFENSE HOUSING SPECIFICATION
NATIONAL HOUSING AGENCY
FEDERAL PUBLIC HOUSING AUTHORITY

Division D-51B

OIL FIRED FURNACE WITH GRAVITY TYPE BURNER AND PRESSURE TYPE BLOWER AND CONTROLS

June 27, 1942

Sec. 1. FURNACE DESIGN, CAPACITY, ETC.

1. Furnace shall be complete with oil burner, blower, blower motor, controls, mechanical draft fan and balanced type draft damper.

2. The furnace design shall be what is generally known as the "highboy" type having the blower mounted in the base and provided with mounting on top of furnace for a plenum.

3. The furnace shall be a direct fired forced warm air unit of "blow-through" type, adaptable for mechanical draft oil burning, designed and arranged for forced air circulation. It shall be capable of developing sufficient heat to deliver a minimum of 60,000 Btu's per hour at the bonnet when connected to a blower of 600 CFM capacity and with incoming air temperature of 70 degrees F. when operating at rated capacity of not less than 70 per cent efficiency. Capacity shall be measured under stack draft conditions not exceeding 0.04 inch water column. Furnace shall produce required output with surface temperature of heating surface at no point of unit exceeding 1000 degrees F.

4. The over-all dimensions of the casing shall be not more than 26 inches wide by 26 inches deep or 26 inches in diameter.

5. Furnace shall be furnished with a knocked-down plenum chamber made of No. 26 U.S. Standard Gage steel and finished in baked enamel to match the furnace casing, and sufficiently high to extend the over-all height of the furnace and plenum chamber to 7 feet 2 inches.

6. Combustion chamber (heat exchanger) shall be constructed of steel, cast iron, or a combination of both, with joints gas tight, steel parts of thickness not less than No. 18 U.S. Standard Gage or No. 20 porcelain enamel, cast iron not less than 3/8 inch thickness. Over-all height of chamber shall be such that when burner is on high fire, the flame will not impinge against top surfaces. Chamber shall have provision for convenient access for servicing burner. Smoke outlet shall be at rear and be equipped with tightly fitted casting, affording means for attaching smoke pipe.

7. Burner shall be of the vaporizing pot type constructed of metal suitable for temperatures encountered under normal operating conditions. It shall be rated and approved by the Underwriters Laboratories for burning No. 2 fuel oil as defined in Commercial Standard CS12-40 "Fuel Oils" and shall meet the applicable requirements including performance tests of Commercial Standard CS75-42 "Automatic Mechanical Draft Oil Burners Designed for Domestic Installation", both standards promulgated by U.S. Department of Commerce.

8. Furnaces shall be provided with automatic balanced type draft regulator.

Sec. 2. MECHANICAL DRAFT FAN

1. Mechanical draft fan shall be direct-connected electric motor driven securely attached to furnace, quiet in operation, designed to supply sufficient primary and secondary air to support combustion for both high and pilot fire operation.

Sec. 3. BLOWER-MOTOR UNIT

1. Blower-motor unit shall be arranged for "blow through" quiet operation, up blast discharge and shall be set directly underneath furnace.

2. The blower shall be the standard catalog product of a reputable manufacturer and shall have a capacity to deliver 600 CFM against a static pressure of 1/4 inch of water, operating at a speed not exceeding 650 RPM. The blower shall be rated and constructed in accordance with the National Association of Fan Manufacturers and the ASHVE Standard Test for Centrifugal and Axial fans. The impeller wheel shall be of the multi-blade type and shall be statically balanced.

3. Motor shall be in accordance with AIEE and NEMA standards; selected for quiet operation; shall be of sufficient capacity to operate the blower at its rated capacity without undue heating and sparking; shall be approved induction type, long hour duty; wound for 115 volt, single phase, 60 cycle, alternating current; with thermal overload protection and automatic reset and shall be arranged for controls hereinafter specified.

4. Blower and motor shall be provided with vibration damping media.

5. The blower unit shall be connected to the driving motor by means of an approved adjustable pulley "V" belt drive that will permit a variation in the speed of the fan. Means shall be provided for tightening the belt.

Sec. 4. FURNACE, BLOWER AND MOTOR CASING

1. Casing shall enclose the entire unit. The casing shall be colored baked enamel, smooth or wrinkle finish, secured from the inside (except where necessary to secure to furnace), of thickness not less than No. 24 U. S. Standard Gage.

2. That portion of casing enclosing furnace shall be equipped with a steel inner liner, of thickness not less than No. 26 U. S. Standard Gage. The liner shall be secured to casing to provide a one inch minimum air space between casing and liner, permitting a positive air flow therein and preventing the outside surface temperature exclusive of the hood or casing cap from exceeding 100 degrees F. above the inlet air temperature, but in no case exceeding 170 degrees F.

3. Access door shall be provided to burner in front side directly ahead of opening in combustion chamber, snugly fitted to outer casing and liner. If no separate door to burner is provided on combustion chamber, door in casing shall have inner liner.

4. Removable panel or door shall be provided in front side for servicing blower-motor unit. Provision shall be made so return air ducts can be connected on either side, back or bottom of furnace.

Sec. 5. CONTROLS

1. Combination constant level and control valve shall be of float and trip type, permitting air escapement, shall be equipped with auxiliary mechanism for manual release and reset, and fitted with a mesh screen easily removable and of ample area to insure delivery of clean oil to burner. All parts of valve shall be corrosion resistant. Valve shall be electrically operated, designed to (1) preclude further supply of oil to burner upon the oil reaching a predetermined level therein; (2) regulate supply of oil to burner at pilot and high fire settings, changing from one setting to the other; (3) cut the flow of oil to pilot flow rate in the event of electric power failure.

2. Valve shall have concealed screws for adjusting pilot and high fire settings with means for restricting pilot and limiting high fire settings.

3. Blower control shall be an immersion type bonnet thermostat designed to start blower-motor when bonnet temperature rises above and stop motor when temperature falls below predetermined control settings. The settings shall be adjustable over a scale range of approximately 90 to 180 degrees F. with a minimum adjustable differential of approximately 25 degrees F.

4. High limit control shall be an immersion type bonnet thermostat, designed to electrically operate the combination constant level and control valve at pilot fire when bonnet temperature rises above, and at high fire when temperature falls below predetermined control settings. Control shall have a non-adjustable differential of approximately 25 degrees F. Means shall be provided to limit the maximum setting at 200 degrees F., at which point it shall be fixed at the factory for operation. Separate "high limit" and fan switches or a combination control incorporating both will be acceptable.

5. Room thermostat shall be designed to electrically operate combination constant level and control valve at pilot fire when room temperature rises above, and at high fire when temperature falls below predetermined settings. Thermostat shall be equipped with thermometer, and be designed to operate on a differential of approximately 2 degrees F. over a scale range of approximately 55 to 85 degrees F.

Sec. 6. UNDERWRITERS' APPROVAL

1. Furnace, burner, and controls shall have the Underwriters' Laboratories current listing or conform to their requirements and be so labeled.

Sec. 7. INSTRUCTIONS

1. With each unit there shall be furnished installation instructions, operating instructions, and list of repair parts. Permanently affix such instructions in each dwelling unit where directed by Government.

DEFENSE HOUSING SPECIFICATION
NATIONAL HOUSING AGENCY
FEDERAL PUBLIC HOUSING AUTHORITY

Division D-51C

COAL FIRED FURNACE WITH PRESSURE TYPE BLOWER, STEEL OR CAST IRON

June 25, 1942

Sec. 1. FURNACE DESIGN, CAPACITY, ETC.

1. The furnace shall be furnished complete with blower, motor, blower control, and manual draft control.

2. Furnace shall be a direct fired, forced warm air unit of "blow through" type, adaptable for coal, hand firing, designed and arranged for forced air circulation, and shall be capable of developing sufficient heat to deliver a minimum of 60,000 Btu per hour at the bonnet. Rating shall be in accordance with the equation set forth in the latest edition of "The Technical Code for the Design and Installation of Mechanical Warm Air Heating Systems," promulgated by the National Warm Air Heating and Air Conditioning Association, and shall be based upon 12,000 Btu per pound coal operating at a combustion rate of 7-1/2 pounds per hour per square foot of grate area.

3. The overall dimensions of the casing shall be not more than 26 inches wide by 26 inches deep or 26 inches diameter.

4. Furnace body shall be constructed of steel or cast iron, with all seams or joints smoke and gas tight.

(a) If of steel, shell and head shall be of thickness not less than No. 10 U. S. Standard Gage (approximate thickness 0.138 inch); ash pit bottom shall be of steel plate of thickness not less than No. 14 U. S. Standard Gage (approximate thickness 0.077 inch) welded in place to prevent air leakage. Fire box shall be equipped with high grade segment type refractory suitable for the service intended, properly inserted and adequately supported, or cast iron chrome alloy protective liner. Cast iron chrome alloy liner, if used, shall be guaranteed by manufacturer for 10 years. Fire door opening shall be equipped with rigidly secured heavy feed chute plate. Furnace shall have a "V" shaped or approved equivalent baffle at flue opening.

(b) If of cast iron, furnace shall be of the open dome or radiator type. Castings shall be of heavy iron without perpendicular joints, free from sand holes or other defects. Ash pit and fire door extensions shall be machine ground, integral respectively with base, and feed or dome sections. Radiator or dome section shall have integral smoke outlet and cleanout. Fire pot shall be not less than 3/8 inch thick.

5. Ash pit of furnace shall be provided with a ventilated air space at least 3 inches off floor and shall be equipped with a removable ash pan.

Ash pan shall be constructed of No. 26 U. S. Standard Gage (approximate thickness 0.018 inch) equipped with handle and bale, and with beaded edges or edges rolled over wire frame.

6. Smoke outlet shall be at rear of furnace, be 7 inches in diameter, and be fitted with a full size heavy cast iron or steel smoke hood, rigidly secured to outlet, fitted with a choke damper and check draft door, both cast iron, and affording means for connection to vertical smoke pipe. Choke damper shall be set between flue outlet and check draft door, have ample opening for passage of gases, and be arranged for convenient manual operation. Check draft door shall be arranged for connection to manual draft control hereinafter specified. The smoke hood shall not project more than 10 inches from rear of furnace casing.

7. Entire furnace, except front, doors, etc., shall be enclosed in a colored baked enamel, smooth or wrinkle finish steel casing, rigidly secured, of thickness not less than No. 24 U. S. Standard Gage (approximate thickness 0.025 inch), equipped with steel inner liner of thickness not less than No. 26 U. S. Standard Gage (approximate thickness 0.018 inch). Liner shall be secrued to the casing to provide a minimum one inch air space between casing and liner permitting a positive air flow therein. Provision shall be made for plenum connection. Design of casing and arrangement of liner shall be suitable for connection of fan discharge duct to either side or back of unit as required for installation.

8. Front plate of furnace shall be cast iron or steel, bolted gas tight, to body of furnace over asbestos gasket; steel front may be welded to body of furnace. Cast iron furnace shall have slip over front. Furnace (steel or cast iron) shall be equipped with all necessary doors, accurately fitted, firing and ash pit doors being of proper size for easy introduction of fuel and ready removal of ashes. Firing door shall be equipped with metal liner, also a check draft door or equivalent designes as a fuel economizer. Ash pit door shall be fitted with a draft door of self-closing type arranged for connection to manual draft control hereinafter specified. Front plate and doors shall be painted with high temperature heat resisting paint.

9. Furnace shall be furnished with a knock down plenum chamber 18 inch square made of No. 26 U. S. Standard Gage steel and finished in baked enamel to match the furnace casing and sufficiently high to extend the overall height of the furnace and plenum chamber to 7 feet 2 inches.

10. Grates shall be of heavy cast iron, duplex or bar, shaking and dumping type, designed for burning coal the sizes of pea anthracite and larger, and shall be actuated from the outside of furnace by a lever mechanism.

11. Poker and lever shaker shall be furnished with each furnace.

Sec. 2. BLOWER-MOTOR UNIT

1. Blower-motor unit shall be arranged for "blow through" quiet operation, horizontal discharge and be suitable for installation directly in rear or on either side of furnace.

2. The blower shall be the standard catalog product of a reputable manufacturer and shall have a capacity to deliver 600 DFM against a static pressure of 1/4 inch of water operating at a speed not exceeding 650 RPM. The blower shall be rated and constructed in accordance with the National Association of Fan Manufacturers and the ASHVE Standard Test Code for Centrifugal and Axial Fans. The impeller wheel shall be of the multi-blade type and shall be statically balanced.

3. Motor shall be in accordance with AIEE and NEMA standards; selected for quiet operation; shall be of sufficient capacity to operate the blower at its rated capacity without undue heating and sparking; shall be an approved induction type; long hour duty; wound for 115 volt, single phase, 60 cycle, alternating current; with thermal overload protection and automatic reset and arranged for controls hereinafter specified.

4. Blower and motor shall be provided with vibration damping media.

5. The blower unit shall be connected to the driving motor by means of an adjustable pulley "V" belt drive that will permit a variation in the speed of the fan. Means shall be provided for tightening the belt.

6. Blower-motor unit shall be securely enclosed in a steel casing, finished and painted same as furnace casing, of thickness not less than No. 22 U.S. Standard Gage. Means shall be provided in casing for electrical connections to motor. Top of casing shall be removable for convenient access to service unit. Casing shall be not wider than the width of the furnace and not deeper than 20 inches, and shall have means to permit return air duct connection on either sides, back or bottom.

Sec. 3. BLOWER CONTROL

1. Blower control shall be a bonnet thermostat of the immersion type, designed and arranged to start blower-motor when bonnet temperature rises above, and stop the motor when the temperature falls below predetermined control settings.

Sec. 4. MANUAL DRAFT CONTROL

1. A manual draft control shall be provided, suitable for connecting to draft door and check draft, with chain, pulleys and control unit for wall mounting.

Sec. 5. INSTRUCTIONS

1. With each unit there shall be furnished installation instructions, operating instructions, and list of repair parts. Permanently affix such instructions in each dwelling unit where directed by Government.

DEFENSE HOUSING SPECIFICATION
NATIONAL HOUSING AGENCY
FEDERAL PUBLIC HOUSING AUTHORITY

Division D-51-D

VERTICAL COAL FIRED STEEL FURNACE WITH PRESSURE TYPE BLOWER INTEGRAL WITH FURNACE

June 25, 1942

Sec. 1. FURNACE DESIGN, CAPACITY, ETC.

1. The furnace shall be complete with blower, motor, blower control, and manual draft control.

2. Furnace shall be a direct fired forced warm air unit of "blow through" type, adaptable for coal, hand-firing, designed for forced air circulation, and capable of developing sufficient heat to deliver a minimum of 60,000 Btu's per hour at the bonnet. Rating shall be in accordance with the equation set forth in the latest edition of "The Technical Code for the Design and Installation of Mechanical Warm Air Heating Systems," promulgated by the National Warm Air Heating and Air Conditioning Association, and shall be based upon 12,000 Btu's per pound coal operating at a combustion rate of 7-1/2 pounds per hour per square foot of grate area.

3. The furnace design shall be what is generally known as the "high boy" type having the blower mounted in the base.

4. The over-all dimensions of the upper part of the casing where the smoke hood is located shall be not more than 26 inches wide by 26 inches deep. Lower part of casing, which houses blower and space above it, may extend rearward an additional 10 inches provided it does not extend beyond the extremity of the smoke hood.

5. Bottom of firing door shall be not more than 38 inches above floor.

6. Blower motor unit shall be accessible from the front for servicing.

7. A substantial angle iron frame shall be provided for mounting the furnace above the blower plenum.

8. Furnace body shall be constructed of steel, with all seams or joints smoke and gas tight.

9. Shell and head shall be of thickness not less than No. 10 U.S. Standard gage (approximate thickness 0.138 inch); ash pit bottom shall be of steel plate of thickness not less than No. 14 U.S. Standard gage approximate thickness 0.077 inch) welded in place to prevent air leakage. Fire box shall be equipped with high grade segment type refractory suitable for service intended properly inserted and adequately supported, or cast iron chrome alloy protective lines. Cast iron chrome alloy liner, if used, shall be guaranteed by manufacturer for 10 years. Fire door opening shall be equipped with rigidly secured heavy feed chute plate. Furnace shall have a "V" shaped or approved equivalent baffle at flue opening.

10. Ash pit of furnace shall be equipped with a removable ash pan. Ash pan shall be constructed of not less than No. 26 U. S. Standard Gage (approximate thickness 0.018 inch) equipped with handle and bale, and with beaded edges or edges rolled over wire frame.

11. Smoke outlet shall be at rear of furnace and shall be fitted with a full size heavy cast iron or steel smoke hood, rigidly secured to outlet, fitted with choke damper and check draft door, both cast iron, and affording means for connection to vertical smoke pipe. Choke damper shall be set between flue outlet and check draft door, shall have ample opening for passage of gases, and shall be arranged for convenient manual operation. Check draft door shall be arranged for connection to manual draft control. The smoke hood shall not project more than 10 inches from rear of furnace casing.

12. Entire furnace, including blower-motor, except front, doors, etc. shall be enclosed in a colored baked enamel, smooth or wrinkle finish steel casing, rigidly secured, of thickness not less than No. 24 U. S. Standard Gage (approximate thickness, 0.025 inch). That portion of casing enclosing furnace heating surface shall be equipped with steel inner liner of thickness not less than No. 26 U. S. Standard Gage (approximate thickness 0.013 inch). Liner shall be secured to the casing to provide a minimum one inch air space between casing and liner permitting a positive air flow therein. Provision shall be made for plenum connection. Casing around blower-motor shall have means to permit return air duct connection on either two sides, back or bottom.

13. Front plate of furnace shall be cast iron or steel, bolted gas tight, to body of furnace over asbestos gasket; steel front may be welded to body of furnace. Furnace shall be equipped with all necessary doors, accurately fitted; firing and ash pit door being of proper size for easy introduction of fuel and ready removal of ashes. Firing door shall be equipped with metal liner, also a check draft door of self-closing type shall be arranged for connection to manual draft control hereinafter specified. Front plate and doors shall be painted with high temperature heat resisting paint.

14. Furnace shall be furnished with a knock down plenum chamber 18 inches square made of No. 26 U. S. Standard Gage steel and finished in baked enamel to match the furnace casing and sufficiently high to extend the overall height of the furnace and the plenum chamber to 7 feet 2 inches.

15. Grates shall be of heavy cast iron, duplex or bar, shaking and dumping type, designed for burning coal the sizes of pea anthracite and larger, and shall be actuated from the outside of furnace by a lever mechanism.

16. Poker and lever shaker shall be furnished with each furnace.

Sec. 2. BLOWER-MOTOR UNIT

1. The blower shall be the standard catalog product of a reputable manufacturer and shall have a capacity to deliver 600 CFM against a static pressure of 1/4 inch of water operating at a speed not exceeding 650 RPM. The blower shall be rated and constructed in accordance with the National Association of Fan Manufacturers and the ASHVE standard test code for Centrifugal

and Axial Fans. The impeller wheel shall be of the multi-blade type and shall be statically balanced.

2. Motor shall be in accordance with AIEE and NEMA standard; selected for quiet operation; shall be of sufficient capacity to operate the blower at its rated capacity without undue heating and sparking; shall be an approved induction type; long hour duty; wound for 115 volt single phase, 60 cycle, alternating current; with thermal overload protection and automatic reset and arranged for controls hereinafter specified.

3. Blower and motor shall be provided with vibration damping media.

4. The blower unit shall be connected to the driving motor by means of an adjustable pulley "V" belt drive that will permit a variation in the speed of the fan. Means shall be provided for tightening the belt.

5. Means shall be provided in casing for electrical connections to motor and for convenient access to serving unit.

Sec. 3. BLOWER CONTROL

1. Blower control shall be a bonnet thermostat of the immersion type, designed and arranged to start blower-motor when bonnet temperature rises above, and stop the motor when the temperature falls below predetermined control settings.

Sec. 4. MANUAL DRAFT CONTROL

1. A manual draft control shall be provided suitable for connecting to draft door and check draft with chain, pulleys and control unit for wall mounting.

Sec. 5. INSTRUCTIONS

1. With each unit there shall be furnished installation instructions, operating instructions, and list of repair parts. Permanently affix such instructions in each dwelling unit where directed by Government.

DEFENSE HOUSING SPECIFICATION
NATIONAL HOUSING AGENCY
FEDERAL PUBLIC HOUSING AUTHORITY

Division D-52A

WATER HEATERS, AUTOMATIC STORAGE TYPE, ELECTRIC, WITH PROCELAIN ENAMEL TANK

June 25, 1942

Sec. 1. DESCRIPTION

1. Heaters shall be of the automatic type in which a vertical water storage tank is combined in one unit with electrically operated heating elements. Nominal tank capacity shall be 30 gallons.

2. Heaters shall be listed under the Underwriters' Laboratories reexamination service.

Sec. 2. CONSTRUCTION

1. Tank shall be of all-welded construction, so designed that it can be properly coated with procelain enamel. All welds that are to be enameled shall be of such character they will not produce enameling imperfections. The metal shall be basic open hearth refined iron or steel especially processed for porcelain enameling.

2. The inside of the tank shall receive at least two coats of procelain enamel completely covering all iron or steel surfaces, which will be exposed to water, and shall be free from all defects which expose bare iron or steel or which will result in exposure in service, such as copper heads, blisters, hairlines, pin holes, crazing, fish scales, filed enamel, etc. Spuds and other outlet or inlet openings if not enameled shall be of non-corrosive material.

3. After enameling and before assembling each part shall be separately inspected for enameling defects described. The enamel shall be resistant to agressive water action and shall have been thoroughly tested for this purpose. Tank shall be guaranteed for 5 years, and if proven defective within this period, the manufacturer will repair or replace the tank free of any charge within the 5 year period.

4. Tank shall be designed for a working pressure of not less than 106-1/4 pounds per square inch and shall withstand a minimum hydrostatic test pressure at the factory, with tank fittings in place, of 250 pounds per square inch without visible change of space affecting the relationship of parts in noticeable way.

5. Necessary tapping shall be provided and means included within the tank to reduce to a minimum the mixing of the incoming cold water at point of entrace with the heated water.

6. Necessary supply connections to tank shall be made full size of tappings terminating at outer sheet with provision for extension to cold and hot water lines. Hot water connection to tank shall be equipped with heat trap.

7. The heating elements shall be of the external or immersion type, fastened to tank so as to be readily removable for servicing without disturbing pipe connections. One heating element shall be located as near bottom of tank as practical and the second element shall be located so as to heat approximately the upper one-fourth of the tank capacity. The capacity of the lower and upper heating units shall be approximately 600 and 1000 watts, respectively. Heating elements shall be held in place so no water is allowed to come in contact with holding bolts or other fastening means under any condition.

8. The heating element coil shall be of approved resistance wire, insulated by material of high electrical insulating value and heat conducting quality at high temperature. Elements shall be readily removable without use of special tools.

9. Equipment shall operate on A. C. circuits, 2 wire, 100 to 240 volts as may be required, at a capacity of approximately 1600 watts.

10. Each heating element shall be controlled by separate thermostat, adjustable over a minimum range of from 130 degrees F. to 160 degrees F. inclusive, settings being plainly indicated in suitable graduations. Thermostats shall be non-radio interfering without the use of relays or condensers, designed to disconnect heating elements when water reached temperature within plus or minus 5 degrees F. of setting. Thermostats shall be set at factory at 140 degrees F. Thermostat controlling the lower heating element shall have an amplitude between on and off operation of not more than 10 degrees F. minus 2 degrees plus 5 degrees F. Thermostat controlling upper heating element shall have a corresponding amplitude of not more than 25 degress F. plus or minus 5 degrees F. Thermostats shall be of such type and so wired that only one heating elements operates at one time.

11. Encase wiring in metallic conduit or electrical metallic tubing, terminating in an outlet box with knockouts readily accessible for electrical connections.

12. Heater shall be provided with an AGA approved 1/2 inch pressure relief valve of the direct spring loaded or diaphragm type, self-closing, set to open at 100 pound pressure.

13. Drain cock shall be not less than 1/2 inch size equipped with threaded end for hose connection.

14. Base for mounting unit shall be heavy cast iron or pressed steel.

15. The complete unit shall be insulated a minimum thickness of 2-1/2 inches, the conductivity of which shall not exceed 0.30 Btu per hour per square foot per degree F. per inch thickness (at mean temperature difference of 90 degrees F.). The insulation shall be securely held in place with a non-metallic jacket, finished with a protective coat of heat proof enamel. Insulation shall not settle after application.

Sec. 3. INSTRUCTIONS

1. With each unit there shall be furnished installation instructions, operating instructions, and list of repair parts.

DEFENSE HOUSING SPECIFICATION
NATIONAL HOUSING AGENCY
FEDERAL PUBLIC HOUSING AUTHORITY

Division D-52C

WATER HEATERS, AUTOMATIC STORAGE TYPE; GAS FIRED, WITH PORCELAIN ENAMEL TANK

June 25, 1942

Sec. 1. DESCRIPTION

1. Water heater shall be of the automatic flue type in which a vertical water storage tank and gas burner are combined in one unit. The nominal storage tank capacity shall be 20 gallons.

2. Heater shall have the current listing of the AGA, or conform to its requirements and be so labeled. Heater shall have minimum input of 15,000 Btu per hour.

Sec. 2. CONSTRUCTION

1. Water storage tank shall be of all welded construction and shall be so designed that it can be properly coated with porcelain enamel. All welds that are to be enameled shall be of such character that they will not produce enameling imperfections. The metal shall be basic open hearth refined iron or steel especially processed for porcelain enameling.

2. The inside of the tank shall receive at least two coats of porcelain enamel completely covering all iron or steel surfaces, which will be exposed to water, and shall be free from all defects, which expose bare iron or steel or which will result in exposure in service, such as copper heads, blisters, hairlines, pin holes, crazing, fish scales, piled enamel, etc. Spuds and other outlet or inlet openings if not enameled shall be of non-corrosive material.

3. After enameling and before assembling, each part shall be separately inspected for enameling defects described. The enamel shall be resistant to agressive water action and shall have been thoroughly tested for this purpose. Tank shall be guaranteed for 5 years, and if proven defective within this period, the manufacturer will repair or replace tank, free of any charge within the 5 year period.

4. Tank shall be designed for a working pressure of not less than 106-1/4 pounds per square inch and shall withstand a minimum hydrostatic test pressure at factory of 250 pounds per square inch without visible change of shape affecting the relationship of parts in a noticeable way.

5. Necessary tappings shall be provided and means included within tank to reduce to a minimum the mixing of the incoming cold water at point of entrance with the heated water.

6. Where tube or tubes for the passage of flue gases extend longitudinally through the tank, they shall be constructed of same material and coating as tank, be properly baffled and shall have wall thickness not less than that of the circumferential shell of tank.

7. The burner shall be constructed of heavy cast iron or steel, shall operate on the Bunsen principle, and be suitable for operation with the type of gas available at project.

8. The thermostatic valve shall be self-contained, and shall have a temperature adjustment, plainly indicated in suitable graduations ranging up to approximately 160 degrees F. The valve shall be designed to operate the gas supply to the burner on and off, through an amplitude of not more than 15 degrees F. plus or minus 3 degrees F.

9. The safety pilot control valve shall be of self-contained type, designed to automatically cut off the supply of gas to the main burner upon flame failure and to remain off until the pilot is relighted. Where burning liquefied petroleum gas, this control shall automatically cut off the supply of gas to the main burner and pilot burner upon flame failure and remain off until pilot is relighted. The function of the thermostatic and safety pilot control valves may be combined in one valve if suitable constructed and operated on the same principles specified for the separate valves.

10. All necessary piping shall be provided, including pilot tubing, shut-off cock and pilot head in the connection of the controls to the unit. The pilot tubing and head shall be of corrosion resistance material. Shut off valve shall be provided for completely controlling the supply of gas to burner and pilot manually.

11. Heater shall be provided with an AGA approved 1/2 inch pressure relief valve, which shall be of the direct spring loaded or diaphragm self-reseating type, set to open at 100 pound pressure.

12. Drain cock shall be not less than 1/2 inch size, equipped with threaded end for hose connection.

13. The base upon which the complete unit shall be mounted shall be constructed of heavy pressed steel.

14. The complete unit shall be insulated, minimum thickness of insulation 1 inch for internal flue, 1-1/2 inches for circumferential flue type, securely held in place with a non-metallic jacket of substantial construction; insulation shall not settle after application. A finish coat of heat proof baked or air dried enamel shall be provided to outside of jacket.

Sec3. INSTRUCTIONS

1. With each unit there shall be furnished installation instructions, operating instructions and list of repair parts.

DEFENSE HOUSING SPECIFICATION
NATIONAL HOUSING AGENCY
FEDERAL PUBLIC HOUSING AUTHORITY

Division D-52D

WATER HEATERS, AUTOMATIC STORAGE TYPE, GAS FIRED, WITH GALVANIZED TANK

June 25, 1942

Sec. 1. DESCRIPTION

1. Water heaters shall be of the automatic flue type in which a vertical water storage tank and gas burner are combined in one unit. The nominal storage tank capacity shall be 20 gallons.

2. Heater shall have the current listing of the American Gas Association or conform to its requirements and be so labeled. Heater shall have a minimum input of 15,000 Btu's per hour.

Sec. 2. CONSTRUCTION

1. Water storage tank shall be constructed of steel with all seams welded, and shall be hot dipped galvanized inside and outside at uniform temperatures after fabrication. It shall be designed for a water working pressure of not less than 106-1/4 pounds per square inch, and shall withstand a minimum hydrostatic test pressure at the factory of 250 pounds per square inch without visible change of shape affecting the relationship of parts in a noticeable way.

2. Necessary tappings shall be provided and means included within the tank to reduce to a minimum the mixing of the incoming cold water at point of entrance with the heated water.

3. Where tube or tubes for the passage of flue gases extend longitudinally through the tank, they shall be properly baffled and shall have wall thickness not less than that of the circumferential shell of tank.

4. The burner shall be constructed of heavy cast iron or steel, shall operate on the Bunsen principle and shall be suitable for operation with the type of gas available at the project.

5. The thermostatic valve shall be self-contained, and shall have a temperature adjustment, plainly indicated in suitable graduations ranging up to approximately 160 degrees F. The valve shall be designed to operate the gas supply to the burner on and off through an amplitude of not more than 15 degrees F. plus or minus three degrees F.

6. The safety pilot control valve shall be self-contained type designed to automatically cut off the supply of gas to the main burner upon flame failure and to remain off until the pilot is relighted. When burning liquefied petroleum gas, this control shall automatically shut off the supply of gas to the main burner and pilot burner upon flame failure and remain off until pilot is relighted. The functions of the thermostatic and safety pilot control valves may be combined in one valve if suitably constructed and operated on the same principles specified for the separate valves.

7. The heating elements shall be of the external or immersion type, fastened to tank so as to be readily removable for servicing without disturbing pipe connections. One heating element shall be located as near bottom of tank as practical and the second element shall be located as as to heat approximately the upper one-fourth of the tank capacity. The capacity of the lower and upper heating units shall be approximately 600 and 1000 watts, respectively. Heating elements shall be held in place so no water is allowed to come in contact with holding bolts or other fastening means under any condition.

8. The heating element coil shall be of approved resistance wire, insulated by material of high electrical insulating value and heat conducting quality at high temperature. Elements shall be readily removable without use of special tools.

9. Equipment shall operate on A. C. circuits, 2 wire, 199 to 240 volts as may be required, at a capacity of approximately 1600 watts.

10. Each heating element shall be controlled by separate thermostat, adjustable over a minimum range of from 130 degrees F. to 160 degrees F. inclusive, settings being plainly indicated in suitable graduations. Thermostats shall be non-radio interfering without the use of relays or condensers, designed to disconnect heating elements when water reaches temperature within plus or minus 5 degrees F. of setting. Thermostats shall be set at factory at 140 degrees F. Thermostat controlling the lower heating element shall have an amplitude between on and off operation of not more than 10 degrees F. minus 2 degrees plus 5 degrees F. Thermostat controlling upper heating element shall have a corresponding amplitude of not more than 25 degrees F. plus or minus 5 degrees F. Thermostats shall be of such type and so wired that only one heating element operates at one time.

11. Encase wiring in metallic conduit or electrical metallic tubing, terminating in an outlet box with knockouts readily accessible for electrical connections.

12. Heater shall be provided with an AGA approved 1/2 inch pressure relief valve of the direct spring loaded or diaphragm type, self-closing, set to open at 100 pound pressure.

13. Drain cock shall be not less than 1/2 inch size equipped with threaded end for hose connection.

14. Base for mounting unit shall be heavy cast iron or pressed steel.

15. The complete unit shall be insulated a minimum thickness of 2-1/2 inches, the conductivity of which shall not exceed 0.30 Btu per hour per square foot per degree F. per inch thickness (at mean temperature difference of 90 degrees F.). The insulation shall be securely held in place with a non-metallic jacket, finished with a protective coat of heat proof enamel. Insulation shall not settle after application.

Sec. 3. INSTRUCTIONS

1. With each unit there shall be furnished installation instructions, operating instructions, and list of repair parts.

DEFENSE HOUSING SPECIFICATION
NATIONAL HOUSING AGENCY
FEDERAL PUBLIC HOUSING AUTHORITY

Division D-52E

STORAGE WATER HEATER, OIL FIRED, WITH PORCELAIN ENAMEL TANK

August 6, 1942

Sec. 1. DESCRIPTION

1. Water heater shall be of automatic flue type, in which a vertical water storage tank and oil burner are combined in one complete unit. Nominal tank capacity shall be 20 gallons.

2. The burner shall be adaptable for burning fuel oil No. 1, as set forth in the latest commercial standards specified for fuel oils issued by the Department of Commerce.

3. Heater, burner and controls shall have Underwriters' Laboratories current listing or conform to their requirements and be so labeled.

Sec. 2. CONSTRUCTION

1. Tank shall be of all-welded construction, so designed that it can be properly coated with porcelain enamel. All welds that are to be enameled shall be of such character that they will not produce enameling imperfection. The metal shall be basic open hearth refined iron or steel especially processed for porcelain enameling.

2. The inside of the tank shall receive at least 2 coats of porcelain enamel completely covering all iron or steel surfaces, which will be exposed to water, and shall be free from all defects which expose bare iron or steel or which will result in exposure in service, such as copper heads, blisters, hairlines, pin holes, crazing, fish scales, piled enamel, etc. Spuds and other outlet or inlet openings if not enameled shall be of non-corrosive material.

3. After enameling and before assembling, each part shall be separately inspected for enameling defects described. The enamel shall be resistant to aggressive water action and shall have been thoroughly tested for this purpose. Tank shall be guaranteed for 5 years and, if proven defective within this period, the manufacturer will repair or replace the tank, free of any charge, within the 5 year period.

4. Tank shall be designed for a water working pressure of not less than 106-1/4 pounds per square inch and shall be tested at the factory to withstand a minimum hydrostatic pressure of 250 pounds per square inch without change of shape affecting the relationship of parts in a noticeable way.

5. Necessary tappings shall be provided and means included within the tank to reduce to a minimum the mixing of the incoming cold water at point of entrance with the heated water.

6. Flue or flues for passage of combustion shall be constructed of same

material and coating as tank, shall extend longitudinally through the tank and be rigidly secured thereto. Flue shall be equipped with an outlet casting constructed of cast iron or steel tightly fitted thereto and affording means for attaching the smoke pipe.

7. The unit shall be mounted on a heavy cast iron or heavy pressed steel base.

8. Heater shall be provided with an AGA approved 1/2 inch pressure relief valve of the direct spring loaded or diaphragm self-reseating type, set to open at 100 pounds pressure.

9. Drain cock shall be not less than 1/2 inch size, equipped with threaded end for hose connection.

10. Sides of complete unit shall be securely encased in a nonmetallic jacket of substantial construction, equipped with spacers to permit an insulating space. Top of water tank shall be insulated with approved insulation, average thickness of 1-1/2 inches, securely held in place with a nonmetallic cover constructed of the same material and minimum thickness as that specified to encase the sides of the unit; insulation shall not settle after application. A finish coat of heat proof enamel shall be applied to the entire cover (sides and top).

11. The oil burner shall be of the vaporizing, pot or sleeve type, supported in a metal enclosed compartment equipped with a door accurately fitted to permit access for lighting, service and cleaning, and provided with necessary openings for air admission. The burner shall be capable of operating under natural draft and shall be of such design that the intensity of the flame will not be regulated by the raising or lowering of the burner, sleeves or wicks.

12. Fuel tank shall have a minimum capacity of three gallons, substantially constructed of corrosion-resisting metal or metal suitably coated to resist corrosion, not less than No. 26 U.S. Standard Gage (approximate thickness 0.018"). Tank shall be rigidly mounted on the heater in its proper position, and have ample filler opening and suitable provision for screening the oil. Provide manual shut-off valve (in addition to automatic control hereinafter specified) to permit removing tank from heater and servicing automatic control

13. A draft regulator of the balanced type shall be provided, durably constructed of noncorrodible metal, or material protected to retard corrosion, suitable for installation in the smoke pipe; or the regulator may be provided integral with the casting. Regulator shall function so as to maintain the desired draft by automatically adjusting the pull of the various drafts with the requirements of the burner operation.

14. Means shall be provided for securing an even supply of fuel to the burner through a constant level valve, designed to preclude the further supply of oil to the burner upon the oil reaching a predetermined level. It shall be protected by a mesh screen, easily removable for service and cleaning, and of

ample area to insure delivery of clean oil to the burner. The valve shall be of the float and trip type, permitting air escapement, and be equipped with an integral oil control and auxiliary mechanism for manual release and reset. The oil control shall be self-contained and be provided with a temperature adjustment knob with range from approximately 120 degrees to 160 degrees F., plainly indicated in suitable graduations and with concealed adjustment screws to permit restricted low and high fire settings. The combined valve shall be properly connected to a thermostat of the immersion, dry well or surface type, and shall regulate the supply of oil to the burner at low and high fire, having an amplitude between these points of not more than 15 degrees F. plus or minus 3 degrees F. All parts of the combined constant level and control valve shall be corrosion resistant. Gaskets, where required, shall be of hard lead or equivalent for screwed joints and sheet packing or equivalent for bolted joints.

Sec. 3. TESTS

1. Before the acceptance of the units, a test shall be conducted by a Government approved laboratory, on one heater, indicating operating efficiency. The test shall be based upon the use of No. 1 oil. Measure the efficiency at the high fire setting as regulated by the control valve. At this setting, such amounts of oil shall be admitted to the burner to heat at a minimum operating efficiency of not less than 60 per cent (exclusive of standby losses) not less than 20 gallons of water per hour based upon a minimum temperature rise of 60 degrees F. above inlet temperatures, with no smoke at the stack and under draft conditions not exceeding 0.04 inch of water column. Test readings shall not be made until continuous draw-off with the burner in operation indicates that steady operating conditions have been reached relative to water temperatures, and rate of flow (regulated at 20 gallons per hour). The test shall then be run for a minimum period of two hours with the continuous draw-off as previously regulated. The report shall include the Btu content of the oil and gallons consumed per hour.

Sec. 4. INSTRUCTIONS

1. With each unit there shall be furnished installation instructions, operating instructions, and list of repair parts.

DEFENSE HOUSING SPECIFICATION
NATIONAL HOUSING AGENCY
FEDERAL PUBLIC HOUSING AUTHORITY

Division D-52-F

STORAGE WATER HEATER, OIL FIRED WITH GALVANIZED TANK

August 6, 1942

Sec. 1. DESCRIPTION

1. Water heater shall be of automatic flue type, in which a vertical water storage tank and oil burner are combined in one complete unit. Nominal tank capacity shall be 20 gallons.

2. The burner shall be adaptable for burning fuel oil No. 1, as set forth in the latest commercial standards specified for fuel oils issued by the U.S. Department of Commerce.

3. Heater, burner, and controls shall have Underwriters' Laboratories current listing or conform to their requirements and be so labeled.

Sec. 2. CONSTRUCTION

1. The water storage tank shall be constructed of steel with all seams welded or riveted and welded, and shall be hot-dipped galvanized inside and outside at uniform temperatures after fabrication. Tank shall be designed for a water working pressure of not less than 106-1/4 pounds per square inch and shall be tested at the factory to withstand a minimum hydrostatic pressure of 250 pounds per square inch without visible change of shape affecting the relationship of parts in a noticeable way. Necessary tappings shall be provided and means included within the tank to reduce to a minimum the mixing of the incoming cold water at point of entrance with the heated water.

2. Flue or flues for passage of gases of combustion shall be constructed of galvanized steel, shall extend longitudinally through the tank, and rigidly secured thereto. Flue shall be equipped with an outlet casting constructed of cast-iron or steel tightly fitted thereto and affording means for attaching the smoke pipe.

3. The unit shall be mounted on a heavy cast-iron or heavy pressed steel base.

4. Heater shall be provided with an AGA approved one-half inch pressure relief valve, be of the direct spring loaded or diaphragm self-reseating type, set to open at 100 pounds pressure.

5. Drain cock shall be not less than 1/2 inch size, equipped with threaded end for hose connection.

6. Sides of complete unit shall be securely encased in a nonmetallic jacket of substantial construction, equipped with spacers to permit an insulating space. Top of water tank shall be insulated with approved insulation, average thickness of 1-1/2 inches, securely held in place with a non-metallic cover constructed of the same material and minimum thickness as that specified to encase the sides of the unit; insulation shall not settle after application. A finish coat of heatproof enamel shall be applied to the entire cover (sides and top).

The oil burner shall be of the vaporizing, pot or sleeve type, supported in a metal enclosed compartment equipped with a door accurately fitted to permit access for lighting, service and cleaning, and provided with necessary openings for air admission. The burner shall be capable of operating under natural draft and shall be of such design that the intensity of the flame will not be regulated by the raising or lowering of the burner, sleeves or wicks.

8. Fuel tank shall have a minimum capacity of three gallons, substantially constructed of corrosion-resisting metal or metal suitably coated to resist corrosion, not less than No. 26 U.S. Standard Gage (approximate thickness 0.018"). Tank shall be rigidly mounted on the heater in its proper position, and have ample filler opening and suitable provision for screening the oil. Provide manual shut-off valve (in addition to automatic control hereinafter specified) to permit removing tank from heater and servicing automatic control.

9. A draft regulator of the balanced type shall be provided, durably constructed of non-corrodible metal, or material protected to retard corrosion, suitable for installation in the smoke pipe; or the regulator may be provided integral with the casting. Regulator shall function so as to maintain the desired draft by automatically adjusting the pull of the various drafts with the requirements of the burner operation.

10. Means shall be provided for securing an even supply of fuel to the burner through a constant level valve, designed to preclude the further supply of oil to the burner upon the oil reaching a predetermined level. It shall be protected by a mesh screen, easily removable for service and cleaning, and of ample area to insure delivery of clean oil to the burner. The valve shall be of the float and trip type, permitting air escapement, and be equipped with an integral oil control and auxiliary mechanism for manual release and reset. The oil control shall be self-contained and be provided with a temperature adjustment knob with range from approximately 120 degrees to 160 degrees F., plainly indicated in suitable graduations, and with concealed adjustment screws to permit restricted low and high fire settings. The combined valve shall be properly connected to a thermostat of the immersion, dry well or surface type, and shall regulate the supply of oil to the burner at low and high fire, having an amplitude between these points of not more than 15 degrees F., plus or minus 3 degrees F. All parts of the combined constant level and control valve shall be corrosion-resistant. Gaskets, where required, shall be of hard lead or equivalent for screwed joints, and sheet packing for bolted joints.

Sec. 3. TESTS

Before the acceptance of the units, a test shall be conducted by a Government approved laboratory, on one heater, indicating operating efficiency. The test shall be based upon the use of No. 1 oil. Measure the efficiency at the high fire setting as regulated by the control valve. At this setting such amounts of oil shall be admitted to the burner to heat at a minimum operating efficiency of not less than 60 percent (exclusive of standby losses) not less than 20 gallons of water per hour based upon a minimum temperature rise of 60 degrees F. above inlet temperatures, with no smoke at the stack and under draft conditions not exceeding 0.04 inch of water column. Test readings shall not be made until continuous draw-off with the burner in operation indicates that steady operating conditions have been reached relative to water temperatures, and rate of flow (regulated at 20 gallons per hour). The test shall then be run for a minimum period of two hours with the continuous draw-off as previously regulated. The report shall include the Btu content of the oil and gallons consumed per hour.

2. A notarized test certificate shall be furnished.

Sec. 4. INSTRUCTIONS

1. With each unit there shall be furnished installation instructions, operating instructions, and list of repair parts.

DEFENSE HOUSING SPECIFICATION
NATIONAL HOUSING AGENCY
FEDERAL PUBLIC HOUSING AUTHORITY

Division D-52G

WATER HEATERS, COAL BURNING

June 25, 1942

Sec. 1. DESIGN, CAPACITY, ETC.

1. Heater shall be of cast iron, adapted for coal firing, designed for a minimum water working pressure of 125 pounds per square inch gage and shall be subjected at the factory to a minimum hydrostatic pressure of 300 pounds per square inch gage.

2. Heater shall have a capacity to heat not less than 60 gallons of water per hour through a minimum temperature rise of 25 degrees F. from inlet water temperature, capacity based upon a minimum six hour firing period. Tappings for inlet and outlet water connections shall be not less than one inch size.

3. Heater shall have a water section, or water section and fire pot with refractory lining. Refractory lining shall extend from top of fire pot to grate line.

4. Minimum distance from grate line to bottom feed opening shall be 7 inches; minimum overall height shall be 18 inches; minimum inside diameter 10 inches; minimum weight of heater 85 pounds. Doors shall be accurately ground and fitted reasonably tight to heater. Smoke pipe connection shall be not less than 5 inch diameter or equivalent oval opening. Necessary automatic dampers shall be provided.

5. Grates shall be heavy pattern cast iron of the shaking and dumping type arranged for operation without opening doors and shall be removable without disturbing heater, adaptable for burning coals the sizes of pea anthracite and larger. Provide pan suitable for installation in the ash pit, constructed of not less than No. 26 U. S. Standard Gage black steel equipped with handle and bale for easy removal and lifting. Pan shall have capacity to hold ashes resulting from not less than 24 hours of continuous operation.

6. Shaker and poker shall be furnished with each heater.

Sec. 2. INSTRUCTIONS

1. With each unit there shall be furnished installation instructions, operating instructions, and list of repair parts.

DEFENSE HOUSING SPECIFICATION
NATIONAL HOUSING AGENCY
FEDERAL PUBLIC HOUSING AUTHORITY

Division D-53 A

STORAGE WATER TANKS, PORCELAIN ENAMEL

June 25, 1942

Sec. 1. CONSTRUCTION

1. Tank shall have nominal capacity of 30 gallons, and be of all-welded construction, so designed that it can be properly coated with porcelain enamel. It shall be designed for a water working pressure of not less than 106-1/4 pounds per square inch and shall withstand a minimum hydrostatic pressure at factory of 250 pounds per square inch without visible change of shape affecting the relationship of parts in a noticeable way.

2. All welds that are to be enameled shall be of such character they will not produce enameling imperfections. The metal shall be basic open hearth refined iron or steel especially processed for porcelain enameling.

3. The inside of the tank shall receive at least two coats of porcelain enamel completely covering all iron or steel surfaces, which will be exposed to water, and shall be free from all defects which expose bare iron or steel or which will result in exposure in service, such as copper heads, blisters, hairlines, pin holes, crazing, fish scales, filed enamel, etc. Spuds and other outlet or inlet openings if not enameled shall be of non-corrosive material. The enamel shall be resistant to aggressive water action and shall have been thoroughly tested for this purpose. Tank shall be guaranteed for 5 years, and if proven defective within this period, the manufacturer will repair or replace the tank, free of any charge, within the 5 year period.

4. After enameling and before assembling, each part shall be separately inspected for enameling defects described.

5. Necessary tappings shall be provided and means included within tank to reduce to a minimum the mixing of the incoming cold water at point of entrance with the heated water. Pressure relief valve shall be 1/2 inch size, AGA approved, of the direct spring load or diaphragm, self-reseating type, set to open at 100 pounds per square inch pressure. Drain cock shall be not less than 1/2 inch size, equipped with threaded end for hose connection. Cast iron or pressed steel floor stand shall be furnished unless otherwise specified.

DEFENSE HOUSING SPECIFICATION
NATIONAL HOUSING AGENCY
FEDERAL PUBLIC HOUSING AUTHORITY

Division D-53B

STORAGE WATER TANKS, GALVANIZED STEEL

June 25, 1942

Sec. 1. CONSTRUCTION

1. Tank shall have nominal capacity of 30 gallons, be constructed of steel with all seams welded or riveted, or welded and riveted; hot dipped galvanized inside and outside at uniform temperatures after fabrication. It shall be designed for a water working pressure of not less than 106-1/4 pounds per square inch and shall withstand a minimum hydrostatic pressure at factory of 250 pounds per square inch without visible change of shape affecting the relationship of parts in a noticeable way.

2. Necessary tappings shall be provided and means included within the tank to reduce to a minimum the mixing of the incoming cold water at point of entrance with the heated water. Pressure relief valve shall be 1/2 inch size, AGA approved, of the direct spring loaded or diaphragm, self-reseating type, set to open at 100 pounds per square inch pressure. Drain cock shall be not less than 1/2 inch size, equipped with threaded end for hose connection. Cast iron or pressed steel floor stand shall be furnished unless otherwise noted.

DEFENSE HOUSING SPECIFICATION
NATIONAL HOUSING AGENCY
FEDERAL PUBLIC HOUSING AUTHORITY

Division D-54A

OIL STORAGE DRUMS (55 GALLON)

June 25, 1942

Sec. 1. CONSTRUCTION

1. Drum shall be approximately 55 gallon capacity, constructed in accordance with the requirements for ICC-5 drums and shall be so marked. It shall have necessary tappings and be equipped with lock type fill cap and lock type spigot, and be arranged for horizontal mounting as shown on the drawings.

2. Paint drum and iron work around tank with a heavy coat of rust resisting paint.

DEFENSE HOUSING SPECIFICATION
NATIONAL HOUSING AGENCY
FEDERAL PUBLIC HOUSING AUTHORITY

Division D-54B

OIL STORAGE TANKS (110 GALLON)

June 25, 1942

Sec. 1. CONSTRUCTION

1. Tank shall be cylindrical in shape sutiable for horizontal mounting of 110 gallon nominal capacity - approximate dimensions 44 inches long by 27-1/2 inches in diameter - constructed of not less than 14 gage steel, with one prime coat on outside. Three 1-1/2 inch IPS tappings shall be provided at top, one 3/4 inch IPS drain tapping at the end, and four supporting lugs tapped 1-1/4 inch IPS for legs. Tank shall have the Underwriters' Laboratories, Inc. label of approval.

DEFENSE HOUSING SPECIFICATION
NATIONAL HOUSING AGENCY
FEDERAL PUBLIC HOUSING AUTHORITY

Division D-55A

GAS RANGES

June 25, 1942

Sec. 1. DESCRIPTION

1. Ranges shall be fully insulated, concealed manifold type, with four top burners, open cooking top, oven below cooking surface, and broiler below oven. Control devices and other protrusions shall come within established overall dimensions and shall be readily accessible from front. Side and back construction shall permit placing directly against kitchen cabinets, walls, etc. Automatic top or oven burner lighters shall not be furnished.

2. Width shall be not more than 20 inches; depth not more than 23 inches (front to back, excluding handles and flue collars); and height of top from floor shall be not more than 36 inches, nor less than 33 inches.

3. Total weight of all metals (sheet steel, cast iron, malleable iron, and brass) used in the construction of range shall not exceed 100 pounds, Copper (brass) shall be limited to construction of orifice hoods, orifice needles, the total weight of such copper bearing parts shall not exceed 4 ounces. Brass valves, if fabricated and available at the date of this bid, can be employed if the total weight does not exceed 26 ounces including orifice hoods and needles.

4. Preference shall be given to ranges commensurate with the reduction in weights of metals employed in their construction below those specified above.

5. Ranges shall be manufactured so as to comply with the requirements for performance, safe operation, and substantial and durable construction as set forth in the War Emergency Requirements for Domestic Gas Ranges published by the American Gas Association. Such compliance shall be determined from laboratory tests on one or more sample range by a nationally recognized testing agency adequately equipped and competent to perform such services, and shall be evidenced by the attachment of its seal or other authorized marking to such ranges. Such agency shall be one which maintains a program of national inspection of production models of all such ranges at least once each year on the manufacturer's premises. Approval by the American Gas Association Testing Laboratories as evidenced by the attachment of their seal or other authorized marking to such ranges and a certificate or letter certifying approval under above mentioned requirements shall be considered as constituting compliance with the provisions of this section.

Sec. 2. CONSTRUCTION

1. Two drop doors or one swing door shall be furnished (right or left hand as required). Oven burner adjustments shall be made from front. With

swing doors, the mixer face of oven burner, if on the side, shall be on side opposite hinges.

2. Manifold shield separate from door shall be furnished and shall be easily removable. Shield must be removable without removing thermostat dial except when setting or stop positions of thermostat are not affected.

3. Removable drip tray or combustion pan of enameling, steel shall be furnished with finish ground coat of vitreous enamel of black Japan.

4. Non-clog type top burners for natural, manufactured, or mixed gas shall be furnished as required. Type of gas available for use at projects will be given to manufacturer with shipping instructions for individual projects.

5. Back splasher not less than 4 inches high and extending full width of range cooking top shall be furnished.

6. Inside dimensions of oven shall be 16 inches wide, 12 inches high, and 18 inches deep with door open. (A tolerance of plus or minus 5 per cent will be allowed the dimensions given).

7. One burner for both broiling and baking shall be furnished. Oven flue gases shall be discharged through oven vent, away from rear wall.

8. Metal surfaces shall be finished as follows:

(a) Exposed faces of splasher back, manifold shield, front panel frame, and door panel or panels shall be finished in white or ivory vitreous enamel. Cooking top shall be of black vitreous enamel finish. Sides shall be white or ivory vitreous enamel (if no section reaches a temperature in excess of 175 degrees F., white or ivory synthetic baked enamel is acceptable). Range back shall be black baked-on enamel. Exposed faces of legs or front and side strips where bases are used instead of legs, shall be of vitreous enamel or synthetic baked-on enamel. Oven interior, sides, back, door and bottom, broiler, glides, pan and insert shall be of vitreous enamel, or equivalent. Top of oven interior shall have a rust-resisting finish.

9. Nonmetallic, noncombustible materials shall be considered acceptable for side and door panels, and other surfaces if not exposed directly to flue gases, and if durably and substantially constructed.

Sec. 3. INSTRUCTIONS

1. With each unit there shall be furnished installation instructions, operating instructions and list of repair parts.

DEFENSE HOUSING SPECIFICATION
NATIONAL HOUSING AGENCY
FEDERAL PUBLIC HOUSING AUTHORITY

Division D-56

ICE REFRIGERATORS

June 25, 1942

Sec. 1. DESCRIPTION

1. Refrigerator shall be of portable type with front door openings, having ice capacity to maintain cabinet temperature as specified hereinafter.

2. Net volume shall be 5 cubic feet with allowable tolerance plus or minus 0.2 cubic feet. Over-all dimensions shall not exceed the following:

Width - 31 inches Height - 61 inches Depth - 26 inches

3. Ice chamber and ice chamber door shall be of size to receive 75 pounds of standard scored ice in one piece.

Sec. 2. CONSTRUCTION

1. Latest standards of construction and performance of National Association of Ice Industries (NAII) and the National Association of Ice Refrigerator Manufacturers shall apply unless otherwise specified.

2. Doors shall be of suitable overlapping type with square or beveled jambs; insulated, sealed and finished as specified for refrigerator walls or with an approved plastic material permanently sanitary and impermeable to moisture. Doors and frames shall be sealed air tight when closed, with rubber or rubber-covered compression gaskets, which do not absorb odors, securely mounted on overlapping edges of doors. Hinges shall be substantial and latches strong, self-closing, quick acting and capable of holding door tightly closed.

3. Single door may be provided if equipped with an inner ice compartment door, otherwise double doors shall be provided.

4. Right and left door swings shall be provided as required.

5. Exposed hardware shall be of simple, substantial design, finish corrosion proof, and securely attached. The finish shall not be affected when subjected for 16 hours to a spray of sodium chloride solution of 20 per cent maintained at temperature between 93 and 97 degrees F.

6. Shelves shall provide maximum utilization of storage space; and shall have corrosion-resisting finish. Sliding shelves, if provided, shall have stops to prevent being pulled out accidentally and striking against food liner when pushed in.

7. Ice chamber bottom, racks and grids shall be riveted or welded to withstand maximum load to which subjected without permanent deformation; fin-type racks and grids shall be galvanized steel fins (minimum 24 gage) or other rust-resistant metal of equivalent strength.

8. Drainage system from ice compartment shall consist of a non-corrosive drain tube, water sealed, with cleanable, sanitary trap.

9. Insulation conductivity shall not exceed NAII requirements. Slabs of insulation shall be wrapped with asphalt sandwich waterproof paper, not less than 30-30-30 type (two layers, 30 pound kraft paper with 30 pound asphalt between ream). Joints in wrapper shall be sealed in hot asphalt and ironed to make joints air tight, or seams of outer shell shall be sealed with metal or asphaltic compound using self-supporting slabs of moisture and rot resistant insulation.

10. Exterior covering and interior shall shall be sheet steel with nonferrous coating, galvanized, galvannealed, or long terne, or uncoated furniture steel, bonderized and ground coated, or otherwise treated to resist rusting.

11. Interior and exterior coverings shall be coated with lacquer, enamel or porcelain, treated to receive finish. Bottom of interior lining shall be finished with white acid-resisting porcelain enamel so as to withstand the following test:

(a) Apply 10 percent solution of acetic acid and allow to remain 30 minutes at room temperature. Wash off with water and examine for glaze. Wash off with Old Dutch Cleanser and dry. Bottom lining shall not indicate staining or loss of glaze.

12. One galvanized steel drip pan, of thickness not less than No. 22 U.S. Standard Gage shall be provided for each refrigerator. In place of galvanized steel, pan of equivalent strength of noncorrosive base metal or metal treated to resist corrosion may be used. Pan shall be of size to fit under refrigerator and shall be not less than 16 quart capacity.

Sec. 3. PERFORMANCE

1. Refrigerator shall meet following performance requirements at 80 degrees F. room temperature under NAII test code:

(a) Temperature in cold section not higher than 45 degrees F.

(b) Average food compartment temperature not higher than 50 degrees F.

(c) Ice meltage per cubic foot food space per day, per degree temperature difference, not greater than 0.140 pounds.

2. The construction and finish of the cabinet interior shall be such as to be non-odor absorbing.

Sec. 4. GUARANTEE

1. Guarantee set forth in the General Conditions shall apply, except as to vitreous enamel.

Sec. 5. INSTRUCTIONS

1. Descriptive literature giving simple instructions as to operation, maintenance, desserts, etc., shall be furnished with each refrigerator.

DEFENSE HOUSING SPECIFICATION
NATIONAL HOUSING AGENCY
FEDERAL PUBLIC HOUSING AUTHORITY

Division D-57

LIGHTING FIXTURES

June 25, 1942

Sec. 1. GENERAL

1. Fixtures shall be simple and sturdy in design, of types which permit ready interchangeability and replacement. Fixtures shown in Exhibit 'A' attached, represent available standard types, embodying features outlined above. Any changes which can be effected to improve the esthetic design of fixtures, without impairing the illumination efficiencies and low cost are encouraged.

2. Fixtures shall conform to Underwriters' standards and be so labeled.

3. Fixtures shall generally be wired complete ready for installation. On certain projects, due to local conditions, fixtures shall not be wired, but wire of proper type, size and length shall be furnished with each fixture.

4. Means for supporting fixture to outlet box shall be provided and shall be corrosion resistant.

Sec. 2. TYPES OF FIXTURES

1. Type A (Living Room): Metal, porcelain, plastic or composition holder with lamp receptacle (keyless) with supporting strap for box. Adapted for supporting link or bead chains and bowls. Bowls to be translucent or opaque (3-inch louver in bottom, if opaque), 12 inch minimum diameter, designed for 100 watt bulb. Chains shall be fastened to shade so as not to become detached therefrom.

2. Type B (Bed Room): Same as specified for Type A except that translucent bowls shall be minimum of 8-1/2 inch diameter and opaque bowls a minimum of 9-1/2 diameter, designed for 75 watt bulb with no louver in opaque bowls.

3. Type C (Kitchens): Lamp receptacle (keyless) 4 inch fitter with white opal globe (approximately 8 inch diameter.)

4. Type D-1 (Halls): Beam fixture with flared ring opening, short pull chain and 30-inch long cord.

5. Type E (Bathroom): Bracket type, keyless.

6. Type F (Utility and Storage Room): Lamp receptacle with (1) short insulated chain or (2) short chain with 30-inch long cord as may be required.

7. Type J (Exterior Bracket Fixture): Bracket lantern consisting of a 4-inch diameter clear glass cylinder supported in frame and hood, approximately 8 inch over-all height, lantern body supported by arm and back plate.

8. Lamp receptacles and fixtures listed under Types C, D-1, E, F and J shall be of metal, porcelain or composition.

Sec. 3. MATERIALS

1. The following materials cover canopies, holders and bowls only. Current carrying parts and fixture supports shall be of materials suitable for purpose intended.

(a) Metal: (Minimum 0.025 inch) bonderized or otherwise treated to prevent corrosion. Finish shall be synthetic enamel baked at 250 degrees F. or higher.

(b) Plastic: Molded from thermal setting urea-formaldehyde.

(c) Composition:)
) High grade, free
(d) Porcelain:) from flaws and
) pin holes
(e) Glass:)

2. Wiring devices: Switches and receptacles shall conform to Federal Specifications WS-893 and WR-151 respectively.

3. Pull Control: Fixtures provided with pull chain control shall have snubber or stop at hole in canopy where chain emerges to relieve strain of excessive pull on cord.

4. Wire Lengths: Each lead on fixtures shall be 6 inches long, measured from a line drawn back of fixture.

Sec. 4. FINISH

1. Standard finish as may be selected.

2. Reflecting surface of metal bowls shall be synthetic white enamel baked at 250 degrees F. or higher.

Sec. 5. CHAIN SUPPORTS

1. Three link or bead chains shall fasten bowl to canopy or lamp holder. The chain supports shall permit easy removal of bowl for cleaning purposes and shall be so fastened to bowl as not to become detached therefrom.