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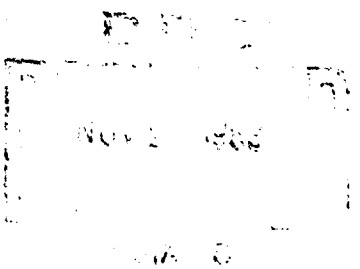
Technical Note N-540

SPECIFICATIONS FOR A TEMPORARY POLAR CAMP

23 October 1963

U. S. NAVAL CIVIL ENGINEERING LABORATORY
PORT HUENEME, CALIFORNIA



SPECIFICATIONS FOR A TEMPORARY POLAR CAMP

Y-F015-11-104

Type B

Compiled by

G. E. Sherwood

ABSTRACT

A temporary polar camp was developed to provide comfortable living conditions for 2- to 5-year occupancy in polar areas. The camp is suitable for use on snow, ice and permafrost as well as firm ground. The design includes structures, air-conditioning, water supply, sanitation, electrical power and other such facilities integrated to form a functional component. A basic camp capacity of 50 men is planned with expansion in 50-man increments to 200-man capacity. This technical note contains the specifications for the camp presented in NCEL Technical Report TR-286 "A Temporary Polar Camp."

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INTRODUCTION

Present activity in the polar areas has shown the need for temporary-type camps with a life of from 2 to 5 years to house operating personnel.[1] A packaged camp complete with structures, air conditioning, electrical power, water supply and waste disposal would meet most requirements of occupancy in any polar region. Although no single camp would satisfy all of the requirements for a specific location and mission, it could meet most of the needs and be easily adapted to satisfy specific requirements. Availability of such camps would simplify the planning and logistics of providing a camp and should improve the living conditions. A temporary polar camp was developed for 50-man occupancy and expansion in 50-man increments to 200-man capacity.[2] The camp is suitable for use on snow, ice and permafrost as well as firm ground. This technical note contains the specifications for the camp developed under contract by King, Benioff and Associates, Consulting Engineers, Sherman Oaks, California. Standard specifications referenced in the text are listed in Appendix A.

DESCRIPTION

1. General

This specification covers the buildings, connecting tunnels, partitioning, air conditioning, plumbing and electrical systems and furniture and equipment for a complete packaged temporary polar camp. The camp is based on 50-man occupancy and is expandable to accommodate 100, 150 or 200 men. It is designed for a useful life of a minimum of 5 years.

The design is directed toward single-room occupancy, but is also suitable for limited periods of double occupancy. It is suitable for surface installation on all types of polar terrain and for all climatic conditions. All structures are temporary type.

The temporary polar camp is detailed in the drawings of Appendix B.

2. Buildings

A. Building No. 1 Quarters-Quarters

This building provides quarters for 22 enlisted men in single rooms, two lounges and head and laundry facilities.

B. Building No. 2 Recreation-Quarters

This building provides quarters for 11 enlisted men in single rooms, one lounge and head and laundry facilities in one end. In the other end is a recreation room consisting of a game area, library, ship's store, photo darkroom and facilities for group activities such as movies and religious services.

C. Building No. 3 Storage-Mess Hall and Galley

This building provides a complete mess hall and galley in one end and a heated storage room, 28 by 52 feet in the opposite end. The mess hall and galley are designed basically for the 50- and 100-man camps and increased in capacity for the 150- and 200-man camps by adding certain equipment and seating. The storage area is equipped with metal shelving and a room is provided for locked storage.

D. Building No. 4 Storage-Utilities

This building provides an unheated storage room, 28 by 52 feet in one end and a utility room 28 by 68 feet in the opposite end. The storage area is provided with steel shelving. The utility room accommodates generator sets; switchboard; water production, storage and distribution equipment; and fuel distribution equipment.

E. Building No. 5 Administration and Communications-Quarters

The administration-communications room occupies an area 28 by 52 feet in one end. Quarters for officers and transients and head and laundry are in the other end. The administration-communications area provides two private offices, ample space for general office, separate area for communications and a post office. The quarters area provides seven individual rooms, 12 by 12 feet, and a lounge. The rooms are of ample size for double occupancy when required.

F. Building No. 6 Quarters-Dispensary

This building provides quarters for 11 enlisted men in single rooms, one lounge and head and laundry facilities in one end. In the other end is a dispensary consisting of corpsman quarters, three-bed ward, examination room, pharmacy, laboratory, doctor's office, storage room, head with tub and a dental operating room when required.

G. Building No. 7 Quarters-Quarters

This building is used only in the 150- and 200-man camps and provides quarters for 12 officers or transients in single rooms, 12 by 12 feet, two lounges, 16 by 24 feet, and head and laundry facilities. The rooms are of ample size for double occupancy when required.

H. Building No. 8 Administration-Communications

This building provides an area of 28 by 52 feet each for administration and communications and is used only in the 150- or 200-man camps. If the 150- or 200-man camp is constructed by adding to an existing 50- or 100-man camp, building No. 5 in the smaller camps shall be converted to building No. 8. This is accomplished by leaving all existing partitions in place and ordering only the additional furniture, equipment and electrical materials as noted on the drawings. Head and laundry facilities are provided in this building.

3. Camps

A. 50-Man Camp

The 50-man camp consists of six buildings, with connecting tunnels plus a camp maintenance shop building.[3] The main buildings are one each of buildings No. 1, 2, 3, 4, 5, and 6. The actual single occupancy capacity of the camp is 52.

B. 100-Man Camp

The 100-man camp consists of the 50-man camp plus two No. 1 buildings and two connecting tunnel units. The actual single occupancy capacity of the camp is 96.

C. 150-Man Camp

The 150-man camp consists of the 100-man camp plus two No. 1 buildings, one No. 2 building, one No. 7 building, one No. 8 building and four connecting tunnel units. The actual single occupancy capacity of the camp is 156 men.

D. 200-Man Camp

The 200-man camp consists of a 150-man camp plus two No. 1 buildings and two connecting tunnel units. The actual single occupancy capacity of the camp is 200.

4. Utilities

The following utilities are furnished.

A. Electrical

Diesel engine generators are used for electrical power. Two 100-kw generators plus one 100-kw generator as a standby are provided for the 50- and 100-man camps. One 100-kw generator must be added for the 150- and 200-man camps thus providing 300-kw capacity with one 100-kw unit for standby. One 10-kw standby diesel engine generator is provided in each

heater room to supply emergency power to each building for heating and limited lighting in the event of complete failure of the central plant. The electrical system is 120/208v, 3 phase, 60 cycle, 4 wire.

B. Plumbing

The plumbing system consists of a fresh water storage and distribution system, head and laundry facilities, sewage collection system and fuel system.

(1) Water System. Storage tanks of 1,175 gallons each are located in the utility room. Four tanks are provided for the 50- and 100-man camps. Four tanks are added for either the 150- or 200-man camps. Water production is not included in this camp design. Space is provided in the utility room for water production equipment which must be ordered to fit the requirements of the camp location. The distribution system is a single-pipe system with constant pressure provided by a continuously running pump located in the utility room. The water supply line outside of the buildings is placed in an insulated metal utility trough and is heated with an electric cable. The trough also contains the main sewer line and fuel supply line. Water heaters are provided in each building where required.

(2) Head and Laundry. Identical head and laundries are provided in all buildings except No. 3 and No. 4. The toilet bowls and urinal are a self-contained type using recirculated, filtered water for flushing. Two toilet bowls, one urinal, three lavatories, two showers, one washer, one dryer, one drinking fountain and one service sink are furnished in each head and laundry.

(3) Waste Disposal. All plumbing fixture waste lines, including the toilet tanks, are connected to a main sewer line which runs the length of the camp and under the buildings. The main sewer terminates 20 feet beyond the last building. The disposal plant, pit or other device, is not included in the camp design and must be provided. The sewer line outside the buildings is placed in an insulated metal utility trough and is heated with electric cable. The trough also contains the water and fuel distribution lines. The sewer is designed as a gravity system and provision for sloping the utility trough must be provided at the site.

(4) Fuel System. A complete fuel system for supply and distribution of fuel to all buildings is provided. The system consists of a main supply tank, 21,000 gallons (two weeks' supply); day tanks, 2,000 gallons at building No. 4 and 400 gallons at each of the other buildings, (four days' supply); a distribution pump located in the utility room and distribution pipe lines. The fuel line is placed in an insulated metal utility trough also containing the sewer and water lines and is not individually heated.

C. Heating and Ventilating

(1) Heating. The heating system is self-contained in each building. All buildings are provided with a complete system except building No. 4 Storage-Utilities. This building is furnished with a furnace only to be erected in the utilities room for use while installing equipment. The heating system consists of a diesel-fueled forced-air furnace and a duct system. A mixture of fresh air and recirculated air assures proper ventilation and all heated air is humidified. Controls are duct mounted thermostats. In the event of a main power supply failure, a 10-kw generator is provided in each heater room for emergency power for furnace and other special equipment and minimum lighting.

(2) Ventilating. Ventilation other than the forced air furnaces, consists of toilet unit ventilation, galley ventilation, and utility room ventilation.

(a) Toilet unit ventilation is provided by a utility-type exhaust fan connected directly by a duct to the toilet unit as indicated.

(b) Galley ventilation is provided by utility-type exhaust fans connected to the hoods over the cooking equipment. The hoods are equipped with grease filters. A furnace is provided in the storage area of building No. 3 to provide heated make-up air required by the hood ventilators.

(c) Utility room ventilation is provided by exhausting the air through the radiators directly to the exterior and bringing in air through louvered pent houses on the roof over the generators.

GENERAL CONSTRUCTION

1. Scope.

This section covers the specifications for all materials and fabrication for items included in the camps other than for Electrical, Plumbing, and Heating.

2. General

The work shall include the furnishing of all labor and materials for the complete fabrication of all items, except as indicated on the drawings. Items designated on the drawings by Federal Stock Number (FSN) are covered by other government specifications. No deviations shall be accepted except as approved by the contracting officer in writing.

3. Materials

A. Wood

(1) Lumber (Referred to on the drawings as "Wood"). All lumber shall be thoroughly and uniformly dried to a moisture content not more than 12 percent at the time of fabrication determined in accordance with Specification MIL-W-6110, and shall be free from decay, case bordering, shakes, checks or any other defect which may affect the strength, wear or serviceability of the member. Not more than two small round knots 1/4- to 1/2-inch in diameter or one 3/4-inch knot will be permitted per square foot. Members shall be finished on all sides to drawings dimensions. Any of the following species of wood may be used, unless otherwise specified: Fir, Douglas, Coast Region; Hemlock, Western; Pine, Norway or Ponderose; Pine, (White) Northern or Western; Spruce (Eastern Sitka); Pine, Southern (long leaf, slash, short leaf and loblolly).

(2) Plywood shall conform to Specification NN-P-530a for all plywood and shall be grade marked to indicate conformance with the following requirements: Douglas Fir, Exterior Type, Grade AC, sanded 2 sides, as per Commercial Standard CS-45 of latest date. All panels shall be stamped with the Grade Mark of the Douglas Fir Plywood Association.

B. Steel

(1) Sheet or strip shall conform to Specification QQ-S-640, FS-1C20 unless noted otherwise.

(2) Bar stock shall conform to Specification AA-S-633a.

(3) Structural shall conform to "Standard Specifications for Structural Steel for Bridges and Building," Serial Designation A-36 of the American Society for Testing Materials.

(4) Corrosion Resistant Steel (CRES) shall conform to Specification QQ-S-766c of alloy or class as indicated in these specifications or on the drawings.

C. Aluminum

(1) For structural purposes. Alloy 6061 or 6062, T-6 Temper, conform to Specification QQ-A-270a. Alloy and use as indicated on the drawings.

(2) Corrugated sheets (for tunnels). Alloy 3004 with ASTM Clad MG11A, Zero temper.

(3) Welding wire. 5154 or 5356 for Alloys 6061 and 6062.

(4) For rivets. Alloy 2024-T4 conforming to Specification MIL-R-5674B.

D. Cloth

(1) Closure band for connecting tunnels shall conform to Specification MIL-C-43006. Gray color. (Herculite #80 as manufactured by Herculite Protective Fabrics, Newark 3, New Jersey, conforms to this specification.)

E. Fastenings

(1) Nails shall be steel, of size and type as indicated on the drawings, and shall conform to Specification FF-N-105.

(2) Screws.

(a) Wood screws shall be steel, of the size indicated on the drawings and of style 2c, flat countersunk head with cross recess drive and shall conform to Specification FF-S-111b. Wood screws shall be used only where length requirements are in excess of 2 inches.

(b) Screws, threaded full length. All screws screwing wood to wood or other materials to wood and where the length requirement is not in excess of 2 inches shall be a type of screw that is threaded full length. These screws shall be cadmium-plated with cross recess drive and head type as indicated on the drawirgs. Type A, Parker Kalon, cadmium-plated screws with Phillips slot conforms to these requirements.

(3) Fasteners, corrugated shall be standard commercial of size indicated on the drawings.

(4) Bolts, nuts, washers.

(a) Bolts, carriage, square neck and nuts. Conform to Type C-2, Table X, of Specification FF-B-571a, and nuts Type A1, Table XII.

(b) Bolts and nuts, hexagonal. Conform to Specification FF-B-571a, Type B1, Table V, and nuts Type A1, Table XII.

(c) Washers shall be standard commercial, cut-cold rolled steel of size indicated on the drawings.

(d) Lag bolts shall conform to Specification FF-B-561a, Type I, Grade B.

(e) Finishes. All bolts, nuts and washers shall be finished with a zinc coating conforming to Type II or III, Class 2 of Specification QQ-Z-325a or a cadmium plating Type II or III, Class 2 of Specification QQ-P-416a.

(5) Adhesive A - Wood to Wood. The adhesive used for adhering wood to wood (other than the manufacture of plywood) shall conform to Type I, Grade A, Class 1 of Specification MIL-A-397B.

(6) Adhesive B - Rubber to Metal. The adhesive used for adhering rubber gaskets to metal or wood shall conform to Specification MIL-A-1154C.

(7) Screws and Rivets for corrugated aluminum.

(a) Screws shall be Series 300 CRES or Alloy 5056 aluminum sheet metal screws with Hex head and neoprene washer. Size as indicated on drawings.

(b) Rivets shall conform to Specification MIL-R-5674B.

F. Insulation

(1) Batts. The insulation material shall be of the preformed fibrous glass type conforming to Specification HH-I-521C, Type 1, Class A except that thermal conductivity shall not exceed .28 Btu per hour per square foot per degree F temperature difference per inch of thickness at 75 F, and the density shall not be greater than three pounds per cubic foot and not less than two pounds per cubic foot.

(2) Building Paper. Conform to Specification UU-P-147b, Type IV, Class A, B or C.

(3) Vapor Barrier shall be aluminum foil, 0.0007-inch thick mounted on one side of Grade B, No. 2, 80 pounds kraft paper.

(4) Ceiling Panels shall be a preformed, fibrous glass type faced on one side with a white decorative plastic film. Panels shall be 24 by 48 by 1 inch. Gross weight shall be .17 pounds per square foot plus or minus .01. The surfaced side shall be one that can be easily cleaned by washing with mild soap or detergent without damage and shall have a light reflection of at least 79 percent. The panel shall have a fire resistance rating equal to "Class C - Slow Burning" in accordance with Specification SS-A-118b. (Sonocor Ceiling Board manufactured by Owens-Corning Fiberglass Corporation, conforms to this specification.)

(5) Mineral Wool for roof jack assembly shall conform to Specification HH-I-521c, Type II.

G. Hardboard

Conform to Specification LLL-H-35, Type II, smooth one side, 1/4-inch thick.

H. Rope

Conform to Specification T-R-605, Type M, Class 1.

I. Coating (not including bolts, nuts and washers)

(1) Galvanizing shall conform to Specification QQ-Z-325a, Type II, Class I zinc coating.

(2) Cadmium Plating shall conform to Specification QQ-P-416a, Class I, Type II.

J. Paint

(1) Primer shall conform to Specification TT-P-636b.

(2) Enamel shall conform to Specification TT-E-529a, Class A. The color shall be No. 24087, Table VI of Standard FED-STD-595.

K. Rubber

(1) Gasket A for panel W-19 shall conform to Specification MIL-C-3133, Class RS, Grade 41.

(2) Gasket B for the roof jack assembly shall conform to Specification MIL-C-3133, Class RS, Grade 43.

(3) Gasket C for the door in panel W-19 shall conform to Specification MIL-C-3133, Class RS, Grade 12 with rubber skin vulcanized on the curved portion and a reinforcing strip of rubber impregnated fabric attached to the flat portion.

(4) Corrugated closure strips shall be made of material conforming to Specification MIL-C-3133, Class RN, Grade 41 or 42, FF (-65 F), black.

L. Acrylic

View window in interior doors shall be of clear commercial grade cast acrylic sheet conforming to Specification L-P-391a, Grade 1.

M. Tape

Tape for flashing of vent pipes to roof jacks and for covering joints in utility trough (see Plumbing) shall be a pressure sensitive aluminum foil tape, 3 inches wide and 7-1/2-mils thick. It shall be capable

of adhering to sheet metal, wood or aluminum at minus 25 F and remain adhered to at least minus 65 F. (3-M Aluminum foil tape #428-A conforms to this specification.)

N. Mirrors

Shall conform to Specification DD-M-411 Grade I, Class E, 18 by 30 inches.

4. Basic Building (Y&D Drawing 943675)

The basic building consists of the following:

Modified T5 Building, 28 by 128 feet.

Insulating board ceiling panels with aluminum tee and angle supports.

Building paper air seal for floor.

Hardboard floor overlay.

Blackout shades.

Foundation as called for on drawings.

Basic foundation

Special Foundation

A. Modified T5 Building

Modified T5 Building[4] is the arctic structure developed by the U. S. Army Corps of Engineers and referred to as "Building, Prefabricated, Panelized, Wood, Arctic by U. S. Army Engineer Research & Development Laboratories, Corps of Engineers, Fort Belvoir, Virginia." Revised door and floor panels are substituted for those indicated for the standard building.

(1) Door Panel W-19 as shown on Y&D Drawings 943715 and 943716 is substituted for Door Panel W-17 and provides a three foot wide door.

(2) Floor Panels 2F1, 2F2, 3F1, 3F2, 4F1, and 4F2 as shown on Y&D Drawings 943666 to 943670 inclusive prepared by the U. S. Naval Civil Engineering Laboratory are substituted for Floor Panels F10 to F15 inclusive.

B. Insulating Board Ceiling Panels shall be of fiberglass as specified in 3. Materials. Panels shall be cut to fit in field. There is no ceiling provided over the heater rooms nor in Building No. 4. Ceiling supports shall be aluminum extrusions as indicated. They shall be placed at every longitudinal panel joint and joint adjacent to the walls as indicated.

C. Building Paper Air Seal

Building paper air seal for the floor shall be furnished in wrapped standard length rolls. It shall be installed over the floor panels under the hardboard floor overlay. All joints shall be lapped a minimum of 4 inches.

D. Hardboard Floor Overlay

Hardboard floor overlay shall be furnished in standard size 4- by 8-foot sheets and cut to size in field. It shall be installed with the long dimension of the sheet parallel to the length of the building and secured with roofing nails. It shall be placed before partitions or any equipment is installed.

E. Blackout Shades

Shades shall conform to Specification DDD-S-251b, Type IV, black cloth of size indicated on the drawings. Shades shall be furnished for all windows.

F. Foundations

Foundations, as shown on Y&D Drawing No. 943712, are of two types, basic and special. The basic foundation is designed to support ordinary floor loads (50 pounds per square foot live load) and provides support for the floor panels at 8- and 10-foot spans. The special foundation is designed to support heavy loads (150 pounds per square foot live load) and provides additional support of the floor panels at their mid span. The beams are designed to be supported on pads or piles to conform to site conditions.

(1) All materials shall be in accordance with 3. Materials.

(2) Fabrication shall be in accordance with American Institute of Steel Construction Specification for Design, Fabrication and Erection of Structural Steel for Bridges and Buildings. All members shall be plainly marked as indicated for erection. Bolts shall be hexagonal-head bolts as specified in 3. Materials and shall be wrapped in waterproof bags with

size plainly marked. Threads of rods shall be protected from rusting with a waterproof plastic coating and protected from physical damage by wrapping.

(3) Painting. All surfaces of steel members, unless zinc coated, shall receive 1 coat of primer and 2 coats of enamel. Application may be by spraying or brushing and shall be done after all parts are completely assembled.

(a) Cleaning. Steel surfaces shall be thoroughly cleaned in accordance with Specification MIL-C-490A(1).

(b) Film Thickness. Dry film thickness of primer coat shall be 0.3 to 0.5 mils. Dry film thickness of each coat of enamel shall not be less than 4.0 mils. Total thickness of protective finish shall not be less than 8.0 mils.

(c) Application of the coatings shall be in accordance with best application techniques to provide uniform dry film thickness as specified. The finished appearance shall be smooth, continuous, and free of dry overspray, pin holes, orange peel, sags or other film defects characteristic of poor workmanship.

5. New Building Panel W-19 (Y&D Drawing No. 943715 and 943716)

A. Use

This panel shall replace Door Panel W-17 of the Modified T5 Building referred to as "Building, Prefabricated, Panelized, Wood, Arctic" as described in 4. Basic Building.

B. Materials

Shall be as specified in 3. Materials and of sizes and type as indicated on the drawings or specified herein.

C. Reference Specification

If, at the time of fabrication of these panels, the Corps of Engineers has prepared and adopted a Military Specification for the fabrication of the "Building, Prefabricated, Panelized, Wood, Arctic" referred to as the Modified T5 that specification shall govern in lieu of this one.

D. Fabrication

(1) Workmanship shall be of the highest grade throughout and in accordance with good commercial practice for this type of work.

(2) Wood and Plywood. All contact surfaces between wood members, including plywood and hardwood shall be glued with Adhesive A in addition to mechanical fasteners. Adhesive manufacturers specifications for gluing operations shall be followed. Wood members shall be accurately sized as detailed. Panels shall e constructed in accurate jigs to assure squareness and dimensions within the tolerances indicated. Tongues shall be hardwood.

(3) Steel and Sheet Metal members shall be accurately made as detailed and shall fit neatly and tightly in place. Plates shall be straight with square corners and accurately located holes. All bends shall be made with metal dies to assure accuracy. All metal parts shall be galvanized.

(4) Insulation and Vapor Barrier. Insulation batts shall be cut to fit snugly in all cavities with a compression fit at edges and against face panels. The vapor barrier shall form a complete and tight fitting liner in each cavity. It shall be applied to the warm face of all panels with the aluminum foil on the warm side. Edges shall be turned up against the framing members and shall be stapled to them in the upper half of the side of these members.

(5) Gaskets shall be Gasket A for the panels and Gasket C for the door of size indicated on the drawings. All gaskets shall be secured with Adhesive B in addition to staples through the fabric backing. All ends of gaskets shall be secured with a 2d nail. Gaskets shall be applied with sufficient pressure to assure good, continuous adhesion.

(6) Hardware shall be galvanized or cadmium plated in accordance with 3. Materials. All plating shall be done after fabrication. Doors and panels shall be properly drilled and recessed for hardware not installed at the factory. The continuous hinge shall be as detailed and the door fastener shall be a heavy duty refrigerator door fastener. (Butcher Boy No. 1M Heavy Duty Main Door Fastener as manufactured by Butcher Boy Refrigerator Door Company, Harvard, Illinois, conforms to this specification.) The door shall be hung in the panel for shipment.

(7) Painting. After fabrication all surfaces of panel and door shall be treated and painted in accordance with Specification MIL-T-704C, Type B. Colors shall be as specified by contracting officer.

6. Interior Partitions and Drop Ceiling Side Panel H-1 (Y&D Drawing Nos. 943713 and 943714)

A. Materials

Shall be as specified in 3. Materials of sizes and type as indicated on the drawings.

B. Fabrication

Individual members shall be accurately cut to size and shape as indicated. All joints shall be a neat, tight fit and panels shall be square. Panel sizes shall be held within the tolerances shown. All contact surfaces between wood members, including plywood, shall be glued with Adhesive A in addition to mechanical fasteners indicated. Panels with doors shall have the doors completely hung with all hardware installed. Exposed hardware shall be wrapped with waterproof material for protection. Insulation blanket shall be cut to fill spaces solidly.

C. Steel and Aluminum Fittings

(1) Clips shall be manufactured of sheet steel of thicknesses and shapes as detailed. Bends shall be made with metal dies to assure accuracy. Tolerances for all dimensions of clips shall be -1/16 inch except that diameters of holes and slots shall be $\pm$ .01 inch. All clips shall be galvanized after fabrication in accordance with Specification QQ-Z-325a, Type II, Class I.

(2) Angles and Tees shall be extruded from alloy 6062-T4 aluminum. Standard extrusions conforming to the sizes detailed may be used.

D. Trim and Posts

Shall be milled from clear white pine to detail as indicated. Posts shall not be twisted.

E. Doors

Shall conform to Specification LLL-D-581 Type III, hollow core doors with Grade 2 hardwood face veneer. Sizes shall be as indicated. Plywood used for face veneer shall be constructed with waterproof glue and all other adhesives used shall be waterproof. Face veneers may be either birch or gum, unselected for color. View windows and louvers shall be installed in doors as indicated. Louver blades shall be fixed and shall be either birch or gum.

F. Hardware

Shall conform to Specification FF-H-106a and FF-H-116c and shall be of type indicated on the drawings. Hinges shall be USP finish. Latch sets shall be US28 finish. All doors shall be drilled and recessed for hardware installation even though hardware is shipped separately. Doors shall be hung in panels as indicated.

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G. Painting

After assembly all panels and door surfaces, including edges, and wood trim and posts shall receive 1 coat of primer and 2 coats of enamel. Application may be by spraying, brushing or rolling in accordance with best application techniques. The finished appearance shall be smooth, continuous, and free of dry overspray, pin holes, orange peal, sags or other film defects characteristic of poor workmanship.

H. Color of Enamel

Shall be Number 24533 (light green) in accordance with Federal Standard 595 unless otherwise specified by contracting officer.

7. Connecting Tunnels (Y&D Drawing No. 943711)

A. Materials

Shall be as specified in 3. Materials and of sizes and type as indicated on the drawings.

B. Fabrication

(1) Aluminum. The aluminum corrugated sheets shall be bent as detailed in a single length if possible. The elimination of the horizontal joints between curved section and straight sections is very desirable.

(2) Alternate. If corrugated aluminum cannot be furnished in one piece, joints may be located as indicated. Joints shall be shop riveted as shown with aluminum rivets so that sections shall be shipped as a single piece.

(3) Sheet metal screws for field connections shall be packed in waterproof containers.

(4) Corrugated Closure Strip shall be of rubber as specified in 3. Materials, furnished in standard lengths in waterproof packages or cartons.

(5) Closure Band shall be made of coated nylon as specified in 3. Materials. Cloth, with folded hem on all edges as detailed. Thread shall be dacron and stitching shall conform to Federal Standard 751, Type 301.

(6) Floor Panels shall be made in units as detailed and shall include ramp panels and ledgers. After fabrication all surfaces shall receive 1 coat of primer and 2 coats of enamel. Color shall be No. 24087, Table VI of FED-STD-595.

(7) The Wood Battens for attaching the closure band to the buildings shall be cut to size as indicated. They shall be finished with 1 coat of primer and 2 coats of enamel. Color shall be No. 24087, Table VI of FED-STD-595.

8. General Furniture and Equipment

This section covers all furniture and equipment shown on the general arrangement drawings. Electrical, plumbing and air conditioning equipment is covered by other sections.

A. Items Covered by Federal Stock Number (FSN)

Such items are covered by other government specifications and are referred to by a FSN on the drawings.

B. Commercial Items

Items not available by FSN are referred to as "Commercial" items on the drawings and are specified in the following paragraphs by description and/or reference to commercially manufactured items. These are examples of equipment that conform to these specifications as a guide for procurement and do not confine the item to one manufacturer.

(1) Folding Door (Building No. 6) shall be of wood, accordion type, suspended from a track overhead. Spring hinges shall be concealed in the closed position. Doors shall be furnished completely assembled. Track shall be of shape as detailed, 1- by 1-inch, 20 gauge steel with corrosion-resistant coating. There shall be no assemblies and bearings shall be of all nylon construction designed for free, quiet operation. Hangers shall be installed on alternate panels. Panels shall be made up of glued-up wood block cores faced with either pine or birch veneer bonded with water-resistant glues. Panels shall be 3-5/8 inches wide by 3/8 inch thick. Hardware parts shall be plated with corrosion-resistant coating. Spring hinges shall be made of .024-inch hard-drawn, high-carbon spring wire, galvanized before drawing, 5/32 inch in diameter. Trim members on jambs shall be furnished with the door and of same materials. Wood shall be standard clear finish of manufacturer. Door shall be complete with all necessary screws, latches, and installation hardware. (Wood Folding Doors as manufactured by Rolscreen Company, Pella, Iowa, conforms to this specification.)

(2) Metal Tables indicated as corrosion-resistant steel (CRES) shall conform to the following specifications:

(a) Alloy 302 or 304 polished corrosion-resistant steel.

(b) Tops. 14 gauge with 2-inch rolled down edges.

(c) Sides. 18 gauge.

(d) Reinforcing. 12 gauge steel channels or angles.

(e) Shelves. 18 gauge, solid, with reinforcing.

(f) Doors. 18 gauge, roller bearings in sanitary track.

(g) Legs. 1-1/4-inch iron pipe size steel pipe, painted with adjustable sanitary foot as indicated.

(h) Drawers. Sides, back and bottom, 18 gauge; front, 14 gauge, double roller bearing channel slides.

(i) Corners, vertical. Interior, coved. Exterior, rounded.

(j) Wood tops and risers. Maple, top laminated with concealed steel tie-rods.

(k) Dimensions. Must be adhered to assure fitting with other equipment.

(3) Commercial Equipment. Specific commercial equipment in each building shall conform to the list in Table I. Electrical, Plumbing and Heating items are listed in their respective sections. Name and number in parentheses refers to a manufactured commercial item that conforms to the requirements. It must be noted that if any of the equipment is changed from that specified or noted as an example, it may affect other equipment connecting thereto. Therefore, all changes shall be considered very carefully by the contracting officer.

C. Miscellaneous Hardware

The following hardware shall conform to Specification FF-H-111a.

Coat Hooks - Type 1173

Shelf Brackets - Type F1068

Surface Bolts - Type F1062

Sizes as indicated on the drawings.

TABLE I - EQUIPMENT

BUILDING NO. 2. RECREATION-QUARTERS

Work Table enclosed base with sliding doors, 24"W x 34"H x 60"L, CRES. (Progressive Chefs Table CTA52)

Coffee Urn five-gallon, CRES, electric, 5 kw, 208v, 1Ø, CRES liner, twin, 32"W x 21"D x 44"H. Provide connection to receive 1/2" FSPS water supply. (McKie SSTAC6)

BUILDING NO. 3. STORAGE - MESS HALL AND GALLEY

Mess Tables shall conform to Specification MIL-T-18143P

Freezer 40 cf, CRES interior and exterior, double door, reach-in type, self-contained, 50"W x 37"D x 72"H plus or minus 1", electric, 3/4 hp, 120v, 1Ø. (Utility S/S-40-F)

Dough Proofing Cabinet capacity, 20 bun pans, single door, air conditioned, insulated, CRES interior, self contained, automatically controlled electric 120/208v, 1Ø, 350w controls, 1/20 hp motor, 4050w Heating, 23"W x 32"D x 89"H, plus or minus 1". Provide connection to receive 1/2" FSPS water supply (Anets SA-20)

Bakers Table CRES, 2" wood top and riser, 3 drawers approximately 24"W, 30"W x 34"H x 8'-0"L. (Progressive BTOA-8)

Mixing Machine, Food 30-quart, floor model, automatic lock at top and bottom of bowl travel, with tinned steel bowl, flat beater, wire loop whip, electric 1/2 hp, 120v, 1Ø. Include chopper, slicer, shredder, grater and french fry plates, grinder, juice extractor, sharpener, colander, ice and hot water jacket, oil dropper, splash cover and ring, 21"W x 21"D x 45"H plus or minus 1". (Hobart D-300)

Ingredient Bins CRES, four rubber-tired swivel casters, rubber bumper, sliding cover. 150-pound capacity. 18"W x 23"H plus or minus 1". Height to fit under Bakers Table. (Progressive PSB)

Oven — 3-section, electric, 27kw, 208v, 3Ø, general purpose type, upper and lower heating units each oven with independent control, temperature control by thermostat 100 F to 450 F, oven light, flue for each oven, wiring to be accessible from front, aluminized steel oven lining, CRES oven throat, insulation all sides, top and bottom, spring-counter-balanced door, double pane view window in door, CRES exterior finish. Approved by Underwriters Laboratories and National Sanitation Foundation. Electric base and 6" adjustable CRES tubular legs. 36"W x 30"D x 41" (max) H. (GE CN19 Ovens)

Refrigerator — 65cf, CRES interior and exterior, triple door, reach-in type, self-contained, 74"W x 37"D x 72"H plus or minus 1", electric, 1/2 hp, 120v, 1Ø. (Utility S/S-65)

37"

Work Table — enclosed base, 3" wood top, no riser, sliding doors, CRES. 30"W x 34"H x 8'-0"L. (Progressive WKGA8)

Slicing Machine, Meat — table model, electric 1/4 hp, 120v, 1Ø, CRES knife, angle feed, must accommodate 12" wide or 7-1/2" diameter meats, cheese, etc., body to be aluminum, 24"W x 22"H x 27"L plus or minus 1". (Hobart 1612 Slicer)

19

Dishwashing Tables — made as indicated in details and conforming to specification for "Work Tables".

Range — electric, 21.9kw, 208v, 3Ø, heavy-duty commercial type, three 12" x 24" thermostatically controlled hot plates and a standard one-pan capacity oven, grease troughs back, sides and front, back splash, top and bottom heating units in oven, thermostatic controls for 250 F to 850 F, CRES front, 36"W x 38"D x 36"H. (GE CR40 Range)

Steamer with Stand — electric, 9.65 kw, 208v, 3Ø, self-contained high-compression steam cooker, with sheath-type tubular browning unit, operate at 15 pounds per square inch steam pressure, capacity to be three #200 size cafeteria pans, CRES throughout, insulated to keep cabinet cool to the touch, steam generation only during cooking cycle and only within cooking chamber, automatic draining of condensate. Controls to

include pressure indicator, 60-minute automatic timer, signal light, power switch all accessible from front. Safety provisions to include automatic temperature control, anti-flooding control, pressure control, concealed safety valve, condensate drain valve. Approved by Underwriters Laboratories and National Sanitation Foundation, 2" adjustable legs, 25"W x 35"D x 27"H, plus or minus 1", without stand. Stand shall be specifically for this steamer and raise it to working level. CRES throughout. Provide connection to receive 3/8" FSPS water supply. (GE CC40 High Compression Steamer with GE CX70 Stand)

<u>Griddle with Stand</u> electric 16.2kw, 208v, 3Ø, self-contained, 4 thermostatic temperature controls, signal lights, 1/2" thick polished steel grid surface, 850 square inches minimum, CRES, except for grid, splatter wall at back and sides and 2" adjustable legs. Grease removal by front and rear drain chutes and troughs to removable drawers. Approved by Underwriters Laboratories and National Sanitation Foundation. Stand shall be specifically for this unit and raise it to working level. (GE C95[illegible] Griddle and GE CX104 Stand)

<u>Fryer with Stand</u> electric 12kw, 208v, 3Ø, self-contained, 2[illegible]-pound fat capacity, thermostatically controlled, signal light, separate power switch, separate overheat protector. CRES throughout. Fat container easily cleaned, and siphon fat removal and straining device. Stand shall provide drawer for storage of extra fat container. Heating units to be swing-up type CRES. Approved by Underwriters Laboratories and National Sanitation Foundation. (GE CK40 Fryer)

<u>Hot Food Table</u> electric, 4-section, dry type, 22" x 14" plates as indicated, 660w per section, 120v, 1Ø. One shelf enclosed with sliding doors, 6" adjustable legs with sanitary feet as indicated. CRES throughout. Full-length maple cutting board supported on brackets. Each section shall be heated separately. 24"W x 4'-0"L x 3[illegible]. Approved by National Sanitation Foundation. (Progressive DE-404)

<u>Cold Food Storage & Compressor with Stand</u> storage box CRES throughout, removable, 3/4" perforated bottom for cold pan, 2 doors, 2 shelves, 34"D x [illegible]"H x 48"L plus or minus 1" with adjustable legs. Compressor 1/3 hp, 115v, 1Ø condensing unit with 6-watt condensing unit fan motor. Compressor stand CRES throughout 34"D x 36"H x 1'-2"W with adjustable legs. (Storage Box-Bastian Blessing Model [illegible]4, Compressor Unit-Bastian Blessing Model C805)

Toaster — electric, 4-slice, 250 per hour automatic, 2.45kw, 208v, 1ø, pop-up type, CRES or chrome plated. (Toastmaster No. 1D2)

Tray Stand — as indicated on drawings, recessed front section to within 15" of floor for trays. Rear section sloped and equipped with nine die stamped cutouts fitted with perforated cylindrical silverware containers. CRES throughout. (Progressive C-3 Recessed Tray Section with Cylindrical Silver Containers)

Coffee Urn Stand — enclosed three sides with two shelves below and 6" backsplash. Top to be 16 gauge with sub-top reinforcing to support urn. Recessed drip pan across front to be removable waste receptable. Waste receptable to be 8-gallon capacity placed on either shelf. Legs to be adjustable. CRES throughout, 29-3/4"D x 4'-0"L x 36"H. (Progressive USS-4 Urn Stand)

Coffee Urn — 5-gallon, CRES, electric, 5kw, 208v, 1ø, CRES liner, twin, 32"W x 21"D x 44"H. Provide connection to receive 1/2" FSPS water supply. (McKie SSTAC4)

Ice Cream Machine — automatic, soft-serve ice cream, sherberts and other frozen products of uniform consistency and texture. Self contained, air cooled, heavy duty, hermetically sealed condensing unit. Mix and air to be automatically metered. Mix tank to be 20-quart capacity and an integral part of machine. Heavy-duty motor, steel dasher and self-sharpening scraper blade. All parts to be chrome plated or CRES for an easy-to-clean surface. Production capacity to be approximately 12 gallons per hour. Electrical requirements 15.5 amps compressor, plus 1 hp motor, 208v, 3ø. Dimensions 15"W x 23"D x 55"H plus or minus 2". (Sweden Softserver Model 1-262C3)

Ice Machine — Self contained, automatic, flaked ice with storage bin. Automatic shut-off when bin is full. Bin to be insulated to provide dry flaked ice. Heavy-duty air-cooled hermetically-sealed compressor with controls for adjustment to climatic conditions. CRES throughout bin and cabinet. Operating capacity 150 pounds of ice minimum per 24 hours based on 90 F air and 70 F water temperature. Bin capacity 60 pounds of ice. Water inlet 1/4" male flare fitting and drain 5/8" O D copper tube. Electric 1/4 hp motor, 120v, 1ø. Provide connection to receive 1/2" FSPS water supply. (Ross-Temp Model RF-151-SC)

Pot Racks — constructed of two 2" x 1/4" CRES bars equipped with 14 sliding white metal, chrome-plated pot hooks complete with bracket for mounting to wall. 6'-0" long. (Progressive WPS-6)

Tray Slide — as detailed, solid type of 14 gauge CRES, polished, complete with brackets of same gauge and material. Furnish in two 10-foot maximum length sections with three brackets each section. (Similar to Bastian Blessing Model 6860)

BUILDING NO. 6. QUARTERS-DISPENSARY

Work Table — enclosed base with sliding doors, 24"W x 34"H x 60"L CRES. (Progressive Chefs Table CTA52)

Work Table — Open base with one drawer, 24"W x 34"H x 72"L, CRES. (Progressive CTS62)

Refrigerator — conforms to Specification AA-R-211e, Type I, Size 8, Grade C. (7.6 cf min.)

Work Table — enclosed base with sliding doors, 24"W x 34"H x 48"L, CRES. (Progressive Chefs Table CTA42)

ABBREVIATIONS USED IN TABLE I

CRES	Corrosion Resistant Steel
Progressive	Progressive Metal Equipment, Inc. Philadelphia, Pennsylvania
McKie	J. E. McKie Los Angeles, California
Utility	Utility Refrigerator Company Los Angeles, California
Anets	Anetsberger Brothers, Inc. Northrock, Illinois
Hobart	Hobart Manufacturing Company Troy, Ohio
G. E.	General Electric Chicago Heights. Illinois
Toastmaster	Toastmaster Division McGraw-Edison Company Elgin, Illinois
Sweden	Sweden Freezer Manufacturing Company Columbus, Ohio
Ross-Temp	Ross-Temp, Inc. Chicago, Illinois
Bastian-Blessing	Bastian Blessing Chicago 45, Illinois

D. Miscellaneous Wood

Wood members, including plywood and items fabricated from wood, indicated on the drawings or listed on the bills of materials shall be cut to size, edges sanded smooth and corners rounded. All members and fabricated items shall receive 1 coat of primer and 2 coats of enamel. Unless otherwise specified by contracting officer the color shall be Number 24533 (Light Green) in accordance with Federal Standard 595.

E. Galley Vent Hoods

Shall be constructed of polished CRES, alloy 302 or 304, as indicated on the drawings. Material shall be 14 gauge and properly reinforced and stiffened with 12-gauge steel channels or angles. Hangers shall be 1/4-inch diameter CRES rods threaded both ends complete with washers and nuts.

ELECTRICAL

1. Scope

This section covers the specification for all materials and equipment to provide a complete electrical system ready for installation as indicated on the drawings.

2. General

The work shall include the furnishing of all labor and materials for the complete fabrication of all items as indicated on the drawings. Workmanship shall be first-class throughout. In general, the system consists of main and emergency generators, switchboard, distribution system, sub-panel boards, all of which provide lighting and power as indicated on the drawings.

3. Materials

All materials shall conform to the following. Where sizes, types or styles are omitted in this specification they shall be as indicated on the drawings. Name and number in parentheses refers to a commercial item that conforms to the requirements. It must be noted that if any of the materials are changed from that specified or noted as an example, it may affect other materials connecting thereto.

A. Conduit

(1) Rigid Aluminum conduit shall conform to Specification WW-C-540a. Aluminum Alloy GS10A, Temper T42, ASTM B235.

(2) Metallic Tubing shall conform to Specification WW-T-806b.

B. Raceways

(1) Raceways and fittings shall conform to Specification W-R-32b, Type I, Size A.

(2) Wireway, surface lay-in type, 2-1/2-inch square section without standing joints. (Square D, Type "LD" duct and fittings.)

C. Conduit Fittings

(1) Nipples for rigid steel conduit shall conform to Specification WW-C-581c.

(2) Outlets and entrance caps, aluminum, shall conform to Specification W-C-586a.

(3) Bushings shall conform to Specification W-F-408a, Type I, Class A, Items 2 and 5.

(4) Locknuts shall conform to Specification W-F-408a, Type I, Class A, Item 1.

(5) Connectors shall conform to Specification W-F-408a, Type I, Class B, Item 12.

D. Outlet Boxes

(1) Non-metallic with covers and accessories for the following boxes indicated on the drawings. Conform to Specification W-O-815. Types I and II.

(a) Box Type A (Union #3090 with ground terminal screw)

(b) Box Type B (Union #5050 with ground terminal screw)

(c) Cover Type A (Union #5051-1 with mounting strap)

(d) Cover Type B (Union #5054)

(e) Cover Type C (Union #5052)

(f) Cover Type D (Union #5055)

(g) Cover Type E (Union #5053)

(2) Junction Box, steel with cover shall conform to Specification W-J-800a, Type II, Size G, Style 19 with Size T, Style 50 cover.

E. Switches

(1) Type A & B toggle, multiple unit switches shall conform to Specification W-S-893a, Type II, without plates and mounting straps.

(2) Manual Motor Switch shall be a single pole single throw type with thermal overload relay and unit mounting. Furnish with each switch three relay units as follows: 2.9-3.3 amps, 6.0-6.5 amps, 9.6-10.3 amps. (Square D, Class 2510, Type AO-1 with W3.65, W7.47 and W12.0 relay units).

(3) Surface Mounted Switches.

(a) Switch Type D on drawings shall conform to Specification W-S-865c, Type NDS, Class 3, Design 3, single throw Box 1, 240v, 30A, fusible.

(b) Switch Type C on drawings shall conform to Specification W-S-865c, Type NDD, Class 3, Design 3SN, double throw, Box 1, 240v, 60A, non-fused.

F. Receptacles

The following receptacles as marked on the drawings shall conform to Specification W-C-596 or as described and referenced to a commercial item.

(1) Type B. Single grounding, 3 wire, 2 pole, 15A, 125v, multiple unit type. (Hubbell No. 1332.)

(2) Type C. Single grounding, surface mounted 3 wire, 3 pole, 30A, 250v, Style S3 with cord set Style S23.

(3) Type D. Duplex grounding, 3 wire, 2 pole, 15A, 125v, Style D3.

(4) Type E. Single, 3 wire, 2 pole, 30A, 250v locking type with matching plug. (Hubbell #3330G receptacle and #3331 plug.)

(5) Type F. Single, 3 wire, 3 pole, 20A, 250v, locking type, Style MI with plug, Style M21.

(6) Type G. Single, 3 wire, 3 pole, 50A, 250v, surface mounted, Style T4 with cord set, Style T25.

G. Miscellaneous Fittings

(1) Cable Straps shall be standard commercial metal, one-hole type for plastic sheathed non-metallic cable conforming to size and shape of cables.

(2) Box Connectors shall conform to Specification W-F-406a, Class 4, Style A, two screw type for 1/2- and 1-inch knockout.

(3) Conductor Splice shall conform to Specification W-S-610 of type and size indicated on the drawings.

(4) Tape, all weather type for application to -10 F. (3M, #88)

(5) Tape, high temperature type. (3M, #27)

(6) Ground Clamp shall be commercial standard. (Bundy, "GAR")

H. Flashing

(1) Roof flashing for conduit shall be commercial standard. (Stoneman #1210)

(2) Water-proofing compound for roof flashing shall be commercial standard and shall be pliable and adhesive to -60 F. (Stoneman "Permaseal")

J. Fuses

Fuses shall conform to Specification W-F-791b(1), Type I, Style A, Class 2, time delay. Sizes as indicated on drawings.

K. Panelboards

Panelboards shall conform to Specification W-P-131a, Class A. Refer to schedules on the drawings for poles, trip ratings and quantities.

L. Wire

(1) Type A. Solid copper conductor with P.V.C. insulation flexible per IPCEA 6.19.3 mandrel test to -40 F. (Rome "Flexall")

(2) Type B. Stranded copper conductor with cross-linked polyethelene insulation flexible per IPCEA 6.19.3 mandrel test to -80 F. Moisture absorption per IPCEA 6.9.2 and 6.9.3, 1 percent maximum. (G. E. "Vulkene")

(3) Type C. Solid copper conductor with spiral interlocked steel flexible armor wrapping. (Triangle-Armored bare ground cable.)

M. Cable

(1) Type A. Two or three solid copper conductors enclosed, individually insulated, and encased in a common P.V.C. jacket. Outer jacket contain one solid copper grounding wire. Insulation shall be flexible per IPCEA 6.19.3 mandrel test to -40 F. (Rome "Flexall")

(2) Type B. Three aluminum conductors, individually insulated, attached by a spiral metal wrapping to a common 30 percent EHS copper-clad, 3/8-inch steel messenger. Insulation shall be cross-linked polyethelene flexible per IPCEA 6.19.3 mandrel test to -80 F. Moisture absorption per IPCEA 6.9.2 and 6.9.3, 1 percent maximum. Cables shall be reversed, layed at standard spacings. (G. E. "Vulkene" preassembled aerial cable)

N. Line Construction Hardware

(1) Guy Wire, galvanized 7-strand steel, 5/16-inch diameter, 5000-pound minimum breaking strength. Commercial Standard.

(2) Aerial Cable Hardware as listed below shall be commercial standard of sizes indicated on the drawings. Numbers in parentheses refer to Line Material Industries, Milwaukee, Wisconsin, catalog numbers for reference and example only. Equivalent fittings of other manufacture are acceptable.

(a) Double Suspension Hanger Steel (#DJ8C1)

(b) Machine Bolt with nut and washer, steel (#DF4R4/DF1W4)

(c) Thimble Clevis, steel (#DG4T1)

(d) Wire Rope Clip, drop forged steel, for 5/16-inch guy cable. (WDG8C4)

(e) Dead End for 3/8-inch messenger. (MDE-381)

(f) Messenger Splice (MS-381)

(g) Eyebolt, steel with lock washer and 2 nuts. (#DF1E6/DF2N2/WDG7W3)

(3) Connectors shall be commercial standard aluminum, tin plated as follows:

(a) Type A Main: 250 MCM-#1/0 Tap: 250 MCM-#6 (ILSCO #GTA-250-250)

(b) Type B Main: 500-350 MCM Tap: 500 MCM-#2 (ILSCO #GTA-500-500)

(c) Type C Main: 250 MCM-#1/0 Tap: #1/0-#6 (ILSCO #GTA-250-0)

O. Heater Cable

Cable shall consist of a #19AWG solid nickel chromium alloy, glass yarn wrap, 3/64-inch silicone rubber insulation with an overall tinned copper outer braid. Cable shall be rated for 10 watts maximum heat dissipation per foot and 0.53 ohms per foot for installation in loops connected to a 208v or 120v source as indicated on the drawings. Loop lengths to be field cut from bulk cable to length between 95 and 105 feet when connected to a 208-volt source, and between 55 and 60 feet when connected to a 120-volt source. (General Electric Company, Bridgeport, Connecticut, Type S1-53921 cable meets the requirements of this specification.)

P. Heater Cable Thermostats

Thermostats for heater cable shall be equipped with remote bulb with 20-foot length copper element. Switch shall be SPST opening on rising temperature 7.4 ampere contact rating at 115v ac. Thermostat range of settings shall be between 0 F and 70 F. (Minneapolis-Honeywell Regulator Company, Minneapolis, Minnesota, Model T415A temperature controller meets the requirements of this specification.)

Q. Relays

Relays shall be 60 cycle, 10 ampere, 600 volt rated 2-pole in general purposes NEMA-1 enclosure. Both poles shall be normally open. Coil shall be rated for 208-volt supply. (Square D Company, Los Angeles, California, Class 8501, Type AG20 relay meets the requirements of this specification.)

R. Timer, Program Repeating

For operating humidifier shall be a continuous repetitive cycle timer, adjustable by non-removable tabs for 1 to 30 operations with on-off time of 1/60 of dial speed or multiples thereof. Timer shall be equipped with a 60-minute dial. Contacts shall be SPDT rated 10 amperes at 120 volts. (Tork Time Controls, Inc., Mount Vernon, New York, Catalog #60M8001 meets the requirement of this specification.)

S. Timer, 0-15 Minutes, Non-Repeating

For operating drain pump, shall be spring driven, hand-set for up to 15 minutes duration, 20 ampere at 120v rating. Timer shall not have hold position. Timer shall be complete with box for surface mounting. (M. H. Rhodes, Inc., Hartford, Connecticut, "Mark Time" #90,005 with surface mounting box meets the requirements of this specification.)

T. Miscellaneous Hardware

(1) Screws

(a) Wood screws shall be steel, of the size indicated on the drawings and of style 2c, flat countersunk head with cross recess drive and shall conform to Specification FF-S-111b. Wood screws shall be used only where length requirements are in excess of 2 inches.

(b) Screws, threaded full length. All screws screwing wood to wood or other materials to wood and where the length requirement is not in excess of 2 inches shall be a type of screw that is threaded full length. These screws shall be cadmium plated with cross recess drive and head type as indicated on the drawings. Type A, Parker Kalon, cadmium plated screws with Phillips slot conform to these requirements.

(2) Bolts, nuts, washers

(a) Bolts and nuts shall be standard commercial, bright, stove bolts with round, slotted heads.

(b) Washers shall be standard commercial cut cold rolled steel of size indicated on the drawings.

U. Aluminum Channels

(1) Aluminum for channels shall conform to Specification QQ-A-270a, Alloy 6061 or 6063, T-6 temper.

V. Bell, 6-inch vibrating alarm

Bells shall be loud ringing, 24 volts, ac, with cast aluminum back box. (Edwards Co., Norwalk, Connecticut, #340, 6-inch, 24v bell with #349 back box meets this specification)

4. Equipment

This section covers all electrical equipment shown on the electrical drawings. Equipment not specifically conforming to a federal specification is described and, after the description, in parentheses, may be a reference to a manufacturer's name and/or catalog number or name of equipment that conforms to this specification. It must be noted that the design and arrangement of equipment is based on this description and any deviation may affect other equipment or space allowances. All changes shall be considered carefully by the contracting officer.

A. Switchboard

The main switchboard in the utility room shall conform to the following:

(1) General Description

(a) Low-voltage, metal-enclosed switchgear shall consist of a stationary structure assembly, removable main air circuit-breaker units fitted with disconnecting devices and other necessary equipment. Fixed-position feeder breakers and auxiliaries shall be provided as specified.

(b) The switchgear will be suitable for 120/208v, 3-phase, 4-wire service and shall receive a dielectric test for 600 voltage class in accordance with NEMA standards. It shall be designed, manufactured and tested in accordance with the latest standards of the AIEE and NEMA.

(c) Each steel unit forming part of the stationary structure shall be a self-contained housing of 30-inch maximum width with individual breaker and instrument compartments and a full-height rear compartment for the bare buses, instrument transformers and outgoing cable connections. Total switchboard dimension shall not exceed 90 inches high, 48 inches deep and 125 inches long, except that a small instrument panel shall be hinged to the right end to contain meters as specified.

(d) The individual circuit-breaker compartments shall be equipped with primary and secondary contacts, rails, stationary disconnecting mechanism parts, and the cell interlock which prevents moving the removable unit into or out of the "connected" position while the circuit breaker is closed. A formed steel door equipped with ventilating grilles and supported by hinges, shall be provided for each circuit-breaker compartment. The door of the unit shall be mechanically interlocked so that access is not permitted to a closed breaker. Front doors shall remain closed in disconnect, test and connected breaker position.

(e) The top of the structure shall be enclosed with removable steel sheets.

(f) The steel structure shall be thoroughly cleaned and bonderized prior to the application of the priming and finishing coats of paint.

(g) A circuit-designation plate shall be provided for each circuit breaker.

(h) Buses and connections. Each main circuit shall include the necessary 400A bus and the connections between the main 1600A bus and one set of circuit-breaker studs. Solderless type terminals for the incoming cables shall be provided on the other set of circuit-breaker studs. The buses will consist of high-conductivity bare bars mounted in heavy insulated supports. The main bus joints and all tap connections shall be silver plated and tightly clamped with through bolts to insure maximum conductivity.

(i) Cleats shall be mounted on support members for securing of outgoing cables.

(j) Terminal blocks with integral-type barriers shall be provided for the secondary circuits. The terminal blocks shall be mounted at the rear of the units, and shall be accessible through a removable cover. They shall be mounted at the top of the switchboard.

(k) Disconnecting devices. The stationary part of the primary disconnecting devices for each circuit breaker shall consist of a set of contacts mounted on an insulating base. Buses and outgoing cable connections shall be directly connected to them. The corresponding moving contacts shall consist of a set of contact fingers suitably spaced on the circuit-breaker studs. In the connected position, these contact fingers shall engage the stationary contacts, forming a current-carrying bridge. The assembly shall provide a multitude of silver-to-silver high-pressure point contacts. High uniform pressure on each finger to be maintained by individual short-leaf springs. The entire assembly shall be full floating and shall provide ample flexibility between the stationary and moving elements. Contact engagement shall be maintained only in the "connected" position.

(l) The secondary disconnecting devices shall consist of floating fingers mounted on the removable unit and engaging flat contact segments located at the rear of the compartment. The secondary disconnecting devices shall be silver plated to insure permanence of contact. Contact pressure shall be provided by helical springs. Contact engagement shall be maintained in the "connected" and "test" positions.

(m) A heavy-duty, finger-type ground contact shall be provided and mounted on the frame of the removable unit and a stationary ground contact of ample capacity shall be bolted to the ground bus. Contact engagement shall be maintained in the connected and test positions.

(n) Generator line circuit breakers shall be electrically operated. "De-ion" principle air circuit breakers equipped with the necessary disconnecting contacts, wheels, and interlocks for drawout application. Breakers shall have a sliding faceplate with adequate movement to permit closing the compartment door with the breaker in the connected, test or disconnected position.

(o) Air circuit breakers shall incorporate circuit-interrupting devices to provide suitable interrupting efficiency and minimize the formation of arc flame and gases. The air circuit breakers shall have solid silver inlay, butt-type contacts operating under high pressure. The auxiliary and main arcing contacts will be of arc-resisting tungsten alloy. The breaker shall be equipped with arc chutes which effectively enclose the arcing contacts and confine the arc to reduce the disturbance caused by short-circuit interruption.

(p) Each breaker shall be equipped with a visible position indicator, mechanically connected to the circuit breaker mechanism and located so that the position of the circuit breaker is indicated from the front door of the compartment. Manual tripping of each main breaker shall be provided from the face of the switchboard with the compartment door closed. Breaker long delay trip element shall be adjustable between 80 F and 160 F of the breaker trip coil rating. The main circuit breakers shall be fully interchangeable within the switchboard.

(q) Feeder Breakers shall be of the plastic case type, manually tripped, with additional shunt trip attachment where noted on the drawings.

(r) Feeder breaker bus shall connect to the main 1600A bus and permit use of the feeder circuit breakers to their full rating.

(s) Auxiliary relays, lights and similar devices shall be provided in the switchboard as required by the detailed operating specifications.

(2) Detailed Operating Specifications

(a) The following Detailed Specifications cover the operation and material requirements for automatic control of paralleled diesel-driven generators, 100kw, .8 percent power factor, 120/208 volt, 3 phase,

4 wire, 60 cycle, 1200 rpm with belt-driven exciter. The generators shall be automatically synchronized and paralleled on the switchboard bus after initiation of cranking circuit. Voltage and frequency relays shall be provided for each generator to lock generator from main bus until normal voltage and frequency are obtained. All control for auxiliary relays, circuit breakers, synchronizing equipment, etc., shall be obtained from the generated power supply. The 24-volt cranking batteries of the engine generator sets may be used for specific auxiliary pilot circuits only.

(b) Normal Operation of the Generating Plant shall permit one generator to be idle for standby service. A base unit selector switch shall be provided to determine which unit shall be standby. In the event one of the generators fails to synchronize or (with all except the standby generator on the bus) if one generator is tripped due to reverse power operation, the standby generator shall be automatically started and synchronized to share load with the remaining energized units. Power relays shall be provided for each generator so that as load decreases the generators shall be shut down in sequence until only one generator shall be running under light load conditions as determined by a "Base Unit" selector switch. As load increases, generators shall be automatically started and synchronized until all generators (except standby generator) are on the bus. When more generators are required to carry load than are operable, feeder breaker S-1 shall automatically open and remain open until manually reclosed. If breaker S-1 opens and overload still exists, breaker S-4 shall automatically open and remain open until manually reclosed.

(c) Provision shall be made for manual synchronization as well as automatic synchronizing in the generator control circuits.

(d) Voltage Regulators shall be provided with a sensitivity of +/-1.5 percent. With each generator under control of its voltage regulator and reactive drop compensation in operation, load division shall be as follows: Active load division under any load condition from zero to rated load with three generators operating in parallel shall not differ by more than 20kw. Reactive power division with each generator under control of its voltage regulator and with reactive drop compensator adjusted for not more than 15 volts at rated frequency and with load division within 20kw, the generators shall operate in parallel with a maximum difference in reactive kva supplied by any one generator not to exceed 15 R-kva at full load and 20 R-kva at no load.

(e) A remote alarm indication shall be initiated when the "automatic-manual" switch is left in the manual position, or "test" position of the switch is left in test position. Remote alarm shall

not be furnished as part of the switchboard. Remote alarm shall indicate any time breaker S-1 or S-4 shall open. Remote alarm shall be actuated by auxiliary contacts on the various devices to be indicated all in parallel and supplied from a 24-volt plant battery. This alarm will also be used for engine generator malfunction. (See "Generator Sets" 100)

(f) With generator main circuit breakers withdrawn to the test position, de-energized generators shall be automatically started and synchronized and breakers closed without paralleling on the main bus. Returning the test switch to the normal position shall trip out the generator breakers and restore all equipment to normal operation.

(g) The generator breakers shall be manually returned to the connected position.

(3) Switchboard Components. Catalog numbers listed for components refer to Westinghouse parts as a guide and were used for space allotment and design. Items of equal quality and function may be substituted by contracting officer after careful consideration.

(a) Section 1 & 4 generator control panels shall contain the following:

2 - Indoor, totally enclosed switchboard sections, numbers 1 & 4, shall each be approximately 18 inches wide by 48 inches deep by 90 inches high and each shall include the following:

2 - Drawout type "DB-25" circuit breakers main generator breakers, 3 pole, single throw, electrically operated, 400 ampere, 50,000 amps interrupting capacity with time delay and instantaneous trip attachments, bell alarm switch. (Second breaker in Section 4 will be a spare on 50 & 100 Man Camps.)

1 - Set of bare, 4-wire copper bus and connections.

2 - Sets of clamp-type connectors for incoming generator cables.

2 - Sets of current-limiting control power fuses for control and potential circuits.

8 - Current transformers, 5 amps secondary, suitable ratio.

2 - Control power contractors for preferred control power bus sequence.

Mounted on the hinged front instrument panel of Section 1 shall be:

2 - Type KA-241 ac voltmeters, 300v coil, suitable scale.

2 - Type KA-241 ac ammeters, 5 amp coil, suitable scale.

2 - Type KY-241 KVAR meters, 5 amp, 150v coils, suitable scale

2 - Type KY-241 wattmeters, 5 amp, 150v coils, suitable scale.

2 - 3 phase voltmeter selector switches.

2 - 3 phase ammeter selector switches.

2 - C/B control switches with red and green indicating lights.

2 - Governor control switches.

(b) Sections 2 & 3 - Exciter control panel shall contain the following:

3 - Indoor, totally enclosed switchboard sections #2 and #3, for control of generator exciter circuits and automatic paralleling equipment. Each panel shall be approximately 30 inches wide by 48 inches deep by 90 inches high and each shall contain the following

2 - Type SRA Silverstat generator voltage regulators.

2 - Type XK automatic synchronizers.

2 - Type KI-241 frequency meters.

2 - Regulator transfer switches.

4 - Type CW overpower and underpower relays.

2 - Type CF-1 frequency relays.

2 - Type SV voltage relays.

2 - Type CW generator anti-motor relays.

2 - Exciter rheostat mountings.

1 - Set of bare copper bus and connections.

1 - Set of miscellaneous auxiliary relays, contactors, timing devices, etc., for proper operation in accordance with the detailed specifications.

2 - Regulator transfer switches.

2 - Synchronizing switches with removable key.

2 - Elapsed time meters.

In addition to the above bill of material, Section #2 shall contain the following test and operating equipment:

1 - "Standby" selector switch.

1 - "Test" switch.

1 - "Automatic-manual" selector switch.

(c) Instrument Panel shall contain the following:

1 - Swinging instrument panel mounted on end of switchboard and containing the following:

1 - Type KA-241 ac voltmeter for bus indication, 300v coil, suitable scale.

1 - Type KI synchroscope.

2 - Synchronizing lights.

(d) Section 5 - Feeder breakers shall contain the following:

1 - Metal enclosed switchgear Section #5, shall be approximately 26 inches wide by 48 inches deep by 90 inches high and shall include the following:

1 - 400A type "LA" breaker, 400A trip rating with shunt trip attachment.

4 - 250A Type "LA" breakers, 250A trip rating, manual operation only.

1 - 250A Type "LA" breaker, 250A trip rating with shunt trip attachment.

1 - 100A Type "F" breaker, 100A trip rating, manual operation only.

1 - Space for 225A frame Type "JA" breaker.

1 - Set bare 4-wire bus and connections.

(4) Factory assembly and tests

(a) The switchgear shall be completely assembled, wired, adjusted and tested at the factory. After assembly, the complete switchgear shall be tested for operation under simulated service conditions to assure the accuracy of the wiring and the functioning of the equipment.

(b) The main circuits shall be given a dielectric test of 2,200 volts for one minute between live parts and ground and between opposite polarities. The wiring and control circuits shall be given a dielectric test of 1,500 volts for one minute between live parts and ground.

(5) Shipping assembly and spare parts

(a) After factory testing the switchboard shall be disassembled and packaged for shipping in accordance with purchasers' requirements. Detailed field assembly, testing, operating and maintenance instructions, manuals and diagrams shall be provided with the switchboard along with all loose material required for reassembly of the switchboard at the construction site.

(b) Supplier shall also furnish spare parts to maintain the switchboard for 5 years after final assembly. A recommended list of material for this purpose shall be submitted for approval to the contracting officer.

B. Generator sets - 100kw

(1) General description. Three phase, four wire, grounded wye, 120/208v, 60 cycle, 100kw, 1,200 rpm, 0.8 power factor, 125 kva

conforming to MIL-G-19826A, Type III, except as modified in the following paragraph. All components of the engine generator units shall be designed to permit parallel operation of up to four generators on a common switchboard bus.

(2) Modifications to MIL-G-19826A

MIL SPEC Reference	Modification
3.1	Plant shall be equipped with spring cushion type vibration isolators.
3.5.2	Table I - Type III, 900 rpm speed shall be changed to 1,200 rpm for this installation.
3.5.3.1	No load to full load speed variation shall be held to less than 1 percent by a hydraulic isochronous governor as required to permit parallel operation.
3.5.4	A 15-gallon day tank shall be mounted on the plant. Two 12-inch long flexible fuel connections. Supply to accept 1/2-inch MSPS and return to accept 3/8-inch MSPS of the fuel distribution system.
3.6	Cooling air to the engine shall be calculated at 60 F maximum ambient temperature.
3.6	Plant shall be equipped with forced-draft fan and radiator for duct attachment. The exhaust manifold shall be connected to the radiator system for liquid cooling.
3.7	Muffler shall be extra light; weight not to exceed 110 pounds. (Kittell 1260-GRS)
3.9	Cranking system shall be by electric motor per Section 3.9.1. Sections 3.9.2 and 3.9.3 shall not apply.
3.9.4	An electric immersion heater shall be provided per section 3.10.
3.11	24-volt starting batteries meeting requirements of this section shall be provided. A

MIL SPEC Reference	Modification
3.11 (Cont'd)	charging generator and charge rate regulator with reverse current relay shall be provided on the engine unit. A zero-center charge-rate ammeter shall be provided at the control panel.
3.12	Instruments shall include (a), (b), (c), (d), (e), and (h). An exciter field rheostat shall be provided conforming to switchboard manufacturers' requirements. A panel light and switch shall be installed on the control panel. A switch shall be provided connected to 24-volt battery for control and supply of ceiling mounted light fixture over plant. Light fixture not furnished with plant. Control panel shall also have a separate indicating light for individual indication of plant malfunctions (over temperature, low oil pressure, etc.). A second contact on each malfunction indicating device shall be connected common to sound remote alarm. Bells from the 24-volt battery system. Two 24-volt, dc, 4-inch vibrating bells shall be furnished with plant.
3.15.9	All connections to the generator, exciter, engine and alarm wiring shall be in a common terminal box on the side of the plant. All terminals shall be identified in the box.
3.16	Radio interference supression shall be supplied as specified.
3.18	Lifting attachments shall be provided meeting this specification.
3.23	Supplier shall also furnish same parts to maintain the generator for 5 years after final assembly. A recommended list of material for this purpose shall be submitted for approval to the contracting officer.

MIL SPEC Reference	Modification
3.24	Technical publications on all plant individual components shall be provided sufficient to permit operation and maintenance without benefit of factory-trained personnel.

C. Generator Sets - 10kw

(1) General description. Three phase, four wire, grounded wye, 120/208v, 60 cycle, 10kw, 1800 rpm, 0.8 power factor, 12.5 kva, conforming to MIL-G-19826A, Type II, except as modified in the following paragraph.

(2) Modifications to MIL-G-19826A

MIL SPEC Reference	Modification
3.1	Plant shall be equipped with vibration isolators.
3.5.3.1	Steady state speed regulation shall be 5 percent.
3.5.4	A one-quart day tank shall be mounted on the engine. Two 12-inch long flexible fuel connections, supply and return to accept 3/8-inch FSPS.
3.6	Plant shall be of the air-cooled type with cooling air enclosure, and discharge flange for duct attachment. A thermostatically controlled damper shall control cooling air temperature. A centrifugal blower shall provide positive movement of cooling air to the air discharge flange which shall be located rear the top and at the side of the engine.
3.7	Omit reference to stub stack
3.9	Cranking system shall be by electric motor per Section 3.9.1.

MIL SPEC Reference	Modification
3.9.4	An electric immersion heater shall be provided per Section 3.10.
3.11	Starting batteries meeting requirements of this section shall be provided. A battery charger with a 1-amp and 3-amp charge rate shall be provided.
3.12	Instruments shall include (a), (b), (c), (d), and (h). Control panel shall also contain: Start-stop push button Voltmeter and ammeter Frequency meter Line Circuit breaker Field Rheostat Battery Charging Ammeter Panel light
3.15	Reduce overload requirement to 10 percent for two hours.
3.15.3	A voltage regulator shall be provided meeting this specification.
3.15.8	Provide for manual voltage control on the plant control panel.
3.23	Supplier shall also furnish spare parts to maintain the generator for 5 years after final assembly. A recommended list of material for this purpose shall be submitted for approval to the contracting officer.
3.24	Technical publications on all plant components shall be provided, sufficient to permit operation and maintenance without benefit of factory-trained personnel.

ABBREVIATIONS USED IN

ELECTRICAL MATERIAL AND EQUIPMENT SECTIONS

Square D	- Square D Company Los Angeles, California
Union	- Union Insulating Company Parkersburg, West Virginia
Hubbell	- Harvey Hubbell, Inc. Bridgeport, Connecticut
3M	- Minnesota Mining and Manufacturing St. Paul, Minnesota
Bundy	- Bundy Manufacturing Company New York 54, New York
Stoneman	- Stoneman Engineering & Manufacturing Co. Inglewood, California
Rome	- Rome Cable Corporation Rome, New York
G. E.	- General Electric Bridgeport, Connecticut
Triangle	- Triangle Conduit and Cable Company New Brunswick, New Jersey
Ilsco	- Ilsco Corporation Cincinnati 27, Ohio
Kittel	- Kittel Los Angeles, California

5. Lighting Fixtures

A. Type A. Surface mounted incandescent for 150w maximum 120v lamp with threaded opal glass diffuser and die cast fitter for mounting on Type "A" outlet box.

B. Type B. Wall mounted incandescent for 100w maximum 120v lamp with threaded opal glass diffuser and die cast fitter for mounting on Type "A" outlet box. 3-5/8-inch diameter by 6-3/4-inch extension from wall box.

C. Type C. Surface mounted rapid start 2-lamp 4-foot long fluorescent fixture, direct distribution, with white enameled steel louver, all metal body, with illuminated metal side panels and with top reflectors.

D. Type D. Vaportight incandescent for 100w maximum lamp with clear glass globe, cast guard and mounting holes, suitable for attachment to Type "A" box, similar to specification 9Yh, plate S, fixture 28, except all aluminum body and guard.

E. Type E. Surface mounted fluorescent with trigger-start ballast, 2-feet long for 20-watt, T12 fluorescent lamp, with formed metal body and for acrylic plastic diffuser. Complete with fittings to attach three similar units to provide 6 feet total length.

F. Type F. Surface mounted incandescent for 150w maximum 120v lamp with standard RLM dome. Porcelain enamel reflector and with fitter for direct mounting to surface mounted outlet box, Type "A" similar to specification 9Yh, plate 3, fixture 12, except for mounting requirements.

G. Type G. Vaportight incandescent for 100w maximum lamp with clear glass globe, cast guard and with integral cast outlet box with mounting feet and 1/2-inch threaded hubs. Similar to specification 9Yh, fixture 27, except cast aluminum construction.

H. Type H. Surface mounted rapid start 2-lamp, 4-foot long fluorescent fixture. Metal back channel containing ballasts, sockets and wiring shall support a wrap-around acrylic lens.

6. Installation

The electrical installation shall be made in accordance with NAVDOCKS Specification 9Yh except as modified by the following items.

Numbers refer to paragraphs in 9Yh.

2.1	Non-metallic sheathed cable, and surface metal raceways shall be used where indicated on the drawings for interior wiring. Detailed installations deviating from National Electrical Code requirements, shall be installed as detailed.
2.2.2	Delete last sentence as follows: The nearby support bracket for the overhead wires shall be not less than 15 feet above the finished grade of the building.
2.3	References to concrete slabs and masonry shall not apply to this installation.
2.7	Non-metallic boxes shall be used for interior wiring where indicated on the drawings.
2.16	This paragraph shall not apply. The following shall be substituted: All metal enclosures, raceways, device mounting straps and similar non-current carrying components of the electrical installation shall be bonded together by means of bonding conductors and fittings. Each building panel enclosure shall be bonded to the cold-water system, so that all metal enclosures, raceways, device mounting straps and similar non-current carrying components are at the same reference level of potential. This shall be considered as the ground potential for the electrical system.
2.17.1	Aluminum conductors shall be used for exterior aerial cables as indicated on the drawings, without steel reinforcing, and supported by a copperweld messenger which shall also serve as the neutral conductor.
2.17.3	Wire and cable insulations shall be as specified under materials, and such specifications shall be followed in lieu of the requirements of paragraphs beginning 2.17.3.
2.25	Outlet mounting heights shall be as noted on the drawings.

2.27	Lamps shall not be furnished and reference to "complete with lamps" shall be deleted.
2.27.5	Paragraphs beginning 2.27.5 shall be deleted. Refer to description of fixtures as specified under Materials, elsewhere in this specification.
2.30.3	Amend this paragraph as follows: Reference to ground shall refer to the reference level of ground potential as described in paragraph 2.16 herein. Reference to #12 AWG ground wire shall be changed to #14 AWG.

PLUMBING

1. Scope

This section covers the specifications for all materials and equipment to provide a complete system, as outlined below, ready for installation as indicated on the drawings and includes the following general divisions:

Water supply and distribution
Waste collection
Fuel supply and distribution
Generator exhaust piping

2. General

The work shall include the furnishing of all labor and materials for the complete fabrication of all items as indicated on the drawings. Workmanship shall be first class throughout.

In general the above divisions shall consist of the following:

A. Water supply and distribution

(1) Storage tanks, distribution pump, piping and fittings, plumbing fixtures, laundry equipment, dishwashing equipment, water heaters, waste pumps, utility trough and insulation. (Water production equipment is not included and must be provided to fit requirements of the camp location)

B. Waste collection

(1) Waste lines and fittings, insulation and vent piping. (Sewage disposal facilities are not included and must be provided to fit requirements of the camp location.)

C. Fuel supply and distribution

(1) Storage tank, heater at storage tank, day tanks at buildings, distribution pump, piping and fittings.

D. Generator exhaust piping

(1) Piping and fittings.

3. Materials

A. Steel

(1) Sheet or strip shall conform to Specification QQ-S-640, FS-120 unless noted otherwise.

(2) Corrosion resistant steel (CRES) shall conform to Specification QQ-S-766c of alloy or class as indicated in these specifications or on the drawings.

(3) Plate for fuel tanks shall conform to ASTM A-7, 60,000 psi minimum tensile strength.

B. Insulation

(1) For utility trough shall conform to Specification MH-I-551b, Type I, Class 2 cut to sizes as indicated.

(2) For exterior exposed piping shall be of one-pound density glass fiber in rolled blanket form two feet wide and seventy-five feet long. (GB Ultralite #100 conforms to this specification. Gustin-Bakon Manufacturing Company, Kansas City, Missouri)

(3) Adhesive for above insulation shall conform to MIL-B-19564.

(4) For interior hot-water piping shall conform to Specification MH-I-552, Type 1, Class A.

C. Copper tubing and fittings

(1) All tube shall conform to Specification WW-T-799a(1), Type I, Form 1, (hard drawn), furnished in standard lengths of sizes as indicated.

(2) Fittings shall be soldered type including required threaded adapters of commercial standard conforming to American Standard Association specifications as follows:

(a) Wrought fittings, pressure type, ASA, B16.22, 1951.

(b) Wrought drainage fittings - MSS, St 64, 1961.

(c) Cast drainage fittings - ASA, B16.23, 1960.

(d) Cast fittings, pressure type - ASA, B16.23, 1960.

(e) Hose Bibbs. For generator exhaust (condensation drainage) and hose, 3/4-inch solid flange sill cock with 3/4-inch hose end and 3/4-inch female pipe thread connection. For washing machine, 3/4-inch polished chrome finish hose outlet, 3/4-inch female pipe thread connection, front-handle type.

(3) Dielectric fittings

(a) Flange-type to fit ASA flanges consisting of gasket kit complete with bolt inserts and washers.

(b) Unions shall be an insulated type with female or male standard pipe size thread on the steel body, (see drawings) copper soldered joint on the copper pipe connections, steel nut and insulating gaskets. (Unions as manufactured by "Epco Sales, Inc.", Cleveland 9, Ohio, conform to this specification.)

D. Aluminum

(1) For water storage tanks shall conform to Specification QQ-A-318c, Alloy 5052, Zero Temper.

E. Coating

(1) Galvanizing shall conform to Specification QQ-Z-325a, Type II, Class I zinc coating.

F. Paint

(1) Primer shall conform to Specification TT-P-636b.

(2) Enamel shall conform to Specification TT-E-529a, Class A. The color shall be No. 24087 (Olive drab), Table VI of Standard FED-STD-595.

G. Oakum and lead for shower drain installation shall be of standard commercial manufacture.

H. Solder and Flux shall be commercial standard used for 150 psi, soldered-type joints for copper pipe.

I. Flexible Connectors. Bronze corrugated metal hose with high-tensile bronze wire braid, helical construction. Each connector to have union FSPS at each end. Size and length indicated on the drawings. System operating temperature 40 F. System operating pressure up to 150 psi. (Keeflex Series Type BH-7 connector as manufactured by U. S. Flexible Metallic Tubing Company, Los Angeles, California, conforms to this specification.)

J. Steel pipe and fittings

(1) For generator exhaust system shall conform to Specification WW-P-406b, Weight A, Class 2, fittings shall conform to Specification WW-P-521b, Type II, nipples shall conform to Specification WW-N-351a, Type I, steel, zinc coated for steel pipe. Flange fittings shall conform to Specification MIL-F-18180, 150 pounds.

K. Pressure gauges

(1) For water, fuel and coolant systems shall conform to Specification GG-G-76b, Type I, Class 1, Style A, scale range 0 to 200 psi, 3-1/2-inch diameter dial with 3/8-inch male pipe thread connection.

L. Pipe hangers

(1) Adjustable wrought ring hanger complete with adjusting nut and steel band. (Grinnell Figure 95 as manufactured by Grinnell Company, Providence 1, Rhode Island, conforms to this specification.)

M. Expansion tank

(1) Thirteen-inch diameter by 18-inch long, 8-gallon capacity, standard construction, 30 psi working pressure steel tank with standard tappings for gauge glass. Other openings in the tank shall be as indicated on the drawings. (Bell & Gossett tank #8 as manufactured by Bell & Gossett Company, Morton Grove, Illinois, conforms to this specification.)

N. Gauge glass

(1) Five-eighths-inch outside diameter of glass by 8 inches long with 1/2-inch MSPS bronze tank connections on 9-inch centers and petcock at drain valve for pressures up to 175 psi. (Ernst Figure 5-0 Catalog #2159 as manufactured by Ernst Water Column & Gage Company, Livingston, New Jersey, conforms to this specification.)

O. Thermometer

(1) Column-type thermometer with case of cast aluminum construction and stainless steel frame front. Stem length 3-1/2-inch with 3/4-inch male standard pipe size thread. White scale with black figures and graduation of range from -40 F to 110 F. (Trerice BX 42402½ conforms to this specification. H. O. Trerice Company, Detroit 16, Michigan.)

4. Equipment

This section covers all plumbing equipment shown on the plumbing drawings. Equipment not specifically conforming to a federal specification is described; and after the description, in parentheses, may be a reference to a manufacturer's name and/or catalog number or name of equipment that conforms to this specification. It must be noted that the design and arrangement of equipment is based on this description and any deviation may affect other equipment or space allowances. All changes shall be considered carefully by the contracting officer.

A. Washing machine

Washing machine shall be a commercial type used in self-service laundries with the following features: Front load, tilted tumbler, frame all steel, bonderized, baked-on enamel, adjustable feet, front and back panels removable for servicing, tub and basket to be porcelain enamel, view window in door, safety switch on door, high speed pump, two speed transmission, sealed power plant, thermostatic water temperature control valve, back siphonage control, not coin operated, motor 1/3 hp, 1725 rpm, 120v, 60 cycle timer. Spare parts for three year period to be included. (Commercial Laundromat Model RC-6 manufactured by Westinghouse conforms to this specification)

B. Dryer

Dryer shall be a commercial type, electric, 5500 watts maximum, 120/230v, 60 cycle. It shall be vented into the room, not outside. Capacity, 9 to 10 pounds dry clothes. Door lockout switch, temperature and high limit thermostats, 1/4-hp motor, adjustable timings of 10-, 20-, 30-, 40-, 50-, or 60-minute increments, lint collector.

Exterior finish white enamel. Interior baked-on enamel. Limiting dimensions 38-inches high by 33-inches wide by 30-inches deep. Not coin operated. (Aldry-10 dryer manufactured by Westinghouse Electric Corporation conforms to this specification.)

C. Plumbing fixtures

All of the following plumbing fixtures shall be of the same manufacture and the trim, as called for, shall be packed with the fixture, ready for installation. All trim shall be of the same manufacture. Where support brackets or clips are required, they shall be included with the fixture. Quantity required shall be as indicated on the drawings. All fixtures shall be as detailed on the drawings. Manufacturer's name and style number shown in parentheses is given as example of a fixture conforming to this specification.

(1) Lavatories shall be wallhung type, size as indicated, with overflow, 17-gauge, class 302 (18-8) CRES, satin finish complete with push button, slow self-closing faucets and coupling nuts, 3/8-inch OD straight male by 12-inch long risers with 3/8-inch iron pipe by 3/8-inch OD, male straight fittings, 1-1/4- by 4-inch long tail piece, preformed gasket and metal stopper.

Lavoratory - Zeigler-Harris A-360

Faucets Type 12S-Specification WW-P-541b

Risers - Speedway 1112A

Tail Piece - Zeigler-Harris ZH-105

(2) Scrub sink for dispensary shall be supported on legs, size as indicated, 14-gauge CRES, class 316 (18-8), satin finish complete with polished chromium-plated brass wall-mounted laundry tray fitting, 7-inch swing spout threaded for hose connection and 1/2- by 4-inch long tail piece, flat strainer, 3-inch flange, gasket, rubber stopper and chain.

Sink - Zeigler-Harris ZH-131-10

Faucet - Kohler K-8955

Tail Piece - Zeigler-Harris ZH-1215RS

(Zeigler-Harris Company, Burbank, California)

(3) Service sink shall be supported on legs, size as indicated, 14-gauge CRES, class 302 (18-8), satin finish complete with polished chromium-plated brass wall-mounted laundry tray fitting, 7-inch swing

spout threaded for hose connection and 1/2-inch iron pipe size unions. 1-1/2-inch by 4-inch long tail piece, flat strainer, 3-inch flange, gasket, rubber stopper and chain.

Sink - Zeigler-Harris ZH-2420 SS

Faucet - Kohler K-8955

Tail Piece - Zeigler-Harris ZH-1215RS

(Zeigler-Harris Company, Burbank, California)

(4) Dark room sink shall be supported on legs, 14-gauge CRES class 302 (18-8), satin finish complete with two polished chrome-plated brass wall-mounted laundry tray fittings having 7-inch swing spout threaded for hose connection and 1/2-inch iron pipe size unions. 1-1/2-inch by 4-inch long tail piece, gasket and metal stopper, 1-inch iron pipe size shank, with locknut and standing overflow tube, 7-inch high, open top.

Sink - Zeigler-Harris ZH-372 Wash Sink as modified

Faucet - Kohler K-8955

Tail Piece - Zeigler-Harris ZH-316

Stand Pipe - Zeigler-Harris CRS-316

(Zeigler-Harris Company, Burbank, California)

(5) Sink unit for laboratory and pharmacy in the dispensary shall be a table-type sink with lower shelf size as indicated and supported on legs. Table top and sink to be 14-gauge and shelf to be 18-gauge CRES, class 302 (18-8), satin finish complete with polished chrome-plated brass wall-mounted laundry tray fitting having 7-inch swing spout threaded for hose connection and 1/2-inch iron pipe size unions, and 1-1/2-inch by 4-inch long tail piece with gasket and metal stopper.

Sink and top similar to Zeigler-Harris A-190-DDT

Faucet - Kohler K-8955

Tail Piece - Zeigler-Harris ZH-316

(Zeigler-Harris Company, Burbank, California)

(6) Galley Sink shall be as detailed, 14-gauge CRES, class 302 (18-8) with legs and gussets, satin finish with drain boards each end,

complete with one swing-spout faucet, type 36, specification WW-P-541b. Sink to be complete with two combination overflow and lever-handle operated waste threaded for connecting to 1-1/2-inch iron pipe size drain line and 1-1/2-inch diameter by 4-inch long tail piece. (Sink - Progressive Metal Equipment, Inc., Philadelphia, Pa., 3SCC-2472, with drain boards.)

(7) Bath Tub shall be as detailed, 14-gauge CRES, class 302 (18-8) with legs and gussets complete with polished chrome-plated brass wall-mounted laundry tray fitting having 7-inch swing spout threaded for hose connection and 1/2-inch iron pipe size unions. 1-1/2-inch connected waste and overflow, rubber stopper with chain and 1-1/2-inch by 3-inch long tail piece.

Faucet - Kohler K-8955

Tail Piece - Zeigler-Harris ZH-214

(Zeigler-Harris Company, Burbank, California)

(8) Shower Cabinets shall conform to Specification WW-P-541b, Outfit No. SC36B with porcelain enameled receptor, complete.

(9) Drinking Fountain. 9-3/4-inch diameter by 2-1/2-inch deep stainless steel bowl with wall bracket, raised-angle stream, shielded anti-squirt head, self-closing valve, automatic stream control and 1-1/4-inch tail piece (no trap).

(Haws 1800)

D. Individual Toilet

Toilet for dispensary shall be a self-contained electrically-powered flush toilet utilizing a chemical-water mixture as the basic flush liquid. The flushing system shall be recirculating and consist of an electric motor, pump, timer, filter and controls which are activated by a push buttom. Flush cycle shall be 12 to 18 seconds. The motor shall be of ample size to operate the pump and filter and operate on 120v, single phase, 60-cycle current. The pump shall be self-priming, corrosion resistant and reversible and shall deliver a minimum of 3 gpm and maximum of 5 gpm. The timer shall be a self-contained assembly that regulates the flushing cycle. The filter shall be a rotating-disc type as descsribed for the recirculating flush toilet unit in this specification. Materials shall be CRES, polished, or steel finished with corrosion-resistant and acid-proof coating. Unit shall be complete with carrying handles, seat and cover, bottom-dump drain with opening handle available from above and completely finished in a sanitary manner. The limiting dimensions shall be 20 inches wide by 16 inches deep by 14 inches high

plus or minus 2 inches. The weight, empty, shall not exceed 32 pounds and the tank capacity shall be a minimum of 5-1/2 gallons. (The "Executette" as manufactured by Monogram Industries, Inc., Culver City, California, conforms to this specification with certain modifications to comply with the available electrical energy.)

E. Recirculating Flush Toilet Unit

(1) General. This unit shall be a self-contained, electrically-powered, flush toilet and urinal utilizing a chemical-water mixture as the basic flush liquid. The main items of the unit are a storage tank with flushing pipe and sloping bottom to drain connection, two toilet bowls, one urinal, flushing system consisting of electric motor, pump, timer and rotating-disc filter and shroud to cover pumps, filter and filter equipment. A water connection is required for tank flushing and initial charging. Drain connects directly to main sewer line through a quick-acting gate valve. Tank shall be fitted with a vent connection for a 4-inch diameter vent pipe.

(2) Materials shall be as specified in paragraph 3 unless specified specifically in this section.

(3) Detail fabrication drawings shall be prepared by manufacturer and submitted to contracting officer for approval before any fabrication is started.

(4) Tank shall be of oval cross section with a maximum length of 6 feet 6 inches and a gross volume of 100 gallons. The tank shall have a sloping bottom to the drain line at a minimum slope of 1/2-inch per foot and equipped with a 3-inch diameter ASA flange. Proper fittings shall be provided for water, vent, filter and flushing device as required. Rigid collars shall be provided to secure toilet bowls to the tank. Four metal tank supports shall be provided as indicated. All parts of tank, including piping, shall be corrosion-resistant steel (CRES) Alloy 321 in accordance with Specification QQ-S-766. All joints shall be welded. Removable access panels shall be provided where required.

(5) Toilet Bowls shall be constructed of corrosion-resistant steel, highly polished, with a removable neoprene splash restrictor and sight trap located at its bottom. Flushing ring and jets shall be installed at rim of bowl to provide a swirling flush. The bowl shall be equipped with a white plastic-coated seat and cover conforming to Specification WW-P-541B. (Series 50 Olsonite Seat conforms to this Specification.)

(6) Urinal shall be provided as indicated, welded to the tank. It shall be provided with a rounded metal bottom with a 1/2-inch diameter drain tube into tank and a tight-fitting, neoprene gasketed cover. Flushing ring shall be installed immediately below the rim of the opening. Urinal shall be constructed of highly polished corrosion-resistant steel.

(7) Flushing System shall consist of an electric motor, pump, timer, filter and controls which are activated by a push button. The system shall be arranged so that the end bowl shall flush separately and the urinal and adjacent bowl shall flush together. Buttons shall be situated so that they cannot be reached easily from the urinal stall. A single pump and filter shall be used with a control arrangement to assure a time lag of at least twenty seconds between actuations of each button.

(a) The motor shall be 1/3 hp, single phase, 60 cycle, 115 volt, 1725 rpm, ac, driving a single-stage gearbox which will in turn drive a pump at motor speed and the filter from the right-angle shaft at approximately 40 rpm. The motor shall be protected by a thermal protector.

(b) The pump shall be self-priming, corrosion-resistant and reversible. Body shall be brass, neoprene impeller and corrosion-resistant steel shaft with carbon bearings. Pump shall be connected to gearbox through a flexible coupling. It shall deliver 3 gpm minimum and 5 gpm maximum.

(c) The timer shall be a self-contained assembly enclosed in a dust-proof case mounted on the tank top under the shroud and connected with the other components of the flushing system. The flushing cycle, controlled by the timer, shall be limited to 15 seconds plus or minus 3 seconds.

(d) The filter shall be a rotating-disc type consisting of a stack of wheel-like steel discs interleaved with spacers. Wheels and spacers shall be firmly mounted on a common spindle. Outside the disc assembly shall be cleaner blades spaced to extend into the gaps in the filter. As filter is rotated at approximately 40 rpm, the cleaner blades shall continuously scrape the gaps free of obstructions. The filter shall not pass particles larger than 300 microns. All parts shall be made of corrosion-resistant material.

(8) The shroud shall be made of corrosion-resistant steel of size and shape as indicated and shall form a complete cover over the rear portion of the tank and enclose the flushing system equipment. Portions that are required to be hinged to provide access to the tank or equipment shall be separately hinged in each compartment. The portion under the partitions shall be fixed.

(9) The finish of all exposed surfaces of the unit shall be a smooth coating of white epoxy enamel.

(10) Spare parts shall be included by the manufacturer to care for the usual anticipated replacements and repairs for a 2-year period. In addition to the above the following spares shall be included: One complete filter, 1 complete pump and 2 flexible couplings with each toilet unit. One complete motor and one complete timer with each 4 or less toilet units.

(11) Chemicals shall be furnished by the manufacturer in sufficient amount with each unit for a 1-year supply, anticipating a complete draining and recharging once every 2 weeks. Chemicals shall control the odor and color of flushing liquid by inhibiting the growth of bacteria. Powder or crystalline must be stable and useful for at least 2 years. Liquid must not be damaged by freezing.

(12) An operating and overhaul manual, including isometric illustrations shall be prepared by the manufacturer and one copy shall be included with each unit. (The Monogram Industries, Incorporated, of Culver City, California, are experienced in manufacturing a unit that complies to these specifications.)

F. Water Heater

Water Heater shall conform to the following requirements: 50-gallon capacity, 120 gallons per hour recovery from 40 F to 140 F with 100 percent burner operation, glass-lined tank with cleanout hand hole and 2-inch thick rockwool insulation, 6-inch diameter vent with draft diverter, oil burner adapted to burn arctic grade fuel oil, flexible fuel oil supply and return sections having 3/8-inch FSPS fittings suitable to accept the 3/8-inch MSPS fittings of the building fuel supply and return systems. Maximum dimensions shall be 26-inch diameter by 60 inches high. (Series 90, Model 50E water heater manufactured by Bock Corporation, Madison, Wisconsin, conforms to this specification.)

G. Grease Interceptor

Grease interceptor shall conform to Specification MIL-T-18361, Class 1 with flow rate of 10 gpm, grease capacity of 20 pounds. Maximum dimensions shall be 14 inches high and height of outlet center line from base 10 inches.

H. Dishwasher

Dishwasher shall conform to Specification 00-D-431, Type II, 50 SMT, for corner installation. 180 F water will be furnished from water heater in Galley. Water tank shall have strainer basket on the drain connection to prevent solids greater than 1/4-inch diameter passing into the drain. (Model AM-9CTZ manufactured by Hobart Mfg., Troy, New York, conforms to this specification and has been used for piping indication. If other machine is used both piping and adjacent tables must be modified to fit.)

I. Pumps

(1) Water Distribution Pump shall be a package consisting of a base-mounted, motor-driven centrifugal pump with variable speed fluid

drive, control motor and electrical cubicle. All components to be interlocked mechanically, hydraulically and electrically at the factory and tested as a package. The unit shall be automatically energized on reduction of pressure due to demand increase and shall be designed to maintain a constant system pressure of 80 psi from zero gpm to 100 gpm. Pump shall be vertical split-case type so designed to permit complete servicing without breaking piping or motor connections. The pump bearings shall be oil lubricated with a visual oil level indicator. The pump shall be all bronze on the liquid end, standard fitted and shall be complete with a 3/8-inch gauge cock attached to the pressure side. Pump shall be long fitted to a horizontal motor of 7-1/2 hp, 3450 rpm, 208 v, 3 phase, 60 cycle with drip-proof enclosure. The unit shall have a pre-wired self-contained control panel box mounted on the common base containing the motor across the line starter, transformer, fuses, terminal blocks, pilot light and manual switch. An auxiliary flow switch, on the suction side shall be provided for safety shutoff, with manual restart, of the unit in case of water supply failure. (Hydro-Flo Pressure Booster Package with N-1510, Type B, 1-1/2-inch AB pump as manufactured by Bell & Gosset Company, Morton Grove, Illinois, conforms to this specification.)

(2) Waste Pump for Bath Tub shall be a centrifugal type meeting the following requirements: Capacity 6 gpm at 4 feet head; cast bronze body and impeller; mechanical seals; water temperature limit 200 F; two pole shaded pole motor, 115 v, single phase, 60 cycle, 35 watts; galvanized steel cooling fan; aluminum motor cover and base. (Gorman Rupp Part No. 72 BJ 161 A7 BC 59F 1S 73-3 as manufactured by Gorman Rupp Industries, Bellville, Ohio, conforms to this specification.)

(3) Waste Pump for Dishwasher shall be a centrifugal type meeting the following requirements: Capacity 7-1/2 gpm at 4 feet head, anti-clog feature up to 1/2-inch diameter solids, stress relieved high impact phenolic impeller and body, lip-type seals, CRES shaft, two pole shaded pole motor, 3450 rpm, aluminum motor cover and base, 115 v, single phase, 60 cycle, 50 watts. (Gorman Pump Part No. 100GR250 - A755100 as manufactured by Gorman Rupp Industries, Inc., Belleville, Ohio, conforms to this specification.)

(4) Fuel Distribution Pump shall conform to Specification MIL-P-17608A, 10 gpm at 100 psi, electric motor driven, 1-1/2 hp, 1200 rpm, 208 v, 3 phase, 60 cycle, horizontal type, with mechanical seal, inlet and outlet 1-1/2-inch diameter female thread. Limiting dimensions 3 feet 6 inches long by 1 foot 6 inches wide by 1 foot 2 inches high. The unit shall have a pre-wired motor starter mounted on the motor. (Model No. H4281 "Straitline" Pump as manufactured by Viking, Cedar Falls, Iowa, conforms to this specification.)

(5) Generator Coolant System Pump shall conform to Specification MIL-P-17608A, 18 gpm at 50 psi, electric motor driven, 1-1/2 hp, 1200 rpm, 208 v, 3 phase, 60 cycle, horizontal type with mechanical seal, inlet and

outlet 1-1/2-inch diameter female thread. Limiting dimensions 3 feet 6 inches long by 1 foot 6 inches wide by 1 foot 2 inches high. The unit shall have a pre-wired motor starter mounted on the motor. (Model No. HL4281 "Straitline" Pump as manufactured by Viking, Cedar Falls, Iowa, conforms to this specification.)

J. Air Chambers

Air chambers shall be CRES, interior bellows type for 3/4-inch pipe, 3/4-inch MSPS connection. (Smith Hydroltrol as manufactured by Jay R. Smith Manufacturing Company, Union, N. J., conforms to this specification.)

K. Valves

(1) Pressure Regulating Valves shall conform to Specification MIL-V-18146, Type I as indicated on the drawings, (screwed type).

(2) Quick-Opening Gate Valves shall be a flanged, iron body, bronze trimmed with quick-opening lever action. (Grane 494 1/2 conforms to this specification.)

(3) Pressure and Temperature Relief Valves shall conform to Specification MIL-V-13612A, Type I, for water heaters.

(4) Gate Valves shall be commercial standard, bronze body for screwed pipe joints, 125 pounds pressure.

(5) Pressure Relief Valve for fuel distribution pump shall be a commercial standard bronze, 100 psi, pressure setting and 3/4-inch size, (screwed type).

(6) Check Valves shall be commercial standard, bronze, 125 psi, horizontal type swing check, bronze disc, (screwed type).

(7) Pressure Regulator Valve for dishwashing machine shall be commercial standard, bronze body, regulator with bronze strainer, pressure range 5 to 35 pounds, (screwed type).

(8) Modulating Valve for generator coolant system shall be proportioning type, 3 port, bronze body with bronze trim and spring-return action. Adjustable speed 115-v motor operator with motor and gear train submerged in oil. Copper liquid filled thermal element with 10-foot length of armored capillary tube. Valve shall be set to modulate and maintain a minimum temperature of 32 F in the generator radiator supply header. (Barber Colman VP 3044 with MU 48202 and AU 321 as manufactured by Barber Colman Company, Rockford, Illinois, conforms to this specification.)

(9) Balancing Cocks for generator coolant system shall be bronze body plug cock type 125-psi working pressure with square head and check stops. (Crane 254 as manufactured by Crane Company, Chicago 32, Illinois, conforms to this specification.)

(10) Drain Cock used on the day tanks shall be lever operated and of bronze construction. (Crane #814 conforms with this specification. Crane Company, Chicago, Illinois.)

L. Hose

(1) Utility Hose shall conform to Specification ZZ-H-601a, Grade 1, 3/4-inch diameter, 75-foot lengths, complete with male and female couplings at ends.

(2) Hose for Generator Coolant System shall conform to Specification ZZ-H-428b, Type II, Grade A, Class 1.

M. Heat Exchangers

Heat exchangers for the large fuel storage tank shall consist of a 6-inch diameter by 7-foot-long open-end steel shell containing 3/4-inch diameter, 18-gauge copper U tubes having 27 square feet of heat transfer surface in 4 passes. Fuel oil shall flow freely into shell and around tubes. Maximum pressure loss in tubes to be 4 feet head with 18-gpm liquid flow. Tubes shall be supported by baffles. Shell shall be fitted with flange, gasket and bolts and a welding flange suitable for connecting to a 21-foot 7-inch diameter tank. Connections as indicated on the drawings. (Similar to Midel "WU" Heat Exchanger less pump and with open end as manufactured by Bell & Gossett Company, Morton Grove, Illinois, conforms to this specification.)

N. Fuel Oil Filters

(1) Filters shall be a flow-through type made of CRES with filter cartridges to remove water and solids. Approximate capacity shall be 15 gpm for light fluids. (Casing No. WY3SS-10-1-1/2 and filter cartridge E39-R10-GV as manufactured by Commercial Filters Corporation, Melrose, Massachusetts, conforms to this specification.)

O. Fuel Level Indicator

Indicator shall be hydrostatic type for day tanks with hand pump on the dial gauge and 1/4-inch diameter by 30-foot long copper air tube with 3/4-inch diameter by 6-inch long bell. Tube shall be provided with a seal to fit a 1-inch diameter FSPS opening in tank. Indicator shall be installed in the field as indicated on the drawings. (Small Model Levelometer as manufactured by Liquidometer Company, Long Island City, New York, conforms to this specification.)

5. Utility Trough

A. Fabrication

(1) The Utility Trough shall be fabricated as indicated on the drawings of sheet metal, galvanized, as specified under 3. Materials.

(2) Finish. All surfaces of the utility trough shall be finished with 1 coat of primer and 2 coats of enamel as specified under 3. Materials.

(3) Cleaning. All zinc-coated surfaces shall be thoroughly cleaned and treated to assure adherence of the primer and enamel.

6. Water Storage Tanks

A. Fabrication

(1) Tanks shall be fabricated of aluminum, Alloy 6061, of thickness and dimensions as indicated on the drawings. All joints shall be welded and ground smooth. Fittings shall be welded or riveted and equipped with necessary gaskets to assure water tightness. Workmanship shall be first class throughout.

7. Fuel Tanks

A. Storage Tank

Storage tank shall conform to FSN C5430-263-2076, 21,000-gallon capacity, 21-foot 7-inch OD by 9 feet 6-1/2 inches high, bolted steel construction modified for piping as indicated on the drawings.

B. Day Tanks

Day tanks No. 1 and No. 2 shall be of welded steel construction as indicated on the drawings. Steel as specified under 3. Materials. Tank shall withstand a pressure of 10 psi. Interior shall be lined with corrosion resisting coating. Exterior shall receive 1 coat of primer and 2 coats of enamel.

HEATING AND VENTILATING

1. Scope

This section covers the specification for all materials and equipment to provide for a complete heating system as outlined below, ready for installation as indicated on the drawings.

2. General

The work shall include the furnishing of all labor and materials for the complete fabrication of all items as indicated on the drawings. Workmanship shall be first class throughout. Each building is heated by a separate system each of which consists of a forced-air furnace, fresh-air intake, supply and return air ducts, humidifier, thermostatic controls and adjustable registers. Building No. 4 has no standard heating system but is provided with a furnace for heating the utility room during installation of equipment and for emergency situation of generator shut-down.

3. Materials

A. Aluminum

(1) For all duct work and hangers shall conform to Specification MIL-A-52174. Thickness as noted on drawings.

(2) Rivets shall conform to Specification MIL-R-5674B.

B. Supply Duct

Preformed ducts shall be of 1-inch thick fibrous glass material with a fire-retardant and vapor-barrier jacket on its surface. "K" value of the insulation shall be 0.22 at 75 F. Insulation shall be pre-cut as indicated on the drawings to form ducts and shall be furnished flat for shipping. Duct assembly shall be with flared-type staples on 2-inch centers in the longitudinal and transverse stapling flaps. Single thickness of 2-inch pressure sensitive heat sealing aluminum tape shall be applied with a heat-sealing iron over the joint. It shall meet National Bureau of Fire Underwriters Standard 90A. (GB prefabricated duct as manufactured by Gustin-Bacon Manufacturing Company, Kansas City, Missouri, conforms to this specification).

C. Aluminum Duct Tape

Pressure-sensitive, heat-sealing aluminum tape 2 inches wide by 2 mils thick in 100-yard rolls. (MacTac, Tape 9 402-011-40 as manufactured by Morgan Adhesive Company, Stowe, Ohio).

D. Fabric Duct Tape

Pressure-sensitive, silver-colored polyethylene laminated to cloth 2 inches wide in 60-yard rolls.

E. Steel

Sheet or strip shall conform to Specification QQ-S-640, FS 1020, galvanized.

4. Equipment

This section covers all heating equipment shown on the heating drawings. Equipment not specifically conforming to a federal specification is described and after the description, in parentheses, may be a reference to a manufacturer's name and/or catalog number or name of equipment that conforms to this specification. It must be noted that the design and arrangement of equipment is based on this description and any deviation may affect other equipment or space allowances. All changes shall be considered carefully by the contracting officer.

A. Forced-Air Furnace

Oil-fired unit complete with blower section, stainless steel primary heat exchanger, controls, burner and draft diverter. Burner capacity of 350,000 Btu/hr input, 280,000 Btu/hr output with arctic grade diesel fuel. Fan capacity 4,000 cfm minimum to 4,400 cfm maximum at 3/4-inch water external static pressure with 1-1/2-hp motor, 208v, 3 phase, 60 cycle. Oil burner of the pressure-atomizing type with 120v, 1 phase, 60 cycle motor pre-wired to controls. Fan wired for continuous operation. Temperature control from snap acting line voltage stats, one located in the return-air intake that will energize the burner on temperature drop of the return air, one located in supply air that will energize the burner when supply-air temperatures are lower than 70 F and high limit that will de-energize the burner when supply air is higher than 140 F, adjustable sheave type fan motor drive, flexible oil supply and return connecting tubes with union ends 3/8-inch FSPS. Maximum outside dimensions for the forced-air furnace are 33 inches wide, 46 inches long and 88 inches high. (Lennox Oil fired furnace type OSH6-350 conforms to this specification and has been used for design and space allocations. Lennox Industries, Inc., Los Angeles, California).

B. Return-Air Grille

All aluminum with extruded borders and 1/2- by 1/2- by 1/2-inch fabricated grille with 90 percent free area.

C. Flue Weather Caps

Caps shall be double-wall type with outer wall of galvanized steel, 26 gage, and inner wall of aluminum .018-inch thick, with air space between. Joints shall be snap-lock type, easily assembled and disassembled. Sizes as indicated on the drawings. (Amerivent Vent Cap manufactured by Amerivent, Los Angeles 22, California, conforms to this specification).

D. Humidifier

Centrifugal atomizer type to provide 24 pounds per hour of water vapor. All materials shall be non-ferrous where exposed to water vapor. Motor shall be capacitor type 100 watts, 120v, 1 phase, 60 cycle. Water reservoir shall be equipped with float which shall regulate flow with inlet pressure less than 75 pounds. Provide 12-inch long flexible connection to receive 3/8-inch MSPS water supply. (Walton duct type, Model WT humidifier as manufactured by Walton Laboratories, Inc., Irvington 11, New Jersey, conforms to this specification).

E. Supply Registers

Side-wall type supply air registers shall be of aluminum rectangular construction and shall be complete with two sets of air foil louvers, front set parallel to the long dimension and individually adjustable to any degree of deflection in the vertical plane. Second set parallel to short dimension and individually adjustable to any degree of deflection in the horizontal plane. Opposed-blade volume control dampers shall be adjustable by use of permanently fixed key. (Titus airfoil series CL-277 conforms to this specification).

F. Toilet Unit Exhaust Fan

Utility type exhaust fan with pressed steel housing, multi-blade wheel and direct drive motor. Fan shall be capable of exhausting 114 cfm at 1/4-inch water static pressure with a 1/20-hp motor, 120v, 1 phase, 60 cycle. Fan shall be equipped with four rubber pads each 3 by 3 by 1/2 inches with 1/2-inch diameter hole in center for the hold-down bolt. (American Blower utility set 45H conforms to this specification. American Blower Division of American Standard, Detroit 32, Michigan).

G. Kitchen Hood Exhaust Fan

Axial-flow type of exhaust fan with air-foil type non-sparking blades and permanently lubricated ball bearing vee belt drive enclosed in a vapor tight housing. Fan shall be capable of exhausting 1650 cfm at 1/2-inch water static pressure with a 1/4-hp motor, 120v, 1 phase, 60 cycle. (DeVilbiss Type JF 17 1/2-inch exhaust stack fan conforms to this specification. DeVilbiss Company, Toledo 1, Ohio). Fan shall be equipped with a "rubber in shear" vibration isolator at each hold-down bolt. (Vibrex type CS as manufactured by M. W. Sausse & Company, 636 No. Roberton Boulevard, Los Angeles, California, conforms to this specification).

H. Kitchen Hood Grease Filters

Aluminum, washable type filters shall conform to Specification MIL-F-16552C, Class 2.

I. Forced-Air Unit Filters

Air filters shall conform to Specification F-F-310. (Replaceable media air filters type D-C with frames as manufactured by Farr Company, Los Angeles 45, California, conforms to this specification).

J. Flexible Connections

A closely woven glass fabric coated on one side with cloroprene containing fire retardant. (Ventglas, Los Angeles, manufactured by Ventfabrics, Inc., Chicago 12, Illinois, conforms to this specification).

K. Extractors

A series of radius blades attached to a frame that pivots on a mounting bracket which attaches to the duct with sheet metal screws. Blades synchronized to operate as a unit. (Tuttle and Bailey "Vectrol" conforms with this specification).

L. Manual Damper Regulators (locking quadrant)

Regulator with a heavy-gauge dial, handle and a hexagon locking nut for 3/8-inch diameter damper rod operation. All steel parts are cadmium plated (635 Ventlok 3/8-inch dial regulator conforms with this specification. Ventfabrics, Inc., Chicago, Illinois).

M. Louvered Penthouse (Building No. 4)

The penthouses shall be constructed of aluminum alloy 6063-T5. All material shall be 12 gauge. Corners shall be mitered and welded. Dimensions and details shall be as indicated on the drawings. (Pennhouse as manufactured by Penn Ventilator Company, Philadelphia 40, Pennsylvania, conforms to this specification).

N. Roof Jack and Stack

Shall be constructed as indicated on the drawings of materials as noted. Parts shall fit accurately to assure weather tightness.

O. Opposed-Blade Dampers

Damper blades shall be 4 inches wide, 16-gauge, galvanized steel with reinforced edges and 3/8-inch diameter pivot rod. Damper frame shall be 12-gauge, galvanized steel channel, 2 inches wide with 1/2-inch web welded throughout. (OPP MD Mixing Damper conforms with this specification. Contralair Manufacturing Company, 1932 South Compton Avenue, Los Angeles, California).

P. Exhaust Cap

Exhaust cap on the kitchen hood discharge shall be of 20-gauge galvanized steel complete with an air diffusion cone and a bell mouth section for direct connection to the exhaust stack. (DeVilbiss Company, Toledo 1, Ohio, manufacturers of DeVilbiss XH-441, 17-1/2-inch diameter conforms with this specification).

Q. Furnace Diffuser Assembly

Adjustable-angle discharge supply diffuser assembly with directional vanes and rotating base to fit the discharge opening on the forced-air furnace. Lennox OSH6-350. (Lennox OSH6-490 conforms to this specification. Lennox Industries, Inc., Los Angeles, California).

5. Duct Work Fabrication

All aluminum ducts shall be constructed of sizes as indicated on the drawings and shall have all flat surfaces cross broken.

REFERENCES

1. NCEL. Technical Note N-435, Temporary Polar Camp - Concept and Design Criteria, by J. E. Schroeder, G. E. Sherwood, and J. E. Dykins. 9 March 1962.

2. NCEL. Technical Report R-288, A Temporary Polar Camp, by G. E. Sherwood. To be published in 1964.

3. NCEL. Technical Report R-265, Temporary Polar Structures - Maintenance Shelter, by J. B. Camm. To be published in 1963.

4. NCEL. Technical Note N-484, Temporary Polar Structures - Preliminary Evaluation of the Modified T5 Barracks, by J. P. Cosenza. December 1962.

Appendix A

Standard Specifications

The standard specifications given in the following list or mentioned elsewhere herein (including the addenda, amendments, and errata listed) shall govern in all cases where references to standard specifications are made. In case of difference between these standard specifications and this specification or its accompanying drawings, this specification or its accompanying drawings shall govern. Especial care shall be exercised to refer in requests for quotations, in orders, and in subcontracts to the standard specifications and to all modifications thereof.

Military

MIL-A-397B	Feb. 3, 1953	Adhesive, room-temperature and intermediate-temperature setting resin (phenol, resorcinol, and melamine base).
MIL-A-1154C	June 22, 1962	Adhesive, Bonding, Vulcanized Synthetic Rubber to Metal.
MIL-A-52174	May 2, 1961	Aluminum Alloy, Duct Sheet.
MIL-B-19564	Aug. 1, 1956	Bedding Compound, Thermal Insulation Pipe Covering.
MIL-C-490A(1)	Mar. 11, 1957	Cleaning and Preparation of Ferrous and Zinc Coated Surfaces for Organic Protective Coatings.
MIL-C-3133	Feb. 14, 1950	Cellular Rubber Products, General Purpose (Except Ebonite).
MIL-C-43006	Jan. 27, 1961	Cloth, Laminated, Vinyl-Nylon, High-Strength Flexible
MIL-F-16552C	Jan. 16, 1962	Filters, Air Conditioning, Cleanable Impingement (High Velocity Type).
MIL-F-18180	Sept. 2, 1954	Flanges and Flanged Fittings, Pipe, Steel.

MIL-P-17608A	Jan. 20, 1956	Pumps, Rotary, Power Driven, Viscous Liquids.
MIL-R-5674B	June 28, 1957	Rivets. Aluminum and Aluminum Alloy.
MIL-T-18143D	Oct. 27, 1958	Table, Dining, Metal (With Four Bracket Seats).
MIL-T-18361	Dec. 23, 1954	Traps, Grease, Waste Water.
MIL-T-704C(2)	June 22, 1956	Treatment and Painting of Material.
MIL-V-13612A	Aug. 30, 1957	Valves, Relief, Pressure and Temperature.
MIL-V-18146	July 30, 1954	Valves, Pressure Regulating, water.
MIL-W-6110	Apr. 11, 1950	Wood; Determination of Moisture Content of.

NAVDOCKS Specification

9Yh		Electrical Appratus, Distributing Systems, and Wiring.

Federal Specifications

L-P-391a	July 27, 1962	Plastic, Sheets, Rods and Tubes, Methacrylate, Cast.
T-R-605	Oct. 31, 1956	Rope, Manila and Sisal.
F-F-310	Oct. 29, 1957	Filter, Air Conditioning, (Viscous-Impingement Type, Replaceable).
W-C-586a	Jan. 12, 1961	Conduit Outlets and Entrance Caps, Electrical; Cast Metal - For Shore Use.

W-C-596	Aug. 19, 1959	Connector, Plug, Electrical; Connector, Receptacle, Electrical; Plate, Wall, Electrical.
W-F-406a	June 9, 1960	Fittings for Electrical Cable and Flexible Metal Conduit.
W-F-408a	Dec. 23, 1958	Fittings for Conduit, Metal, Rigid (Rigid Steel and Electrical Metallic Tubing).
W-F-791b(1)	Jan. 25, 1957	Fuse, Cartridge and Plug.
W-J-800a	Apr. 2, 1958	Junction Box; Extension, Junction Box; Cover, Junction Box, (Steel, Cadmium or Zinc-Coated).
W-O-815	June 21, 1956	Outlet Boxes; Non-metallic with Covers and Accessories.
W-P-131a(2)	Apr. 13, 1951	Panelboards; Equipped with Automatic Circuit-Breakers.
W-R-32b	Mar. 12, 1957	Raceways and Fittings; Metallic, Surface.
W-S-610	Apr. 2, 1958	Splice, Conductor.
W-S-865c	Sept. 3, 1959	Switch, Box (enclosed), Surface-Mounted.
W-S-893a	Apr. 8, 1956	Switches, Toggle, Multiple Unit; with Wall Plates.
AA-R-211e	Feb. 5, 1962	Refrigerator, Mechanical, Household (Electrical, Self-Contained).
DD-M-411	Oct. 21, 1948	Mirrors; Plate Glass, Framed.
FF-B-561b	Apr. 30, 1962	Bolts, Lag.
FF-B-571a	Jan. 9, 1934	Bolts, Nuts, Studs, and Tap Rivets (and Material for same).

FF-H-106a(1)	Dec. 10, 1952	Hardware, Builder's; Locks and Door Trim.
FF-H-111a	July 8, 1948	Hardware, Builder's; Shelf and Miscellaneous.
FF-H-116c	July 3, 1957	Hinges, Hardware, Builder's.
FF-N-105	Oct. 6, 1952	Nails, Wire, and Staples.
FF-S-111b	May 15, 1961	Screws, Wood.
GG-G-76b	Aug. 25, 1960	Gages, Pressure and Vacuum, Dial Indicating.
HH-I-521c(1)	Dec. 15, 1948	Insulation, Building, Mineral-Wool: Batts, Loose-Fill, and Granular-Fill.
HH-I-552	July 10, 1956	Insulation Pipe Covering, Thermal, and Insulation Blanket, Thermal, Pipe Covering.
HH-I-551b	Jan. 17, 1962	Insulation Block and Pipe Covering, Thermal Cellular Glass.
NN-P-530a	Nov. 2, 1960	Plywood; Flat Panel.
OO-D-00431a	Sept. 20, 1950	Dishwashing Machines, (Commercial)
QQ-A-270a	Nov. 6, 1957	Aluminum Alloy, Bars, Rods and Shapes; extruded; 6061 and 6062.
QQ-A-318a	Mar. 12, 1958	Aluminum Alloy Plate and Sheet 5052.
QQ-P-416a	Dec. 11, 1956	Plating, Cadmium (Electro-deposited).
QQ-S-633a	Nov. 6, 1957	Steel Bars, Carbon, Cold Finished and Hot Rolled (General Purpose).

QQ-S-640	Aug. 8, 1952	Steel, Carbon Sheet and Strip.
QQ-S-766c(2)	Apr. 16, 1962	Steel, Plates, Sheets, and Strip - Corrosion Resisting.
QQ-Z-325a	May 13, 1959	Zinc Coating, Electro-deposited, Requirements for.
SS-A-118b(3)	Dec. 18, 1958	Acoustical Units, Prefabricated.
TT-E-529a	Oct. 30, 1959	Enamel, Alkyd, Semi-Gloss.
TT-P-636b	Feb. 23, 1954	Primer Coating, Synthetic, Wood and Ferrous Metal.
UU-P-147b	Sept. 9, 1954	Paper, Building, Water-proofed.
WW-C-540a	Nov. 2, 1960	Conduit, Metal Rigid (Electrical, Aluminum).
WW-C-581c(2)	Oct. 28, 1958	Conduit, Electrical, Steel, Rigid, Zinc-Coated.
WW-N-351a	Mar. 13, 1956	Nipples, Pipe, Threaded.
WW-P-406b	June 26, 1961	Pipe, steel (seamless and welded) (for ordinary use).
WW-P-521d	July 22, 1959	Pipe fittings, Malleable Iron, Wrought Iron and Steel, (Screwed) 150 lbs.
WW-P-541b		Plumbing Fixtures for Land Use.
WW-T-799a(1)	June 27, 1946	Tubing, Copper, Seamless (for use with soldered or flared fittings).
WW-T-806b	Apr. 23, 1951	Tubing, Electrical, Metallic.
ZZ-H-428b	June 19, 1961	Hose, Rubber: Preformed and Straight; Hose, Preformed: Flexible, Wire Reinforced. (For the Coolant Systems of Automotive and Other Liquid-Cooled Engines).

ZZ-H-601a	Aug. 29, 1957	Hose, Rubber, Water (Yarn-Reinforced).
DDD-S-251b	Sept. 2, 1954	Shades, Windows, Rollers, Slats, Cords and Accessories.
LLL-D-581	Feb. 6, 1953	Doors, Exterior and Interior, Wood Flush Type, Veneered.
LLL-H-35	Dec. 21, 1955	Hardboard, Fibrous-Felted (Fiberboard).

Federal Standards

FED-STD-595	Mar. 1, 1956	Colors
FED-STD-751	Aug. 14, 1959	Stitches, Seams and Stitchings.

Non-Government Specifications

All of the following specifications shall be of latest date unless indicated otherwise:

American Society for Testing Materials (ASTM)

Douglas Fir Plywood Association (DFPA)

American Institute of Steel Construction (AISC)

Commercial Standard CS-45

Commercial Standard CS-120

American Institute of Electrical Engineers (AIEE)

Insulated Power Cable Engineers Association (IPCEA)

National Electrical Manufacturers Association (NEMA)

Manufacturers Standards Society (MSS)

Appendix B

Drawings for the Temporary Polar Camp

The original of the drawings listed below and shown at reduced scale are available at the U. S. Naval Civil Engineering Laboratory, Port Hueneme, California. All drawings are 28 by 40 inches.

Y&D Drawing No.	Title
943671	Camp Vicinity Plan 50, 100, 150 & 200 Man Camps
943672	Camp Site Plans 50, 100, 150 & 200 Man Camps
943673	Camp Electrical Distribution 50, 100, 150 & 200 Man Camps
943674	Camp Water, Fuel & Waste System 50, 100, 150 & 200 Man Camps
943675	Modified T5 Structure Basic Building
943676	Bldg. No. 1, Quarters-Quarters General Arrangement
943677	Bldg. No. 1, Quarters-Quarters Heating
943678	Bldg. No. 1, Quarters-Quarters Electrical
943679	Bldg. No. 2, Recreation-Quarters General Arrangement
943680	Bldg. No. 2, Recreation-Quarters Heating
943681	Bldg. No. 2, Recreation-Quarters Electrical
943682	Bldg. No. 2, Recreation-Quarters Plumbing

943683	Bldg. No. 3, Storage-Mess Hall, Galley General Arrangement
943684	Bldg. No. 3, Storage-Mess Hall, Galley Galley Equipment
943685	Bldg. No. 3, Storage-Mess Hall, Galley Heating
943686	Bldg. No. 3, Storage-Mess Hall, Galley Electrical
943687	Bldg. No. 3, Storage-Mess Hall, Galley Plumbing
943688	Bldg. No. 4, Storage-Utilities General Arrangement
943689	Bldg. No. 4, Storage-Utilities heating & Ventilating
943690	Bldg. No. 4, Storage-Utilities Electrical
943691	Bldg. No. 4, Storage-Utilities Plumbing
943692	Bldg. No. 5, Admin., Comm.-Quarters General Arrangement
943693	Bldg. No. 5, Admin., Comm.-Quarters Heating
943694	Bldg. No. 5, Admin., Comm.-Quarters Electrical
943695	Bldg. No. 6, Quarters-Dispensary General Arrangement
943696	Bldg. No. 6, Quarters Dispensary Heating

943697	Bldg. No. 6, Quarters-Dispensary Electrical
943698	Bldg. No. 6, Quarters-Dispensary Plumbing
943699	Bldg. No. 7, Quarters-Quarters General Arrangement
943700	Bldg. No. 7, Quarters-Quarters Heating
943701	Bldg. No. 7, Quarters-Quarters Electrical
943702	Bldg. No. 8, Admin.-Comm. General Arrangement
943703	Bldg. No. 8, Admin.-Comm. Heating
943704	Bldg. No. 8, Admin.-Comm. Electrical
943705	Service Core Basic Heating
943706	Heating System Duct Details
943707	Service Core Basic Electrical
943708	Service Core Basic Plumbing
943709	Plumbing System Equipment Details
943710	Interior Partitions Erection
943711	Connecting Tunnels Erection & Fabrication
943712	Foundation System Fabrication

943713	Interior Partitions Panel Fabrication
943714	Interior Partitions Miscellaneous Fabrication
943715	Modified T5 Structure Door Panel W-19
943716	Modified T5 Structure Door for Panel W-19

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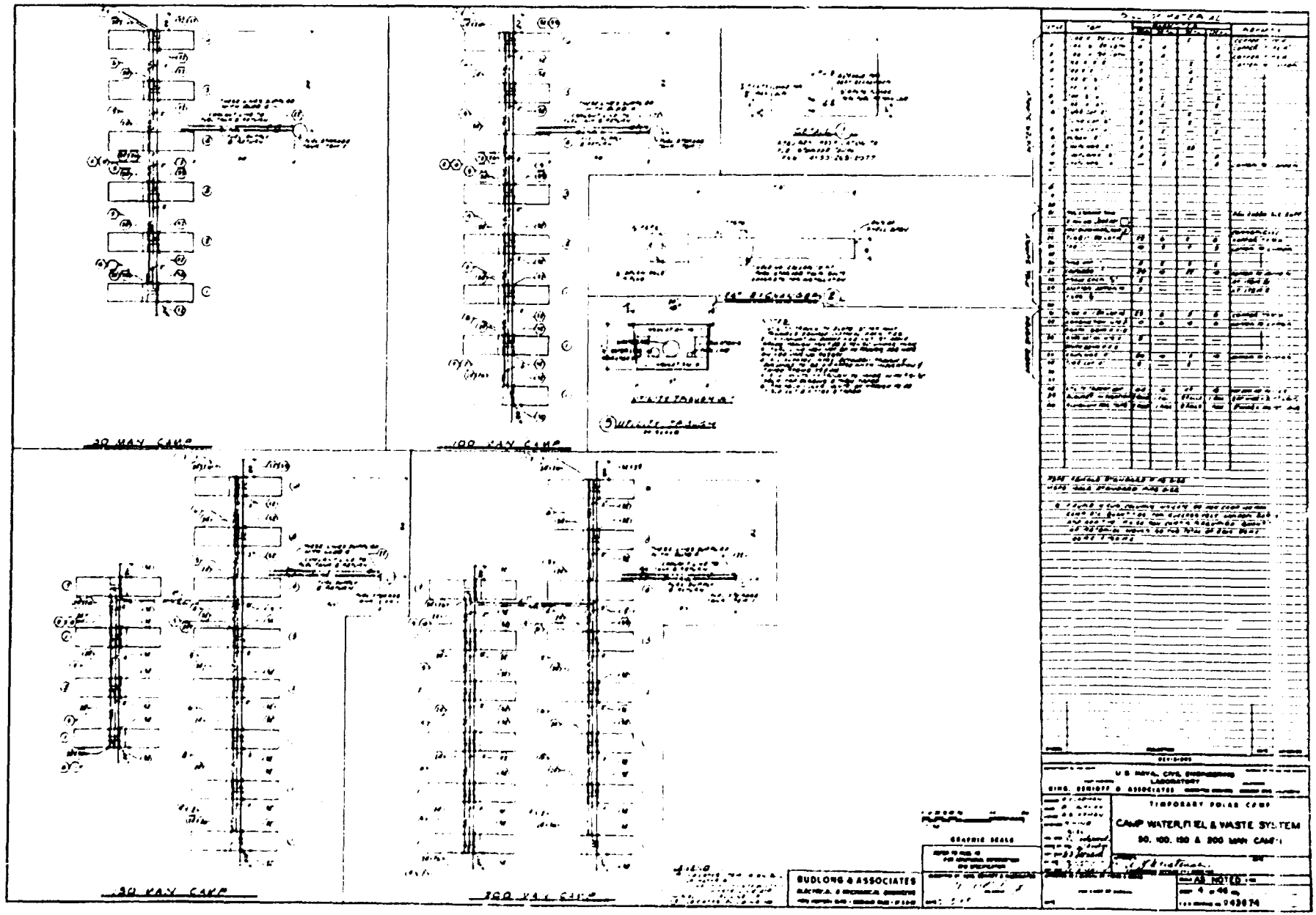

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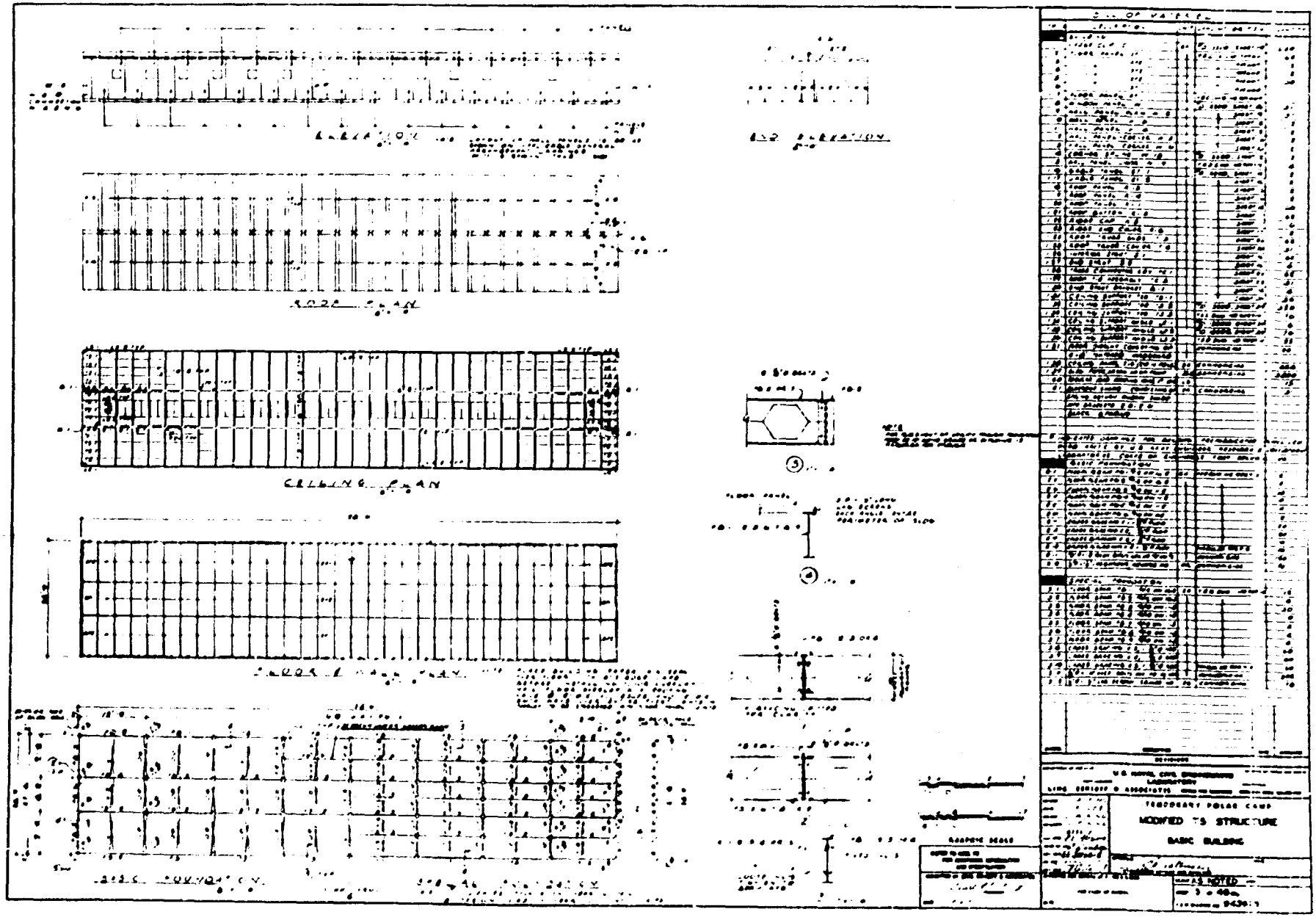

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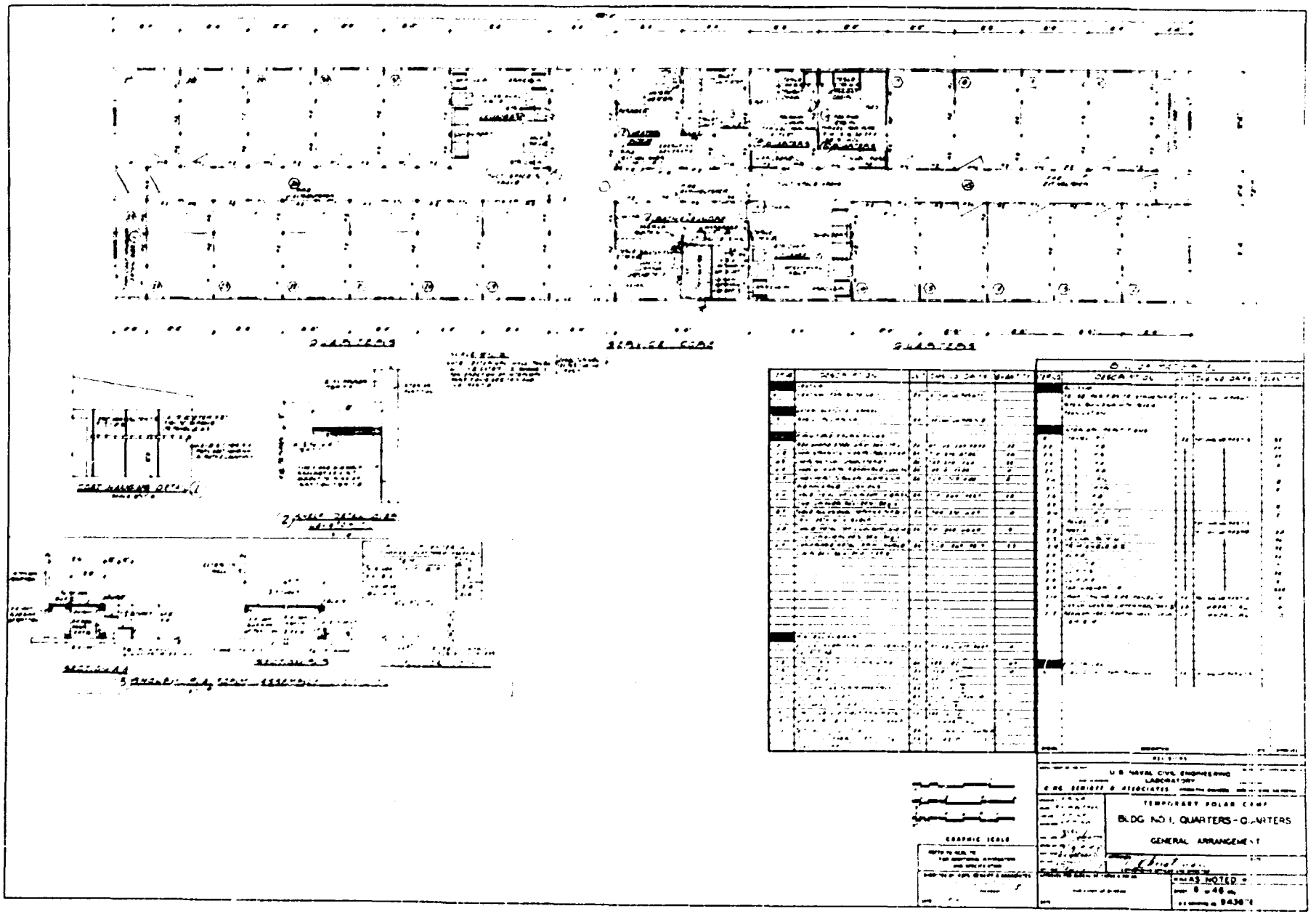

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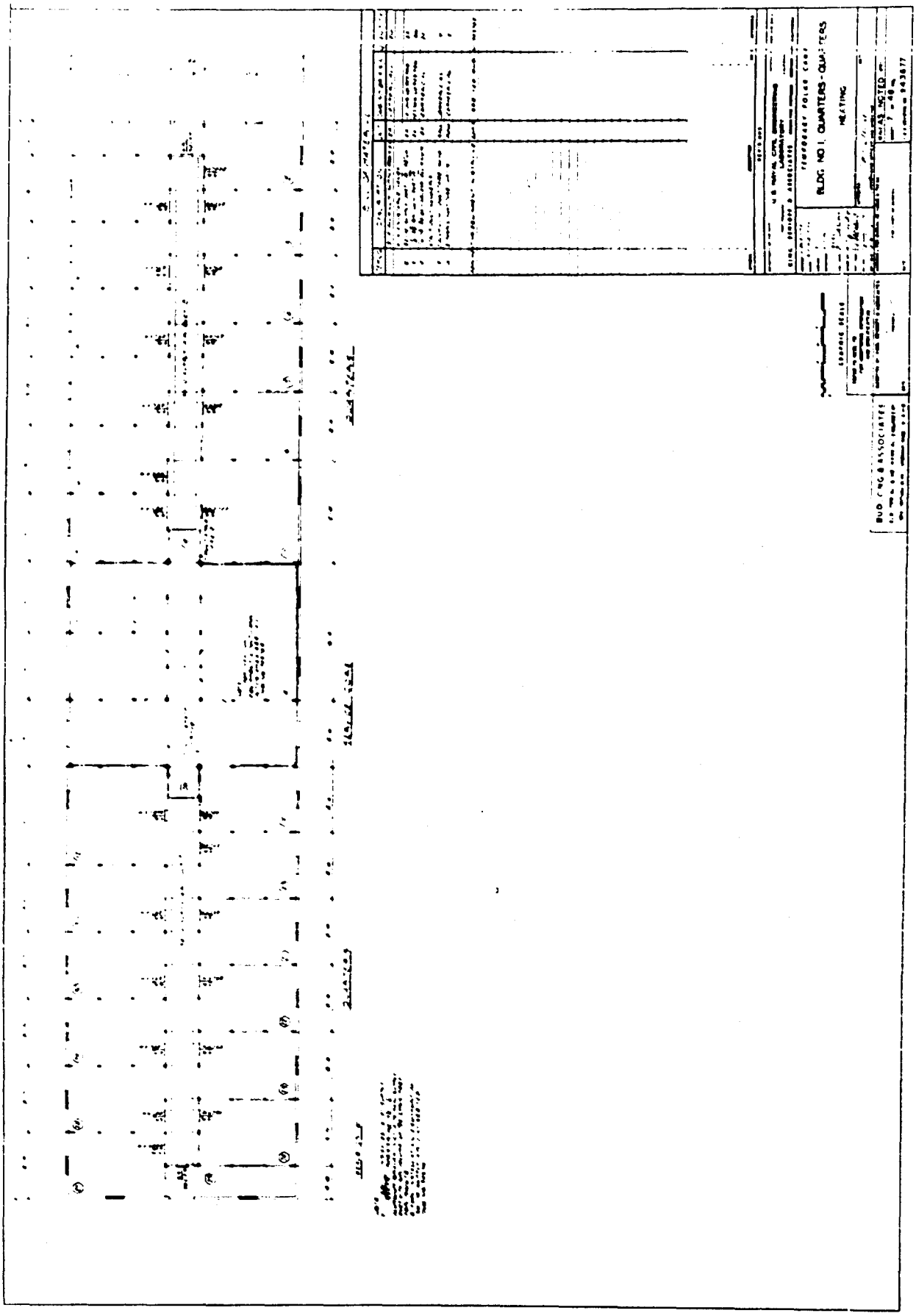

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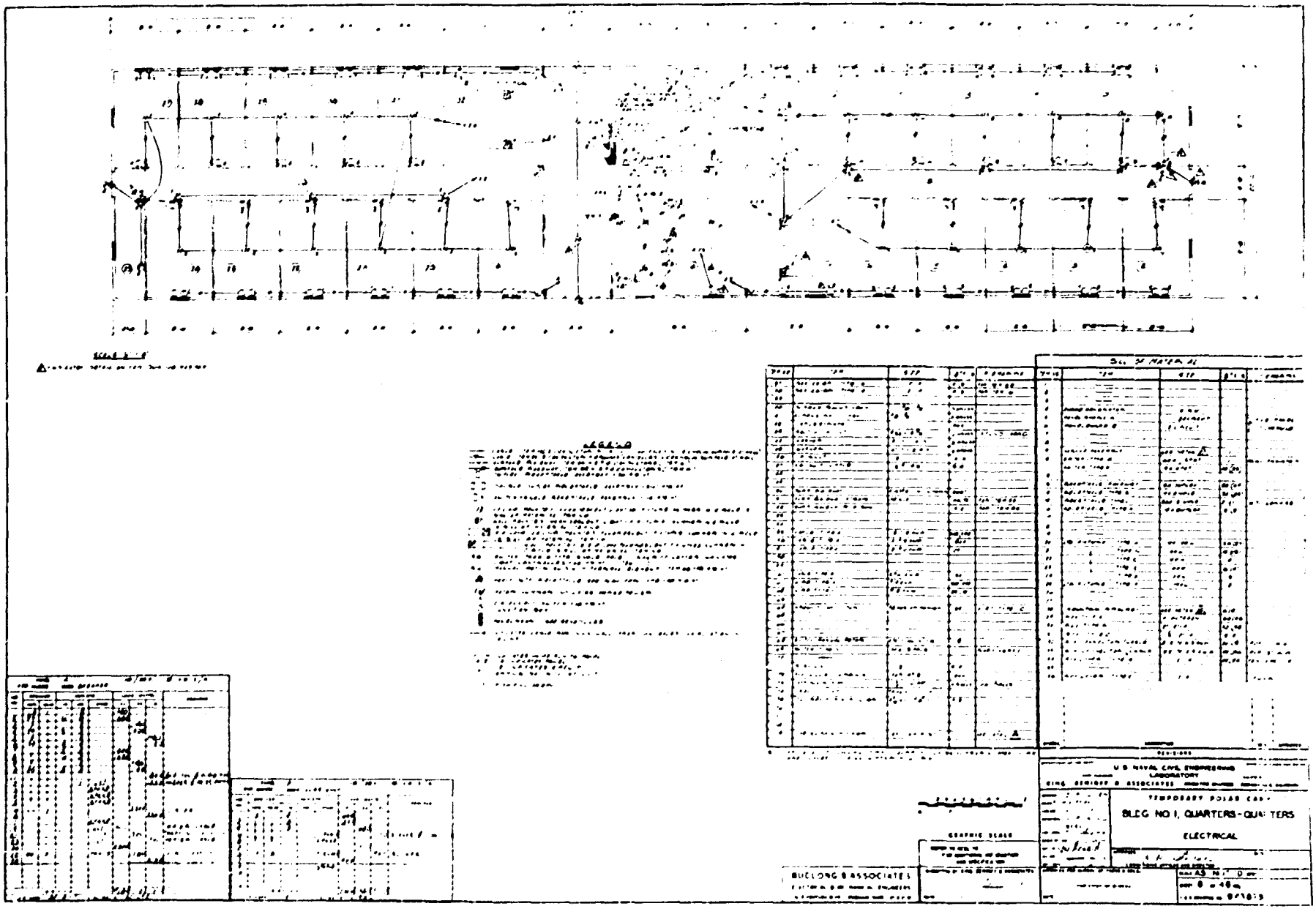

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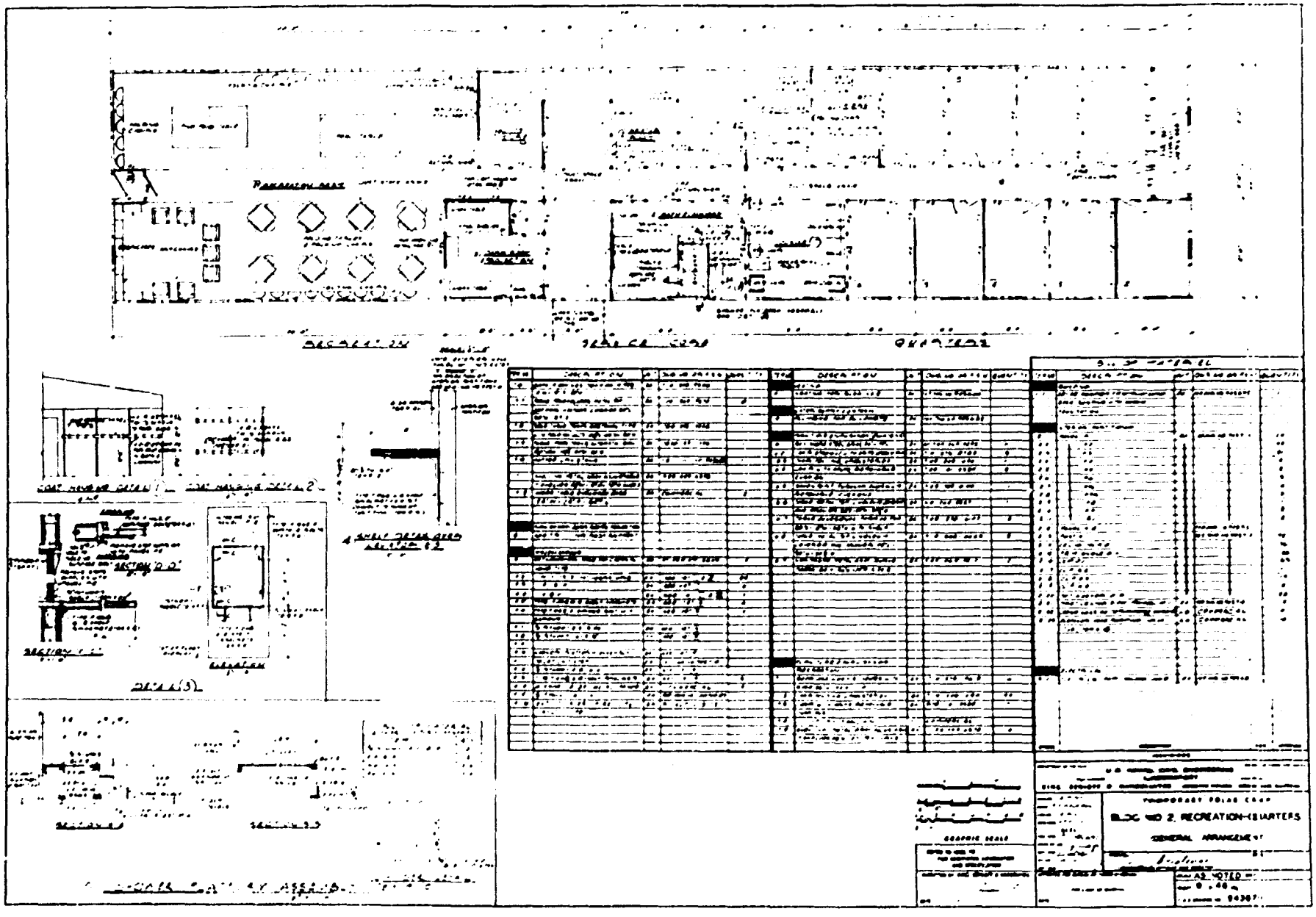

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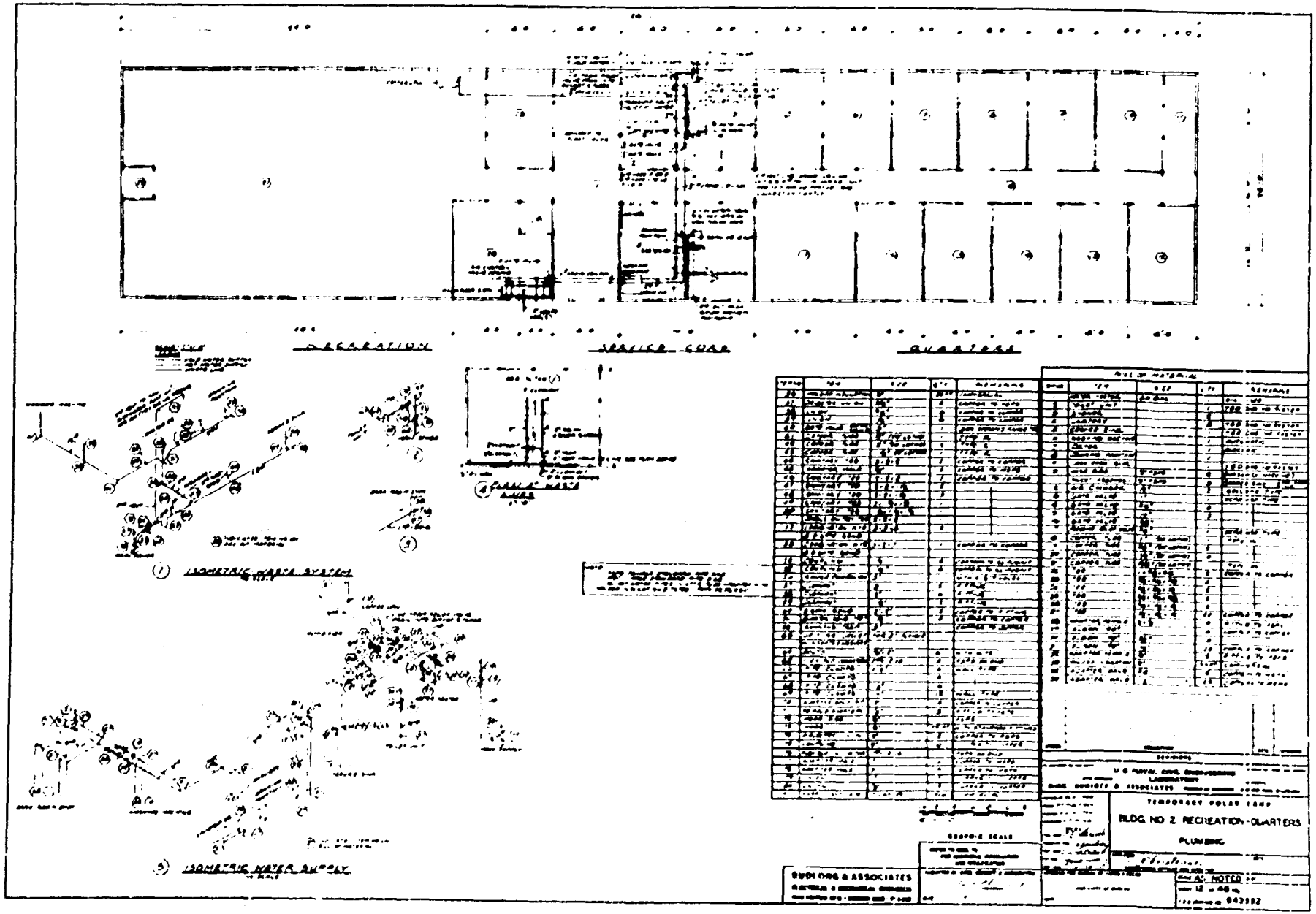

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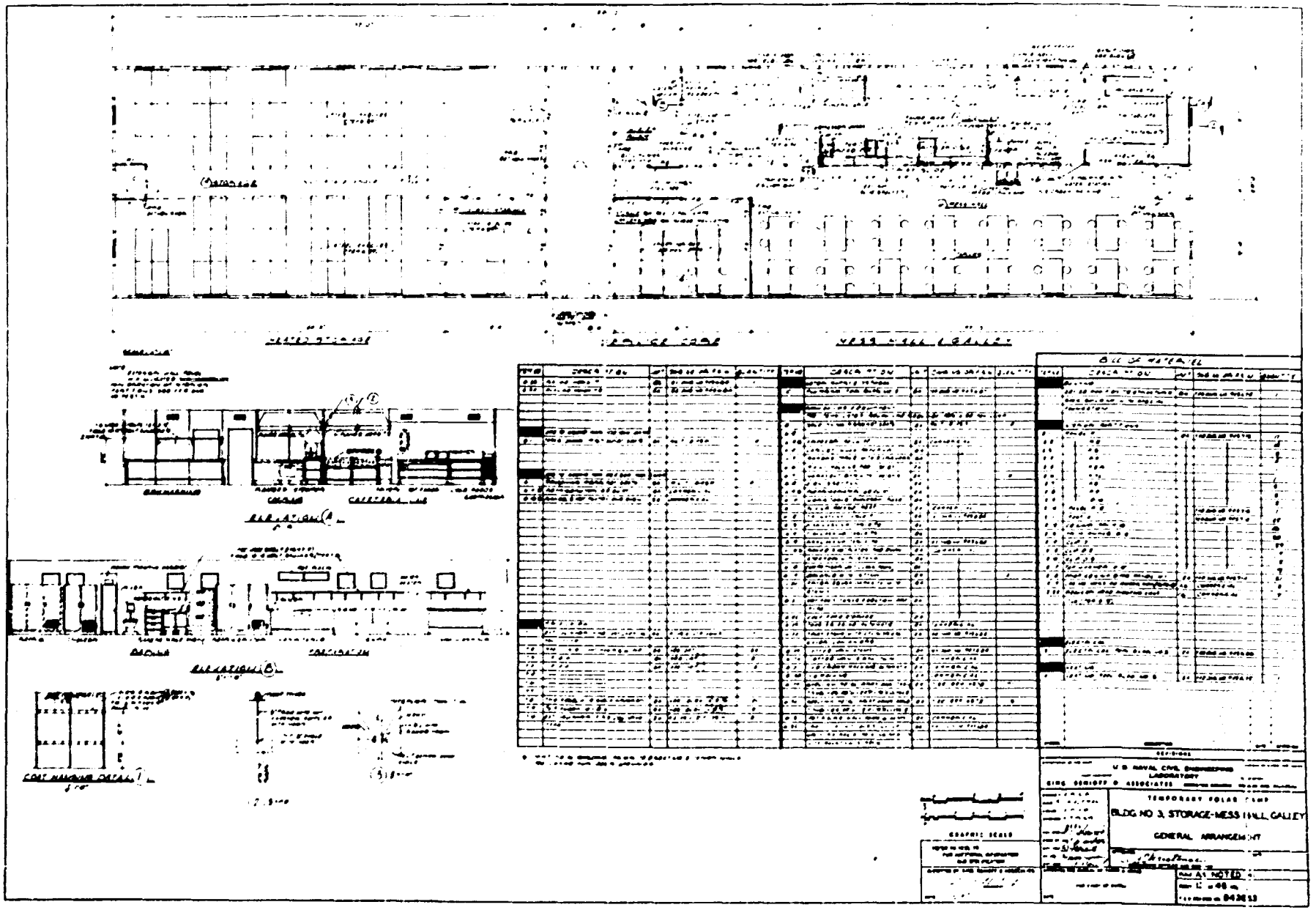

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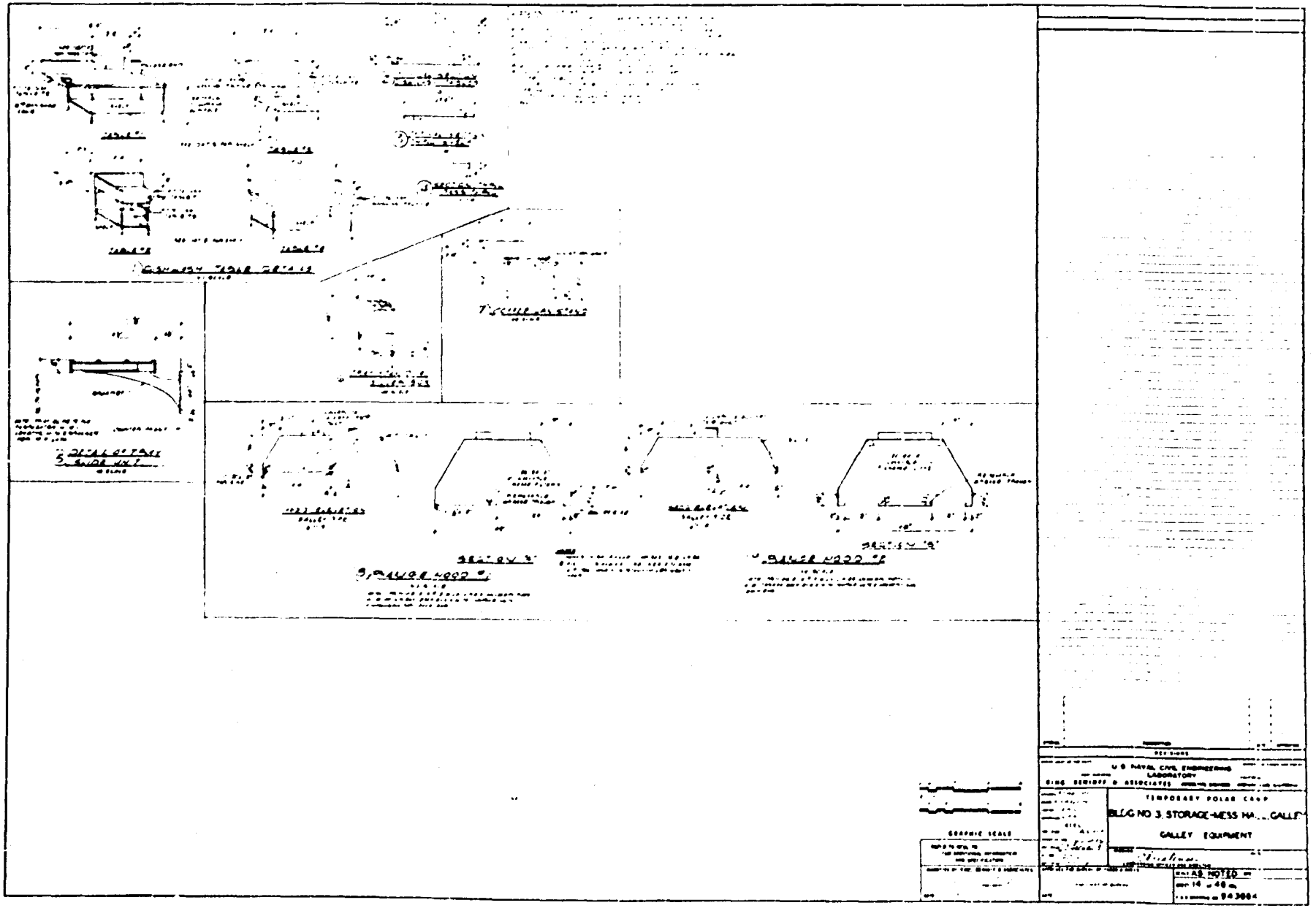

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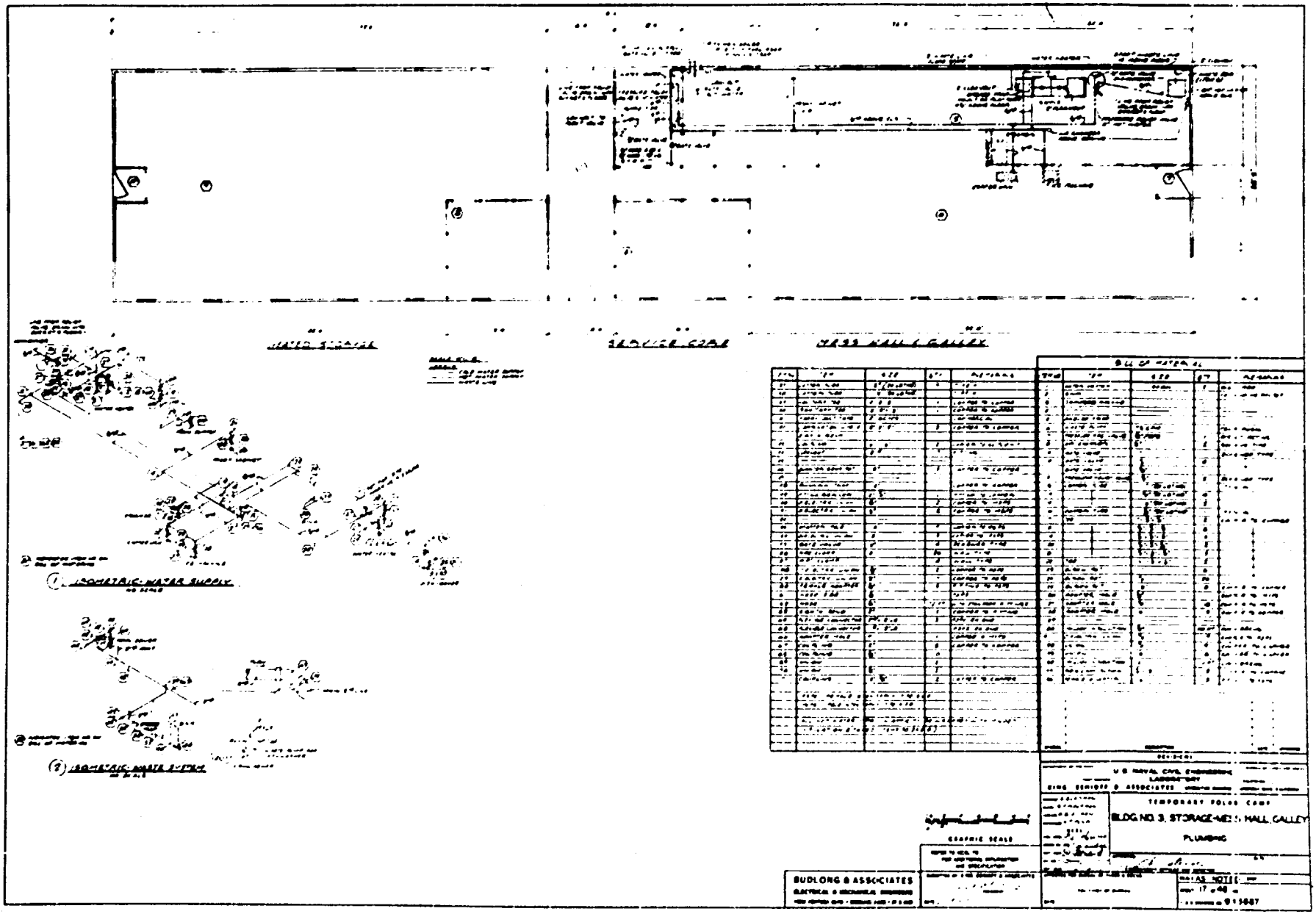

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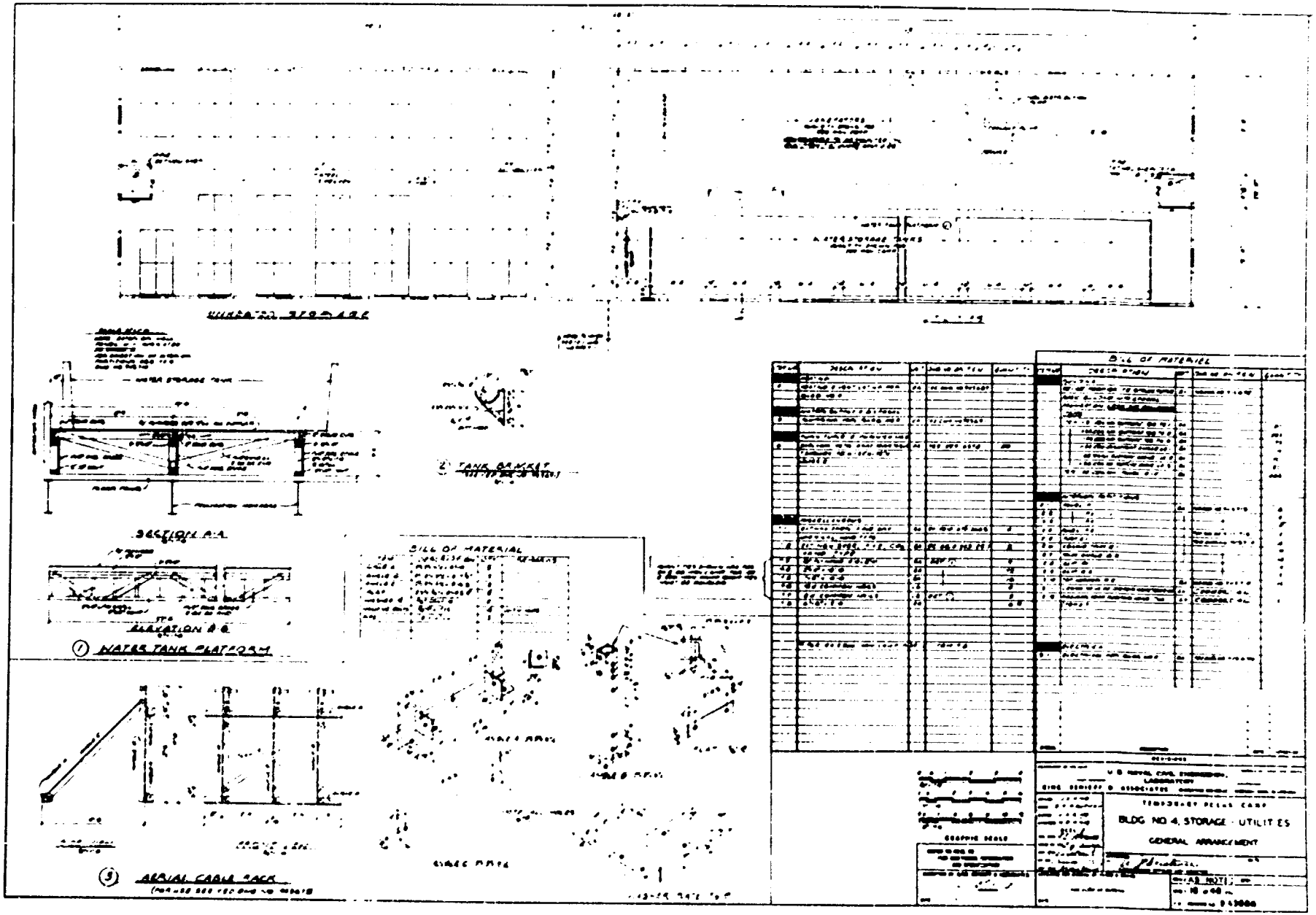

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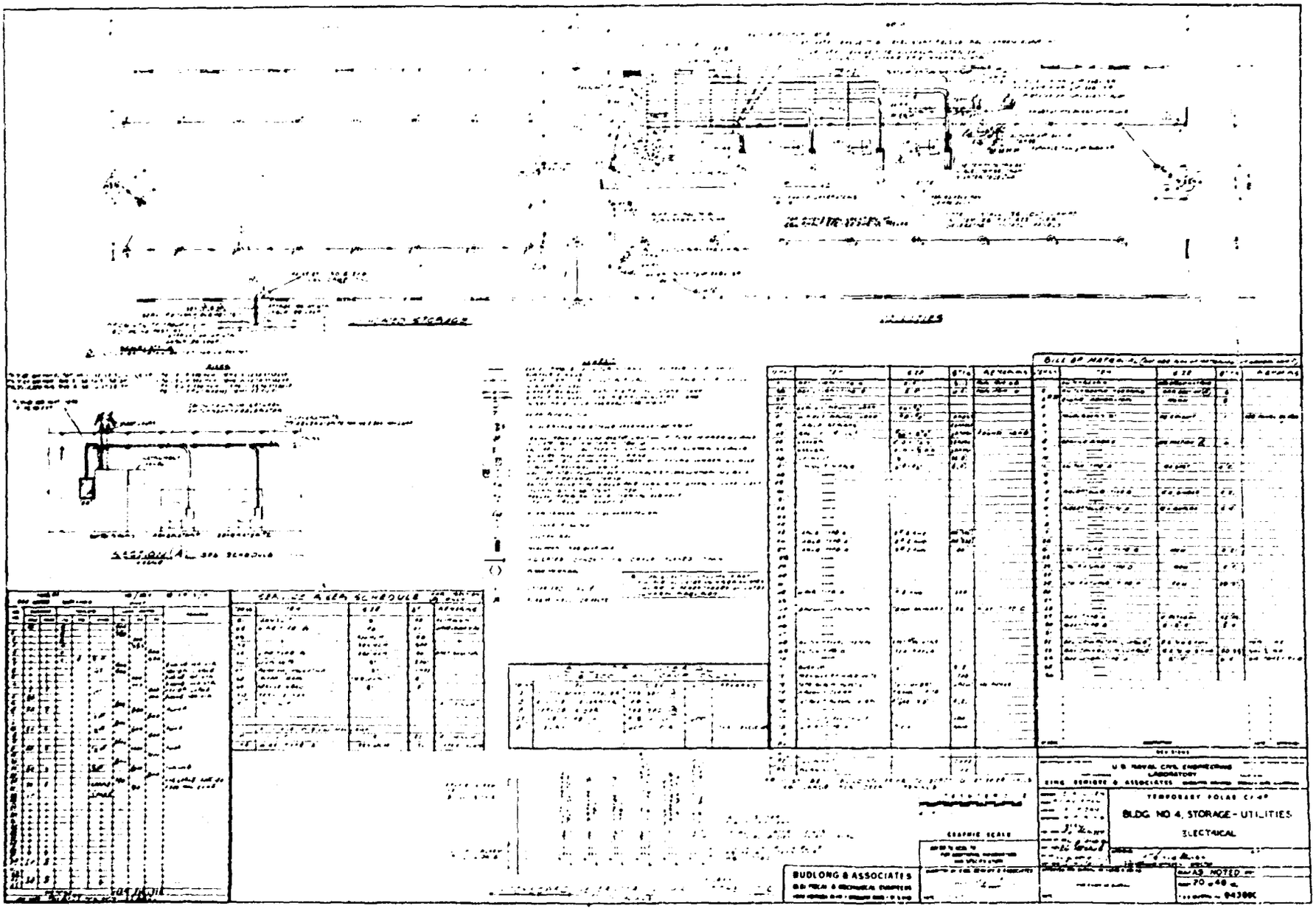

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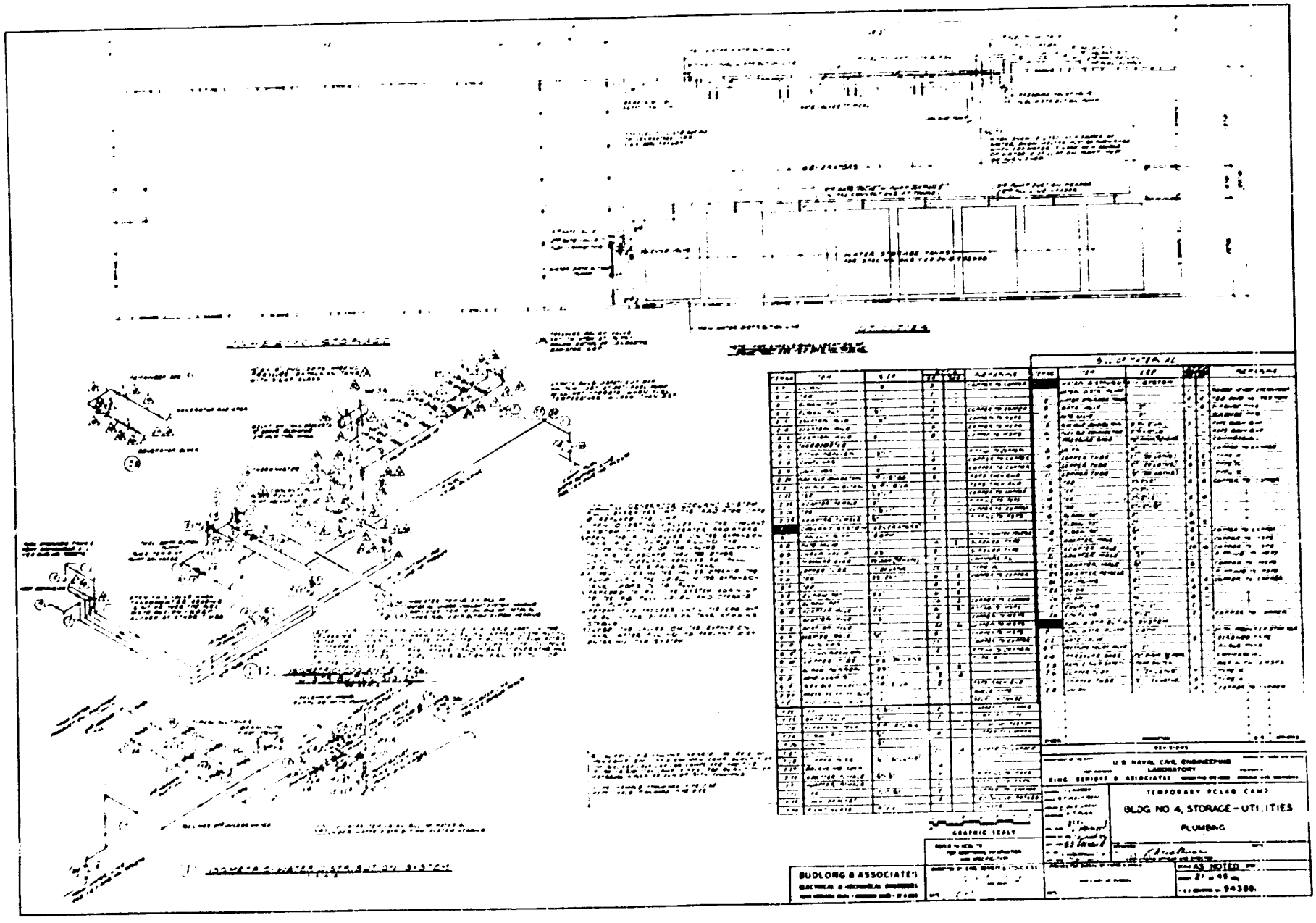

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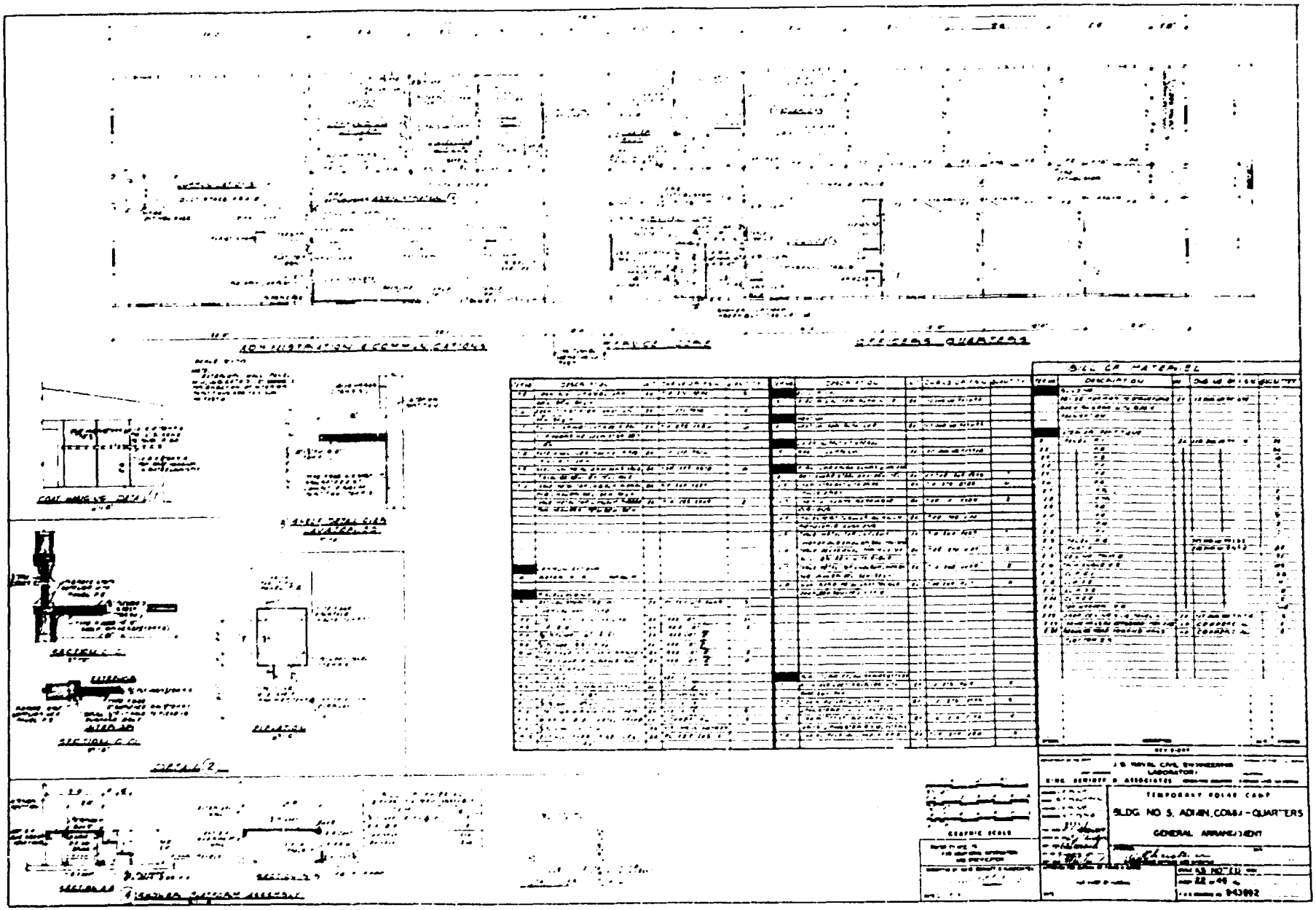

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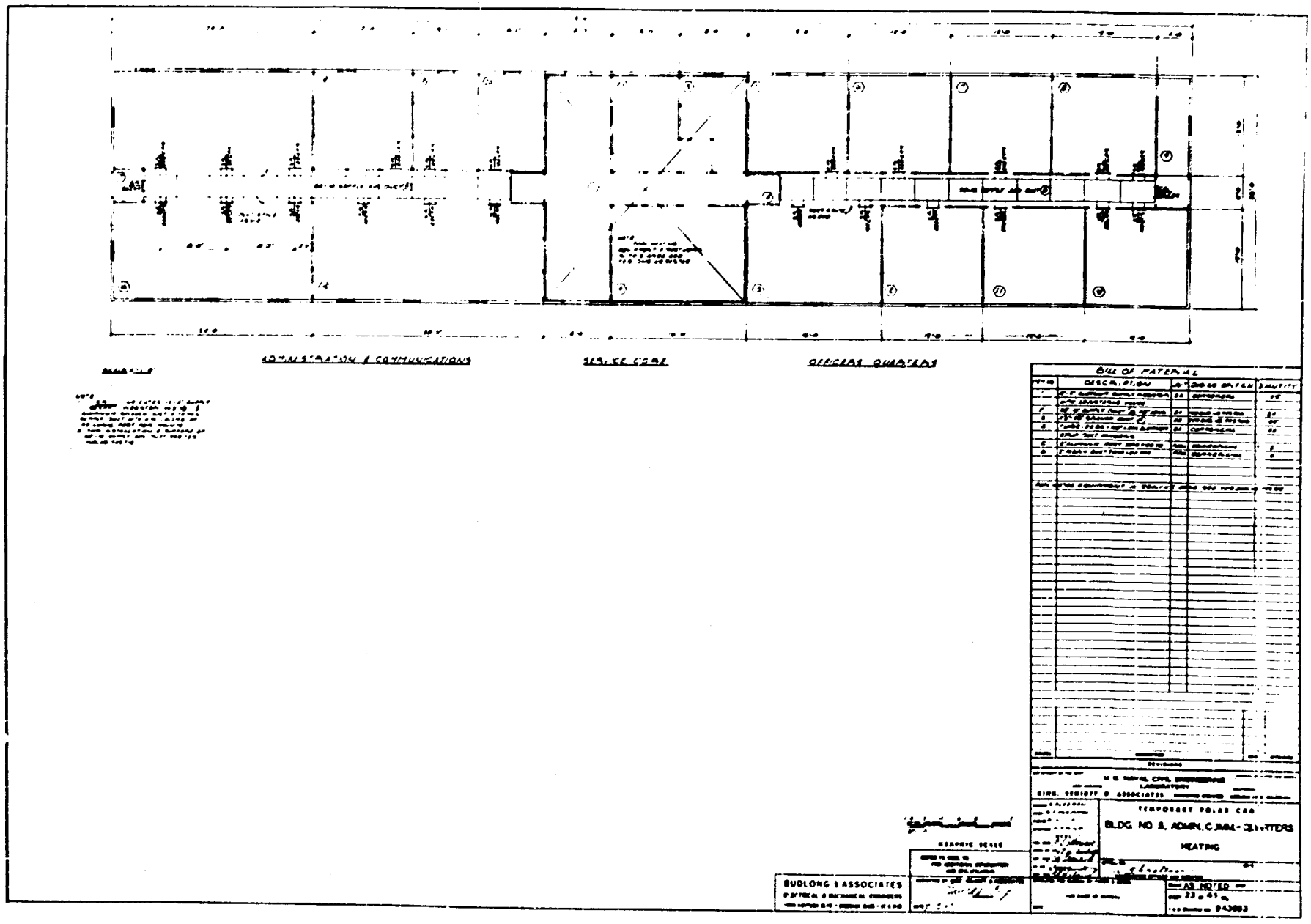

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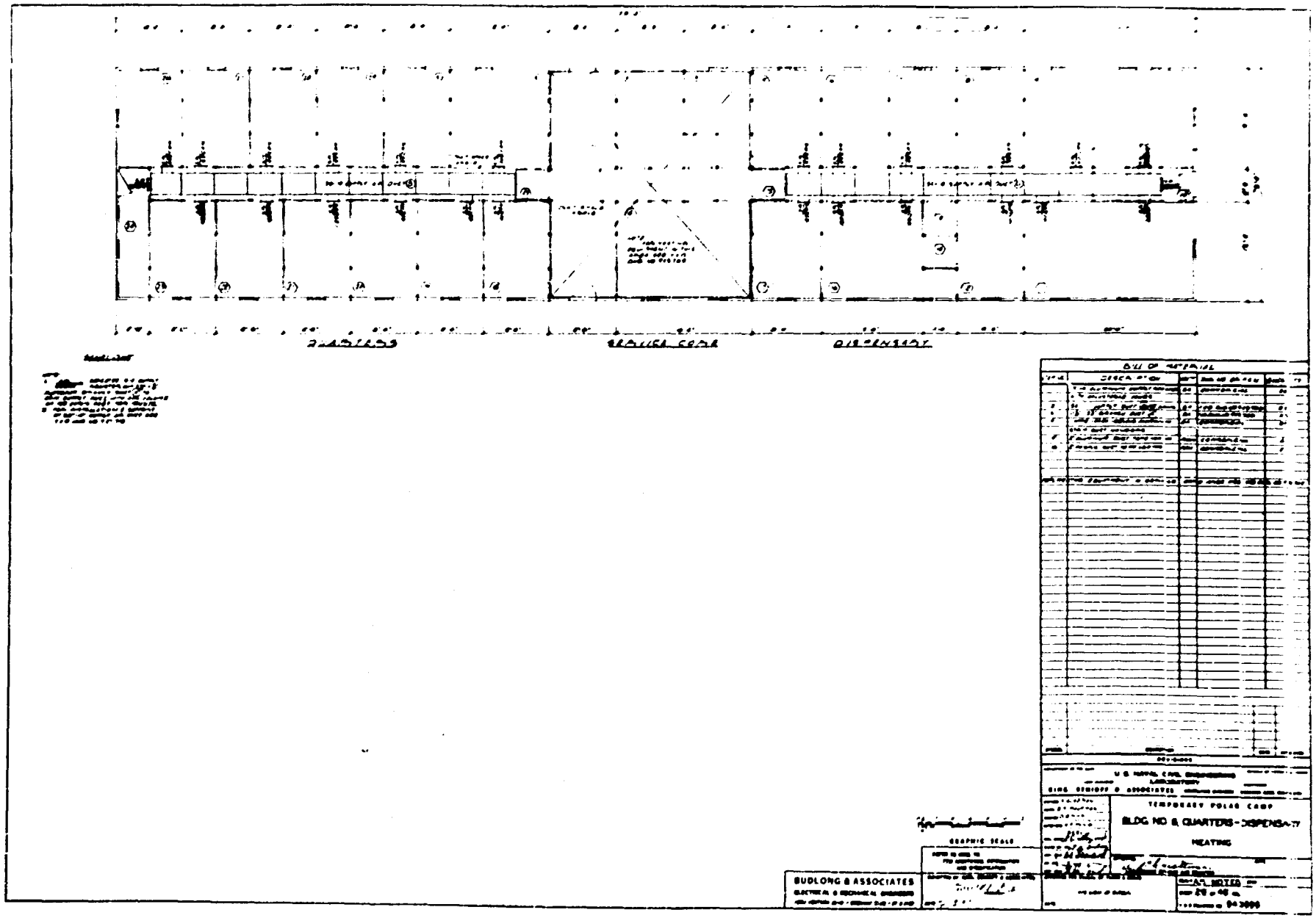

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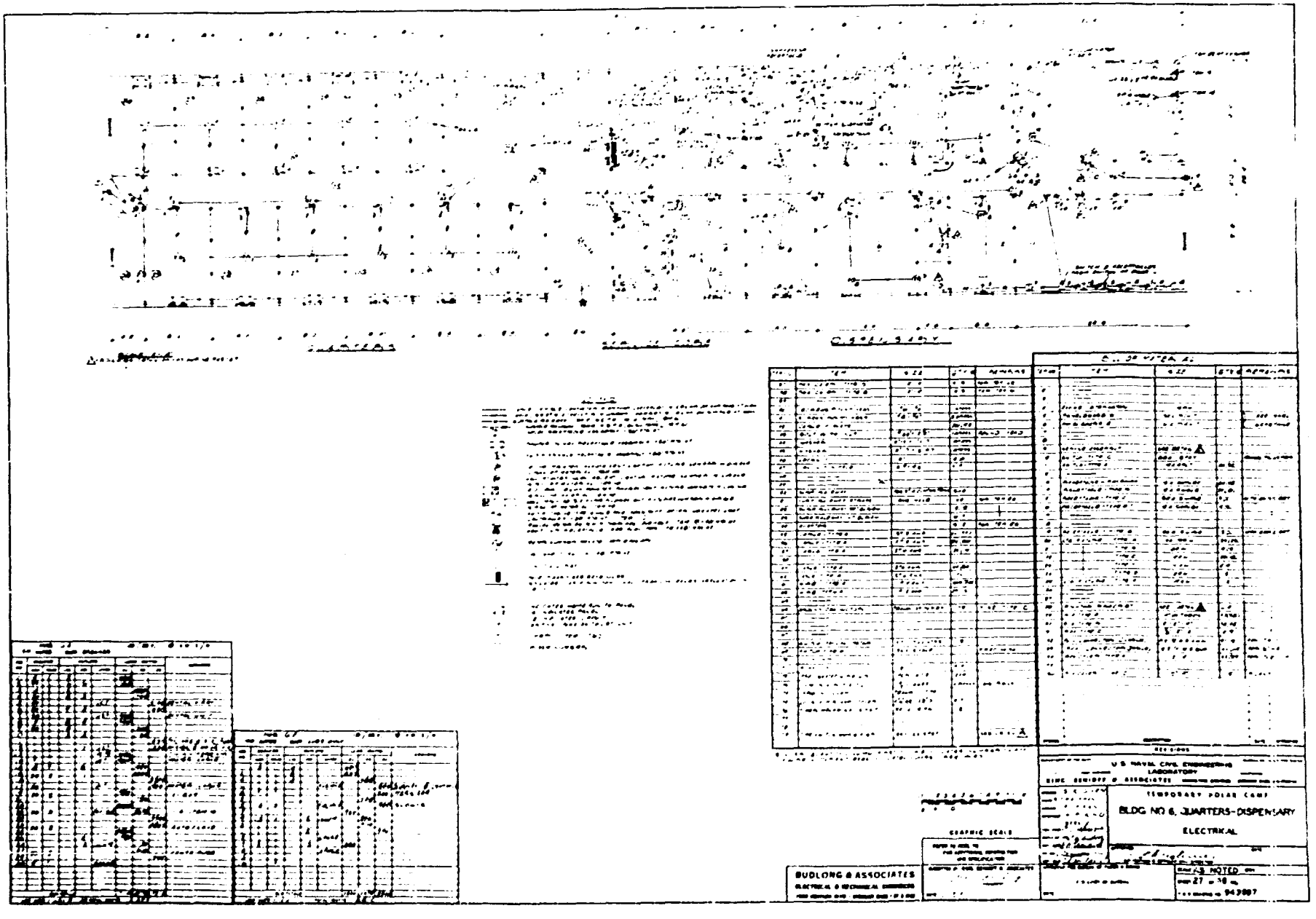

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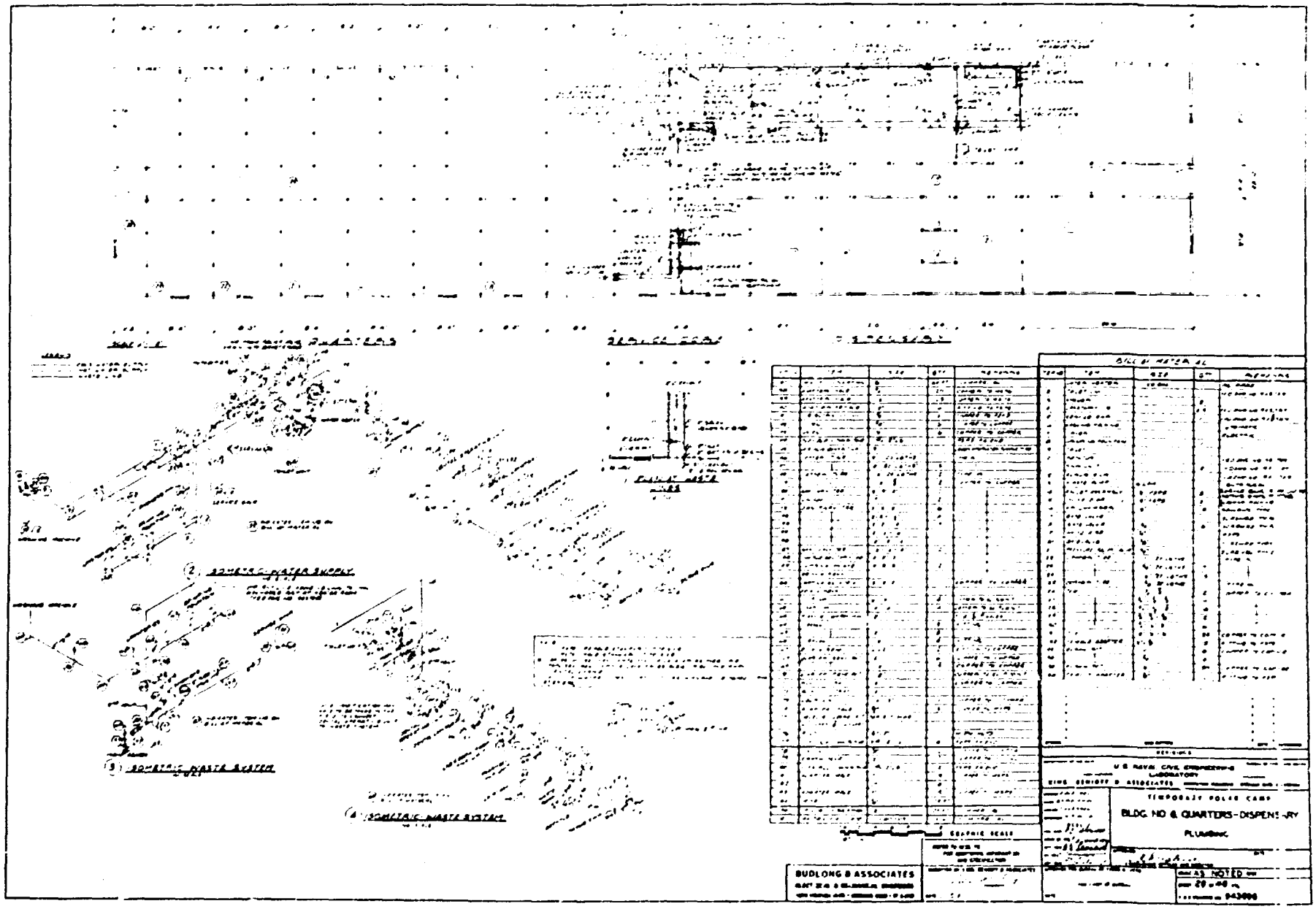

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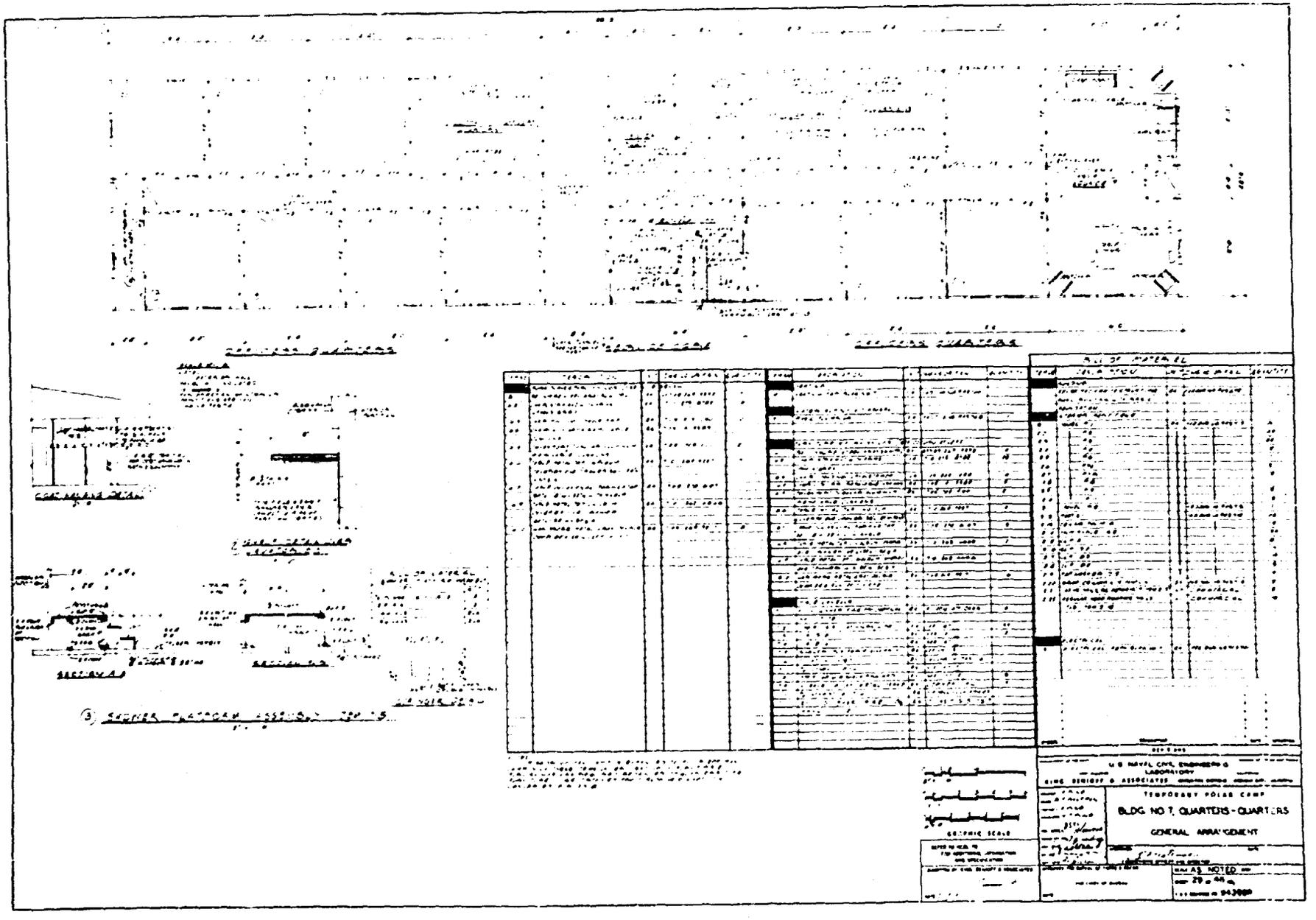

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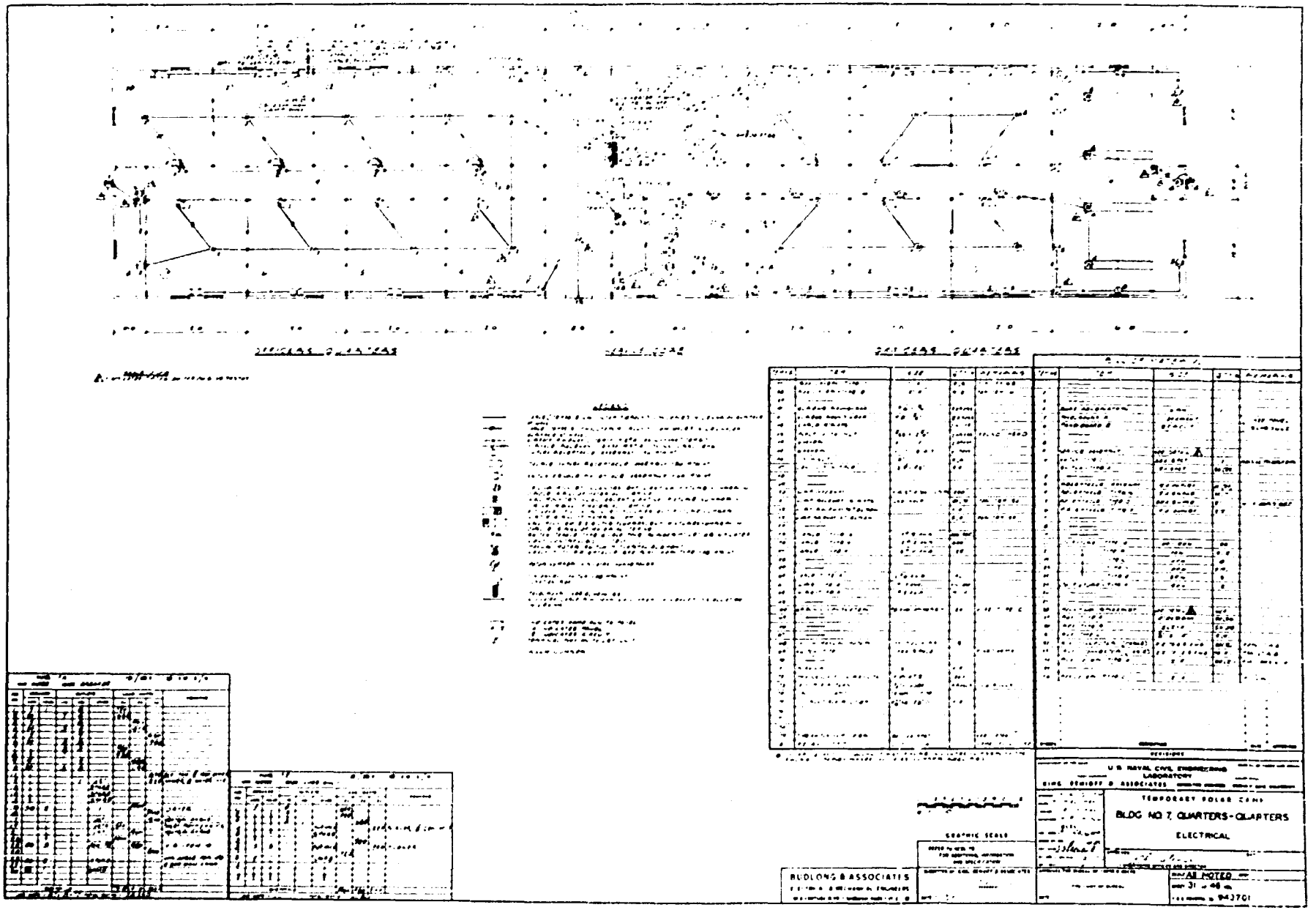

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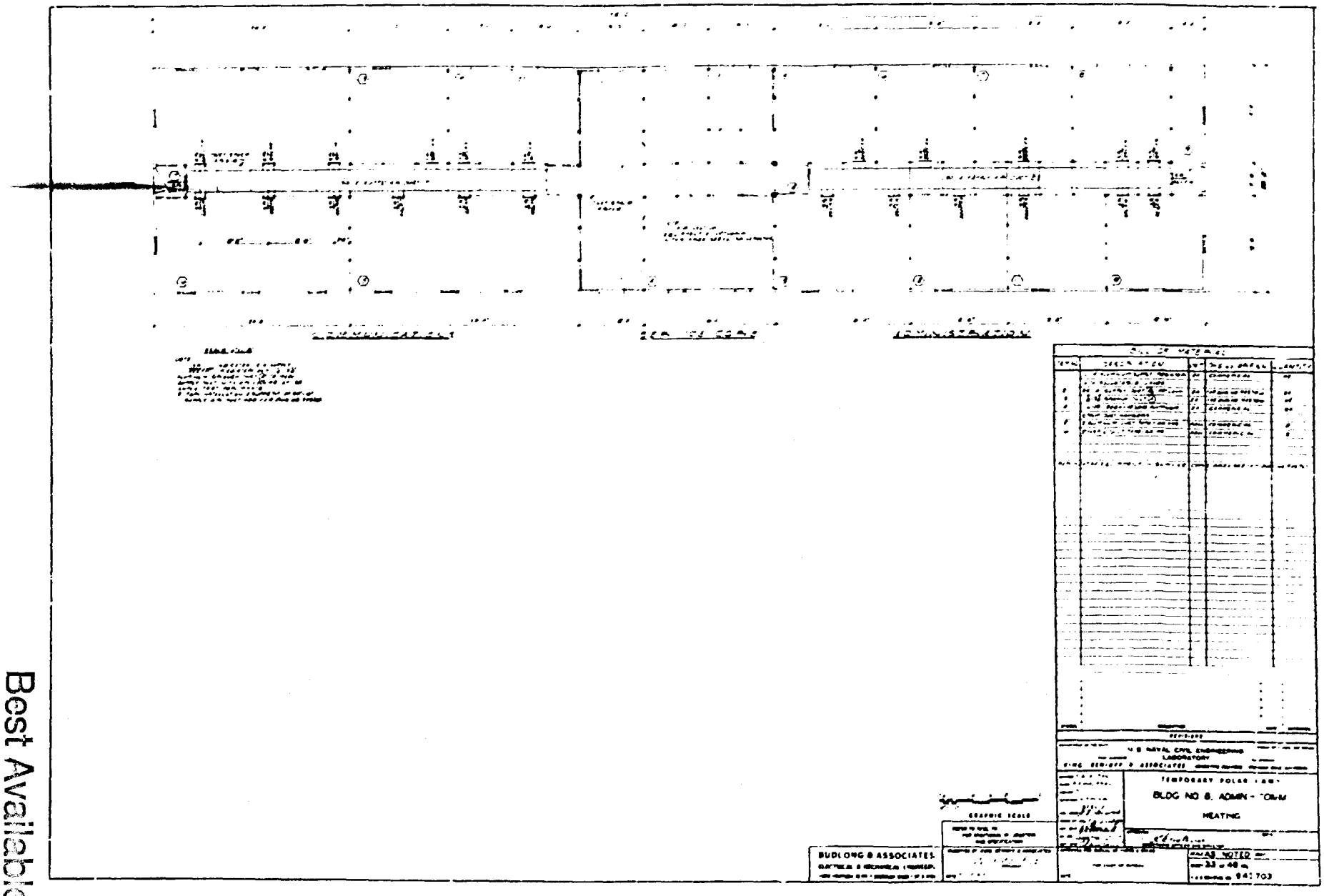

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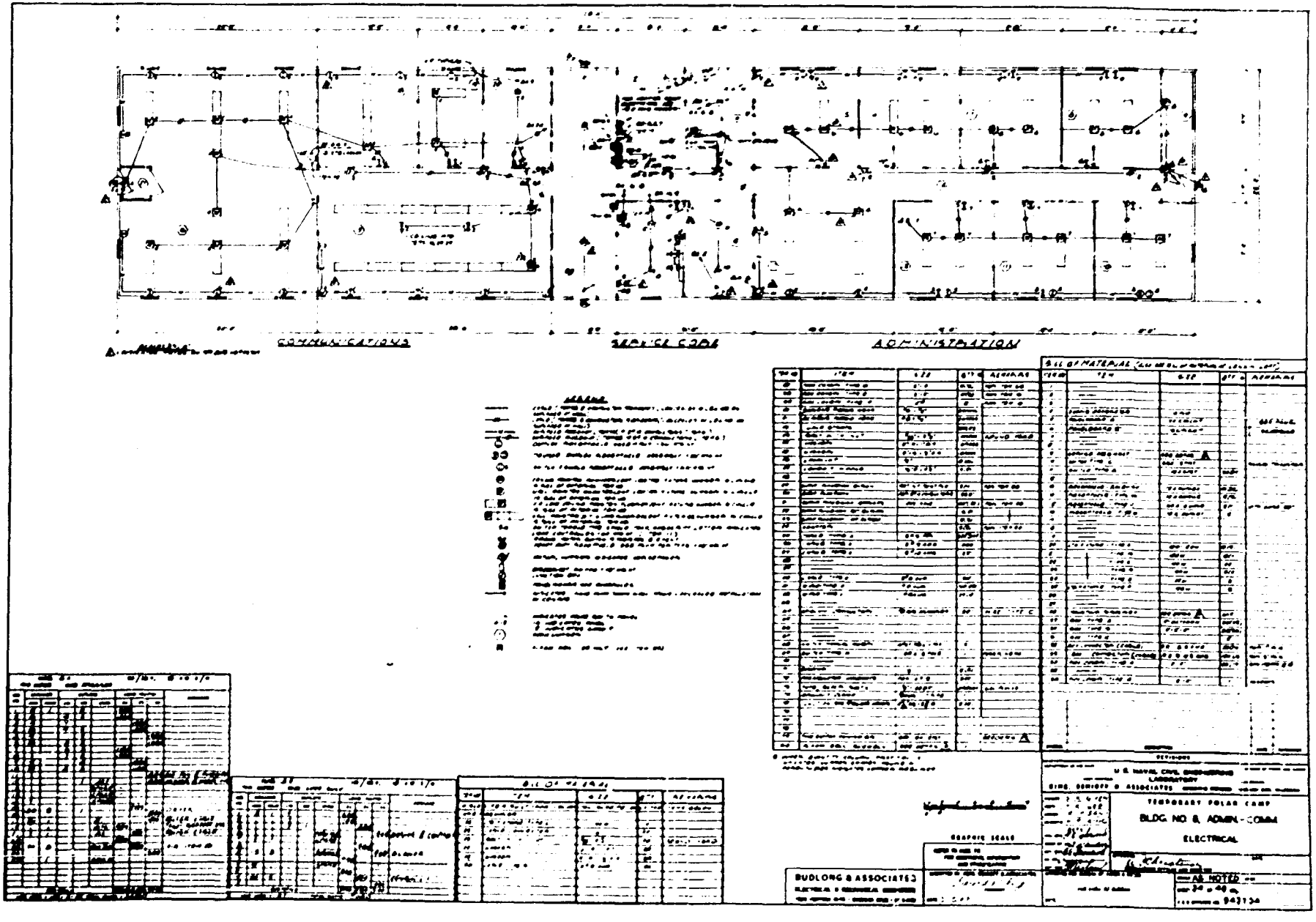

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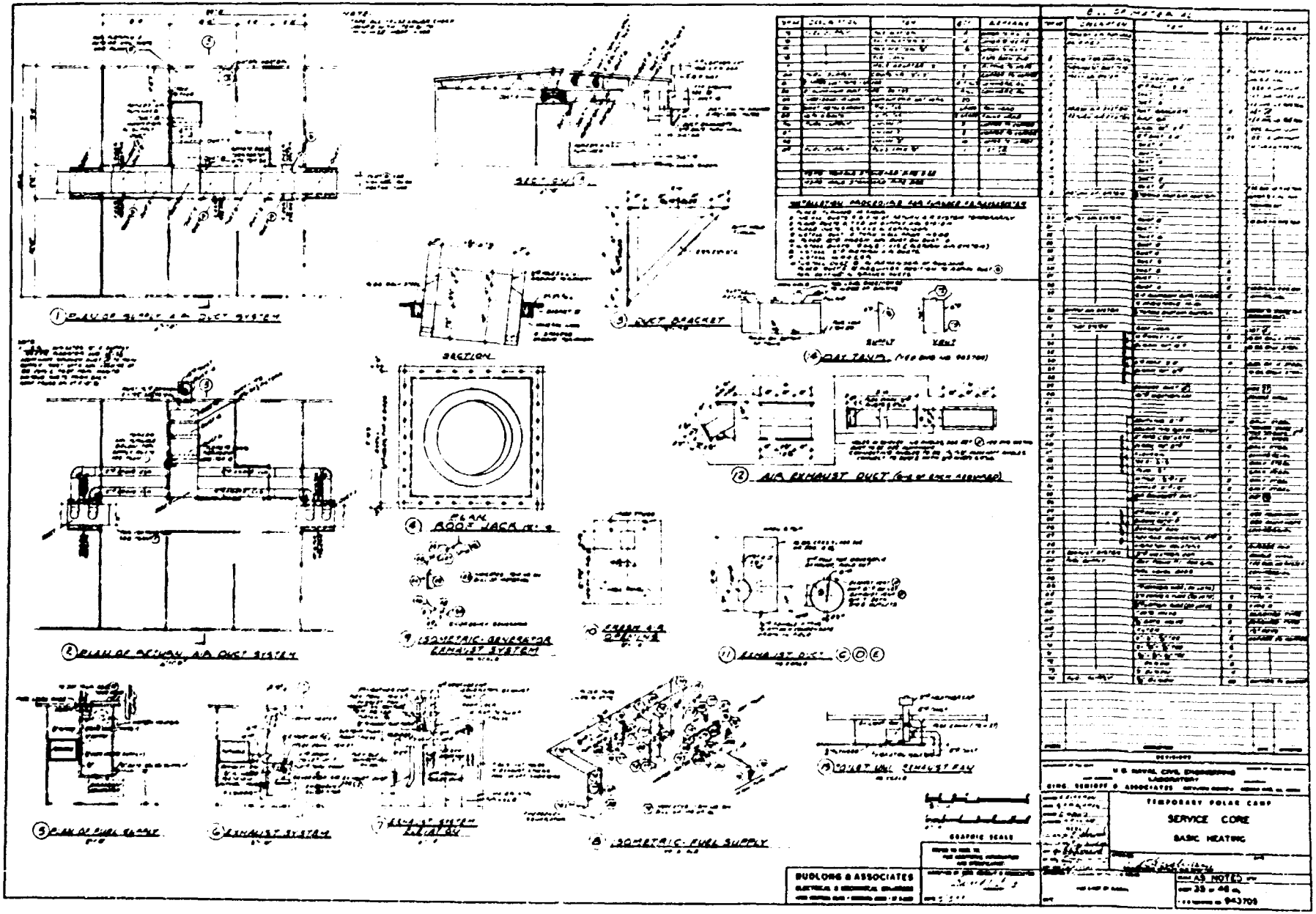

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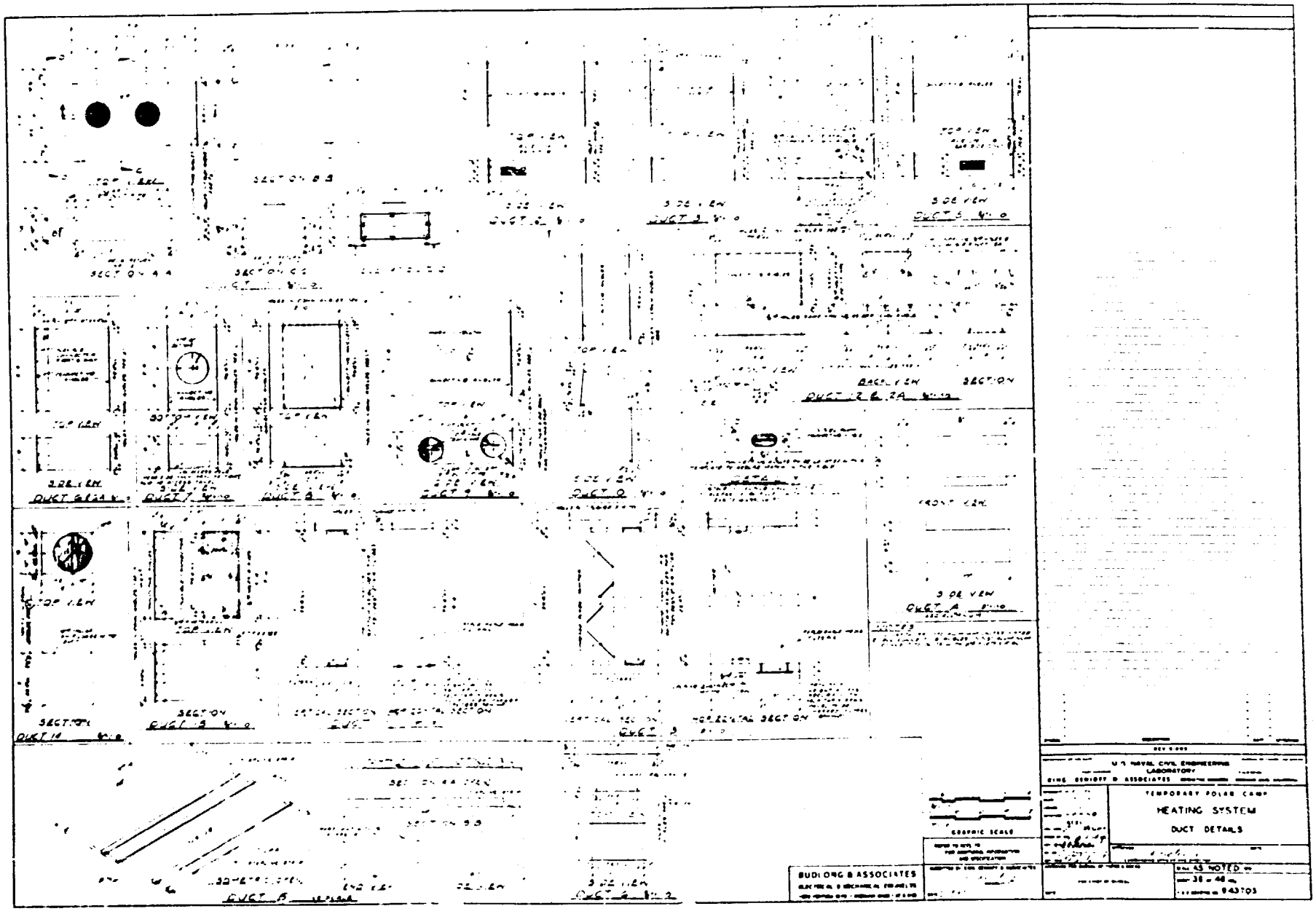

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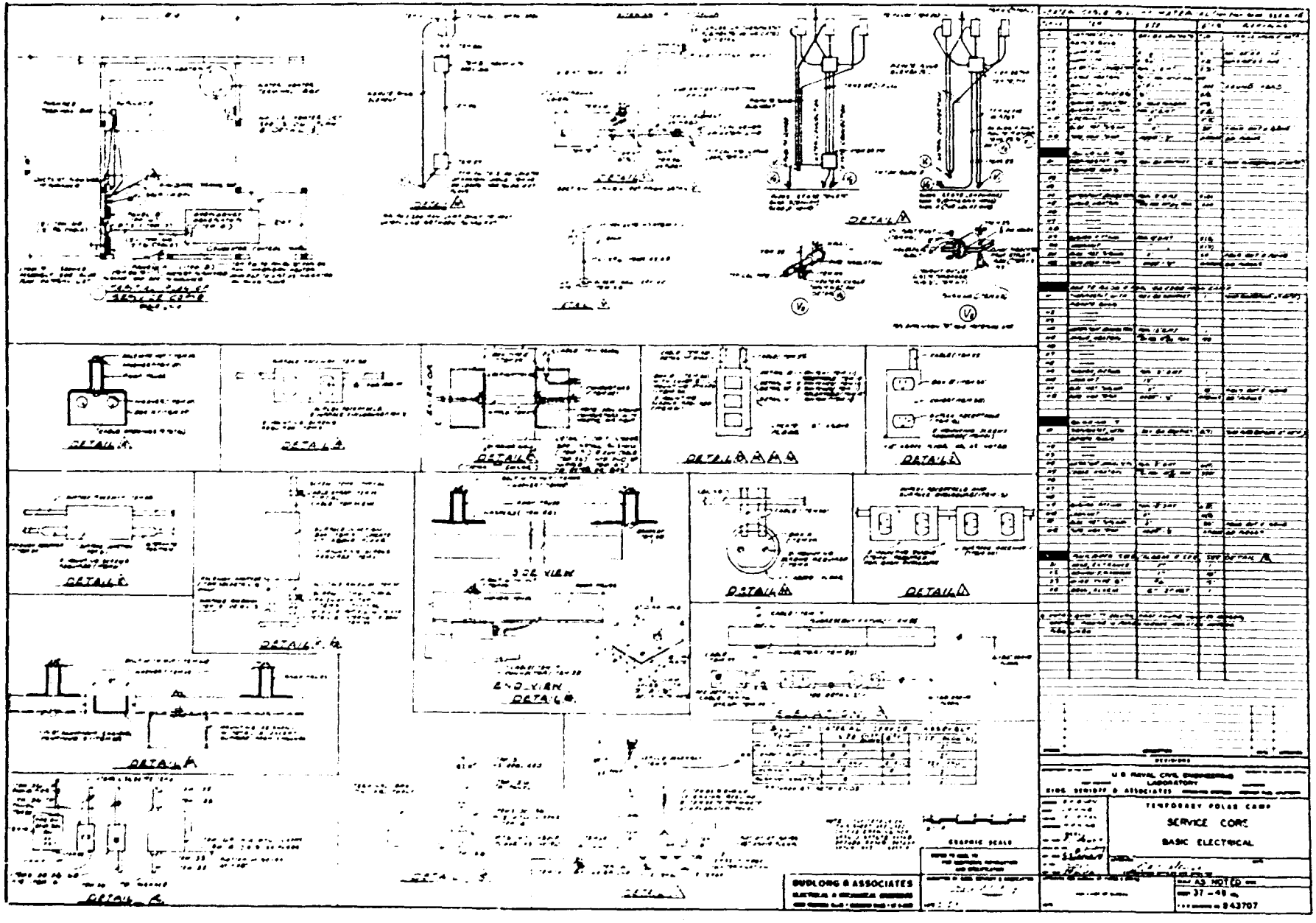

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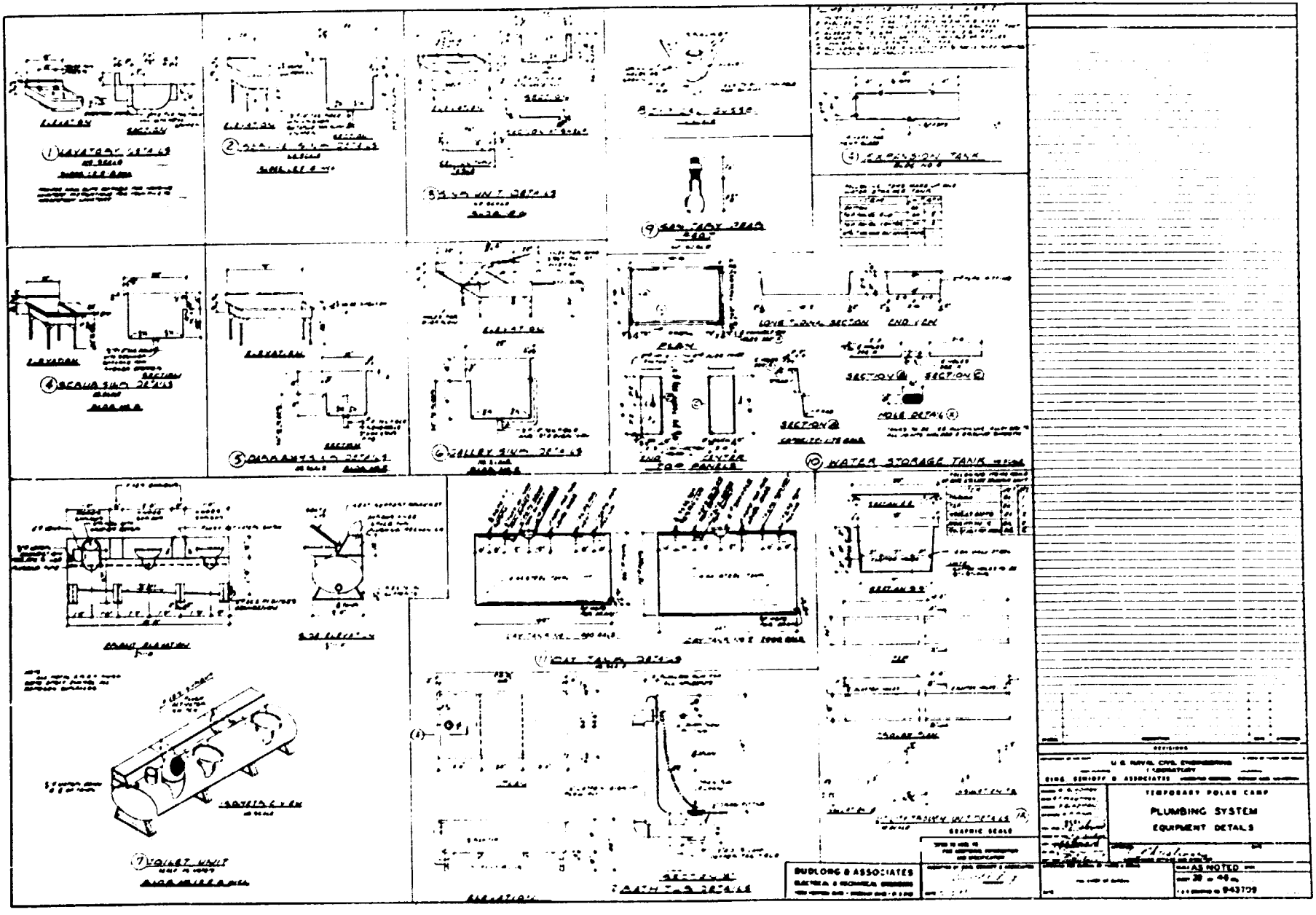

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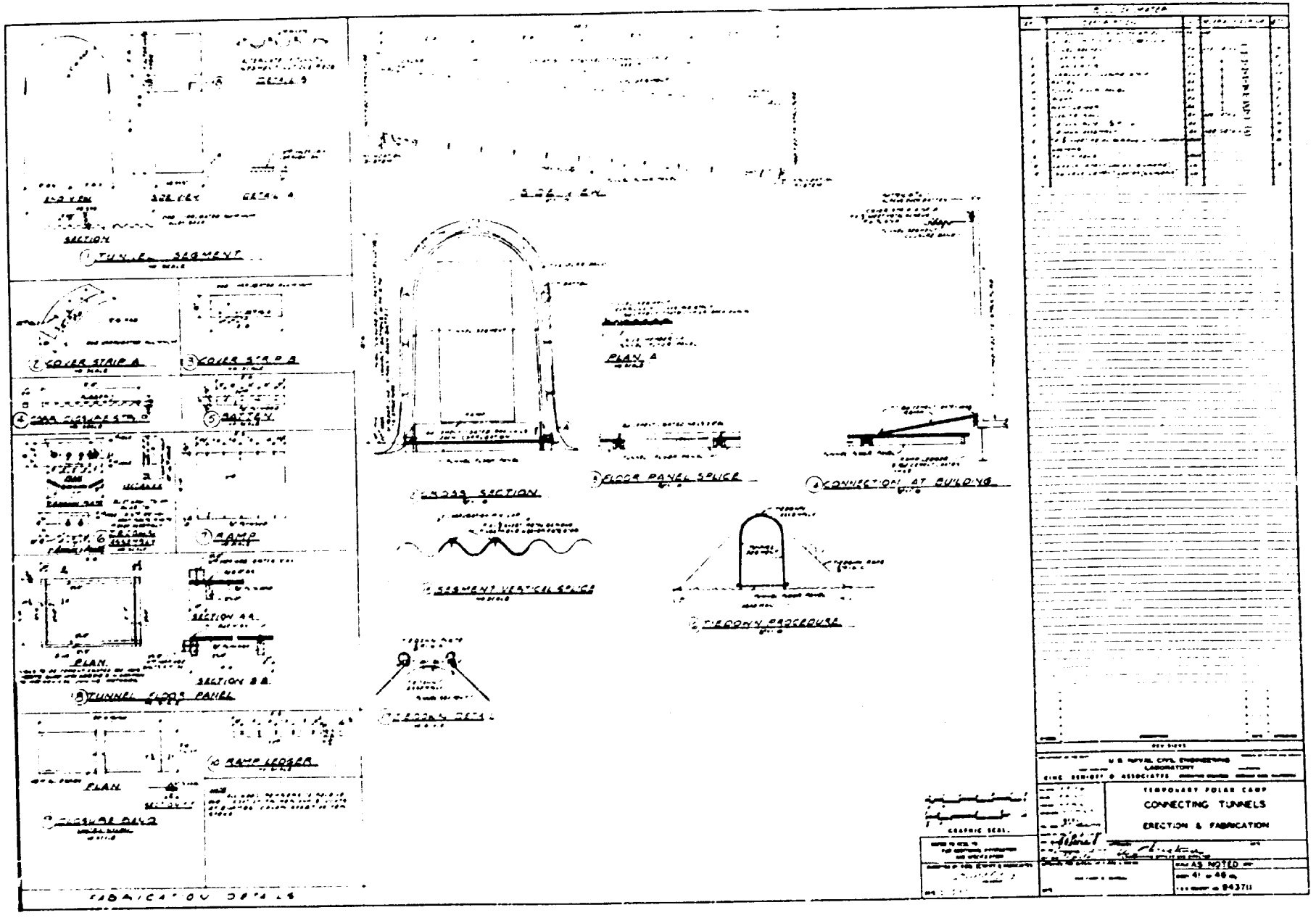

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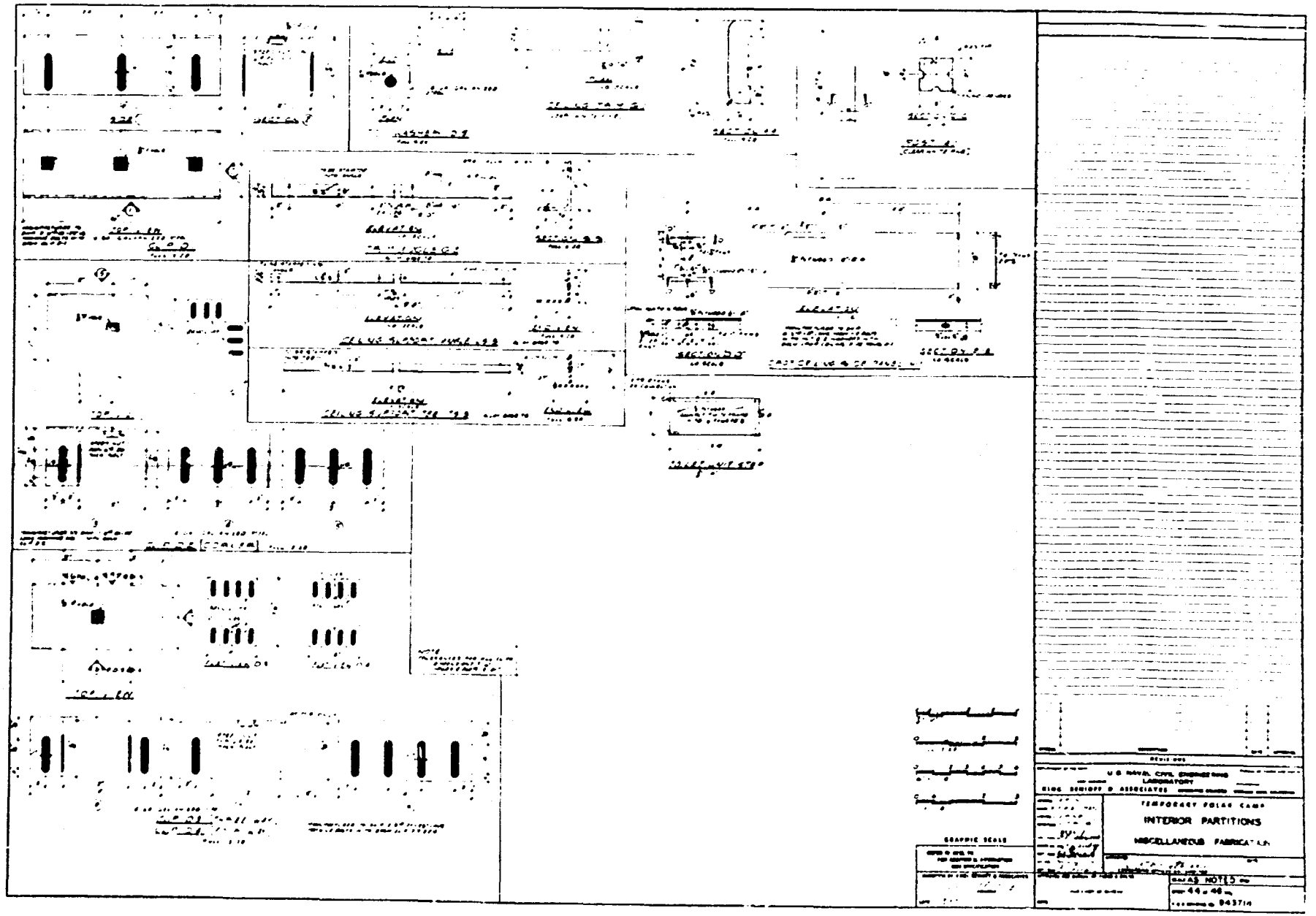

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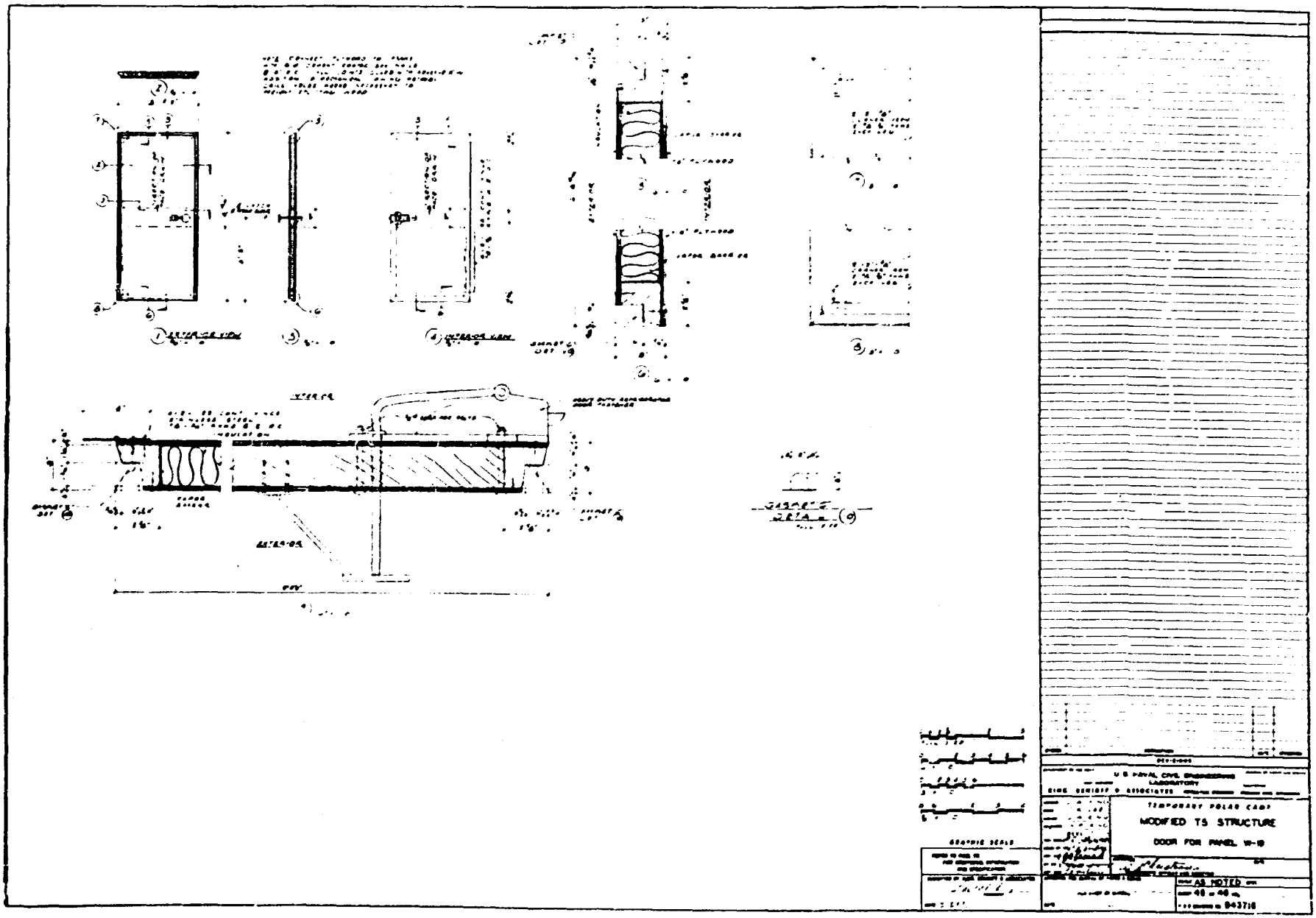

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