KAISER ENGINEERS
DIVISION OF HENRY J. KAISER COMPANY

KAISER GYPSUM COMPANY, INC.
Seattle, Washington

SPECIFICATION
FOR
WALLBOARD PLANT

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No. 5340-4

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ENGINEERS CONTRACTORS

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EXHIBIT "A"

SPECIFICATION
FOR
WALLBOARD PLANT

GENERAL CONDITIONS

1.00 SCOPE

(a) The work under this specification consists of furnishing all equipment, material, labor, supervision, tools, supplies and transportation, except as specified herein to be furnished by Owner, required to construct complete a Wallboard Plant with appurtenant facilities at Seattle, Washington, as shown on the drawings and specified herein.

(b) The work includes wallboard building, calcining building, covered storage building, machine shop, warehouse and change house, office building, oil storage facilities, sawdust storage, boiler house, all conveyors including supporting structures, transfer towers and housings.

The work also includes all grading, drainage, paving of roadways and parking areas, fencing, railroad trackwork, alterations to dock, all utilities, piping, plumbing and electrical work.

(c) Owner has purchased major items of equipment as hereinafter specified which Contractor shall receive, receipt for, unload, store and install. Contractor shall be responsible for any loss or damage to Owner furnished material from receipt thereof to final acceptance of the work by Owner. Contractor shall as a part of the work furnish and install all equipment, not specifically set out herein as furnished by Owner, as required for a complete installation.

(d) Owner has entered into separate contracts for the furnishing and installing of the following items of work which will be installed by Others concurrently with the work under this specification.

(1) Structural steel for buildings, bins and hoppers, belt and screw conveyor structures and transfer towers, in accordance with Specification 5340-3. Steel contractor will furnish base plates for the storage building and leveling plates for all other building columns which shall be set and grouted by general contractor.

(2) Structural gypsum roof decking.

(3) Freight elevators in wallboard and calcining buildings, complete with gates and hatchway doors.

(4) Calcining kettle brick setting including refractory and insulating brick and high temperature block insulation.

1.00 SCOPE (Cont.)

(5) Calcining kettle brick setting including refractory and insulating brick and high temperature block insulation.

(6) Sawdust conveying system complete with one No. 15 high pressure exhauster, motor, sliding base, V-belt drive and guard.

Two 96 inch diameter Cyclone separators, structural steel cyclone supports, rotary seal valve complete with gear motor, chain drive and guard. The rotary seal valve shall be located under the cyclone in the Wallboard building.

All the necessary piping from the feeder outlet to the Hummer Screen and from the Hummer Screen reject to the sawdust waste bin.

All the necessary conveying piping, elbows and switches from the conveyor discharge to the blower inlet; the necessary quick connecting pipes for the railroad car unloading; the necessary discharge line and valve to the Primary cyclone; the necessary conveying line to the cyclone in the Wallboard building.

(7) Plaster bagging dust collectors complete with two cloth tube dust arrestors with steel support.

Two exhausters, motors, sliding bases, multiple V-belt drives, guards, and two 8-inch air locks, gravity type.

All the necessary dust collecting piping from the two baggers and the two elevators to the inlet of the dust collectors together with the clean air piping from the dust collectors to the inlet of the exhausters together with a vent to the atmosphere.

The necessary piping to convey the collected dust to the elevator.

(8) Gypsum conveying system complete with one exhauster, motor, sliding base, multiple V-belt drive and guard.

One Cyclone separator, dust arrestor, and three rotary seal valves together with the necessary gear motors, chain drives and guards. Rotary valves will be installed under kettle feed bin and the two Raymond tubular dust collectors.

All the necessary conveying line from the three rotary feeders to the inlet of the exhauster together with the necessary discharge line from the exhauster to the 60-inch diameter cyclone in the Wallboard building.

All the necessary pipe connections and air locks from the cyclone and dust arrestor outlets to the accelerator bin. The necessary connection from the cyclone to the inlet of the dust arrestor.

1.00 SCOPE (Cont.)

(9) Sawdust recirculating system complete with one exhauster direct connected to a motor and one 30 inch cyclone.

All the necessary chutes and piping from the overflow hopper to the inlet of the exhauster together with the necessary discharge pipe from the outlet of the exhauster to the inlet of the cyclone and a vent stack for the cyclone.

(10) Wallboard and trim conveying system complete with one exhauster, motor, sliding base, multiple V-belt drive and guard.

One Cyclone Separator, dust arrestor, two-8-inch air locks, gravity type, one 15-inch diameter Butterfly type by-pass valve, air operated.

All the necessary piping and hoods and flexible connections from the two trim saws together with the necessary hoods, flexible connections and suction piping from the two scoring wheels and exhaust hood on the Wallboard machine near the pin mixer to the inlet of the exhauster and to the inlet of the cyclone.

All the necessary connections from the outlet of the cyclone to the inlet of the dust arrestor together with the necessary reject pipes from the material outlet of the cyclone and dust arrestor to the sawdust waste bin.

(11) Miscellaneous sheet metal work

a. Piping and connections from the Paper Pulper to Paper Pulper cyclone, paper pulper cyclone together with a cyclone vent to the outside and a cyclone drop connection to Conveyor No. 18

b. Piping between the Fiberglass roving cutter and Conveyor No. 18.

1.01 DRAWINGS

The following drawings are referred to and by such reference are made a part hereof. Where conflict occurs between the drawings and specification, the Owner's decision shall govern. The drawings and specification are complimentary, and what is called for by either shall be as binding as if called for by both.

General Arrangement Drawings

Drawing No.	Title
101-G	Plant General Arrangement
102-G	Calcining Building - General Arrangement
103-G	Calcining Building - Plans and Section - General Arrangement

1.01 DRAWINGS (Cont.)

Drawing No.	Title
104-G	General Arrangement
105-G	Ground Floor Plan and Sections - General Arrangement
106-G	Ship Unloading Belt Conveyors 1, 2, and 3 - General Arrangement
107-G	Belt Conveyor No. 4 - General Arrangement
108-G	Belt Conveyors 5, 6, and 7 - General Arrangement

Structural Drawings

Drawing No.	Title
1-101-SS	Wallboard Plant - Framing Plans
1-102-SS	Wallboard Plant - Sections
1-103-SS	Wallboard Plant - Details
1-104-SS	Wallboard Plant - Stucco, Sawdust and Sawdust Storage Bins
1-105-SS	Wallboard Plant - Raw Gypsum and Wad Bins, and Solution Tanks
1-106-SS	Wallboard Plant - Catwalks, Stairways, Etc.
1-107-SS	Wallboard Plant - Screw Conveyor Bridge
1-101-SC	Wallboard Plant - Foundations - Plan and Sections
1-102-SC	Wallboard Plant - Foundations - Sections and Details
1-103-SC	Wallboard Plant - Floor Slabs
2-101-SS	Calcining Building - Framing Plans
2-102-SS	Calcining Building - Sections and Details
2-103-SS	Calcining Building - Miscellaneous Sections and Details
2-104-SS	Calcining Building - Miscellaneous Catwalks
2-105-SS	Calcining Building - Stucco and Pebble Bins
2-106-SS	Calcining Building - Kettle Feed Bin
2-101-SC	Calcining Building - Foundations - Plan and Sections
2-102-SC	Calcining Building - Main Floor - Plan and Sections
2-103-SC	Calcining Building - Concrete Floor Details
3-101-SS	Covered Storage Building - Plan and Sections
3-102-SS	Covered Storage Building - Details
3-101-SC	Covered Storage Building - Reclaim Tunnel and Building Foundations
4-101-SS	Outside Conveyors - Belt Conveyors 1 and 2
4-102-SS	Outside Conveyors - Belt Conveyor 3 - Tail End
4-103-SS	Outside Conveyors - Belt Conveyor 3 - Head End
4-104-SS	Outside Conveyors - Belt Conveyor 4
4-105-SS	Outside Conveyors - Belt Conveyor 5 and Crushing Plant
4-106-SS	Outside Conveyors - Belt Conveyor 6 and 7
8-101-SC	Fuel Oil Storage - Tank Foundation and Protection Wall

1.01 DRAWINGS (Cont.)

Architectural Drawings

Drawing No.	Title
1-101-A	Wallboard and Calcining Buildings - Roof Plan and Elevations
1-102-A	Wallboard and Calcining Buildings - Roofing, Siding and Miscellaneous Details
1-103-A	Wallboard and Calcining Buildings - Gypsum Roof Details and Sections
1-104-A	Wallboard and Calcining Buildings - Room Plans, Sections and Interior Elevations
5-101-A	Office Building - Foundation Plan and Details and Floor Plan
5-102-A	Office Building - Exterior, Interior Elevations and Sections
5-103-A	Office Building - Schedules, Roof Framing Plan, and Details
6-101-A	Warehouse, Machine Shop and Change House - Floor and Foundation Plans and Details
6-102-A	Warehouse, Machine Shop and Change House - Elevations, Details and Mechanical Plans

Mechanical Drawings

Drawing No.	Title
1-101-M	Gypsum Wallboard Plant - Screw Conveyors 15, 16, and 17 - Arrangement and Details
2-101-M	Gypsum Wallboard Plant - Screw Conveyors 1 and 4 - Arrangement and Details
2-102-M	Gypsum Wallboard Plant - Calcining Building - Chutes - Arrangement
2-103-M	Gypsum Wallboard Plant - Chutes for Bucket Elevators and Screens - Arrangement
2-104-M	Gypsum Wallboard Plant - Screw Conveyors 3, 5 and 6 - Arrangement and Details
2-105-M	Gypsum Wallboard Plant - Screw Conveyors 7, 8, 9, 10, and 11 - Arrangement and Details
2-107-M	Gypsum Wallboard Plant - Calcining Building - Screw Conveyors 12, 13, and 14 - Arrangement and Details
4-101-M	Gypsum Wallboard Plant - Raw Material Handling - 30" Belt Conveyors 1, 2, and 3 - Mechanical Details
4-102-M	Gypsum Wallboard Plant - Raw Material Handling - 30" Belt Conveyors 4 and 5 - Mechanical Details
4-103-M	Gypsum Wallboard Plant - Raw Material Handling - 30" Belt Conveyors 6 and 7 - Mechanical Details
4-104-M	Gypsum Wallboard Plant - Raw Material Handling - Loading Chutes to Conveyors 1 and 2 - Transfer Chutes-Conveyors 1 to 3 - Transfer Chutes-Conveyors 2 to 3 - Arrangement
4-105-M	Gypsum Wallboard Plant - Raw Material Handling - Transfer Chutes - Conveyors 3 to 4 - Conveyor 4 to Stock-pile - Arrangement

1.01 DRAWINGS (Cont.)

Drawing No.	Title
4-106-M	Gypsum Wallboard Plant - Raw Material Handling - Transfer Chutes - Conveyors 6 to 7 - Conveyor 7 to Screw Conveyor 1 - Arrangement
4-107-M	Gypsum Wallboard Plant - Raw Material Handling - Transfer Chutes - Conveyor 5 to Hammermill - Hammermill to Conveyor 6 - Arrangement
4-108-M	Gypsum Wallboard Plant - Raw Material Handling - Stock-pile Reclaiming - Pan Feeders and Skirtboards - Arrangement

Civil and Piping Drawings

Drawing No.	Title
1-101-P	Wallboard Building - Steam and Condensate Piping
1-102-P	Wallboard Building - Boiler House Piping
1-103-P	Wallboard Building - Utility Piping
1-104-P	Wallboard Building - Miscellaneous Piping
1-105-P	Wallboard Building - Process Piping
2-101-P	Calcining Building - Salt Water System
2-102-P	Calcining Building - Utility Piping
8-101-P	Fuel Oil Storage - Fuel Oil System
101-P	Domestic Water and Fire Protection Yard Piping
102-P	Fire Protection Arrangement
103-P	Storm and Sanitary Sewer
101-C	Grading - Plan and Sections
102-C	Roads and Railroads

Electrical Drawings

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101-E	Wallboard Plant - Power Distribution and Substation Layout
102-E	Wallboard Plant - One Line Diagram
103-E	Wallboard Plant - Elementary, Interlocking and Panel Drawings
104-E	Wallboard Plant - Elementary Diagram, Interlock and Control Panels - Sheet 2
1-101-E	Wallboard Building - Lighting
1-102-E	Wallboard Building - Lighting
1-103-E	Wallboard Building - North End Conduit Layout
1-104-E	Wallboard Building - South End Conduit Layout
2-101-E	Calcining Building - Lighting
2-102-E	Calcining Building - Lighting
2-103-E	Calcining Building - Conduit Layout
4-101-E	Outside Conveyors and Screw Conveyor Bridge - Power and Lighting
5-101-E	Office - Warehouse and Shop Lighting Layout

1.01 DRAWINGS (Cont.)

Construction Standards

CS-101	Anchor Bolt and Curb Angles
CS-102	Handrail and Stairs
CS-103	Ladders
CS-104	Base Plates

1.02 SURVEYS, LINES AND GRADES

Owner will establish primary base line and bench mark only. Contractor shall establish all lines and grades for the work in accordance with the drawings and shall be responsible for the accuracy thereof.

1.03 FIELD OFFICE FOR OWNER AND ENGINEER

Within 45 days after award of contract, Contractor shall provide for the sole use of the Owner or his representative a minimum of 400 sq. ft. of office space in the machine shop and warehouse building. The space shall be partitioned off and provided with a door with lock.

Adequate lighting and heating and one telephone shall be provided. Toll charges will be paid by Owner.

Water and sanitary facilities shall also be provided.

1.04 RELOCATION OF POWER LINE

Owner will arrange for the relocation or raising as required of the existing power line crossing the property.

1.05 PROPRIETARY ARTICLES

Where a manufacturer's catalog item or trade name is used in this specification to designate material of definite quality or an item of defined utility, a like material or item equal in quality and utility and a standard catalog product of a representative manufacturer may be used when approved by the Owner or his representative. All materials shall be new, full weight and standard in every way, the best quality of their respective kinds, and satisfactory to the Owner. No claims by the Contractor as to the special fitness of any material specified, or his inability to produce first-class work with the same, shall be entertained unless such claim is referred to the Owner in writing before the work is started.

1.06 CLEANING UP

The Contractor shall at all times keep the premises free from accumulations of waste materials or rubbish caused by his employees or work and, at the completion of the work, he shall remove all his rubbish from and about the building and all his tools, scaffolding and surplus materials and shall leave his work "broom clean" or its equivalent.

1.07 SAMPLES

Bidder shall submit with his proposal a sample concrete masonry block on which his bid is based. Sample submitted by successful bidder will be retained for use as a control of the quality, texture and color of block used in the construction.

1.08 CODES AND REGULATIONS

All work shall be performed in strict compliance with the Building Code of the City of Seattle, the General Safety Standards of the Department of Labor and Industries, State of Washington, and the rules and regulations of any governmental body having jurisdiction except where plans and specifications call for work of a higher quality or greater utility than required by codes or regulations the plans and specifications shall govern.

1.09 ERECTION SUPERVISOR - Owner has arranged for and will pay for the services of the manufacturer's erection supervisor for the Ehrsam wallboard machine and Coe dryer. Contractor shall advise Owner by telephone or telegram not less than one week in advance of the date on which he will start the erection of the above equipment.

1.10 LABORATORY TESTS - Contractor shall arrange for the services of a material testing laboratory acceptable to the Owner, who shall take all samples and perform all material tests specified herein and/or required by the Building Code of the City of Seattle. All costs for such service shall be included as part of the cost of the work by Contractor. The laboratory selected shall have had not less than ten years experience in similar work and shall be well equipped and staffed to perform the specified services.

Tests shall be made in accordance with standard methods of the American Society for Testing Materials and shall include the following:

(a) Compaction of embankments - One sample for each 200 cu. yds. of embankment but not more than two per day. Tests of subgrades under floors otherwise supported are not required.

(b) Concrete - Seven and twenty-eight day compression tests, one for each pour of fifty cubic yards or fraction thereof.

(c) Reinforcing steel - Tensile and bend test each fifty tons or fraction thereof.

(d) Structural gypsum - One compressive test per each 5000 sq. ft. of structural gypsum deck but not to exceed two per day. Ultimate compressive strength required 500 p.s.i.

EARTHWORK

2.00 EARTHWORK - shall consist of site grading, excavation, borrow, and embankment, preparation of subgrades, excavation and backfill for structures and of trenches.

2.01 ROUGH GRADE - The site has previously been rough graded and tunnel trench excavated and backfilled by Owner as shown on Drawing 101-C. All other earthwork shall be a part of the work under this specification.

2.02 EXCAVATION AND EMBANKMENT

(a) Excavation - All excavation shall be accurately and neatly cut to lines, sections, and grades shown on the drawings or established in the field. All suitable materials excavated shall be used as far as practicable in forming the embankments and at such other places as directed. No excavated material shall be wasted unless so ordered by the Owner.

(b) Borrow Excavation - Additional fill material required shall be obtained from borrow pits located outside Owner's property, at Contractor's expense. Borrow material shall be granular and of such gradation and composition as to compact readily and shall be subject to approval by Owner.

(c) Embankments - Embankments shall be constructed in successive horizontal layers distributed uniformly over the grading cross section. No stumps, logs, brush or other deleterious material shall be placed in embankments.

Where embankments less than 2 ft. in height are to be constructed, the existing surface upon which the embankment is to be placed shall be scarified or plowed to a depth of 4 inches.

Embankments shall be constructed in layers not exceeding 12" in thickness, uniformly placed, and compacted evenly and densely by distributing the hauling over the entire area. A blade grader or other suitable machine shall be kept on the work and shall be used on each lift while the embankment is being placed.

2.03 COMPACTION OF EMBANKMENTS - Where embankments form subgrades for floors, roadways or railroad, they shall be constructed and compacted as follows:

(a) The fill material shall be deposited in uniform layers not exceeding 6" in depth. The moisture content shall not exceed that required for compaction to maximum density.

(b) Each layer shall be compacted by rolling or other means approved by the Owner to 95% of maximum density as determined by Method of Test for Moisture - Density Relations of Soil, A.S.T.M. Serial Designation D-698-42T. Additional moisture shall be added to the fill material when required to obtain the specified density.

(c) Following the compaction of the final layer, all ridges shall be levelled and depressions filled and the surface again rolled and

2.03 COMPACTION OF EMBANKMENTS (Cont.)

finished to the required grade.

2.04 PREPARATION OF SUBGRADE

(a) Preparation of subgrade consists of the fine grading and preparation of previously rough graded surfaces upon which floors and pavements are to be constructed, and includes all excavating, filling, compacting, sprinkling, disposal of excess excavation and borrow of fill material required to construct subgrades to the elevations shown on the drawings and/or established in the field.

(b) Subgrades shall be accurately constructed to grades given, with all high and low spots eliminated. Soft spots developing during the preparation of the subgrade shall be corrected as directed by the Owner. All excavation shall be used in constructing fills and no excavation shall be wasted as excess until so ordered by the Owner.

(c) Following the fine grading the subgrade shall be compacted by rolling with a power roller weighing not less than six tons. Hand tamping will be permitted only in areas inaccessible to the roller.

After rolling the subgrade shall be tested with a template, straightedge, and/or level and all irregularities of grade corrected, and if directed by the Owner, the subgrade re-rolled.

Subgrade equal to one-half day's pour of concrete shall be kept finished and rolled in advance of the placing of concrete.

(d) Immediately prior to placing concrete the subgrade shall be sprinkled with sufficient water to thoroughly moisten the subgrade, leaving no puddles or wet pockets.

2.05 EXCAVATION FOR STRUCTURES - The work includes all excavating required for the construction of footings, foundations, and walls, and the subsequent backfilling of excavations to designated grade and the disposal of all excavation not required for backfill.

(a) Excavation - Except as otherwise shown on the drawings, excavation shall be made 12 inches outside neat lines of footings indicated on the drawings and/or designated by the Owner in the field with half to one side slopes. Bottoms of excavations shall be accurately finished to grades shown on the drawings or established in the field.

The Contractor may, at his own discretion, excavate to lines and slopes either steeper or flatter than those specified above, except where steep slopes are required to maintain the stability of existing foundations.

If conditions require, the Contractor shall provide and operate adequate pumping facilities to maintain excavations in a dry condition and suitable for placing concrete.

2.05 EXCAVATION FOR STRUCTURES (Cont.)

(b) Backfill - Excavations shall be backfilled to natural ground or grades designated on the drawings.

Backfill shall be either tamped or flooded backfill as directed by the Owner and shall be placed and compacted as follows:

(A) Tamped backfill shall be placed in uniform layers not exceeding 6 inches in depth and each layer thoroughly compacted by the use of pneumatic tampers.

(B) Flooded backfill shall be compacted by flooding or by jetting with water during the placing of the backfill. Sufficient water shall be used to thoroughly soak the backfill material while being placed.

(c) Disposal of Excess Excavation - Excavated material not required for backfill shall be disposed of by filling of yard areas as directed by Owner, and constructing compacted fill in building areas.

Fill in yard areas shall be deposited in uniform layers not exceeding 1 ft. in depth, bladed to reasonable level surface, and compacted by distributing the hauling uniformly over the area.

(d) Barricades and Lights - Where directed by the Owner, or required for protection of workmen, or public safety, substantial barricades shall be erected and maintained. Warning flares or lights shall be maintained on such barricades at night.

2.06 TRENCHING

(a) The bottom of the trench shall be even and true to the established alignment and grade, and of sufficient width to permit proper laying of the pipe, making joints, and tamping around and over the pipe. Where necessary or required by local regulations or ordinances, the trench shall be braced and shored, or sloped to the natural angle of repose to prevent caving and to protect the workmen. The work shall include all pumping, bailing, draining or other work necessary to keep the trench clean and suitable for laying pipe. All other underground utilities encountered shall be protected and supported in such a manner as to prevent damage to them.

(b) When soft, unstable bottom is encountered in trenches it shall be excavated and replaced with selected material as directed by the Owner. The removal of unstable soil below the grade of the bottom of the trench and placing of selected material backfill, if required, shall be performed at the price agreed upon in writing in advance of such excavation.

(c) Trenches left open after working hours shall be barricaded, and after dark suitable lights shall be placed in conspicuous places as additional protection. The length of trench opened in advance of laying shall be limited to 100 feet, and the total length of trench open at one time shall not exceed 1,000 feet.

2.06 TRENCHING (Cont.)

(d) Trench shall be backfilled as soon after pipe laying and testing as possible. The backfill shall be placed in six inch layers, each layer to be well rammed or tamped before the succeeding layer is deposited. Care shall be exercised in placing and compacting the backfill uniformly on each side of the pipe.

All shoring and bracing shall be removed prior to backfilling unless ordered left in place.

PILING AND TIMBER WORK

3.00 SCOPE

The work under this section consists of furnishing and driving plain timber, creosoted timber, and composite piling as shown on drawings and specified herein. The work shall also include all timber work for the supports of conveyors Nos. 1, 2 and 3 and alterations to the dock and construction of pump structure.

3.01 PILE TYPES AND LOCATION

(a) Dock and supports for conveyors Nos. 1, 2 and 3 shall be creosoted piling.

(b) Foundation piling for covered storage building shall be creosoted.

(c) Wallboard and calcining building - All piling with cut-off at elevation 0.50 ft. shall be plain timber. The timber section of composite piling shall likewise be plain timber, cut-off at elevation 0.50 ft.

3.02 MATERIAL

(a) Plain timber piling shall be peeled Class B piles conforming to A.S.T.M. Specification D-25. The timber section of composite piles shall conform to this requirement.

(b) Creosoted timber piles shall conform to the above and shall be treated with Grade 1 creosote under pressure with the full-cell treatment to provide a final net retention of not less than 12 lbs. of creosote per cubic foot of piling.

(c) Composite piles shall consist of a plain timber lower section, cut-off at elevation 0.50 ft. and a cast-in-place reinforced concrete upper section. In footing E-1 of Calcining Building, the vertical piles shall have a tension splice between concrete and timber section which shall develop not less than 7 kips. Four piles under the Coe dryer as shown on Drawing 1-101-SC shall likewise have a similar tension splice. The joint between concrete and timber section shall be Raymond Concrete Pile Company, wedge ring or equal approved by Owner. The concrete section shall have a minimum 28 day compressive strength of 3000 p.s.i., cast in tapered corrugated metal shell which shall remain in place. The minimum diameter of the concrete sections shall be $12\frac{1}{4}$" at the joint and approximately 13" at the top.

(d) Reinforcing steel shall be intermediate grade bars conforming to A.S.T.M. Specification A-15 and A-305.

(e) Timbers and plank shall be Douglas Fir No. 1 (1450f) rough, in accordance with W.C.L.A. Standard Grading and Dressing Rules No. 14.

3.02 MATERIAL (Contd)

(f) Structural shapes, plates and rods shall conform to A.S.T.M. Specifications A-7, A-283 and A-107 respectively. All bolts shall be American Standard Regular with square heads and hex nuts. All bolts, heads and nuts bearing on wood shall have heavy bevel pattern malleable iron washers.

3.03 DRIVING EQUIPMENT

(a) Piles may be driven with either single or double acting steam or air hammer. Single acting steam hammer shall have a ram weighing not less than 5,000 lbs. and a stroke of not less than 3 feet. Double acting hammer shall have a ram weighing not less than 3,600 lbs. and shall be operated at a speed sufficient to deliver not less than 15,000 foot pounds of energy per blow. Pile driving equipment shall be maintained in efficient operating condition so that the length of stroke and number of blows per minute for which the hammer was designed would be obtained.

3.04 PILE DRIVING

(a) Piling shall be driven to a minimum bearing capacity of 25 tons and to not less than the following total penetration, whichever occurs last: dock and conveyors No. 1, 2 and 3, as indicated by pile lengths shown on drawings: all other to tip elevation of - 29.5 feet. The bearing capacity shall be calculated by the following formula:

$$R = \frac{C}{E}$$

C = 45 for bearing value of 25 tons.

E = Energy of the blow of a single acting steam manner in foot kips.

R = Resistance to penetration of the pile in blows per inch for the last three inches driven.

(b) Piles shall be located accurately in the positions shown on the drawings and their heads protected by the use of a steel driving block or anvil. Piles shall be driven vertically or battered as shown on the drawings within 3 inches of the location shown and the tops brought to, or cut off, at the elevations indicated. If piles are not in the proper position after driving, correction shall be made by Contractor at his own expense in the form of additional piles as directed to the satisfaction of the Owner. Closely spaced piles shall be redriven to correct penetration should any change in elevation occur during the driving of succeeded piles in the group. Splicing of wood piling will not be permitted. Piles broken or damaged during driving shall be withdrawn and new piles driven without additional compensation.

(c) Treated piles cut, dapped or bored after treatment shall have such surfaces liberally painted or swabbed with 3 applications of No. 1 creosote.

3.04 PILE DRIVING (Contd)

(d) The wood section of composite piles shall be driven to a minimum bearing of 25 tons and a total penetration of 30 feet below elevation 0.50 feet. The wood pile shall be driven with a mandril encased in the metal shell which shall remain in place when the mandril is withdrawn. The shell shall be accurately cut off at the elevation shown on the drawings and the shell filled with concrete, poured in the dry, and reinforced as shown. The concrete shall be worked or vibrated sufficiently to insure a close bond between the concrete and the shell and the reinforcing steel.

3.05 PILE DRIVING RECORD

A record in duplicate shall be kept of the dimensions, total penetration, behavior during driving and elevation of cut-off of every pile. One copy of such record shall be filed with the Superintendent of Buildings of the City of Seattle and one copy with the Owner upon completion of pile driving.

3.06 TIMBER WORK

Pile heads shall be framed and capped as shown. All hardware and iron shall be fitted tightly and to full uniform bearing. All work shall be well nailed or bolted as required for substantial, durable construction. Three inch floor plank shall be nailed at each support with 60 d nails not less than 2 nails to an 8" width or 3 to a 12" width. Bracing of pile bents shall be bolted with 3/4" diameter bolts; 4" x 12" stringers shall be attached to pile caps with 5/8" x 20" drift pins. Holes for bolts and drift pins shall be 1/16" less in diameter than the bolt or pin. The existing dock shall be altered as shown for the installation of conveyor No. 3. Such alterations shall be performed in a manner causing no damage to the existing structure or interference with its continuous use during alterations except by previous agreement with the Owner.

3.07 MEASUREMENT FOR PAYMENT

All work specified herein shall be included in the total lump sum price for the construction of the Wallboard Plant with appurtenant facilities.

Contractor shall state in his proposal unit prices for additional piling as follows:

Plain timber piling, in place . . . . . per lin. ft.
Creosoted timber piling, in place . . . . . per lin. ft.
Concrete section of composite piling, in place . . . per lin. ft.

Quantities of piling less than shown on drawings or specified herein will be deducted from the lump sum price at the rate of 75 per cent of the stated price for additional piling.

CONCRETE MASONRY

4.00 SCOPE

The work under this section consists of furnishing all labor, material, forms, mixing, placing and finishing required to construct Portland Cement concrete masonry and the furnishing and installing of reinforcing steel and anchor bolts as shown on the drawings and as specified herein. The work includes the fireproofing of Columns 5-8 inclusive, Line A and all roof beams of adjacent canopy between Wallboard Building and Calcining Building with concrete as shown.

4.01 MATERIALS

(a) Cement - Portland cement shall be a standard brand conforming to the requirements of "Standard Specifications for Portland Cement", Designation C-150 (latest revision) of the American Society for Testing Materials. The brand of cement used for concrete shall not be changed during the progress of the work, unless authorized in writing.

(b) Aggregates - All aggregate for concrete or cement finish shall conform to the "Standard Specifications for Concrete Aggregates", A.S.T.M. Designation C-33 (latest revision). Coarse aggregates shall be gravel or crushed stone, and shall be tested for abrasive resistance in accordance with the Standard Specification, A.S.T.M. Designation C-131 (latest revision). The loss after 100 revolutions shall not exceed 10-1/2 per cent. The loss after 500 revolutions shall not exceed 42 per cent. The maximum size of coarse aggregate shall be 1-1/2".

(c) Water - The water required for all purposes shall be clean, free from strong acids, alkalis, oil, or organic materials, or other harmful substances.

(d) Storage of Aggregates - All aggregates shall be stored on the site separately, and measured separately, in a manner to avoid the inclusion of foreign materials.

(e) Admixtures shall be used only as ordered and directed by the Owner.

(f) Anchor Bolts - shall be as shown on the drawings.

(g) Reinforcing Steel - shall be to the dimensions indicated and shall conform to the requirements of the A.S.T.M. Serial Designation A-15 (latest revision) intermediate grade deformed bars. Deformations shall meet the requirements of A.S.T.M. Serial Designation A-305. Wire mesh shall conform to A.S.T.M. Serial Designation A-185.

(h) Expansion joint material shall comply with Federal Specification No. HH-F-334.

4.02 CONCRETE MIX

(a) All concrete masonry shall have a minimum compressive strength of 3000 psi at 28 days, unless otherwise shown on the drawings. Lean concrete shall be mixed in the proportions of 1 part cement, 3 parts sand and 6 parts coarse aggregate.

The Contractor shall be responsible for furnishing concrete of the strength, quality and workability specified. Should results of tests for any portion of the work indicate that the concrete fails to meet the requirements of this specification, the mix shall be immediately adjusted to obtain the specified result. Any changes in the concrete mix ordered or required to produce concrete meeting the requirements of this specification shall be made at the Contractor's expense and no extra compensation will be allowed.

(b) Where no preliminary tests of materials are to be made, the water-cement ratio shall not exceed those in the following table, in which the net quantity of water in the mix shall include all surface water carried by the aggregates.

ASSUMED STRENGTH OF CONCRETE

Water-Cement Ratio U.S. Gallons Per Sack of Cement	Assumed Compressive Strength at 28 Days - psi
6	3,000

(c) The proportions of aggregates to cement for concrete of any water-cement ratio shall be such as to produce a concrete that will work readily in the forms and around reinforcement. The combined aggregate shall be of such composition and size that, when separated by the No. 4 Standard sieve, the weight retained on the sieve shall be not less than one-half nor more than two-thirds of the total, nor shall the amount of coarse aggregate be such as to produce harshness or honeycombing in the structure.

(d) Concrete materials shall be accurately measured and proportioned by use of approved weighing and measuring equipment. The water to cement ratio shall be accurately controlled.

4.03 MIXING CONCRETE

All concrete shall be mixed in a power batch mixer equipped with automatic devices for timing and mixing operations. The materials for each batch of concrete shall be accurately and separately measured and placed in the mixer. The water shall be measured and combined with the batch and the whole mixture shall be mixed not less than 1-1/2 minutes during which time the mixer shall rotate at a peripheral speed of about 200' per minute. Overloading of mixers, or excessive overmixing of batches will not be permitted.

4.04 READY-MIXED CONCRETE

Should the Contractor elect to furnish ready-mixed concrete, it shall conform to the requirements of A.S.T.M. Standard Specification No. C-94 (latest revision), except as specified herein.

4.05 CONSISTENCY

Supplementing the pre-determined amount of water by additional water because of slowness of discharge or for any other reason will not be permitted. The consistency of the concrete shall be measured by the "Standard Method of Slump Test for Consistency of Portland Cement Concrete". A.S.T.M. Serial Designation C-143 (latest revision). The test shall be made twice each day's run of mixer. A complete and accurate record of these tests shall be kept by the Contractor. The maximum slumps shall be as follows:

For slabs on soil - other than floors	3"
For concrete (lightly reinforced)	4"
For concrete (heavily reinforced)	5"

For floor slabs see Paragraph 4.10 (Monolithic Concrete Floors)

4.06 PLACING REINFORCEMENT

Steel reinforcement and embedded items shall be accurately placed as shown on the drawing and secured in position against displacement during the placing of the concrete by the use of templates, metal bars or mortar blocks. Reinforcement shall be free from mill scale, rust pits or flakes, dirt, paint, oil, or grease, and after placement, shall be maintained in a clean condition until completely embedded. Bar laps, spacing of bars, bond, etc. shall be in accordance with City of Seattle "Building Code".

4.07 FORMS FOR CONCRETE WORK

(a) No concrete shall be placed in any portion of the work until the forms for that portion have been completed. Forms shall be mortar tight and of sound materials, securely braced and sufficient in strength and rigidity to prevent distortion or movement during pouring and curing of the cement. They shall be built true to the lines designated and shall be so maintained until the concrete has sufficiently hardened to permit their removal. Form lumber for exposed surfaces shall be dressed and matched lumber of uniform width and thickness. The inside of all forms shall be oiled with a light paraffin base oil which will not discolor the concrete. Forms re-used shall be maintained in good condition at all times, and shall be re-oiled as required, or ordered by the Owner. The oiling of forms shall be performed at such time and by methods which will avoid splashing of reinforcing steel and concrete surfaces.

(b) Removal - The removal of forms shall be carried out so as to insure the safety of the structure as a whole. Side forms not subject to dead load bending stresses may be removed within 1 to 5 days if permitted by the Owner.

4.08 PLACING

No concrete shall be placed until all forms, embedded items and the surface upon which the concrete is to be placed have been approved by the Owner. Concrete shall be delivered to the forms by methods and equipment insuring its delivery at the required consistency without excessive loss of slump, or segregation. Concrete shall be deposited in all cases as nearly as practicable directly in its final position and shall not be caused to flow in a manner to permit or cause segregation. All concrete shall be placed in continuous horizontal layers, the thickness of which generally shall not exceed 12". Concrete shall be rammed, tamped, or worked with suitable applicances until the concrete has been compacted to the maximum practicable density, is free from pockets, closes snugly against all surfaces, and is in perfect and complete contact with all reinforcement bars and other metal embedded in the concrete.

4.09 FINISHING

The surface of concrete finished against forms shall be smooth, free from projections, thoroughly filled with mortar, and in perfect alignment. Immediately upon the removal of forms, all unsightly ridges or lips shall be removed and undesirable local bulging on exposed surfaces shall be remedied by tooling and rubbing. Before final acceptance of the work, all exposed concrete surfaces shall be cleaned of all encrustations of cement mortar or grout, and unsightly stains. All voids shall be neatly filled with mortar. Top surfaces which are not to be covered by additional concrete shall receive a trowel finish.

All exposed corners shall be chanfered 1".

4.10 MONOLITHIC CONCRETE FLOORS

(a) Floor slabs which form finished floors shall be of one course of the thickness shown and shall be constructed with integral finish.

The mix shall contain not less than 5-1/2 sacks of cement per cubic yard and the water-cement ratio shall not exceed 6 U. S. gallons per sack of cement. The water-cement ratio shall be carefully controlled and kept to the minimum requirement consistent with placing conditions.

(b) Where floor slabs are to be placed on earth subgrades, the subgrades shall be thoroughly moistened immediately prior to placing the concrete. Slabs shall be poured in a checkerboard pattern with contraction joints at not to exceed 60 ft. spacing. Twenty-four hours shall elapse between pours of adjacent slabs.

(c) Concrete surfaces which form finished floors shall be struck off and consolidated by screeding and tamping to exact elevations and slopes shown on the drawings or as directed. The concrete shall then be further smoothed and consolidated to a uniform close textured surface by means of a wood float or power floating machine and all high and low spots exceeding 1/4 inch under a 10 foot straight edge eliminated.

4.10 MONOLITHIC CONCRETE FLOORS (Contd)

Floating and testing of the surface shall be continued until all high and low spots are corrected and a dense uniform surface obtained. Floating in excess of that required to level and consolidate the surfaces and bring a small amount of grout to the surface will be prohibited. In addition to the above, the floor shall be finished by wood trowelling after the concrete has hardened sufficiently (30 - 45 minutes depending on weather conditions) to prevent excess fine material from working to the surface. The final finish shall be smooth and free from defects and blemishes. However, the exceedingly slick finish usually obtained by steel trowelling is not desired or required under this specification except in offices and toilets.

(d) All freshly placed concrete shall be protected from the elements and from all defacement due to building operations.

As soon as the concrete has hardened sufficiently to prevent damage thereby, it shall be covered with at least 1" of wet sand, or other satisfactory covering and shall be kept continually wet by sprinkling with water for at least 7 days. In lieu of other curing methods, the concrete may be covered with asphalt-impregnated, waterproof paper. All seams of such paper shall be overlapped and sealed with tape.

(e) Where non-slip surfaces are called for on the drawings, a dry mixture in the proportions of one sack of Portland cement to 200 pounds of Master Plate, as manufactured by the Master Builders Company, shall be evenly sprinkled over the surface immediately after the first floating operation in the proportions of 100 pounds of metallic aggregate per 100 sq. ft. of floor. One-half of this shake shall be distributed over the surface and floated into the surface with the mechanical float. The other half of this shake shall then be distributed over the surface and floated into the surface with the mechanical float, bringing sufficient water up from the floor through the shake to permit trowelling. The final finish shall be by means of a wood float as previously specified, using a swirling motion of the wood float.

4.11 CURING AND PROTECTION

All concrete shall be protected against injury until final acceptance. Exposed finished surfaces of concrete shall be protected from direct sun rays for at least three days. All concrete and mortar work shall be kept continuously moist for a period of at least 10 days after the concrete or mortar has been placed.

Adequate equipment shall be provided for heating the concrete materials and protecting the concrete during freezing or near freezing weather. No frozen materials or materials containing ice shall be used. All concrete materials and all reinforcement, forms and the ground with which the concrete is to come in contact, shall be free from frost. Whenever the temperature of the surrounding air is below 40° F, all concrete placed in forms shall have a temperature of between 70° F and 80° F, and adequate means shall be provided for maintaining a temperature of not less than 70° F for 3 days or 50° F for 5 days.

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HOLLOW CONCRETE MASONRY

5.00 SCOPE

The work under this section consists of furnishing all labor, materials, tools and equipment required to construct the hollow concrete masonry, concrete sills, parapet caps, and lintels, and reinforcement as shown on the drawings and specified herein.

5.01 MATERIALS

(a) Hollow masonry block shall be concrete block conforming to ASTM Serial Designation C-90 for Class B hollow load bearing masonry units.

Masonry blocks shall be 8 x 8 x 16.

(b) Reinforcing bars shall conform to ASTM Serial Designation A15, latest revision, intermediate grade deformed bars. Deformations shall meet the requirements of ASTM Serial Designation A-305.

(c) Aggregate for mortar shall conform to ASTM Serial Designation C-144, latest revision.

(d) Portland cement shall conform to ASTM Serial Designation C-150, latest revision, Type II.

(e) Mortar shall consist of 1 part portland cement, 1/2 part hydrated lime or lime putty and 4-1/2 parts mortar sand. Mortar shall be colored to match hollow masonry block.

(f) Concrete for bond beams, parapet caps, and lintels shall conform to the following requirements:

The water-cement ratio shall not exceed that in the following table, in which the net quantity of water in the mix shall include all surface water carried by the aggregate.

ASSUMED STRENGTH OF CONCRETE

Water-Cement Ratio U. S. Gallons per Sack of Cement	Assumed Compressive Strength at 28 Days p.s.i.
6	3,000

5.02 CONSTRUCTION AND WORKMANSHIP

All masonry walls shall be true and plumb and built to dimensions shown on the drawings. Masonry blocks shall be laid in straight uniform courses, with vertical joints aligned in stack or checkerboard bond.

Provision shall be made for all special units as may be required to form all

5.02 CONSTRUCTION AND WORKMANSHIP (Cont.)

bond beams, openings and offsets, and maintain a proper bond throughout the length of the wall.

Mortar joints shall be 3/8" thick with full mortar coverage of the face shells in both the horizontal and vertical joints. Vertical joints shall be shoved tight. Exterior horizontal joints shall be struck weathered. Exterior vertical joints shall be raked. Interior joints shall be struck flush where exposed.

The surfaces of the walls are to be kept clean and free of mortar, and all joints are to be made with a straight clean line, and tooled to a dense surface. Mortar shall be cleaned off all sash immediately before the mortar takes initial set by brushing with clean water.

The work of the masonry contractor shall be coordinated with that of the other trades. All openings for heating, plumbing and electrical ducts, pipes and conduits shall be built into the masonry walls. At the conclusion of the masonry work, the contractor shall clean down all masonry walls, remove all scaffolding and equipment used in the work, clean up all debris, refuse and surplus material, and remove them from the premises.

Forms for concrete lintels, parapet caps, and bond beams shall be mortar tight and of sound materials, securely braced and sufficient in strength and rigidity to prevent distortion or movement during pouring and curing of the cement. They shall be built true to the lines designated and shall be so maintained until the concrete has sufficiently hardened to permit their removal.

Vertical reinforcement shall consist of poured concrete studs formed by the cells of the masonry units aligning directly over each other, reinforced with 3/8" round deformed bars, overlapping dowels in foundation. The spacing of these studs shall be: One at each corner, one at both sides of each opening, and one at a maximum spacing of 32" between openings. Poured studs to be continuous from foundation to top of wall. A cleanout unit shall be provided in the first course at every dowel for cleanout of mortar and to insure proper alignment and lap of vertical steel to dowels.

Horizontal reinforcements shall be placed in bond beam units; channel up, poured with concrete, including vertical cells of beam units, and reinforced with two 1/2 inch bars lapped 40 diameters except as otherwise shown on the drawings.

STRUCTURAL GYPSUM ROOF DECK

6.00 SCOPE

Where indicated on the drawings, Contractor shall furnish and install Kaiser Structural Gypsum Roof System, which shall consist of subpurlins, formboard, bonding mesh, and structural gypsum.

6.01 MATERIALS

(a) Subpurlins shall be Bulb T #200 and shall be provided with one coat of factory finish.

(b) Formboard shall be Kaiser Formboard made for this purpose, 1/2" thick x 32" wide, length conforming to main purlin spacing, or 1/4" asbestos formboard where indicated on the drawings.

(c) Bonding mesh shall be electrically welded, galvanized wire mesh, consisting of #12 gage longitudinal wires 4" on centers and #14 gage transverse wires 8" on centers.

(d) Structural gypsum shall be Kaiser Structural Gypsum, manufactured in accordance with A.S.T.M. and Federal Specification for this material and requiring only the addition of water on the job in accordance with manufacturer's instructions.

6.02 ERECTION

(a) Subpurlins shall be spaced at 32-5/8" centers on, and at right angles to, the main purlins, and welded at alternate sides at each main purlin with 3/4" fillet welds. Ends of subpurlins shall bear on the supporting structural members.

(b) Formboard shall be supported on the flanges of the subpurlins, with end joints over the main purlins. Forms shall fit snugly at all edges and end joints. Where asbestos formboard is used, sheet metal T's shall be used for end support.

(c) Bonding mesh shall be placed with the #12 wire at right angles to the subpurlins. End laps shall be not less than 8", with the wire ends hooked over the mesh of the adjacent sheet. Sides of the mesh shall be butted without lapping.

(d) Structural gypsum shall be mixed with clean water in a suitable mixer as close as possible to the point of application. Mixing instructions on the container shall be strictly followed. When the thickness of the deck, as indicated on the drawings or specified, has been attained, the surface shall be screeded to an even, uniform surface. Cants, saddles, curbs, etc., shall be constructed as shown on the drawings. The average thickness of poured material shall be not less than 2", except over asbestos formboard, where the average thickness shall be not less than 2-1/4".

6.02 ERECTION (Cont.)

(e) Protection of Structural Slab. The poured gypsum slab and any formboard laid in advance of the pouring of the gypsum slab shall be protected from rainfall prior to the installation of the membrans specified under Roofing.

BUILT-UP ROOFING

7.00 SCOPE

(a) The work under this section consists of furnishing and installing all built-up roofing as shown on the drawings and specified herein.

(b) Built-up roofing shall consist of 4 plies of 15 lb. felt with a gravel surface. A 6 lb. rosin sized dry sheet shall be installed under roofing on wooden decks.

7.01 MATERIALS

(a) Asphalt saturated felt shall conform to the latest revision of Federal Specification HH-F-191, Type I, for 15 lb. asphalt saturated felt.

(b) Base flashing shall be 90 lb. mineral surfaced cap sheet.

(c) Asphalt shall be homogenous and free from water and shall conform to the following requirements:

Melting poing	165° - 185°F
Flash point	450°F
Penetration @ 32°F	10 min.
Penetration @ 77°F	20 - 50
Ductility @ 77°F	5

(d) Gravel for surfacing shall be hard, dry, pea gravel, free from sand, clay, or dirt, and shall be graded within the following limits:

Passing a 3/8" mesh screen	100.0%
Passing a 1/4" mesh screen	3.0%

(e) Nails used in nailing under-felt to poured gypsum deck shall be "Crescent Simplex" nails with factory applied metal cap or 1-3/4" large headed galvanized roofing nails.

(f) Nail for use on wood decks shall be 7/8" x 11 ga. barbed large head galvanized roofing nails.

(g) Dry sheet shall be 6 lb. rosin sized sheathing paper.

(h) Primer for concrete surfaces shall conform to ASTM Specification D41.

7.02 INSTALLATION

(a) Under-felts - As soon as the top surface of the gypsum deck is reasonably dry, the underfelt (1 ply of 15# felt) shall be laid dry and shower nailed to the deck. The minimum nailing requirements for the dry sheet shall be shower nailing 18" O.C., staggered. For turned down roofing at eaves and rakes, nail 3" O.C. one inch up from the lower edge of the roofing. For turned up roofing at vertical walls nail 8" O.C. one inch down from the

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7.02 INSTALLATION (Cont.)

upper edge of the roofing. On concrete decks prime with an asphalt primer which shall be allowed to dry and mop solid with 25# asphalt per 100 sq. ft. only after concrete is thoroughly dry. On wood decks, one thickness of rosin sized sheathing paper shall be laid, lapped one inch and nailed along the edges.

(b) Roofing - Asphalt shall not be heated above 400°F and shall be hot when applied. The sheets of felt shall be laid free from wrinkles and buckles with no pronounced ridges formed at the laps. Moppings of asphalt between the four plies of felt shall uniformly cover the entire lapped surfaces so that in no place shall felt touch felt.

On gypsum and concrete decks, three layers of 15 lb. felt shall be laid at right angles to the pitch of the roof, shingled in 3-ply construction to provide three layers of roofing over the entire roof. End laps of sheets shall be 6". The base felts shall be fully mopped to the underfelts, cants, and parapet with 30 lb. of asphalt per 100 sq. ft. All felts shall be carried up abutting vertical surfaces as indicated on drawings, or turned down over rake or eave as required and nailed on 8" centers.

On wood decks one ply of 15# felt shall be laid over the sheathing paper parallel to the slope of the roof lapped three inches with all laps sealed with hot asphalt and nailed 6" O.C. on edges and shower nailed on about 12" centers. Three plies of felt shall then be laid shingle fashion at right angles to the pitch and fully mopped with asphalt applied at the rate of 30 lbs. per 100 sq. ft.

(c) Base flashing shall be installed at all angles formed between the roof surfaces and the abutting walls, curbs, and similar vertical surfaces, and shall extend out over the roofing a minimum of 6". Upper edges of base flashing shall be carried up the wall as indicated. Two plies of 15 lb. felt not less than 18" wide shall be mopped on over the flange of the gravel stop prior to gravelling.

Following the laying of all felt and base flashing, the entire surface shall be given a uniform flood coat of hot asphalt applied at the rate of 60 lbs. per 100 sq. ft., into which, while hot, shall be embedded an even, uniform layer of gravel surfacing applied at the rate of 400 lbs. per 100 sq. ft. of roof.

All metal flashing shall be in place before the top coating of asphalt and gravel is applied. All joints between pipes, ducts or vents and roof plate shall be made waterproof by means of a bituminous cotton fabric mopped in place.

MEMBRANE WATERPROOFING

8.00 SCOPE

(a) The work under this specification consists of furnishing all material, labor, tools and equipment required to waterproof the areas of masonry shown on the plans as specified herein.

(b) The waterproofing membrane shall consist of one application of asphalt primer applied directly to the masonry surface to be waterproofed, two layers of asphalt-saturated fabric, and three layers of waterproofing asphalt applied as specified. The completed waterproofing membrane shall be protected with a layer of backing board.

(c) Before applying the waterproofing, the surface of the masonry shall be dry, free from imperfections, and acceptable as a satisfactory base for waterproofing.

8.01 MATERIALS

(a) Asphalt Primer - Asphalt primer for use with asphalt in waterproofing shall conform to Standard Specifications A.S.T.M., Serial Designation D-41 (latest revision).

(b) Waterproofing Asphalt - Waterproofing asphalt shall conform to Standard Specifications, A.S.T.M., Serial Designation D-449 (latest revision) for Type A waterproofing asphalt.

(c) Asphalt Saturated Fabric - Asphalt saturated fabric shall be woven cotton fabric saturated with a bituminous substance, conforming to Standard Specifications A.S.T.M., Serial Designation D-173 (latest revision), or "Glasfab" as manufactured by Owens-Corning Fiberglas Corporation.

(d) Protection Board - Protection or backer board shall be commercial grade asphalt saturated fibre board of a minimum thickness of 1/8". It shall be tough, rot resistant and suitable for underground use.

8.02 WORKMANSHIP

(a) Before starting construction of the waterproofing membrane, the masonry surface shall be dry and clean of all dust or other foreign matter.

(b) Waterproofing asphalt shall be hot when applied but shall not be heated to exceed 325° F.

(c) Sheets of fabric shall be laid free from wrinkles, and buckles with no pronounced ridges formed at the laps.

(d) Moppings of asphalt shall uniformly cover the entire surface so that in no place shall felt touch felt or fabric touch fabric.

8.02 WORKMANSHIP (Contd)

(e) Application

(1) The masonry surface to be waterproofed shall be first given one brush coat of asphalt primer. The asphalt primer shall be allowed to dry completely before any succeeding applications.

(2) After the asphalt primer has dried, the surface shall be given an application of waterproofing asphalt consisting of 25 lbs. per 100 square feet for fabric membrane. The application of asphalt shall be so controlled that the succeeding layers of felt or fabric will be laid in hot asphalt. The application of each layer of waterproofing membrane shall start at the lowest point and proceed upward.

(3) The succeeding number of layers specified shall be built up of alternate layers of waterproofing asphalt applied at the rate of 25 lbs. per 100 square feet and asphalt saturated fabric. Each layer of fabric shall be rolled or pressed into the preceding application of hot asphalt. Where water proofing membrane is to be placed in the floor, a sufficient length of fabric shall be left to permit membrane from the floor to be turned up 12" on the outside of walls.

(4) In laying multi-ply waterproofing membrane, the plies shall be shingled in a manner which will fully cover the masonry with the specified number of plies at all points. Ends shall be lapped 10" and laps shall be staggered 24".

(5) Extreme care shall be exercised in constructing the waterproofing around the pipes and other utilities extending through the masonry so that a completely waterproof job will result.

(6) Protection or backer board will be laid in an application of hot asphalt. On vertical surfaces, the board will be firmly bonded with the asphalt by pounding with a wooden mallet. On horizontal surfaces, the protection board may be rolled or firmly pressed into the asphalt.

8.03 WARRANTY

The Contractor shall furnish a written warranty stating that all work executed under this specification will be free from defects in workmanship for a period of two years from the date of final certificate, and shall further agree that the waterproofing membrane shall be guaranteed and warranted for a total period of two years. The following types of failures will be adjudged as defective work:

(a) Leaking
(b) Creeping
(c) Splitting, pulling loose from the foundation, alligatoring, buckling, and tearing

SHEET METAL, CORRUGATED SIDING AND ROOFING

9.00 SCOPE

The work under this section consists of furnishing all labor, material, tools, fasteners, scaffolding and subsequent removal thereof required to construct and erect galvanized corrugated iron roofing, siding, ridge roll, corrugated translucent window material, flashings, door hoods, gutters, downspouts, gravel stops, louvers, copings, all as specified herein and shown on the drawings.

The work shall include: the covering of the division wall in the Calcining Building, the metal partitions in the Wallboard Building, the arch type conveyor covers, hatch covers and gutters over each rib of the Covered Storage Building, metal roofing on plant toilet and office rooms, and siding for elevator enclosures.

9.01 MATERIAL

(a)

Use and Thickness Schedule	U. S. Std. Gauge
Wallboard Building siding	22 galvanized
Calcining Building siding	22 galvanized
Conveyor Gallery siding and roofing	24 galvanized
Wallboard Building partition Col. Row 6	14 black painted
Wallboard Building Paper Pulper partition	26 galvanized
Calcining Building dust tight partition	26 galvanized
Elevator enclosures	26 galvanized
Plant Office and Toilet Rooms roofs	24 galvanized
Calcining Building Roofing	20 galvanized
Door hoods	22 galvanized
Gravel stops, chimney flashing, wall flashing, counter flashing, copings, gutters and all other miscellaneous flashings	22 galvanized
Louver frames	20 galvanized
Louver blades	20 galvanized
Covered Storage Building siding and roofing	20 galvanized
Covered Storage Building flashing, gutters and hatch cover	20 galvanized
Downspouts at Office Building	Std. Steel Pipe galvanized
Arch type conveyor cover	24 galvanized

(b) All galvanized sheet metal shall have a zinc coating of not less than 1.75 oz. per sq. ft. of double surface and meet the requirements of A.S.T.M. Standard Specifications A-93-52T, Class C, for 22 gauge and heavier and Class B for 24 and 26 gauge. Corrugated roofing and siding shall have $2\frac{1}{4}$ x $\frac{1}{2}$ nominal size corrugations. Each sheet shall be marked with the name of the manufacturer's gauge of metal and coating.

9.01 MATERIAL

(c) Steel panel at Wallboard Building Column row 6 shall be fabricated from steel sheets meeting the requirements of A.S.T.M. Standard Specifications A 245-52T, grade A.

(d) Pipe downspouts shall be fabricated from steel pipe meeting the requirements of A.S.T.M. Standard Specifications A 120-47 standard weight. Downspouts shall be galvanized after fabrication in accordance with A.S.T.M. Standard Specification A 123-47.

(e) Fasteners for corrugated galvanized siding and roofing and accessory flashings shall be Nelson Rivweld Studs and Nelson blind rivets or approved equal. Studs shall be 5/16" and blind rivets 3/16" diameter.

(f) The Contractor shall furnish all bolts, washers, lock washers, nuts, rivets, screws, cinch anchors or other fasteners required for the construction and erection work. All fasteners shall be galvanized or tinned or similarly protectively coated.

(g) Solder shall be half and half made from virgin lead and tin.

(h) Bevel corrugation closer strips between gutter and bias cut corrugated siding on covered storage building shall be asphalt composition premolded bevel caulking as manufactured by Fabricated Products Company, West Newton, Pennsylvania, or approved equal.

(i) Mastic between end and side laps of siding installed on covered storage building shall be A. C. Horn's Vulcatex or approved equal.

(j) Translucent window material shall be made from polyester resin material reinforced with glass fibers which is insoluble and infusible and shall have the following physical properties:

Weight	approx. 8 oz. per sq. ft.
Thickness	0.050 to 0.060 minimum
Tensile strength	7500 p.s.i.
Ultimate flexural strength	10000 p.s.i. minimum
Expansion	0.16 of 1% for 200°F rise in temperature
Color	opalescent blue or light green

All of the above values from flat sheets containing 65% resin by weight.

Sheets shall have corrugations to match corrugated galvanized steel siding.

Fastening shall be 1/4" sheradized bolts with felt or neoprene and steel washers on not to exceed 18" centers.

9.02 INSTALLATION

(a) Sheet metal fabrication and erection shall be installed under competent supervision by experienced workmen. All parts shall be accurately formed with clean, sharp dies to the shape and dimensions required by field measurements and the drawings to make a neat, workmanlike, weatherproof installation.

(b) Gravel stop and facia shall be formed with one flange extending onto the roof surface at least 5 inches and shall be nailed through the 4 plies of roofing felt with large headed galvanized nails spaced 6 inches apart before the top two plies of felt flashing are applied. Gravel stop shall terminate at the lower edge with a 1/4" folded edge formed drip. Ends shall have a one inch deep double lock joint on the roof flange and lap joint on vertical flange. The joint of the roof flange shall be nailed and soldered tight. Lower edge of vertical flange shall be riveted.

(c) Counter flashing installed in masonry wall shall be placed after the roofing and base flashing are applied in a formed metal reglet and extend into the masonry 3 inches and terminate with 1/4" folded edges. Counter flashing shall extend down over roofing or base flashing at least 4 inches or as shown on the drawings. End laps 6 inches long shall be set in mastic or caulking compound and riveted at lower edge. Laps shall be to the lee of the prevailing winds. Flashing shall be anchored into the reglet with lead wedges spaced not more than 24 inch centers and at each joint. Reglet shall then be completely filled with caulking compound and the exterior surface finished smooth.

(d) Base flashing shall be placed and joined in the same manner as facia and gravel stop hereinbefore specified.

(e) Gutters shall be formed as detailed and shop assembled in one piece complete with end caps and thimble. Bottom shall be graded to drain. Gutter shall be supported by 1/8 x 1 galvanized steel straps spaced not more than 36 inch centers. The roof edge of the gutter shall extend under the facia and flange out at least 3 inches on the wood deck. Flange shall be nailed at approximately 18 inch centers with large headed galvanized nails and straps shall be screwed to sheathing with at least two screws for each strap. Exposed screw heads shall be cap soldered.

Downspouts shall be installed true and plumb. Three galvanized Carpenter and Paterson or equal offset pipe clamps shall be provided for each leader and attached to the building with galvanized lag screws.

(f) Wall louvers shall be Burt Manufacturing Company Figure No. 1, or equal, with 20 gauge frames and blades, galvanized finish, operating chain, clip and closing spring.

(g) Monitor louvers shall be Burt Manufacturing Company Figure No. 8, or equal, fixed, weatherproof, with 20 gauge frame and blades, galvanized finish. Provide 14 gauge, 2 mesh, galvanized bird screen behind fixed louvers.

9.02 INSTALLATION (Cont.)

(h) Copings shall be formed as indicated with 1/4" folded and formed drip at lower edge of flanges. Coping shall be fastened with concealed clips. Nailing through flanges will not be permitted. Ends shall be joined with drive slip connections formed to make weatherproof joint.

(i) Door hoods shall be provided over all exterior manway doors and horizontal sliding doors. Hood shall be formed with gutter at lower edge to drain water to either end of hood. Hood shall extend beyond door opening or track at least 6 inches. Hoods shall be rigidly supported on brackets spaced not over 5 feet apart.

(j) Corrugated roofing on Calcining Building and conveyor galleries shall be laid with a side lap of 1-1/2 corrugations and at least 6 inch end lap. End laps shall be made over purlins. Each sheet shall be attached to the structure with weld studs on 12 inch centers at each intermediate purlin and approximately 7-1/2 inch centers at end laps. All sheets shall be lapped to the lee of the prevailing winds. Side laps shall be blind riveted on 12 inch centers.

(k) Corrugated siding on Calcining building, Wallboard building and conveyor galleries shall be laid with a side lap of one corrugation and minimum end lap of 4 inches and shall be attached to the structure with welding studs on 12 inch centers at each girt. All sheets shall be laid with the lap to lee of the prevailing winds. Side laps shall be blind riveted at 24 inch centers. The roof ridge and building corners, sills, and eaves shall be flashed with preformed galvanized flashing as shown on the drawings and attached with weld studs or galvanized self-tapping screws on not to exceed 12 inch centers. The completed siding and roofing shall be weather tight.

(l) Corrugated roofing and siding on the Covered Storage building shall be made with a side lap of 1-1/2 corrugations and at least 6 inch end lap. End laps shall be made over purlins. All end and side laps in roofing sheets between top ring girder and 2nd from top 12 in. W.F. shall be completely bedded in caulking compound. Each sheet in the area of the two top arch rings shall be attached to the structure with weld studs on 12 inch centers at each intermediate purlin and approximately 5 inch centers at end laps. All sheets shall be lapped to the lee of the prevailing winds. Side laps shall be blind riveted on 6 inch centers. Sheets which cross break in the roof line of this building shall be machine bent to fit by means of corrugated rolls or dies designed to maintain the original transverse dimensions and section of the sheet. Corrugated sheets in the third to fifth, inclusive, arch ring area shall be attached to the structure with weld studs on 12 inch centers at each intermediate purlin and approximately 7-1/2 inch centers for end laps. Side laps shall be blind riveted on 12 inch centers. Gutter flange shall be fastened through mastic closure strip to the top of each intersecting corrugation with heavy sheet metal screws. Gutter cover plate shall be blind riveted to the top of each intersecting corrugation.

9.02 INSTALLATION (Cont.)

(m) Mastic corrugation closer shall be furnished and installed at the joint between roof sheets and gutter at each rib of the Covered Storage building as shown on the drawings.

9.03 ARCH TYPE CORRUGATED CONVEYOR COVERS - shall have 1-1/2" x 1-1/2" x 1/4" galvanized stiffener angles at each edge and shall be provided with corrugated band at least four corrugations wide at each joint, which shall be attached each end of alternate sections by riveting. Covers shall be fabricated in sections 8 or 10 feet in length with at least three heavy galvanized hinges on one side per section.

9.04 BACK PRIMING - All surfaces of sheet metal flashings, gutters, and louvers inaccessible after installation shall be painted one coat of Farbertite or approved equal.

9.05 SHOP PAINTING - After fabrication all black steel work shall be thoroughly cleaned of all rust, scale, grease or other foreign material and given a shop prime coat of paint equal in quality to Federal Specification TT-P-86a, Type II.

9.06 GUARANTEE

The Contractor shall guarantee all workmanship performed under this section for the period of one year after acceptance of the work. Any leaks due to faulty workmanship shall be repaired to the satisfaction of the Owner.

MISCELLANEOUS IRON WORK

10.00 SCOPE

The work under this section consists of furnishing and installing miscellaneous structural steel items not included under "Structural Steel", chutes including gates and operating mechanisms, salt water flumes and their terminal connections, items embedded in concrete, curb angles, structural supports for equipment, mesh folding door in warehouse, lockerbaskets, and plant sign.

The work shall also include the installation of roof beams, furnished by Others under "Structural Steel" on the Machine Shop and Warehouse Building.

10.01 SHOP DRAWINGS

The Contractor shall submit two (2) prints each of all shop drawings and catalog cuts and specifications of manufactured items for the approval of the Owner, and shall make such corrections in shop drawings as are required, and re-submit two (2) prints of corrected drawings for final approval. The Contractor shall file with the Owner one (1) duplicate tracing of all approved drawings. Owner will approve drawings for design only and such approval shall not relieve the Contractor of the responsibility for any errors or omissions on the shop drawings.

10.02 MATERIALS

(a) All materials shall conform to the requirements of the latest revisions of the A.S.T.M. Standard Specifications, Serial Designation as follows:

A-7	Steel for Bridges and Buildings
A-107	Commercial Quality Hot Rolled Steel Bars
A-141	Structural Rivet Steel
A-283	Structural Quality Carbon Steel Plate, for Welding

(b) Bolts shall meet the requirements of A.S.T.M. A-307.

(c) Mesh for folding door in warehouse, shall be 1-1/2" diamond wire mesh of not lighter than No. 10 W & M gauge wire, substantially framed with 1" channels, painted finish, constructed in accordance with Woven Wire Products Association standards.

(d) Lockerbaskets shall be as manufactured by the Moore Company, Charleston, West Virginia, or equal. The basket shall be 14 inches square and shall provide approximately 1200 cu. in. of unobstructed storage space. Basket shall be suspended by a 5/16" diameter hanger with formed center ring and integral clothes hooks. Basket and hooks shall be heavily galvanized after fabrication. Included with the lockerbasket shall be 25 ft. of galvanized chain with locking ring, 2 galvanized pulleys, 1 galvanized split link, 2 galvanized hooks for hanging pulleys, 1 galvanized locking eyebolt and 1 aluminum number plate numbered as directed by the Owner

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10.02 MATERIALS (Contd)

(e) Entrance Sign - Contractor shall include in his lump sum bid an allowance of five hundred dollars for furnishing and installing the sign on the office building as shown on Drawing 5-102-A. Letters shall be alumilited aluminum, satin finish, eight, four and two inches in height mounted on a redwood panel 2" thick, 2 ft. wide by 14 ft. long. Drawings shall be submitted for Owner's approval prior to fabrication.

(f) Chutes - shall include hoists, sheaves, cable and other operating equipment, and gates and their operating mechanisms as shown on the drawings. The work shall also include the cutting and reinforcing of openings and drilling of holes for attachment of chutes and all supports and means of attachment of chutes and their operators to the structure.

Fabrication of chutes shall be by welding except where bolting is indicated on drawings. Provide "Armorite" on skirt boards as shown. Check all dimensions in field prior to fabrication.

(g) Salt water flume shall be welded to each support on both sides of flume. Provide substantial anchorage for all terminals.

10.03 FABRICATION AND ERECTION

(a) Fabrication and erection of all structural work shall conform to the A.I.S.C. Specification for the "Design, Fabrication and Erection of Structural Steel for Building", as revised June 1949, and approved shop drawings.

All welding shall be done by Welders certified under, and in conformity with the A.W.S. "Code for Fusion Welding".

(b) Fabrication shall be by riveting or welding. All nuts and bolts shall have lock washers.

10.04 SHOP PAINTING

After fabrication, all work shall be thoroughly cleaned of all rust, scale, grease, or other foreign material and given a shop prime coat of paint equal in quality to Federal Specification TT-P-86a, Type II.

CARPENTRY

11.00 SCOPE

The work under this section consists of furnishing and installing all rough and finish woodwork, interior trim, casework, wood doors as shown on the drawings and specified herein.

All woodwork attached to piling or connected to the dock is covered under the section titled "Piling and Timber Work."

11.01 MATERIAL

(a) All lumber shall be air dried and well seasoned, and shall conform to the American Lumber Standard sizes and the grading rules of the manufacturer's association under which it is produced.

(b) Grade Use

(1) Douglas Fir Plywood shall be Exterior AA Grade for exterior walls and Interior AB Grade for all other applications except casework of thickness shown on the drawings.

(2) Framing lumber, purlins, nailers and sheathing shall be Douglas Fir No. 1, 1450f bending stress grade. Wood bumpers shall be No. 1 Post and Small Timbers.

(3) Subfloor shall consist of Douglas Fir 1 x 6 No. 2 Boards and Sheathing S4S and 5/16" thick Plybase plywood with 1 layer 15 lb. asphalt felt between.

(4) Exposed mullions and window sills shall be Douglas Fir B and Better Industrial Clear.

(5) Door sills shall be F.A.S. White Oak.

(6) Redwood trim and facia shall be Clear All Heart grade.

(7) Joist hangers shall be fabricated from 3/16 x 2½ flat bar and shall be furnished with holes for fastening the hanger to the joist and to the wall.

(8) Ceiling strips shall be nominal 1" thick No. 1 grade Douglas Fir.

(9) Sills and blocking on concrete shall be Redwood, Foundation grade.

(10) Ceiling on interior office roofs shall be "C" grade F.G. Flooring.

(11) Trim shall be "moulding stock" grade, Douglas Fir.

(12) Oak for benches shall be F.A.S. Plain Red Oak.

11.01 MATERIAL (Cont.)

(13) Main office lobby cabinet shall be Birch plywood, Natural pattern, rotary cut, architectural grade. All other cabinet work and counters shall be Interior AB grade Douglas Fir Plywood.

(14) Window and Door casings shall be Oregon White Pine, Grade C.

(15) Formica counter top shall be heat proof type.

(16) Gypsum Board shall be as manufactured by Kaiser Gypsum Company of thickness indicated.

(17) Doors shall be Douglas Fir stock Doors, vertical grain of sizes and style shown on the drawings.

(18) Plank walkways and platforms shall be Douglas Fir rough "Dense No. 1 Plank," 1700f bending stress grade.

(c) Insulation in restroom walls and ceiling shall be Kaiser Rock Wool Insulating Quilt, 1 inch and 3 inch thickness respectively.

(d) Insect screen shall be copper or bronze, 16 x 16 mesh.

(e) Acoustical tile shall meet the requirements of Federal Specification No. SSA-118a, Type IV, Class B.

11.02 WORKMANSHIP

(a) Rough Carpentry - Framing shall be of the size and spacings shown on the drawings.

(1) Joists, Rafters and Headers - shall be doubled at all openings in ceiling and/or roof. Where headers exceed 6 ft. in length and when they occur more than 3 ft. from bearings, trimmers shall be tripled. All headers longer than 6 ft. shall be carried by steel joist hangers or heavy cleats on trimmers.

(2) Cross Bridging - shall be made of 2" x 3" strips with ends bevelled and double crossed, spaced as follows:

One row on spans	8 to 10 ft.
Two rows on spans	10 to 20 ft.
Eight feet apart on longer spans	

Ends of bridging shall be nailed with two 10d nails. Bottom of bridging shall be nailed after laying of sheathing. Solid bridging shall be installed as shown on the drawings.

(3) Stud Framing - Studs shall be spaced 16" o.c. unless otherwise noted or required. Studs shall be securely spiked to all ribbons,

11.02 WORKMANSHIP (Cont.)

joists, caps and sills. Studs shall be doubled at the sides of all openings. Inside studs shall be broken at the head to receive headers. Framing over openings shall be provided as follows:

	Bearing Partition or Wall	Non-Bearing Partition
1 Stud	Openings less than 3'-0"	Openings less than 4'-0"
2 Studs	Openings 3'-0" to 5'-0"	Openings 4'-0" to 7'-0"

All partitions and walls shall be cross bridged once in their height by 2" x 4" studs set diagonally. Non-bearing plates shall be constructed with a 2" thick sole of the width of the plate, and caps of 2 - 2" thickness by the width of the stud. Provide diagonal bracing at each exterior wall in accordance with Code requirements.

(4) Roof Sheathing - one inch thick shall be laid diagonally, and two inch thick shall be laid perpendicular to joists with joints in adjacent boards broken at least 24 inches and all joints made over bearings. Boards shall be tightly nailed as shown in nailing schedule at every bearing.

(b) Finished Carpentry - All mill work shall be made from measurements taken at the job and erected plumb and square in accordance with detailed drawings. All corners shall be carefully mitered, well nailed and the nails countersunk. Mill assemblies shall be joined with concealed nails and screws, and where practical with mortise and tenon joints, well glued with best quality waterproof glue. All mouldings shall be cleanly cut to details.

All interior finished mill work shall be primed at the mill before shipping. Exposed surfaces shall be machine sanded to an even smooth surface, ready for finish.

(c) Insulation - shall be installed in rest room walls between studs to form an unbroken insulating blanket over the entire area. Insulation in ceiling shall be placed between studs and securely stapled to rafters.

(d) Special Blocking - Contractor shall supply and install special blocking and cut pipe notches and holes as required for installation of plumbing and heating or ventilating duct work.

(e) Nailing and Fastening - All wood framing shall be securely connected together, and the connections between the various parts shall be adequate for substantial, durable work. Following is a schedule of minimum permissible connections for certain details; increased strength shall be

11.02 WORKMANSHIP (Cont.)

provided where necessary or directed. Bolted connections shall be as called for on the drawings.

Schedule of minimum permissible connections:

Detail	Fastening*
Joists or rafters to side of studs	
8 inch joists or less	3-16d
Each additional 4 inches in depth of joist	1-16d
Joists or rafters at all bearings	
**Toe nails, each	2-10d
Studs to bearings	
**Toe nails, each	2-10d
Blocking between joists or rafters	
**To joist or rafters - Toe nails, each side, each end	2-10d
**To joist or rafter bearings - Toe nails, each side	2-10d
Sheathing at all bearings	
One (1) inch by six (6) inches	2-8d
One (1) inch by eight (8) inches	3-8d
Two (2) inch by six (6) inches	2-16d
Plybase sub-floor at edges	6d @ 6 in.
Plybase sub-floor at all other bearings	6d @ 12 in.
Herringbone blocking	2-10d
Ceiling strips	
1 inch x 3 inch furring strips to under side of joists, per bearing	2-8d
Ribbons to studs	
One (1) inch ribbons	2-8d
Two (2) inch ribbons	2-16d
Double top plates	
Lower plate to top of stud	2-20d
Upper plate to lower plate - staggered	16d @ 18 in.
Multiple studs stagger for widths more than four (4) inches	16d @ 12 in.
Double joists under partitions	
Where not blocked apart, staggered	16d @ 12 in.
Where blocked apart, at each block	2-20d

* All nails shall be common wire nails.
** Where possible nails driven perpendicular to the grain shall be used instead of toe nails.

(f) Casework - All cases shall be fabricated in a substantial manner and as detailed. Formica top shall be thoroughly bonded to 3/4 in. waterproof plywood. Casework shall be completely shop assembled to templates.

11.02 WORKMANSHIP (Cont.)

All exposed edges of personnel reception desk counter shall be covered with Formica. Bottoms in all casework shall be rabbeted in the front and sides. Fronts and frames of all work shall be accurately fabricated at the mill, and personnel contact edges shall be rounded and sanded smooth.

(g) Walkway and platform planking shall be laid with approximately 3/8" space between.

Cross cleats shall be laid 24-30" spacing on all covered walkways exceeding 10% grade and on all outside walkways exceeding 8% grade.

(h) All plywood except plybase shall have all edges sealed with thick lead and oil paste. Sealer shall consist of 100 lbs. of paste white lead, 1-3/4 gallons raw linseed oil and 1 pint of dryer and shall be knifed on as panels are installed. Plywood panels shall be back primed during construction where surfaces are to be concealed and exposed surfaces primed as soon as possible after erection.

(i) Furnish and install thresholds and bottom hook as shown on the drawings.

HARDWARE

12.00 SCOPE

The work under this section consists of furnishing and installing rough and finish hardware for the office and plant buildings as listed in the hardware schedule and as herein specified.

12.01 MATERIALS

(a) Each unit shall be furnished complete with all fasteners and accessory equipment separately packaged and labelled.

(b) Interior doors of each building shall be keyed separately. Exterior doors of each building shall be keyed alike. Each building shall have separate master keys. Three Grand master keys shall be provided.

12.02 ACCEPTANCE

Prior to acceptance, all hardware shall be properly adjusted and placed in first class operating condition. All hinges, locks, catches, etc., shall operate smoothly, without binding or unnecessary pressure. All defects shall be corrected to the satisfaction of the Owner.

12.03 SCHEDULE

(a) Sliding door, Pilot door and Fire door hardware except locking is furnished under section headed "Sash, Glass and Doors."

(b) Warehouse - Machine Shop and Change House, Wallboard and Calcining Building:

(1) Each Swinging Door:

1-1/2 pairs hinges, 5 x 5 steel full mortise template type loose pin, Federal Specification FF-H-116b, Type 2010½.

(2) Toilet Room and Change Room Doors, each active leaf:

Door Closer, Federal Specification FF-H-121a, Type 3001, Size IV.
Door Pull, Federal Specification FF-H-106a, Type 451.
Push Plate, Federal Specification FF-H-106a, Type 465R.

(3) All Other Doors, Interior and Exterior:

Schlage C 52 PD, all purpose lock. Cambridge, aluminum finish.

(4) Change Room, exterior doors, inactive leaf:

Panic bolts, Federal Specification FF-H-106a, Type 821.

12.03 SCHEDULE (Cont.)

(5) All other double leaf doors, inactive leaf:

Chain and Foot bolts, Federal Specification FF-H-111a, Type F 1023 AC and F 1023 B.

(6) Covered Storage Building:

1-1/2 pairs Richards-Wilcox No. 434-D or equal each door, 1 - 1025-4 Door latch, 1 - 514-3 Heavy top spring bolt and No. 524 Cane Bottom bolt No. 3.

(7) Provide metal thresholds of type indicated where called for on drawings.

(c) Office Building

(1) Each exterior door:

1-1/2 pairs hinges, 5 x 5 wrought bronze full mortise template type, Federal Specification FF-H-116b, Type 2001½.

(2) Each interior door:

1-1/2 pairs hinges, 4 x 4 wrought steel, Federal Specification FF-H-116b, Type 2014½.

(3) Toilet room doors:

Door closer, Federal Specification FF-H-121a, Type 3001, Size IV.
Door pull, Federal Specification FF-H-106a, Type 451.
Push plate, Federal Specification FF-H-106a, Type 465R.

(4) Exterior and Vestibule Doors:

Door closer, Federal Specification FF-H-121a, Type 3001, Size IV.

(5) All doors, except toilet doors, interior and exterior:

Schlage C 52 PD, all purpose lock. Cambridge, aluminum finish.

(d) Sliding doors and Pilot doors

Provide heavy industrial type latches with keepers for all doors on the East, North and South elevations of the Wallboard Building and all doors in the Warehouse - Machine Shop.

SASH, GLASS AND DOORS

13.00 SCOPE

The work under this specification consists of furnishing and installing steel sash, glass and doors for the office and plant buildings.

13.01 SHOP DRAWINGS

The Contractor shall submit two (2) prints each of all shop drawings for the approval of the Owner, and shall make such corrections in shop drawings as are required, and re-submit two (2) prints of corrected drawings for final approval. The Contractor shall file with the Owner one (1) duplicate tracing of all approved drawings. Owner will approve drawings for design only and such approval shall not relieve the Contractor of the responsibility for any errors or omissions on the shop drawings.

13.02 MATERIALS

(a) The steel sash shall be Ceco or equal, fixed and pivoted commercial or architectural projected type as shown on the drawings. Sash shall be designed for inside glazing, ventilators shall be equipped with rust proof malleable iron or steel latch bar. Contractor shall furnish all clips, anchor bolts for installing sash and wire glazing clips for double strength glass.

All steel sash shall be processed by Bonderizing. Following the Bonderizing process the sash shall be painted with a special primer for metal treated with phosphates which shall be baked on for at least 1/2 hour at a temperature of 300°F.

(b) Clear window glass shall be double strength, B quality, of an average weight 24.5 ozs. per sq. ft. and shall conform to Federal Specification DD-G-451.

Obscure glass shall be "Luxlite" or equal as manufactured by the Mississippi Glass Company.

Rib wire glass in door lights shall be Type E, wire glass conforming to Federal Specification DD-G-451.

(c) Putty for glass shall be special steel window plate.

(d) Office and Man Doors

(1) Wood doors in office building and warehouse building are covered under paragraph heading "Carpentry."

(2) All other swinging doors shall be Overly Kalamein type non label or equal with 16 gauge pressed metal frames as shown on the drawings.

(3) Fire doors shall be Class A Underwriters Label doors complete with

13.02 MATERIALS (Cont.)

Underwriters approved hardware. On vertical sliding doors Contractor shall provide the required structural support between jambs at top to support weight of door and counterweights.

(4) Vertical sliding and horizontal sliding, non label, doors shall be constructed with structural steel frame, No. 24 gauge corrugated galvanized sheet metal cover (one side), counterweights for vertical doors and all sheaves, cables, rollers and guides. All horizontal sliding doors shall be provided with lock joint track and hangers with roller bearing wheels of the weight specified by door manufacturer, end stops, stays, rollers, and guide roll strips. Doors shall be designed for a wind load of 15 lbs. per sq. ft. with deflection under design load not to exceed 0.05 inch per ft. of span. 18'-0" x 10'-0" doors shall be furnished with hand chain operators. On vertical sliding doors Contractor shall provide the required structural support between jambs at top to support weight of door and counterweights. Hinged doors in covered storage building shall be Richards-Wilcox No. 467 or equal.

(5) Steel Roll Up Fire door shall be Kinnear "Akbar" or equal Underwriters Label door.

(6) Provide tin clad doors for Belt Hole openings complete with Underwriters Label and approved hardware.

13.03 INSTALLATION

(a) All sash shall be set plumb and true, properly aligned and securely anchored.

(b) All glass shall be accurately cut to fit openings and set with equal bearing on all edges. Glass shall be secured with spring wire glazing clips.

Putty shall be run along all four edges and on each side of the pane in neat straight lines parallel with the inside of muntin or glazing rebate. Corners shall be carefully made and excess putty removed and surfaces left clean.

(c) Contractor shall drill all holes for installation of doors, hardware, weatherstrip and shall furnish all bolts and screws or other means of attachment required for the complete installation thereof.

(d) Doors shall be properly adjusted, all hardware oiled, and shall operate freely without binding or excessive pressure.

PLASTER AND STUCCO

14.00 SCOPE - The work under this section consists of furnishing and installing all lath, metal studs and furring, plaster and exterior stucco as shown on drawings and specified herein.

All interior plaster shall be gypsum plaster.

14.01 MATERIALS

(a) Gypsum Plaster shall conform to A.S.T.M. "Standard Specification for Gypsum Plaster" C28-40, as manufactured by Kaiser Gypsum Company.

(b) Sand shall be washed conforming to A.S.T.M. "Standard Specification for Sand for use in Plaster" C35-39.

Sieve	Percentage Retained	
	Maximum	Minimum
No. 4	0	...
No. 8	10	0
No. 30	80	15
No. 50	95	70
No. 100	...	95

(c) Lime shall conform to A.S.T.M. "Standard Specification for Normal Finishing Hydrated Lime" C6-44.

(d) Keene's Cement shall conform to A.S.T.M. "Standard Specification for Keene's Cement" C61-40.

(e) Expanded Metal Lath shall be mesh copper alloy steel, painted, weighing 3.4 lbs. per sq. yd.

(f) Lath for gypsum plaster in office building shall be Kaiser perforated gypsum lath 3/8" thick.

(g) Portland Cement shall conform to Standard Specification, A.S.T.M. Serial Designation C-150, latest revision.

(h) Sand for stucco shall conform to Standard Specification, A.S.T.M. Serial Designation C-35, except that it shall be graded within the following limits:

Passing No. 4 Sieve	100%
Passing No. 8 Sieve	80-98%
Passing No. 16 Sieve	60-90%
Passing No. 30 Sieve	35-70%
Passing No. 50 Sieve	10-30%
Passing No. 100 Sieve	Not more than 10%

14.01 MATERIALS (Cont.)

(i) Water shall be potable, free from organic material, injurious acids or alkalis.

(j) Waterproof Paper - A.S.T.M. Serial Designation D-250, 15 lb. felt.

(k) Metal Reinforcing shall be a 1 inch stucco mesh, fabricated from not lighter than 20 gauge galvanized steel wire.

(l) Nails shall be a galvanized stucco furring nail 1-1/2 inches long.

(m) Coloring shall be commercially pure mineral oxides which are unaffected by lime, cement or action of the elements.

(n) Furring Channels shall be 3/4", weighing not less than 300 lbs. per 1000 lineal ft. Main ceiling runners shall be 3" hot rolled channels weighing not less than 4.1 lbs. per lineal ft. Metal studs shall be 3-1/4", 16 gauge, weighing not less than 720 lbs. per 1000 ft., Milcor or equal.

14.02 LATHING AND APPLICATION

(a) Metal Lath shall be stretched tight and flat with a lap of one full mesh on sides and two full meshes on end joints and securely nailed with galvanized nails at not more than 6 inch centers.

Joints shall be staggered and shall be at least one foot from corners or angles in lieu of returning the metal lath. Where column occur in walls and partitions the metal lath shall be carried around and cover the exposed faces of columns and shall be secured in an approved manner.

(b) Gypsum Lath shall be applied with long dimension at right angles to the studs or joists, with 13 gauge, 1-1/8" long, 3/8" flatheaded, blued nails approximately 5 inches on center at every stud, and not less than 3/8" from edges or ends. There shall not be less than four nails per lath per support. End joints in adjoining courses shall be staggered.

(c) On suspended ceilings, main runners shall be spaced 4'-0" o.c., suspended from each purlin by means of 8 gauge annealed wire and clamp type hangers. Furring channels shall be spaced 16" o.c. and securely wired to each main runner.

(d) Metal Studs shall extend from floor to the structural framing of the roof and shall be provided with floor and ceiling tracks which shall be substantially attached to floor and roof framing. Provide 3/4" horizontal stiffener channels with webs horizontal at mid-height.

(e) Where indicated on drawings, provide 6" flush metal base of not lighter than 18 gauge galvanized steel.

14.03 PROPORTIONS AND COATS

(a) Scratch and brown coat shall be gypsum plaster mixed in the following proportions:

Scratch coat; 1 part gypsum plaster to not more than 2 parts sand by weight.

Brown coat; 1 part gypsum plaster to not more than 3 parts sand by weight.

(b) The finish coat over gypsum plaster on walls shall be Keene's cement, hard finish, mixed in the proportions of one part of lime putty to three parts of Keene's cement by volume.

(c) Gypsum sand float finish on ceilings shall be mixed in the proportions of one part of gypsum neat unfibered plaster to not more than two parts of sand by weight.

14.04 MIXING

Plaster shall be machine mixed for not less than one minute and not more than three minutes. The mixer shall be cleaned of all set or hardened material before materials for a new batch are loaded, and no material which has partially set shall be retempered or used.

14.05 WORKMANSHIP

(a) Plaster shall finish not less than 3/4" thick. Plastered surfaces shall be clean, true, even, out of wind, and free from cracks, blisters, pits, checks, crazing and discoloration. Plaster work shall be formed carefully around angles and well up to grounds. The brown coat shall be worked to screeds, and floated to a compact, true surface, plumb, level and shall be free from projections and loose particles. Finish coats shall be applied over a thoroughly set base coat which is nearly but not quite dry and trowelled to straight, smooth, uniform hard surfaces. Finish coat shall be not less than 1/8 inch thick. All internal angles shall be square.

(b) Damaged or discolored or imperfect plaster shall be removed. All patching shall match existing work in texture and color and shall be finished smooth and to a true plane at the joining with plaster applied previously.

14.06 APPLICATION OF REINFORCEMENT FOR STUCCO

(a) The wire mesh shall be applied over the building paper by starting the first width at the roof line and extending around the building. The second width shall lap the first at least 2 inches, lapping so that wire laps against wire. Vertical joints shall be staggered and lapped 3 inches and shall not be made at the corners or under or over openings.

14.06 APPLICATION OF REINFORCEMENT FOR STUCCO (Cont.)

It shall be carried up to the openings or under the moldings of all doors and windows. For added protection at the corners of window or door openings, an 8" x 12" strip of lath shall be applied diagonally to provide double reinforcing.

Nailing shall be over stud lines only, 6" o.c. vertically over each stud and at a 6" interval around all openings. Furring nails shall penetrate the support not less than 1", and shall hold the reinforcement 1/4" away from the backing.

(b) Building paper shall be lapped a minimum of 3" at edges and ends.

14.07 MIXING AND APPLICATION OF STUCCO

(a) Stucco shall be machine mixed a minimum of two minutes after all materials are in the mixer, and applied in accordance with the following table:

Coat	Maximum Volume of Sand Per Volume of Cement	Minimum Thickness	Minimum Period Moist Curing	Minimum Interval Between Coats
First	3-1/2	3/8 inch	48 hrs.	
Second	3-1/2	(1st & 2nd coats)-3/4"	48 hrs.	
Third	*2	1/8 inch		7 days

*Approved prepared finish coats containing not less than 1/3 Portland cement by weight may be used.

Hydrated lime not exceeding 1/10 part by volume may be added to the mix to improve workability. An approved waterproofing admixture shall be added to the mix in the proportions recommended by the manufacturer.

(b) The first coat shall be forced through all openings in the reinforcement so as to solidly fill all spaces, and shall be scored in two directions at approximately right angles to each other. The second coat shall be rodded and water floated, and shall be finished to true planes with no variation greater than 1/4" under a 5 ft. straight edge. The third coat shall receive an integrally colored sand floated finish, color as selected by the Owner.

14.08 SHRINKAGE CRACK CONTROL - EXTERIOR STUCCO - The following provisions shall be incorporated in the work to control cracks caused by shrinkage of portland cement stucco.

(a) Wire mesh shall not be lapped around corners. Provide light gauge metal strips in form of 3/4" x 3/4" angles to break bond and to provide a sliding joint between ceiling and wall stucco and at wall corners.

14.08 SHRINKAGE CRACK CONTROL - EXTERIOR STUCCO (Cont.)

(b) At all perpendicular projections through stucco such as fixture outlets, pipes, columns, and door or window casing provide 1/4" x 3/4" felt strips to break bond and permit movement.

PAINTING

15.00 SCOPE

(a) The work under this specification includes the furnishing of all materials, supplies, tools and equipment, the erecting and subsequent removal of all scaffolding, the preparation of surfaces and application of paint to all surfaces (except wood; walkways, platform and dock, galvanized; roofing and siding and contiguous flashing, galvanized hoppers, bins, ducts and cyclones; machinery, electric motors, galvanized piping, conduit and galvanized switch boxes, and toilet partitions) as indicated on the drawings and specified herein.

(1) It is the intent of this specification to include the painting of all metal, wood, gypsum and plaster surfaces except as noted, which are a part of the new construction. The Contractor shall include as a part of the work any miscellaneous metal surfaces not specifically mentioned herein. Coating of such surfaces shall be similar to those specified for the major items of work.

(2) Painting of structural steel shall also include the painting of all base plates, anchor bolts, ladders, platforms, railings, and plate, exposed black piping, mesh partitions, exposed surfaces of poured gypsum roof slab framing steel, exterior surfaces of stacks, bins and all other miscellaneous iron and steel items which are a part of the work and all switchboards, panelboards which are not provided with a permanent factory finish.

(3) Painting of sheet metal shall include all ventilators, flashings, gutters and downspouts and gravel stops.

(4) Exposed piping shall be painted the same as the background surface.

(b) All structural steel will be shop primed. The Contractor shall, however, include as a part of the work, the application of any primer or field spotting of the prime coat which may be required to place previously primed surfaces in condition to receive finish coats. The Contractor shall store all material in one place as directed, and shall maintain such storage place in a neat, clean condition at all times.

15.01 SCHEDULE OF SURFACES AND COATS

The following surfaces shall be painted in colors as selected by the Owner at the time of application.

On two coat work the undercoat shall be let down with properly proportioned white one step below the finish coat except aluminum which shall have prussian blue added at the rate of 1/4 lb. 50% paste for each 1-3/4 lb. of Standard Paste No. 205 for the purpose of visual inspection of the coverage.

(a) Structural Steel Framing

Federal Specification TT-P-86a, Type II for spotting prime coat.

15.01 SCHEDULE OF SURFACES AND COATS (Cont.)

Two coats Federal Specification TT-P-40, Type I, Class B, except that a non-chalking rutile titanium dioxide TT-T-425, Type III, Class C, shall be used.

(b) Steel Oil Storage Tank, Exterior Platework, Bins and Metal Partition in Wallboard Building, Column Row 6

Two coats Aluminum Pigment Powder TT-A-468a, Type I, Class B, mixed with Aluminum Paint Mixing Varnish TT-V-81b, Type II, Class A, mixed at the rate of 2 lbs. per gallon. Exterior of tanks and bins only.

(c) Stacks from Boiler and Kettles

Two coats Thurmalox No. 10 Heat Resisting Aluminum as manufactured by the Dampney Company, applied as received without thinning.

(d) Sheet Metal Ventilators, Flashings, Gravel Stop, Gutters and Downspouts Office and Warehouse - Machine Shop and Change House

One coat Zinc Dust and Zinc Oxide Primer meeting the requirements of Federal Specification TT-P-641, Type I, Class A.

Two coats Enamel, gloss, meeting the requirements of Federal Specification TT-E-489, Class A.

(e) Steel Sash, Interior and Exterior

Two coats Enamel TT-E-489, Class A.

(f) Metal Covered Doors and Metal Frames, Roll Up Doors and Fire Doors Except Galvanized Corrugated Metal Covered Doors

One coat Zinc Dust and Zinc Oxide Primer TT-P-641, Type I, Class A.

Two coats Enamel TT-E-489, Class A.

(g) Interior Wood Beams, Ceiling and Joist Hangers and Concrete Above Dado in Warehouse and Machine Shop

One coat primer TT-P-25a on woodwork.

One coat primer TT-P-56a on concrete.

One coat paint, ready mixed, TT-P-102, Class A, on concrete and woodwork.

(h) Interior Concrete Walls, Machine Shop Below Dado

One coat Primer Sealer TT-P-56.

Two coats ready mixed paint TT-P-102, Class B.

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15.01 SCHEDULE OF SURFACES AND COATS (Cont.)

(i) Interior Wood Beams, Ceiling and Concrete Walls Above Dado in Change Room

One coat Primer TT-P-25a on woodwork.

One coat Primer TT-P-56a on concrete.

Two coats Enamel TT-E-506b, Class B, on concrete and woodwork.

(j) Interior Concrete Walls in Change Room and All Toilet Room Walls

One coat Primer TT-P-56a.

Two coats Enamel TT-E-506b, Class B.

(k) Interior Gypsum Board and Plaster Except Walnut Grained Board

One coat Primer TT-P-56a.

Two coats Enamel TT-E-508.

(l) Plywood Exterior

One coat Primer TT-P-25a.

Two coats Enamel TT-E-489, Class A.

(m) Plywood Interior

One coat Primer TT-P-25a.

Two coats Paint TT-P-103.

(n) Wood Doors, Frames and Cabinet Work

One coat Primer TT-E-543.

Two coats Enamel TT-E-506, Class B.

(o) Birch Plywood and Oak Benches

(1) Birch Plywood -

Two coats Shellac Varnish TT-V-91a, Type I, Grade A.

One coat Varnish TT-V-121c.

(2) Oak Benches -

One coat primer TT-P-25a.

Two coats Enamel TT-E-489, Class A.

15.01 SCHEDULE OF SURFACES AND COATS (Cont.)

(p) Exterior Wood Trim and Framing Except Redwood

One coat Primer TT-P-25a.

Two coats Enamel TT-E-489, Class A.

(q) Concrete Block, Exterior Surfaces and Both Surfaces of Parapet Walls

Two coats Hydrocide S-X Colorless or equal, applied at the rate of 1 gallon per 125 sq. ft. for each coat.

(r) Redwood

Two coats Cabots No. 325 or equal. Redwood Stain.

15.02 PAINT

The paint shall be delivered in unbroken original packages bearing the manufacturer's name and description and Federal specification number, if applicable.

15.03 SEQUENCE OF WORK

The Contractor shall arrange and schedule his work so that all surfaces of structural steel or other contact surfaces may be given two coats of paint on surfaces inaccessible after the installation of galvanized corrugated roofing and siding.

15.04 WORKMANSHIP

(a) Preparation of Surfaces - Before painting, all surfaces shall be dry and clean, free from rust, dirt, grease, scale or other objectionable coating. Body and finish coats shall be applied only to properly primed surfaces. Surfaces of galvanized sheet metal with grease or oil film shall be washed with mineral spirits and wiped dry before application of the prime coat.

(b) All paints shall be thoroughly mixed by the Contractor immediately prior to application to insure proper formulation and weight per gallon. Paints shall be thinned to good brushing consistency but not to exceed 12½% by volume.

(c) Painting - Paint may be applied by brush and/or spraying. The Contractor shall determine from the proper union agent the extent to which spray painting will be permitted under their rules. No paint shall be applied during wet, damp or frosty conditions or when the temperature is below 50°F. Second and finish coats shall be applied only on a thoroughly dry undercoat which, in the judgment of the Owner, is suitable for repainting. The finished paint surface shall be free from pin holes, holidays, sags, runs or other imperfections. Spray equipment shall be

15.04 WORKMANSHIP (Cont.)

of a type capable of producing a workmanlike job free from heavy spots, runs or sags. Air lines shall be equipped with grease and water separators which shall be maintained in clean serviceable condition at all times. The Contractor shall be responsible for the protection of his own work and shall properly protect adjacent surfaces and floors during his operations.

15.05 CLEANING UP

Upon completion of the work, all equipment shall be removed from the premises. All paint spots shall be removed and the work left in acceptable condition.

VINYL TILE FLOORING

16.00 SCOPE

The work under this section consists of furnishing and installing vinyl tile flooring on all floors of Office Building except heater room as shown on the drawings and specified herein.

The work includes furnishing and laying of lining felt over wood subfloors.

16.01 MATERIAL

(a) Tile shall be 3/32 inches thick composed of thermoplastic material of the resinous type. Tile shall be of uniform thickness, accurately cut with true square edges. Color shall be as selected by the Owner. Cove shall be 4" rubber base.

(b) Lining felt shall be 15 lb. asphalt saturated felt meeting the requirements of Federal Specification HH-F-191, Type I.

(c) Adhesive shall be a high viscosity water vehicle rubber base type Minnesota Mining Adhesive No. 60, or equal.

16.02 INSTALLATION

(a) Vinyl tile shall be stored at a minimum temperature of 75° F. for at least 24 hours before installation.

(b) Lining felt shall be laid with butt joints and bonded with adhesive to the subfloor. Felt shall be rolled with a 150 lb. or heavier 3 section roller from the center to the edges. Seams and edges shall be rerolled.

(c) Apply adhesive uniformly and evenly with a smooth trowel at the rate of 100 to 125 sq. ft. per gallon of adhesive and allow to set to a maximum tackiness.

(d) Tile shall be laid from the center of the room out to the walls. After adhering, the tile shall be rolled with 150 lb. or more 3 section roller, starting at the center and working to the edges.

Wipe up surplus adhesive with a damp rag. Surface shall be left clean and smooth.

TOILET PARTITIONS

17.00 GENERAL DESCRIPTION

Metal toilet partitions and sight screen shall be of approved design, of the flush type, with paperboard cores, and shall be equipped with all fastenings, supports, fittings, shoes, hardware and other accessories necessary for a complete and satisfactory installation; they shall have either posts or pilasters and head rails extending across the fronts and all return ends. Posts, pilasters and head rails shall be of plain design, square or rectangular in section, except that posts may be paneled. Doors and panels shall be 1" thick with a permissible variation of plus or minus 1/16"; pilasters shall be 1-1/4" thick of construction similar to that specified for panels. Partition panels and doors shall be 4'-10" high; the dimension between the floor line and the bottom of the doors and panels and from the tops of the doors and panels to the tops of the head rails shall be 12"; the depth of the enclosures and the width between panels shall be approximately as indicated.

17.01 CONSTRUCTION AND INSTALLATION

(a) Metal enclosures shall be secured to the contiguous construction in a rigid and an approved manner, and shall be set straight, plumb, and square and with all horizontal lines level. All surfaces shall be free from waves, warps and buckles. Evidence of drilling of floors or other structural work shall be concealed in the finished work. Operating hardware shall be adjusted as may be necessary to insure the satisfactory operation thereof. All finished surfaces shall be clean, smooth and in approved condition.

(b) Metal sheets and strips for enclosures not specified otherwise shall be of sheet metal with a tight zinc coating which shall be processed to provide a permanent base for enamel or other finish.

The minimum nominal thickness of black steel sheets and/or plates, without any coatings and prior to fabrication, shall be as follows: 0.030" for face plates or doors; 0.036" for face plates of panels and for all edge locking strips; 0.061" for plain posts; 0.049" for paneled posts and for head rails and 0.076" for reinforcement for tapping.

(c) Supports and fittings shall be of plain designs and heavy patterns. Wall supports shall be of wrought steel, malleable iron, or brass. Shoe fittings at bottoms of posts shall be of aluminum alloy, nickel, bronze or chromium-nickel-steel, with through fastenings of metal matching that of the shoe fittings and with expansion screws secured in the floor. Exposed surfaces of aluminum alloy, nickel, bronze or chromium-nickel-steel shall be highly polished.

(d) Cores of doors and panels shall consist of 1 paperboard about 1" thick and weighing about 34 pounds per 1,000 square feet, formed of not less than six layers of corrugated straw paper; or two of interliners, of chip paper liner, weighing about 26 pounds per 1,000 square feet; and outside liners, of 0.016" 100% sulphate four-drinier kraft paper. Liners and

17.01 CONSTRUCTION AND INSTALLATION (Cont.)

corrugations shall be glued together thoroughly.

(e) Doors and panels shall be formed of two steel sheets with U-formed edges and cemented under pressure over the cores and assembled by interlocking the U-formed edges with die-drawn locking strips. Locking strips shall be of the slip type, designed to lock the face plates with a tension grip, and shall be mitered and welded at the corners and, for doors, shall be welded internally to the U-formed edges at points halfway on the vertical edges of the doors. Strips on edges of doors and on edges of panels not in contact with posts shall be uniformly rounded; edges in contact with posts shall be flat, with three hooks in shear. Panels shall be anchored to each post by not less than three steel platehooks 0.076" thick, inserted into the posts through vertical openings, then forced downward drawing the posts and panels tightly together by a tension grip. Partition panels shall be secured permanently by welding their top and bottom corners to at least one post. Partition panels shall be secured at their wall ends by not less than two stirrup brackets through-bolted to the panel and having two bolts into the wall.

(f) Finish - All exposed surfaces of sheet steel and of steel and iron fastenings, fittings, and supports including brass wall supports, shall be given one dip or spray coat of rust inhibitive paint baked on and two coats of synthetic resin baking enamel, each baked on separately; each of the three coats shall be different in color. The color of the finish coat shall be as directed. Surfaces on which each coat is applied shall be clean and dry.

(g) Provide coat hook and toilet paperholder.

PLUMBING

18.00 SCOPE

The work under this section consists of furnishing and installing all hot and cold water (for plumbing fixtures only), sanitary drain and vent piping, plumbing fixtures, electric water heaters and drinking fountains. Water piping and sanitary drain piping shall be connected to piping provided under sections headed "Storm and Sanitary Sewers" and "Piping."

18.01 MATERIALS

(a) Cast Iron Soil, Waste and Vent Piping and Fittings shall be standard weight, cast iron pipe with bell and spigot joints, conforming to ASTM Standard Specification A-74 (latest revision), and shall be coated with coal tar pitch enamel.

(b) Steel Pipe shall be galvanized and shall conform to ASTM Standard Specification A-120 as manufactured from open hearth steel.

(1) Water Piping shall be Schedule 40, galvanized steel pipe, threaded and coupled.

(2) Steel Vent Piping shall be Schedule 40, galvanized.

(c) Fittings - Screwed fittings for Schedule 40 pipe shall be galvanized standard weight steel or malleable iron. Screwed fittings shall conform to ASA Specification B-16c.

(d) Valves - 2 inch and under 150 lbs. standard brass globe valves, threaded, 2-1/2 inch and over shall be IBBM 150 lb. wedge disc gate.

(e) Pipe Hangers shall be perforated strap iron spaced at maximum intervals of 10 ft. Strap hangers for water lines shall be not less than 1" x 14 gage, and for soil, waste and vent piping not less than 1-1/2" x 1/4".

(f) Floor, Wall and Ceiling Plates of nickel plated steel shall be provided at all points where piping passes through floors, walls and ceilings.

(g) Plumbing Fixtures shall be of the make and catalog number specified or equal in quality, size and utility, meeting the Owner's approval, as follows:

(1) Water Closets - "American Standard" F-2223-VS Madera elongated closet 1-1/2" top spud, floor outlet; Church No. 9500-B Moltex black open front seat with check hinge; Sloan Royal No. 110-FYV flush valve.

(2) Urinal (Trough) - "American Standard" P-6460-F (4) four foot acid resisting cast iron trough urinal; B-993 beehive strainer; B-968 - 1-1/2" bag trap; P-6425-A enameled XX #1 automatic flush tank; B-2040-C flush pipe assembly.

18.01 MATERIALS (Cont.)

(3) Urinal (Stall) - "American Standard" F-6230-C Casal wall hung single Sloan Royal 180-YV exposed valve.

(4) Lavatories - "American Standard" P-3139-A 24 x 20 Preston cast iron lavatory combination supply filling with pop-up drain; B-820 supply pipes with stops; B-960 1-1/4" P trap.

(5) Service Sink - "American Standard" P-7700-A Argo 22 x 18 AR enameled cast iron sink; B-997-E strainer; P-7798 enameled inside adjustable trap outlet threaded 2 inch; B-914-HE double faucet bucket hook and hose end-rough plated body and rim guard.

(6) Drinking Fountain - shall meet the requirements of Federal Specification 00-C-566b, Type II, Size 5.

(7) Electric Water Heater - shall be 20-gallon Rheem series 61 with 1000 watt upper element and 600 lower element fully automatic.

(8) Wash Fountain - shall be Bradley Type A.F.A., Bradstone with soap dispenser.

(9) Safety Shower and Eyewash Fountain - shall be Howe Model No. 8975.

(10) Hot Water Heater for Change House

One Ray Model 60 or approved equal, vertical automatic oil-burning water heater having a storage capacity of 60 gallons and a recovery of 220 gallons per hour with 90° temperature rise. The unit shall be complete with insulation and steel jacket and shall automatically maintain a water temperature of 140°F. The burner shall be suitable for firing PS 200 and/or Diesel oil. Electrical characteristics shall be 120 Volt, 60 Cycle. The burner shall be equipped with a positive electric spark ignition for fully automatic control and have all the required safety devices to meet the specifications of the National Board of Fire Underwriters and applicable state and local codes.

18.02 INSTALLATION

(a) Soil waste and vent piping shall be laid in practical alignment and to uniform grade. Vent pipes shall be run to a uniform grade of not less than 1/8" per foot. Drain piping shall be run to a uniform grade of not less than 1/4" per foot. Soil or waste pipe from fixtures shall be equal in diameter to that of the fixture outlet. Each plumbing fixture shall be separately trapped and vented, with traps placed as close to the fixture as practical and with vents not more than 24" from the trap seal. Fixture traps shall have a water seal of not less than 2" and shall be set and supported so as to protect the seal. The arrangement and slope of all piping between fixture traps and vented soil or waste lines shall be such as to prevent the breakage of the trap seal. No supply pipes shall be run in exterior walls.

18.02 INSTALLATION (Cont.)

(b) Plumbing fixtures shall be securely attached to walls, floor or ceiling in an approved manner with bolts and/or screws of brass or other non-ferrous material.

(c) Cleanouts shall be installed in all horizontal runs of soil or waste piping and at the upper terminal of every horizontal run of pipe exceeding 5' in length. Cleanouts shall be installed in readily accessible positions, with 18" clearance in front of the cleanout and shall be provided with a brass plug. The size of cleanouts and plugs shall be required by the plumbing code.

(d) Changes in direction shall be made by use of Y's and long sweep bends, except that sanitary tees may be used in vertical stacks, and short 1/4" bends may be used in soil or waste lines where the flow is from horizontal to vertical. Tees and crosses may be used in vent pipes.

(e) All joints shall be made gas and water tight. Joints in cast iron pipe shall be caulked with oakum and the joint poured with commercial caulking lead and well caulked. Slip joints shall be used only in the trap seal or on the inlet side of the trap.

(f) All roof vents shall be equipped with 26 gage galvanized iron flashing.

(g) Piping - All galvanized pipe, and pipe 3" diameter and under shall have screwed joints. The male end of the pipe shall be reamed to remove burrs, and the threads of both parts cleaned and a leaded thread lubricant applied to the male threads only before making up the joint. Changes in direction of galvanized pipe shall be made by standard galvanized fittings. Branches in threaded and coupled pipe shall be made by standard screwed fittings.

All reducers, caps and plugs for galvanized pipe shall be standard galvanized fittings. Open ends of pipe shall be capped or plugged at all times during the construction to keep the interior of the pipe clean.

Piping shall be laid to slope towards traps or drains.

18.03 TESTS

Prior to backfilling pipe in trenches, the Contractor shall test all piping as follows:

(a) Soil, Waste and Vent Piping shall be tested by filling the vent piping to the roof level.

(b) Water Piping - shall be subjected to a hydrostatic test of 100 p.s.i. All leaks shall be repaired and piping re-tested to the satisfaction of the Owner.

HEATING AND VENTILATING

19.00 SCOPE

The work under this section consists of furnishing and installing heating and ventilating in the Wallboard Building, Office Building, and the Warehouse, Machine Shop and Change House Building as shown on the drawings and specified herein.

19.01 CODES AND REGULATIONS

All equipment and materials used which are represented on the Underwriter's Laboratories, Inc., list of approved materials shall have the Underwriter's listing and shall be so labeled.

All sheet metal duct work shall be in accordance with the American Heating and Ventilating Engineers "Heating, Ventilating and Air Conditioning Guide", latest edition.

All manufactured articles, materials and equipment shall be applied, installed, connected, erected, used, cleaned and conditioned as directed by the manufacturers, unless herein specified to the contrary.

19.02 GENERAL DESCRIPTION OF WALLBOARD BUILDING

(a) Laboratories and Offices

The laboratories and offices shall be heated by convectors using 50 psi steam from the 50 psi plant steam line. Condensate shall be returned to hot well located between Columns 14D and 15D.

The laboratory convectors shall be Trane Type S.W. or approved equal, wall mounted with chain operated dampers. The office convectors shall be Trane Type SFG or approved equal, floor mounted with chain operated dampers. The size and location shall be as shown on the drawings. The radiator valves shall be 1/2" Trane No. 44 or equal. The traps shall be 1/2" Trane Medium Pressure thermostatic or approved equal. Traps and valves for the laboratory convectors shall be located beneath the floor. Traps and valves for the offices shall be located inside the convector cabinets.

(b) Solution Tanks, Dryer Discharge, and Pin Mixer

Spot heating at the solution tanks, dryer discharge, and pin mixer shall be provided by horizontal discharge propeller type unit heaters, Trane Type H with louver fin diffuser or equal, The units shall use 50 psi steam from the 50 psi plant steam line. Condensate shall be returned to the hot well located between Columns 14D and 15D. The size and location of the heaters shall be as shown on the drawings. The heaters shall be multi-speed, wound for 110 volt, single phase, 60 cycle current and furnished complete with selector switch. Control shall be manual through the selector switch.

19.03 GENERAL DESCRIPTION OF OFFICE BUILDING

(a) Space Heating and Ventilating

Building heating shall be supplied through a duct distribution system and oil-fired warm air furnace.

The furnace shall be Ray 230-E or approved equal, fully automatic oil-fired warm air furnace and shall consist of a fan and motors, replaceable type filters, steel heat exchanger with refractory lined combustion chamber, oil burner, and thermostat complete with all accessory local controls and assembled in a steel casing of approved design and with a neat appearance and finish. The burner shall be equipped with a positive electric spark ignition for fully automatic control and have all the required safety devices to meet the specifications of the National Board of Fire Underwriters and applicable state and local codes. The unit shall be suitable for firing PS 200 and/or diesel oil drawn from an underground tank having a total suction lift not exceeding 14 feet. The tank shall be 1000 gallon nominal capacity constructed and installed in accordance with the City of Seattle Code. Electrical characteristic shall be 120 volt, 60 cycle.

The furnace shall have a capacity of 172,000 BTU/Hr. at the bonnet and deliver 2,000 CFM against 3/8" external static pressure.

The registers shall be the double deflection type with integral volume control, Barber-Colman Model MA, or approved equal. Ceiling outlets shall be Barber-Colman SQSD with circular mesh, or approved equal. Barber-Colman deflectrols shall be installed at each register or ceiling outlet take-off.

Return grilles shall be Barber-Colman Model MF with multi-louver damper and removable key.

Temperature shall be controlled by the thermostat furnished with the furnace and shall be mounted in the location shown on the drawings.

(b) Toilet Exhaust System

Toilet exhaust fans shall be Allen Type T Roof Ventilator or approved equal, to deliver 250 CFM at 1/8" static pressure. Perforated grilles with connecting ducts to the fans shall be provided.

19.04 GENERAL DESCRIPTION OF WAREHOUSE, MACHINE SHOP AND CHANGE HOUSE

(a) Space Heating and Ventilating

Building heating shall be supplied through a duct distribution system and oil-fired warm air furnace.

The furnace shall be a Ray 450 or approved equal, fully automatic oil-fired warm air furnace and shall consist of a fan and motor, replaceable type filters, steel heat exchanger with refractory lined combustion

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19.04 GENERAL DESCRIPTION OF WAREHOUSE, MACHINE SHOP AND CHANGE HOUSE (Cont.)

chamber, and oil burner, complete with all accessory local controls and assembled in a steel casing of approved design and with a neat appearance and finish. The burner shall be equipped with a positive electric spark ignition for fully automatic control and have all the required safety devices to meet the specifications of the National Board of Fire Underwriters and applicable state and local codes. The unit shall be suitable for firing PS 200 and/or diesel oil drawn from an underground tank having a total suction lift not exceeding 14 feet. The tank shall be 1000 gallon nominal capacity constructed and installed in accordance with the City of Seattle Code. Electrical characteristics 120 volt, single phase, 60 cycle, 208 volt, single phase, 60 cycle, and for motors over 1/2 HP rating: 208 volt, 3 phase, 60 cycle.

The unit furnace shall have a capacity of 330,000 BTU/Hr. at the bonnet and deliver 4425 CFM against 1/2" external static pressure.

The registers shall be the double deflection type with integral volume control, Barber-Colman Model FA, or approved equal. Barber-Colman SQS, or approved equal ceiling outlets shall be mounted off the underside of the duct where shown on the drawings. The registers and ceiling outlets shall be mounted on four inch collars off the branch ducts and a Barber-Colman Deflectrol or approved equal shall be used at each such take-off.

The return grille shall be Barber-Colman Model MF, or approved equal, with multiple louver damper and removable key.

Temperature shall be controlled by a mercury switch thermostat complete with guard and located as shown in the drawings.

19.05 DUCT WORK

All ducts shall be fabricated from galvanized sheets meeting the requirements of A.S.T.M. Serial Designation A-93, Class C, and as follows:

U.S. Std. Gauge	Maximum Size Inches	Type of Transverse Joint Connections[b]	Bracing
26	Up to 12	S, Drive, Pocket of Bar Slips, on 7'-10" centers	None
24	13 to 24	S, Drive, Pocket or Bar Slips, on 7'-10" centers	None
	25 to 30	S, Drive, 1" Pocket or 1" Bar Slips on 7'-10" centers	1 x 1 x 1/8" angles 4' from joint

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19.05 DUCT WORK (Cont.)

U.S. Std. Gauge	Maximum Size Inches	Type of Transverse Joint Connections[b]	Bracing
	31 to 40	Drive, 1" Pocket or 1" Bar Slips on 7'-10" centers	1 x 1 x 1/8" angles 4' from joint
22	41 to 60	1½" Angle Connections or 1½" Pocket or 1½" Bar Slips with 1-3/8" x 1/8" bar reinforcing on 7'-10" centers[c]	1½" x 1½" x 1/8" angles, 4' from joint
20	61 to 90	1½" Angle Connections, or 1½" Pocket or 1½" Bar Slips 3'-9" maximum centers with 1-3/8 x 1/8" bar reinforcing	1½" x 1½" x 1/8" diagonal angles or 1½ x 1½ x 1/8" angles 2' from joint
18	91 and up	2" Angle Connections or 1½" Pocket or 1½" Bar Slips 3'-9" maximum centers with 1-3/8 x 1/8" bar reinforcing[d]	1½ x 1½ x 1/8" diagonal angles or 1½ x 1½ x 1/8" angles 2' from joint

a) For normal pressures and velocities utilized in typical ventilating and air conditioning systems. Where special rigidity or stiffness is required, ducts should be constructed of metal two gauges heavier. All uninsulated ducts 18 in. and larger should be cross-broken. Cross-breaking may be omitted on uninsulated ducts if two gauges of heavier metal are used.

b) Other joint connections of equivalent mechanical strength and air tightness may be used.

c) Duct sections of 3 feet 9 inch may be used with bracing angles omitted, instead of 7 feet 10 inch lengths with joints indicated.

19.06 INSULATION

Supply ducts in Office Building System shall be insulated with 2 plys Aerocor PF 316 and bound with Fiberglas tying cord half hitched with loops approximately every 8 inches.

19.07 INSTALLATION

All equipment shall be connected to the utilities.

Ventilating fans and motors shall be aligned and mounted and connected in a manner to preclude the transmission of noise and vibration.

19.07 INSTALLATION (Cont.)

Air ducts shall be connected properly to the building openings, grilles and equipment. Supports shall be substantial and braced rigidly to prevent vibration of the ducts. The vertical stiffeners may be extended to form hangers. After completion, the dampers, deflectors and splitters shall be adjusted to provide approved volumes of air flow through the ducts, after which they shall be locked securely in the proper position.

Piping shall have at least 24 inches earth cover and shall be in accordance with the City of Seattle Fire and Explosion Hazard Ordinance.

19.08 ELECTRICAL WORK

All electrical work shall be in accordance with the applicable provisions of the section of the specifications hereinafter headed "Electrical Work".

19.09 TESTING AND ADJUSTING

All equipment shall be lubricated, operated, tested and adjusted in the presence of the Owner. Any defects appearing at the time of tests shall be repaired to the satisfaction of the Owner. The Contractor shall furnish all labor, material and instruments required for testing and adjusting.

19.10 GUARANTEE

The Contractor shall guarantee all equipment and wiring free from inherent mechanical and electrical defects for a period of one year from the date of installation. Any replacement of parts or adjustments, including labor, made necessary by inherent mechanical or electrical defects shall be rendered without cost to the Owner within the guarantee period.

The manufacturer shall furnish gratis to the Owner a one year contract effective from date of installation of maintenance and inspection service of the manufacturer's equipment with a minimum of two inspections during the contract year.

SPRINKLER AND STANDPIPE SYSTEM

20.00 SCOPE

(a) The work under this section consists of furnishing and installing a dry pipe sprinkler and standpipe system for fire protection of the areas shown on the drawings and specified herein.

(b) Contractor shall furnish 50 ft. of hose, nozzle and hose rack installed at each hose station. An automatic fire alarm gong shall be provided and installed as required by the Building Code. Sprinkler wrench and 12 extra sprinkler heads in an appropriate cabinet shall be supplied and installed.

20.01 MATERIAL AND WORK - All material and work which are a part of this system shall be in accordance with the requirements of the City of Seattle and National Board of Fire Underwriters Standards for "Ordinary Hazard Occupancies." Dry pipe valves shall be housed and protected as specified by N.B.F.U.

20.02 TESTS AND APPROVAL - Contractor shall prepare all detail plans, bills of material and specifications and obtain necessary approvals of the authority having jurisdiction and shall perform all tests and obtain certificate of approval upon completion of the work. One copy of certified plans, specifications and certificate of approval shall be filed with the Owner.

PIPING

21.00 SCOPE

(a) Piping shall consist of furnishing and installing of all utility piping and includes high and low pressure water piping, fire protection mains and hydrants outside the buildings, salt water supply piping, process piping, fuel oil, compressed air, and steam piping including their connections to all equipment.

(b) Contractor shall arrange for and include as part of the cost of the work, the connection between the 30" city main east of East Marginal Way and Owner's service including meter near the north east corner of the wallboard building. This connection shall be not less than 10" diameter pipe and shall be constructed in accordance with the City of Seattle standards.

(c) Piping shall include all pipe, valves, fitting, controls, meters, insulation and other material and work required for complete ready-to-operate installation as shown on drawings and specified herein.

21.01 MATERIAL

(a) Water piping shall conform to the following standard specifications:

(1) Connection to City of Seattle main - cast iron, Class D, bell and spigot, A.W.W.A. C-100.

(2) Fire protection piping 6" diameter and over shall be Schedule 40 black, bevel end, conforming to A.S.T.M. A-135 or A-139.

(3) All other fresh water piping and process piping except "Saran" lined shall be Schedule 40 conforming to A.S.T.M. A-120. Pipe 2" diameter and under shall be galvanized, threaded and coupled; over 2" diameter, black, bevel end.

(4) All under ground steel piping, except galvanized, shall be coated and wrapped.

(5) Salt water piping from hose at pump to 4" x 3" reducer at cyclone shall be Class 100 asbestos cement pipe conforming to A.S.T.M. Specification C-296. Couplings for straight runs of pipe shall be Simplex rubber ring type. All other fittings for asbestos-cement pipe shall be Tifco cast iron rubber ring fittings. All other pipe shall be Schedule 40 black with 125 lb. standard C.I. flanged fittings. Provide galvanized clamps and tie rods of adequate strength at all bends to prevent movement of the pipe and to resist reaction due to internal pressure. Provide hose and spray nozzles as indicated on drawings; 1" I.D. spray hose shall be Goodyear Wingfoot Cord; 8" slurry hose shall be Goodyear Style W.

(b) Steam and condensate return piping shall be Schedule 40 black, con-

21.01 MATERIAL (Cont.)

forming to A.S.T.M. A-53 and A-135, Grade A. Steam piping shall be electric resistance welded pipe. Low pressure steam piping (50 p.s.i.) may be threaded and coupled; all other shall have welded joints. Pipe 2" diameter and larger shall have bevel ends.

(c) Fuel oil piping shall be Schedule 40 black, conforming to A.S.T.M. A-53, Grade A. Pipe 2" diameter and over shall have bevel ends. Joints in pipe under 2" diameter shall be socket welded. Where placed underground pipe shall be coated and wrapped.

(d) Compressed air piping shall be Schedule 40 black, threaded and coupled, conforming to A.S.T.M. A-120.

(e) Pipe and fittings from Concentrate Mix Tank to pump, drain and Solution Tank and from Solution Tanks to Cup Feeders and Pin Mixer shall be Saran lined steel pipe and Saran injection molded fittings of sizes indicated.

(f) Welding fittings shall be steel butt welding fittings of the same material and wall thickness as the run of pipe in which they are to be installed, except socket weld fitting 2" and under in steam and oil lines, which shall be 2000 lb. WOG.

(g) Screwed fittings 2" diameter and under for high pressure, low pressure, and fire protection water piping shall be 150 lb. malleable iron, galvanized; for fuel oil 2000 lb. WOG; for compressed air 150 lb. malleable iron.

(h) Flanges for 200 p.s.i. steam piping shall be 300 lb.; all other flanges shall be 150 lb. Standard forged steel butt-welding flanges.

(i) Gaskets shall be 1/16" thick compressed asbestos.

(j) Bolting for steam service shall conform to A.S.T.M. A-193, Grade B7, and A-194, Grade 2; for all other service, A-107.

(k) Unions for steam service shall be 2000 lb. WOG; for all other services 150 lb. Standard malleable iron.

(l) Valves shall be manufacturers' standard or equal for the specified pressure and temperature. Facing and drilling shall conform to American Standard B16.

(1) Valves for high pressure steam service shall be 600 lb. Standard cast steel socket welding for 2" and under; over 2" 300 lb. Standard cast steel, flanged. Valves for 50 lbs. and under steam service shall be as shown.

(2) Valves for high and low pressure domestic, fire protection and salt water shall be 125 lb. Standard, iron body brass trim, flanged for 2-1/2" and over; 2" and under 150 lb. Standard, brass, rising stem,

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21.01 MATERIAL (Cont.)

screwed; gate valves shall be solid wedge; globe valves shall have composition disc. Underground gate valves in valve boxes shall be non-rising stem.

When required on buried lines, provide cast iron extension valve boxes with cover marked "Water." Provide extension key or keys as required.

(3) Valves for compressed air shall be 150 lb. Standard, brass, rising stem, screwed; gate valves shall be solid wedge; globe valves shall have composition disc.

(4) Valves for fuel oil shall be 125 lb. Standard, all iron for 2" and over; under 2" 600 lb. Standard socket welding, cast steel.

(5) Compressed air quick acting hose couplings shall have built in check valves which positively close and seal the coupling against leakage when the hose is uncoupled.

(6) Valves in Saran lined pipe shall be Saran lined Grinnell-Saunders diaphragm valves of sizes indicated.

(7) Relief valve in Booster pump bypass shall be J. C. Lonegran Model TR or equal.

(m) Fire hydrants - shall be 5" A.W.W.A. Standard 7 F.3 with 2 2-1/2" hose nozzles and 1 pumper nozzle. Hose threads shall conform to City of Seattle standards. Provide post indicator valves as indicated.

(n) Preformed pipe insulation shall be mineral wool molded-type conforming to A.S.T.M. Standard C281-52T. For 200 p.s.i. steam the nominal thickness shall be 1-1/2" for pipe up to 4" diameter and 2" for pipe over 4" in diameter; all other shall be 1" nominal thickness.

(o) Provide fuel oil meters at each kettle burner and at boiler - Bowser Xacto 460-15-1.

(p) Flexible Tubing shall be U.S. Flexible Specification F 15 steel tubing with heatproof couplings.

21.02 PIPE COATINGS

(a) Coating and Wrapping and Inside Enamel where specified shall be in accordance with A.W.W.A. Specification C-204, finished with kraft paper.

(b) Pipe with welded joints shall be field coated and wrapped after testing in the same manner. All fitting in pipe having protective coatings shall have the same protective coatings as the run of pipe.

21.03 INSTALLATION

(a) All outside water lines shall be underground with a minimum bury of three feet over the top of pipe. High pressure and fire protection water pip-

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21.03 INSTALLATION (Cont.)

ing shall have welded joints except where connections to valves require flanges. Low pressure water piping shall be made up with screwed joints. Asbestos cement pipe installed underground shall be laid on wood blocks conforming to the pipe manufacturer's recommendations. Wood blocks shall be located at the points indicated on the pipe and tamped firmly to grade, following which the pipe shall be lowered into the trench and the couplings assembled in accordance with the manufacturer's instructions. Concrete thrust blocks shall be provided at all changes in direction and at dead ends. Where supported on piling or other structures, the pipe shall be supported by substantial brackets as indicated on the drawings. The minimum requirement shall be two supports for every other length, and one center support at intermediate lengths. An allowance for expansion and contraction shall be made by separating the ends of the pipe in the coupling not less than 1/4". In the vertical run of pipe up the side of the Calcining Building, each length of pipe shall be substantially attached to the building by not less than two supports which shall be so designed that they carry the total load of the pipe and/or its reaction due to internal pressure.

(b) Oil piping - shall in general be run above ground. The unloading line from dock to storage tank shall be attached to the dock and conveyor structures, and shall be sloped to drain back to the barge connection. The oil distribution system from the tank to boiler house and within buildings and to equipment as indicated shall be steam traced. Where indicated adjacent to equipment tracer shall be copper tubing. All joints shall be welded except where flanged connections are required to valves and equipment.

(c) Steam, condensate return and compressed air piping shall be run above ground, except as otherwise shown. Piping larger than 1" diameter shall be joined by welding, except where connections to valves or equipment require flanges.

(d) The fabrication of piping and welding of joints shall conform to the requirements of the American Standard "Code for Pressure Piping." Welders shall be qualified in accordance with the provisions of paragraph 632 of the above code.

Changes in direction, size, and connection to other piping shall be made by standard fittings. Where shown on the drawings, connections shall be made by the use of welding neck flanges. Open ends of pipe shall be capped or plugged at all times during the construction to keep the interior of the pipe clean. Pipe shall be accurately laid to grades and alignment shown on the drawings.

Pipe supports and hangers shall be fabricated to the details shown on the drawings, accurately set to grade and alignment, and grouted and/or bolted in place. Cement grout shall consist of 1 part Portland cement and 2 parts sand to which shall be added sufficient water to obtain the required consistency.

21.03 INSTALLATION (Cont.)

After fabrication all structural steel supports and hangers shall be given a prime coat of red lead and linseed oil primer, and after erection all abrasions of the prime coat and all bolts and nuts shall be spot primed.

(e) Fire hydrants shall be provided with gravel drain and concrete blocking to undisturbed earth.

21.04 INSULATION - Steam piping, condensate return piping, and steam traced oil lines shall be insulated and protected with a canvas or weatherproof jacket as follows:

(a) Sections of preformed insulation shall be tightly butted, and each section banded with three 1/2" x .015" Acme insulation bands, uniformly spaced on 12" centers. At each point of support where movement occurs, metal saddles of not lighter than 12 gauge metal shall be provided and securely attached to the insulation.

(b) Insulation shall cover all valves and fittings, but not including gauges, moving parts, steam traps or piping directly connected with the trap. Insulation for valves and fittings shall in general be cut from sections of preformed insulation, with all joints cemented with asbestos cement and finished off smooth with hard finish asbestos cement to a uniform total thickness not less than that of the adjacent pipe. The insulation shall be stopped a sufficient distance from flanges so that bolting can be removed without damage to the insulation or the weatherproofing. The insulation shall be beveled down to the pipe at an approximate 45° angle. Where cut sections of preformed insulation can not be utilized to insulate valves and/or fittings, they shall be wrapped with mineral wool felt applied in the same thickness as the pipe covering. The layers of felt shall be wired in position and overlaid with 1" wire mesh, to which shall be applied a 1/2" thick layer of high temperature insulating cement.

(c) Steam traced oil lines shall be wrapped with 1/2" mesh hardware cloth around all pipe and bound with wire loops not less than 3 to each section, and insulated with half sections of preformed pipe insulation of proper pipe size with block insulation of the same thickness laid between and held in place with 3 loops of 16 B & S gauge wire, and the joints filled with insulating cement.

(d) The insulation of all exterior piping shall be covered with a layer of asphalt saturated rag felt weighing not less than 40# per 108 sq. ft. Joints shall lap 2" and shall be cemented with lap cement. Longitudinal joints shall be made with the lap down. The felt covering shall be bound with #16 B & S gauge copperweld wire with laps spaced not to exceed 4" centers. The felt covering shall be drawn tightly around the pipe and left smooth and free from wrinkles.

(e) All interior piping shall be enclosed in a jacket of 8 oz. canvas sewed

21.04 INSULATION (Cont.)

on. Seams shall be located where least visible, and stitches shall be not less than three to an inch. All insulation of valves and fittings shall be neatly finished with an 8 oz. canvas jacket, cemented on. All canvas jackets shall be finished by painting with one coat of glue sizing.

21.05 PAINTING - All bare piping above ground exposed to the weather, except galvanized, shall be cleaned of all rust, scale, grease or other foreign substance, primed with a Bitumastic primer, and painted with two heavy coats of Bitumastic No. 50.

21.06 TESTING - Prior to backfilling or covering joints, Contractor shall test all piping under hydrostatic pressure as follows:

(a) High pressure and fire protection water lines 200 p.s.i.

(b) Low pressure and industrial water lines 100 p.s.i.

(c) Oil piping 150 p.s.i.

(d) Steam and condensate return piping 300 p.s.i.

(e) Compressed air piping 150 p.s.i.

All joints shall be inspected under test pressures and all leaks repaired and the line retested to the satisfaction of the Owner.

21.07 FIRE FIGHTING EQUIPMENT

Provide 200 ft. of 2½" cotton rubber lined hose with play pipes and all standard equipment, including Figure 1 hose house at each hydrant, as specified in N.B.F.U. Pamphlet No. 25.

ELECTRICAL

22.00 SCOPE

a. The Contractor shall furnish all labor, materials, tools, transportation, equipment, temporary work of every nature, service, and facilities required for the complete, proper and substantial installation of electrical work as shown on the drawings and specified herein.

b. The work shall include all materials, appliances and apparatus not specifically mentioned herein or noted on the drawings as being furnished or installed by Others, but which are necessary to make a complete working installation of all electrical systems shown on the drawings or described in this specification.

c. The electrical work shall include the following items:

1. The substation including provisions for placing but not furnishing or placing of the high voltage switchgear or power transformers.

2. All wiring in the substation except the high voltage wiring between the utility pole and the high voltage side of the transformers.

3. The current transformers and metering equipment furnished by Others shall be mounted by the Contractor in the low voltage switchgear.

4. All feeder service from the low voltage switchgear to the plant electrical service equipment.

5. Motor control centers.

6. Lighting transformers, panel boards, cabinets and receptacles.

7. Telephone cabinets, conduit and outlets.

8. Lighting fixtures and lamps.

9. Signal systems and intercommunication systems.

10. Wiring and connections to motors and control centers and installing control centers with associated control devices.

11. All wiring for heating and ventilating equipment.

12. Grounding as required by codes, ordinances and drawings.

13. Furnishing and installation of a 9 gauge, 8-foot chain link fence around the substation. The fence shall have an equipment gate and man gate on opposite sides of the

22.00 SCOPE (Cont.)

enclosure. The fence shall be grounded in accordance with code requirements.

14. Arrange with the City Light and Power Company for the construction of the substation and coordination of the work therein.

22.01 COOPERATION WITH OTHER CONTRACTORS

The Contractor for electrical work shall cooperate with other contractors doing work on the building as may be necessary for the proper execution of the building as a whole.

22.02 INFORMATION TO BE OBTAINED IN FIELD

Contractor shall by field examination and examination of the plans and specifications for "Heating and Ventilating", and by field determination of the electrical requirement of equipment furnished by Others, thoroughly acquaint himself with all details of the work required under this specification which are not clearly shown on the drawings.

22.03 RULES AND REGULATIONS

a. All work and materials shall be in full accord with the latest rules of the National Board of Fire Underwriters, of the State of Washington and City of Seattle Electrical Codes, laws and ordinances regulating the jurisdiction and authority of the State and City Fire Marshals and the prevailing rules of the State of Washington, Department of Labor and Industry, Division of Safety.

b. When these specifications call for or describe materials or construction of a better quality or larger size than required by the above mentioned rules and regulations, the provisions of the specifications shall take precedence over the rules and regulations.

c. The Contractor shall furnish without any extra charge any additional material and labor when required for the compliance with the rules and regulations, though the work not be mentioned in these specifications or shown on the plans.

22.04 LICENSES, PERMITS, AND FEES

The Contractor shall provide, procure and pay for all permits, licenses, fees, etc., required to carry on and complete his work.

22.05 SUBMITTAL OF SHOP DRAWINGS

a. Within a reasonable time after award of Contract and in ample time to prevent delays in construction, the Contractor shall submit to the Owner for approval the shop drawings listed below and/or noted hereinbefore. These shop drawings shall be submitted in addition to the list of materials required by the "Materials and Substitution" section of the specification.

b. The shop drawings shall be completely dimensioned, giving the plan together with such sections as shall be necessary to clearly show construction. The drawings shall be submitted, revised as directed, and resubmitted for final approval.

c. The Contractor shall check all drawings whether his own or those of his suppliers to determine that the Owner's specifications are complied with. Further, the Contractor shall be fully responsible for observing the need for, and making changes which may be required by the equipment he proposes to supply, both as pertain to his own work or any work covered by sections of these specifications.

d. Shop drawings shall be submitted for the following equipment:

1. Main Switchboard.

2. Distribution Switchboards, Lighting and Receptacle Panelboards.

3. Intercommunication System Equipment.

4. Signal Systems.

5. Telephone Terminal Cabinets and Pull Boxes.

6. Pull Boxes and Handholes.

22.06 ELECTRICAL DISTRIBUTION SYSTEM

The electrical distribution system shall be 3-phase, 3-wire, 440-volt for power and 3-phase, 4-wire SN, 120/208 or 3-wire SN, 120/240 volts for lighting.

22.07 MATERIALS - GENERAL

a. Material specified by manufacturer's name and catalog designation is for the purpose of defining quality and utility only. Electrical equipment equal in quality and utility will be accepted subject to approval by Owner, but the burden of proof as to the equality of any proposed substitution shall be upon the Contractor.

22.07 MATERIALS - GENERAL (Cont.)

b. All electrical materials and equipment shall bear the label of the Underwriters' Laboratories, shall be listed by them in their list of Electrical Fittings, and shall be approved by them for the purpose for which they are to be used unless the equipment or material is of a type for which the Underwriters' Laboratories do not list or provide a label service.

c. Within fifteen days after the award of the contract, a list of materials for the electrical work shall be submitted for consideration to the Owner. This list shall be submitted in quintuplicate. Any proposed substitution which may be offered shall be accompanied by blue prints and complete data, of the proposed substitutions. The material list of the equipment shall include type of finish where applicable.

22.08 CONDUIT

a. Conduit shall be full weight, rigid iron pipe, galvanized or sherardized. Each length shall bear the label of the National Board of Fire Underwriters.

b. Galvanized or sherardized electrical metallic tubing in sizes 1" and smaller may be used in concealed locations, but not in concrete or underground. Connections for EMT shall be water-tight compression type.

22.09 OUTLETS

a. Outlets in exposed exterior locations shall be cast metal conduit bodies, and in concealed and interior locations shall be sheet steel boxes with sherardized or galvanized finish.

b. Sheet Steel Outlet Boxes. Sheet steel outlet boxes shall be standard one-piece knockout boxes of the shape best suited to the particular location and of sufficient size to contain all wires and connections without crowding. Boxes shall be not less than 4" in diameter and 1-1/2" deep.

c. Cast Metal Conduit Bodies. Cast metal conduit bodies shall be Crouse-Hinds condulets, Appleton unilets, or approved equal. Boxes shall have threaded connections for rigid conduit. All conduit bodies shall have gasketed covers for exterior and moist locations.

d. Where two or more outlet boxes are adjacent, ganged boxes shall be used.

22.10 WIRE AND CABLE

a. All wire and cable for power and lighting shall be new 600-volt insulated, N.E.C. Standard of types specified below for different

22.10 WIRE AND CABLE (Cont.)

a. applications. All wire and cable shall bear the Underwriters' label and shall be brought to the job in unbroken packages. Wire shall be color coded as follows: A phase, black; B phase, red; C phase, blue; neutral, white.

b. Type RHHW wire shall be used for power and lighting.

c. Single conductor wire shall be used throughout unless otherwise indicated.

d. Feeder wiring from the transformers to the metal enclosed switchgear shall be single conductor, RHHW 500 MCM cable in conduit as shown on the drawings.

e. Cables connecting the 480-volt metal-enclosed switchgear and the control centers shall be RHHW in conduit as shown on drawings.

The Contractor may substitute as an alternate, interlocked armored cables, 3-conductor varnished cambric of equivalent current capacity to that shown on the drawings. This cable shall be G.E.S.I.-12345 or equal. The installation of interlocked armored cable must, however, meet all code requirements regarding exposure and shall be supported in trays, troughs or a method approved by the local code authorities and the manufacturer of the wire.

f. Type AF fixture wire shall be used in fluorescent fixture channels.

g. Intercommunication system wire shall be as designated in Intercommunication Specifications.

22.11 SWITCHES

a. Wall switches shall be "T" rated toggle switches, 20-ampere, Bryant 3700 series or equal.

b. Thermal-protective switches (St) for the control and protection of single phase fractional horsepower motors shall be Arrow-Hart #28211-F, or approved equal, two-pole, single throw switches with one pole of the switch connected to the motor and the other pole connected to a pilot light.

c. Externally operated switches shall be Type "A" of the proper size and rating and shall be Westinghouse, Square D, Trumbull or equal.

22.12 RECEPTACLES

a. Receptacles for single phase, 110-volt, 10-ampere service shall be Bryant 5260 or equal.

b. Receptacles for single phase, 110-volt, 20-ampere service shall be Hubbell 7310G or equal.

c. Receptacles for 1-phase, 110/208-volt, 20-ampere service shall be Hubbell 7410-B-G or equal.

d. Receptacles for 3-phase, 440-volt service shall be Crouse-Hinds DBR56742-WT70-3 or equal.

22.13 COVER PLATES

a. Flush plates for wall switches, receptacles and telephone outlets in office areas shall be Bryant stainless steel satin finish plate, or approved equal.

b. Cover plates for wall switches, receptacles and telephone outlets outside of the office areas but not exposed to the weather shall be galvanized.

c. Where two or more switches or receptacles are installed together they shall have suitable ganged plates.

d. Plates for motor control switches shall be engraved with identifying markings as noted on the drawings or as directed by the Owner.

22.14 CIRCUIT BREAKER PANELS

a. Power panels for 480 volt service shall be the equivalent of Westinghouse Type CDP Convertible Panelboards, free standing dead front with provision for locking out in "OFF" position any breaker. Circuit Breakers shall be Westinghouse AB, Trumbull or I.T.E. plastic case type.

b. All circuit breakers shall be by one and the same manufacturer.

22.15 SHEET METAL

All sheet metal used for cabinets, switchboards, panelboards, telephone cabinet, power panels, and motor control panelboard shall be finished with a protective priming coat and two finish paint coats on all sides. Doors for all sheet metal enclosures having terminal strips or moving electrical contacts shall have sponge rubber gasketed doors or covers. All face plates and trims for switchboard power panels, panelboard, telephone cabinet and motor control panelboard shall be made of cold rolled steel stretcher leveled sheets. Sheet metal shall be not less in thickness than the National Electric Code or NEMA Standards for the dimensions of cabinets.

22.16 PULL BOXES

Pull boxes shall be of size to conform with the applicable codes or regulations.

22.17 SWITCHGEAR

a. Low voltage metal enclosed switchgear shall consist of a stationary structure assembly with removable air circuit breaker units fitted with disconnecting devices and other necessary equipment. The switchgear shall be suitable for 600 volts maximum service and shall receive a dielectric test for that 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.

b. Each cubicle forming part of the stationary structure shall be fabricated from stretcher leveled steel and shall be a self-contained housing having one or more individual units and a full-height rear compartment for the bare busses, instrument transformers and outgoing cable connections.

c. The individual circuit breaker compartments shall be equipped with primary and secondary contacts, rails and 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 made from stretcher leveled steel, and supported by concealed hinges, shall be provided for each circuit breaker compartment. Opening the door of the breaker unit automatically trips the breaker. This interlock can be modified to allow opening of the door when the breaker is closed to permit inspection of the breaker.

d. The top of the structure shall be enclosed with removable sheets made of stretcher leveled steel.

e. The structure shall be so designed that future additions may readily be made at either end, at any time. The steel structure shall be thoroughly cleaned and bonderized prior to the application of the priming and finishing coats of paint.

f. A black, engraved circuit-designation plate, approximately 1-1/4 inches high and 3-1/2 inches wide shall be provided on each circuit-breaker door.

g. Each circuit shall include the necessary 3-phase bus and the connections between the bus and the circuit-breaker studs. The busses shall consist of high-conductivity bare copper bars mounted in heavy insulating supports. The main bus joints and all tap connections shall be silver-plated and tightly clamped with through-bolts to insure maximum conductivity. The bus shall be supported independent of the breaker studs. Bus work shall be braced to withstand short circuit stresses of 25000 amperes, and equipment lugs shall not be used as bus supports.

22.17 SWITCHGEAR (Cont.)

h. The cables shall be supported by cleats mounted on bus support members. 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 top.

j. The stationary part of the primary disconnecting devices for each circuit-breaker shall consist of a set of contacts mounted on an insulating base. Busses 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 operating 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 shall 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.

k. 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 springs. Contact engagment will be maintained in the "connected" and "test" positions.

l. 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 will be bolted to the ground bus. Contact engagement shall be maintained in the "connected" and "test" positions.

m. All air circuit breakers shall be Drawout type, Westinghouse Type DB, G.E. Type AK or I.T.E. Type KB and KC. These breakers shall incorporate specially designed circuit-interrupting devices which provide improved interrupting efficiency and minimize the formation of arc flame and gases. The air circuit breakers shall have solid silver-inlay, butt-type contacts which operate under high pressure. The auxiliary and main arding contacts shall 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.

n. 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 on the front door of the cell.

22.17 SWITCHGEAR (Cont.)

o. 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.

p. The main circuits shall be given a dielectric test of 2200 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 1500 volts for one minute between live parts and ground.

q. The Contractor shall provide selective tripping of switchgear breakers by providing on the main drawout breakers long time overcurrent protection of 1200 amp., short time overcurrent protection of 3000 amp.

The feeder breakers shall have long time overcurrent protection as indicated on the drawings, short time overcurrent protection of 250% of the long time value and instantaneous trip not to exceed 12000 amp. on any feeder breaker.

22.18 GROUPED MOTOR CONTROL CENTERS

The control centers shall be suitable for use on a 480 volt, three-phase, three-wire, 60-cycle, ungrounded system capable of developing a three-phase RMS symmetrical short circuit current of 15,000 amps.

Each control center shall be totally enclosed and shall consist of NEMA Type 1A with sponge rubber gasketing free standing structures having a nominal 20" depth joined together to form a single assembly. The structure shall be fabricated from sheet steel of not less than 11 gauge, preformed into standardized, modular sections so that at any time the removable starter cells and breaker cells of any size can be interchanged without modification of the structure.

A continuous horizontal wiring trough shall be provided at the top and also at the bottom of each control center to facilitate horizontal wiring between starter cells. A continuous vertical wiring space shall be provided between the starter cells and the side sheet of each structure to facilitate vertical wiring to the individual starter and breaker cells. The vertical wiring space shall be equipped with cable tie supports to hold cables and wiring in place.

A main horizontal rectangular copper bus shall be provided across the top of each control center. Each structure shall also be complete with a vertical copper bus not less than 1/4" x 1-1/2" to distribute incoming power to each circuit breaker and starter in the structure. The horizontal bus shall be silver plated where it makes contact with the vertical bus and the vertical bus shall be silver plated where it makes contact with the individual starter stab. Each structure will be so

22.18 GROUPED MOTOR CONTROL CENTERS (Cont.)

designed that units may be readily removed or future structures added to either end of the assembly as required.

All starter or circuit breaker units shall be built in interchangeable combinations of unit heights. All starters Size 1 to 4 inclusive and all breakers through the 225 amp frame size shall be line plug-in type capable of being placed in a position such that the circuit breaker is disconnected from the bus without being removed from the structure.

A latching device shall be furnished to allow padlocking the unit in the disconnected position.

To facilitate the removal and replacement of unit starters, suitable guide rails shall be provided in each structure. All standardized plug-in units shall be interchangeable without modification of the structure. The plug-in units shall have pressure type line disconnecting stabs of high strength copper alloy which are heavily silver plated. The stabs shall be so designed as to give a positive wiping contact with the vertical bus. Each removable unit shall be held in place by means of quick captive screw fasteners arranged so that the units can be removed or remounted readily without access to the rear of the structure. The door shall be mounted on the structure and not on the removable starter, so that it may be closed to cover the open buses after the starter unit has been removed. The unit door shall be so interlocked that the breaker must be in the "Off" position before the door can be opened.

Each starter and breaker unit shall be effectively baffled so as to cool and isolate any ionized gases which may occur within it. Each unit shall be so ventilated that it can be located anywhere within the structure using the same overload heaters for the same load.

The circuit breakers shall be air break plastic case type, manually operated, trip free from the handle and provided with inverse time, thermal element overload protection and instantaneous magnetic short-circuit protection. The breaker shall have an interrupting rating of not less than 15,000 amperes.

The operating handle shall clearly indicate whether the breaker is in the "On" or "Off" or "Tripped," position. It should be so designed that it can be locked in the "Off" position by means of one to three padlocks. The line starter shall be full voltage magnetic with low voltage protection and circuit breaker short circuit protection, with external manual reset possible of the bi-metallic thermal overload relays. No starter smaller than NEMA Size 1 shall be used. The starter sizes will be as shown on the single line drawings.

Any spaces left in the control centers after insertion of the number of starters and breakers required by the one-line drawings shall be available for the installation of future breakers or starters with the addition of guide rails, and hinged door panels. Blank screw fastened panels shall be provided to cover these spaces.

22.18 GROUPED MOTOR CONTROL CENTERS (Cont.)

A laminated black on white engraved micarta nameplate shall be provided on each starter or breaker door with the engraving to be as indicated on the single line drawing.

The control centers shall be furnished with NEMA Type A wiring and shall be given one coat of rust resisting primer and two coats of gray enamel both inside and outside prior to shipment.

22.19 LIGHTING AND RECEPTACLE PANELBOARDS

a. Lighting panelboard shall be as shown on the drawings.

b. Dust-tight lighting panel enclosures shall have the doors sealed with sponge rubber strips.

c. Lighting panelboards shall be Trumbull or approved equal.

22.20 TELEPHONE, INTERCOMMUNICATION AND SIGNAL TERMINAL CABINETS

Telephone, Intercommunication and Signal System Terminal Cabinets shall be dimensioned as shown on the drawings.

22.21 TRANSFORMERS

a. Lighting transformers shall be sized as shown on the drawings, and shall be dry type, 60-cycle, 3-phase, 440-volt Delta to 120/208 volt Wye or 1 phase, 440 volt/120-240 with 2-2½% Taps full capacity above normal and below normal. Lighting transformers shall be in a heavy sheet steel enclosure with conduit knockouts in each end, they shall be removable cover and all terminals inside of the enclosure. A nameplate shall be on each transformer clearly showing the polarity and impedance.

b. Signal System transformers shall be dry type, 120 volt-24 volt or 48 volt, single phase, 60-cycle, enclosed in sheet metal enclosure with all terminals and leads clearly marked or identified. Sizes shall be as shown on the drawings.

22.22 IDENTIFICATION OF CIRCUIT BREAKERS AND APPARATUS

a. All switchboard circuit breakers, motor starters, relays and all apparatus used for the operation or control power circuit, appliances or equipments shall be properly and permanently identified by means of descriptive engraved nameplates.

b. Lighting and receptacle panel circuit breakers shall be identified by permanently fixed numbers and a typewritten directory, as herein specified.

C. All nameplates or lettering shall be submitted to Owner for approval before being secured or printed on the apparatus.

22.23 FIXTURES

Shall be as indicated on the Luminaire schedule on the drawings.

22.24 LAMPS

a. The Contractor shall supply lamps for all fixtures as shown on the drawings.

22.25 DESIGNATION OF CIRCUITS

The drawings accompanying these specifications indicate generally the routes of all branch circuits. All runs to panels have been indicated merely as starting from the nearest outlet and pointing in the general direction of the panel. The Contractor shall continue all circuits to the panels as indicated.

22.26 DESIGNATION OF WIRE SIZES

All branch circuits shall be wired with #12 AWG except when larger wire sizes are specified or shown.

22.27 INSTALLATION OF CONDUIT

a. All conduits shall be installed as hereinafter specified and shall, where necessary, be built in during the course of construction. Wherever possible, conduit shall be installed concealed in concrete slabs or in furred spaces unless otherwise noted in drawings. All conduits shall be rigidly secured in position without sagging by means of pipe clamps, or where three or more conduits are included in any run they shall be mounted on Kindorf or Unistrut hangers applied in strict accordance with manufacturer's Structural recommendations.

b. All exposed conduits shall be installed straight and true with reference to adjacent work.

c. Running threads are prohibited. Where necessary for connecting conduits, right and left couplings or conduit unions shall be used.

d. Flexible conduit should be used only where it is impossible to use rigid conduit, and then only with the approval of the Owner.

e. All conduits where they enter panelboards, pull boxes or outlet boxes shall be secured in place by galvanized locknuts and bushings, one locknut inside and one locknut outside the box with bushing on the end of the conduit.

f. In long runs of conduit, sufficient pull boxes shall be used to facilitate pulling wires and cables. All pull boxes shall be of ample dimensions and shall be furnished with screwed covers.

g. All underground conduits shall be enclosed in a concrete envelope. The concrete envelope shall be colored with red dye.

22.28 TRENCHING, BACKFILLING AND CONCRETE WORK

a. Trenches for all underground conduits shall be excavated to depth shown on drawings. Where depths are not indicated, conduits shall be buried not less than 24""below finished grade.

b. Underground runs of conduit shall be encased in not less than 3" thick concrete envelopes.

c. Backfilling shall be done with clean earth in 6" layers, wetted and tamped to produce a compaction equal to that of the adjacent undisturbed soil. All disturbed finished surfaces shall be restored to original finish and grades as directed and approved by the Owner.

d. Any damage to existing underground facilities caused by the Contractor during his excavation work shall be repaired immediately to the satisfaction of the Owner.

22.29 PRIMARY SERVICES

The Contractor shall furnish and install necessary conduit and cables from the low voltage terminals of the 2 - 750 KVA transformers, furnished and erected by Others, to the distribution switchgear, and place in the distribution switchgear current transformers and meters furnished by Others in space indicated on drawings for that purpose.

22.30 P. T. & T. COMPANY TELEPHONE SYSTEM

a. The Contractor shall furnish and install conduit, outlets, grounding to nearest water pipe, terminal boards and terminal cabinets for telephone as outlined on the drawings.

b. The Contractor shall be responsible for verifying sizes of equipment with the representative of the telephone company.

c. The service conduit for the telephone system shall be installed as shown on the drawings from the telephone cabinet in the Office Building. The location shall be verified in the field.

d. In conduit runs over 50' in length, the Contractor shall provide a #12 AWG galvanized iron pull wire.

22.31 SIGNAL SYSTEMS

a. A signal system in the office permitting the receptionist to signal the Sales Manager and the Credit Manager or both simultaneously. Equipment shall be the equal of that shown on the drawings.

b. A non-coded call system consisting of Horns and Buzzers located throughout the plant, actuated by pushbutton stations located in Wallboard Superintendent's and Personnel offices, shall be furnished and installed, all equipment shall be as shown on the drawings or approved equal.

22.32 INTERCOMMUNICATION SYSTEM

The Contractor shall supply a sound powered telephone system of three stations. Each telephone shall have a shock resistant hook and shall be a hang-up and hand-set instrument.

At each instrument station there shall be a pushbutton and horn.

The intercommunication equipment shall be located as shown on the drawings, and shall be as specified on drawings.

Conduit and wire shall be furnished and installed as shown on the Conduit Layout drawings.

22.33 MOTORS AND CONTROLLERS

a. No motors shall be furnished under the work included in this section.

b. The Contractor shall install motors as required and shall furnish and install remote control stations and starters and make all electrical connections to motors and controls in rigid galvanized iron conduit and flexible conduit as required for correct operation. All motor and starter frames shall be grounded.

C. The Contractor shall ascertain from the list of equipment furnished by the Owner the exact size and type of all motors, the exact location of such equipment and the proper point where electrical connections shall be brought through floors or walls. The locations on the drawings are diagrammatic only and the full responsibility for correct locations shall be the responsibility of the Contractor.

d. Motor Starters. All motor starters located in motor control centers shall be furnished and installed as specified under "Grouped Motor Control Centers" and as shown on the drawings. Motor starters not located in Control Centers shall be of required voltage, 3-phase, 60-cycle, A.C., magnetic, across the line, full voltage with thermal overload trips, and low voltage protection. Starters shall be of NEMA size and horsepower rating shown on the drawings. Each starter shall be provided with overload trip heater elements of the proper size to protect the motor controlled. The nameplate full load current of each motor shall be checked in the field and overload heater sizes selected accordingly.

e. Equipment Connections. The Contractor shall furnish and install all wiring materials necessary to connect equipment furnished under other sections of the work or by the Owner.

f. The Marcy Tube Mill motor shall have a 5-step drum controller and shall energize the contactor from Step 1 and de-energize from Step 1 when the controller is brought back to the "Off" position.

22.33 MOTORS AND CONTROLLERS (Cont.)

The Contractor will furnish and install a Marcy Mill motor bearing temperature alarm device consisting of a 480-110 volt transformer fused on both legs of the 480 volt winding, each fuse not to exceed 3 amp value.

The transformer shall be of at least 100 volt amp capacity continuous rating and shall be energized from the load side of the contactor. One leg of the transformer secondary shall be connected to the paralleled bearing temperature contacts and thru them to a horn. The horn shall be of equivalent quality to those used in the Wallboard signal system but the Contractor shall adjust it to vary the tone to differentiate from the signal system horns.

g. The Contractor shall furnish and install a current relay equal to Westinghouse Class 15-827, Type H1, direct current industrial control relay with 5-15 ampere range and shall enclose the current relay in a NEMA 1A enclosure and mount the relay and enclosure adjacent to the magnetic pulley DC power source. One leg of the DC feeder to the pulley shall be seriesed through the current coil of the relay, and the contact in the relay shall be a permissive contact in the control circuit of Belt Conveyor No. 5. The magnetic pulley and DC power source will be furnished under Section 29 of this specification.

h. The Contractor shall check and verify all motor horsepower and all motor overload protection and include a record of such data to the Owner upon completion of the contract.

i. The Contractor shall connect up the space heater in the salt water flushing pump, and shall provide and install a water-tight starter with an additional normally closed auxiliary contact to energize the space heater. The added auxiliary contact shall be energized at the same points as the control circuit.

j. All starters and control devices shall be the product of one manufacturer which shall include the circuit breakers, fused disconnects, starters, pushbutton stations and associated control equipment.

22.34 SPECIAL EQUIPMENT

a. Material flow measuring devices furnished by the Owner shall be installed by the Contractor and energized and tested in the presence of an authorized representative of the Jeffery-Traylor Company.

b. Bindicator lights and alarm bell for bindicators shall be furnished and installed. The bindicator lights shall be Lintern Catalogue Number 400X with red lens. The alarm bell shall be 110-volt, 60-cycle with a 6" gong for use with Bindicator, Type "A", furnished and installed under another section of the specifications.

22.34 SPECIAL EQUIPMENT (Cont.)

c. The Contractor shall provide conduit and wire and two flop gate indicating lights which will be connected thru a limit switch mounted at the flop gate. The lights shall be Lintern Catalogue No. 400X, one with yellow and one with blue lens. Location of the lights shown on the drawings.

d. All Owner furnished special control equipment, i.e., Clark panel for the Coe Dryer, Wallboard Machine panel, Boiler Control panel shall be wired as shown on the drawings, but it shall be the responsibility of the Contractor to check before wiring this equipment with the supplier of any or all equipment and ascertain the exact wiring scheme. The Contractor will test this equipment in the presence of the supplier's field representative.

e. The Contractor shall place the feeders for the elevators, connect each thru a Type A non-fused disconnect as indicated on the drawings and connect each to the elevator motor controllers installed by the Elevator contractor.

f. The Contractor shall furnish and install all wiring included with the kettle burners and shall check with the vendor of the equipment before placing such wiring to determine the requirements beyond those delineated on the drawings.

g. The Contractor shall wire two Lintern Catalogue No. 400X Lights to the High-Low alarm on the boiler water deaerator and shall place the lights on the top of the boiler control panel.

22.35 PAINTING

All switchboards, panelboards and similar equipment furnished with enameled or lacquered finish by the manufacturer which are scratched or defaced by the Contractor during construction shall be repainted and restored to the original finish.

22.36 GROUNDING

a. The lighting neutral, all conduit systems, switchboards or any other applicable items of equipment shall be permanently and effectively grounded by means of approved ground clamps in accordance with the applicable codes or regulations having jurisdiction.

b. The Ground Grid system shall be as shown on the drawings.

22.37 TESTS

a. The Owner will conduct from time to time such tests as may be required to any part of the equipment to determine if it is installed in accordance with specifications. The Contractor shall extend to the Owner all facilities to this end and shall furnish any skilled or unskilled help required.

22.38 GUARANTEE

The Contractor shall guarantee all materials, equipment, apparatus, and workmanship furnished by him for a period of one year and shall agree to replace or repair any defective items as required. Any existing work which has been damaged by him during the replacement of the defective items must be repaired at no cost to the Owner.

STORM AND SANITARY SEWERS

23.00 SCOPE

(a) Furnish and install storm and sanitary sewers as shown on drawings and specified herein. Sanitary sewers shall be connected with existing City manhole at East Marginal Way. Storm sewers shall empty into Duwanish Waterway. All manholes, catchbasins, gratings and other appurtenant structures required for a complete system shall be included as part of the work. Provide drain around covered storage building with spillways as indicated and drain with valve through dyke around oil tank.

(b) The Contractor shall secure and pay for all permits, inspections and tests as required by the local code, ordinances and statutes, and shall perform all work in strict compliance with the provisions of such ordinances, codes and statutes.

23.01 MATERIAL

(a) Pipe for sanitary sewers shall be vitrified clay sewer pipe, standard strength, conforming to A.S.T.M. Specification C-13, except under railroad and roadways and parallel and adjacent to railroad where it shall be extra strength conforming to A.S.T.M. Specification C-200.

(b) Pipe for storm sewers shall be non-reinforced concrete pipe conforming to A.S.T.M. Specification C-14, except under roadways where it shall be reinforced concrete conforming to A.S.T.M. Specification C-75. Drain around covered storage building and spillways shall be half section 16 gauge corrugated metal pipe.

(c) Manholes shall be precast concrete and manhole covers and frames cast iron, conforming to City of Seattle standards.

(d) Concrete shall be 3000 p.s.i. conforming to Section 4, Concrete Masonry.

(e) Drains under railroad track along west side of wallboard building shall be 16 gauge corrugated metal culvert pipe conforming to A.A.S.H.O. Designation M-36.

(f) Drain through dyke at oil tank shall be Schedule 40 steel pipe; valve shall be 100 lb. Standard, cast iron, gate valve, flanged.

23.02 TRENCHING AND BACKFILLING

Pipe trenches shall be of sufficient width for laying of pipe and proper making of joints. The bottom of the trench shall be shaped to the pipe and shall provide a firm uniform bearing for the full length of the pipe. Bell holes shall be excavated as required. Following the satisfactory completion of tests, trenches shall be backfilled and compacted to a density equal to that of the original ground.

23.03 INSTALLATION

(a) Sewer pipe shall be accurately laid to lines and grades established. Hub ends shall be laid upgrade with the spigot end fully entered into the adjacent hub and the joint so made that the inner surface of the abutting pipe is flush and even.

(b) Joints in storm and sanitary sewers shall be well caulked with oakum and the joint filled with 1:2 cement mortar and a bead formed around the pipe outside the joint. After completing the joint the inside of the joint shall be wiped clean and smooth.

(c) Sewer pipe under railroad track shall be incased in concrete not less than 4" in thickness.

23.04 MANHOLES - shall be constructed with mortar joints, which shall be water-tight throughout. The floors of manholes shall be shaped to the invert of the sewer for a minimum depth of one-half the diameter of the pipe, and the balance of the floor sloped towards the channel formed.

23.05 INFILTRATION TEST

Sanitary sewers will be subjected to a 24-hour infiltration test, during which the infiltration as measured by the leakage from the section under test shall not exceed one gallon per hour per inch of diameter per 100' of sewer. Excessive leakage shall be corrected by the Contractor and the section re-tested.

RAILROAD TRACKWORK

24.00 SCOPE

(a) The work under this section consists of furnishing all material and installing the railroad trackwork shown on the drawings and specified herein.

(b) The railroad company will furnish and install the turnout from their track to the heel of frog of the turnout. Contractor shall include as part of his work all necessary trackage to complete the work as shown.

(c) Both rails of a section of track not less than 100 ft. in length immediately north of the wallboard building shall be insulated electrically from the adjacent track.

24.01 MATERIAL

(a) Ties - shall be Grade No. 1, Douglas Fir, treated with eight pounds of creosote per cubic foot in accordance with the A.R.E.A. Specification for Preservative Treatment of Wood. Ties shall be 7" x 9" - 8' long except on turnouts, where the length will be increased as required to accommodate the turnout.

(b) Rail and Track Accessories -

(1) Rail shall be 90# relayer rail, A.R.A. Section 9020, which shall be straight and without excessive vertical or side wear, or vertical defects such as splits, pipes, or broken base.

(2) Material for each rail joint shall consist of the following:

2 - 34" joint bars for 90# rail (second hand).
6 - 1" x 6" heat treated track bolts with square nuts and "hi-power" nut locks.

(3) Tie plates shall be A.R.E.A. 7-3/4" x 10" (second hand).

(4) Spikes shall be 9/16" x 5½" cut track spikes.

(5) Turnouts shall be complete ready to operate track units as installed, consisting of switch, frog, rail, ties and operating appurtenances. Turnouts and frogs shall conform to A.R.E.A. dimensional standards for the number 7 turnout.

Switches shall be straight split type; frogs shall be rigid type complete with foot guards, toe and heel blocks, rolled steel flangeway fillers, tie plates, and all bolts, nuts and nut locks. Guard rails shall be 8'-3" in length, complete with separator and end blocks, tie plates and all bolts, nuts and nut locks. Switch stands shall be Ramapo-Style 36D or equal.

24.01 MATERIAL (Cont.)

(6) Bumping posts shall be Buda No. 30, or equal.

(c) Ballast - shall be crushed stone, slag, or gravel conforming to the following gradation:

Passing 2-1/2" square openings	100%
Passing 1-1/2" square opening	35-70%
Passing 1/2" square opening	0-5%

24.02 TRACK LAYING

(a) Sub-grade - No track material shall be placed on the sub-grade until the sub-grade has been finished true to the alignment and the grade established.

(b) Ties - Ties shall be laid with the heart side down spaced 20" on centers, at right angles to the track, with the ends lined uniformly, and shall provide full bearing for the rail or tie plate. Each rail joint shall be supported by two ties. Tie plates shall be so placed that the shoulder of the plate is in contact with the base of rail or splice bar throughout the entire length of the shoulder.

(c) Rail -

(1) In laying rail, the joints shall be staggered to bring the joint within twelve (12) inches of the center of the other rail. Necessary gauging shall be done while laying rails and shall conform to standard railroad practice.

(2) Joints shall be fully bolted and the rail drilled where necessary. All bolts must be tightened before the track is turned over to operations. A full set of bolts with nut locks shall be used at each joint.

(3) Rails will be spiked to each tie with four spikes per tie. The inside and outside spikes shall be as far apart as the width and character of the tie will permit with inside spikes on the same side of the tie.

On curves of three degrees or more, three spikes shall be used on each rail, the extra spike to be placed on the inside of the rail. All spikes shall be started and driven vertically and square with the rails, and so driven that the head of the spike shall have a full hold on the base of the rail.

(4) On curves in excess of eight degrees the gauge of the track shall be increased one-sixteenth inch for each degree in excess of eight degrees.

24.03 BALLASTING

(a) The required amount of ballast shall be uniformly distributed along the track and leveled down, and the track given a preliminary surfacing to approximate final grade with allowance for settlement. Care shall be exercised in jacking the track to avoid bending the rail or straining the joints. All ties that are loosened shall be re-spiked to a firm bearing. The ballast shall be well tamped with suitable tamping tools on both sides of the ties, from a point fifteen (15) inches inside the rails to the ends of the ties. Tamping shall start at the outside of the tie.

(b) After the track has been properly compacted by traffic, the track shall be accurately aligned and surfaced to the grade and alignment stakes given. The ballast shall again be thoroughly tamped, and shaped to the typical section shown on the drawings.

(c) Any excess ballast remaining on the roadbed after trimming the ballast, shall be disposed of as directed by the Owner and the portion of the subgrade outside the ballast left with a smooth even surface and the shoulders properly dressed to standard section.

24.04 ROAD CROSSINGS

Provide guard rail type flangeway at all paved crossings including main line at plant entrance.

PAVING

25.00 SCOPE - The work under this section consists of constructing base course and bituminous surface on roads and other indicated paved areas and crushed stone surfacing on the parking lot east of the warehouse as specified herein. Where indicated, ditches shall be paved with 1" thickness of plant mix surfacing.

25.01 PAVEMENT TYPES

(a) Bituminous surfaced roads and areas shall consist of 12" thick ballast base course and 4" of plant mixed bituminous surface.

(b) Crushed stone surfacing on the parking lot shall consist of 6" thick ballast course and 3" of crushed stone surfacing.

25.02 BASE COURSE - shall conform to Standard Specifications, Department of Highways, State of Washington, dated April 1948, Section 24, Paragraphs - 2.02, - 2.02A, B and C, and - 3.19C.

25.03 PLANT MIX - shall conform to Section 29 of the above Standard Specifications, using 200-300 Penetration asphalt.

25.04 CRUSHED STONE SURFACING - shall conform to Section 24 of the above Standard Specifications.

25.05 DITCH PAVING - Trim accurately to section and place 1" compacted thickness of plant mixed surfacing. Compaction shall be by hand tampers or small roller.

FENCING

26.00 SCOPE

(a) The work under this section consists of removing and relocating the existing fence along the east line of Owner's property, installing used fencing stored on the site and providing new gates including gate posts as shown on the drawings and specified herein.

(b) The used fence and that to be removed consists of chain link fence 6 ft. in height to top of chain link fencing with projecting arms and 3 strands of barbed wire above.

26.01 GATES

(a) Gates, gate posts and hardware shall be of the same manufacture and standard as the used fencing. Gates shall be provided with catch stops and center rests as required and latches and padlocks.

(b) Provide gates as follows:

(1) East of boiler house - 12 ft. single swing.

(2) At railroad - 18 ft. double swing.

(3) At roadway - 24 ft. double swing.

26.02 INSTALLATION

(a) Posts shall be set on not to exceed 10 ft. centers in not less than 36" depth of concrete. All corner posts shall be braced and trussed in accordance with manufacturer's standard installation practice.

(b) All fence posts shall be set in concrete in accordance with the manufacturer's standard installation practice. Wire fabric shall be tightly stretched and securely attached. All gates shall be furnished with standard latches and shall be substantially hung and placed in good operating condition.

The existing fence posts may be either moved with the concrete base intact or removed from the concrete and new concrete bases provided at the Contractor's option. All holes resulting from the removal of existing posts shall be backfilled and the material thoroughly compacted.

INSTALLATION OF EQUIPMENT

27.00 SCOPE

(a) This specification covers the installation of all equipment furnished either by Contractor or Owner.

(b) Owner will furnish all lubricants or other operating supplies necessary for initial operation.

27.01 GENERAL

(a) Vendor's drawings of Owner furnished equipment, where available, will be supplied the Contractor. Equipment shall be carefully assembled and installed in accordance with the drawings and any instructions of the equipment manufacturer, and where furnished, manufacturer's erection supervisor.

(b) All work shall be performed by skilled, qualified mechanics working at their respective trades under experienced supervision. Welders shall be "certified welders" in accordance with the A.S.M.E. Boiler Construction Code.

(c) Equipment shall be completely assembled and all work shall be the product of first class workmanship. Any defective or unsatisfactory work shall be corrected by Contractor at his own expense.

27.02 GROUTING

All work shall be carefully plumbed and aligned, fully bolted and securely anchored to foundations, floor or other supports. Where grouting is required the equipment shall be carefully aligned on shims or metal wedges and grouted with Portland cement grout mixed in the proportions of 1 part Portland cement: 1-1/2 parts concrete sand; 1/2 part Embeco, thoroughly mixed dry. Use not to exceed 5-1/2 gallons of water per sack of cement.

27.03 CHECKING OF CLEARANCES AND ALIGNMENT

Upon completion of the installation of any unit of operating equipment with moving parts, Contractor shall fully lubricate such equipment with lubricants furnished by Owner and slowly turn over such equipment, carefully checking for clearances and improper adjustment or misalignment and make such corrections as required or directed by Owner. All bolts shall be carefully checked and tightened.

27.04 CONVEYOR BELTING

Conveyor belts shall be installed with standard diamond vulcanized splice which shall develop not less than plus 80% of the belt strength in tension. Belting shall be tensioned to operating tension at the time of making the splice. Idlers shall be adjusted and belt trained so as to run centrally throughout its entire length.

27.05 STEAM GENERATING EQUIPMENT

The installation of steam generating equipment shall include all auxiliary equipment and controls and their piping and controls, the insulation thereof as required, and furnishing and installing boiler breeching and stack.

Upon completion of the installation, Contractor shall perform such tests and obtain certificates as required by applicable codes or regulations of the State of Washington and/or City of Seattle for the operation of the steam generating equipment.

27.06 PNEUMATIC CONVEYING SYSTEMS - All pipe joints shall be soldered or welded air-tight. Provide substantial supports or hangers as required at not to exceed 10 ft. spacing.

27.07 OPERATING TESTS

As a condition of acceptance, Contractor shall test operate all equipment in the presence of the Owner and shall make any adjustment required to place all equipment in first class operation condition.

Where equipment is furnished by Contractor, tests of capacities specified will be required.

EQUIPMENT FURNISHED BY OWNER AND INSTALLED BY CONTRACTOR

28.00 SCOPE

(a) Owner has purchased the items of equipment listed below, which will be delivered to Contractor F.O.B. cars or trucks at Seattle. Contractor shall receive, receipt for, unload and properly install and place in first-class operating condition. Any shortages or damaged material shall be immediately reported to Owner. It is anticipated that certain items of this equipment will be delivered at Seattle prior to completion of permanent facilities at the plant, and Contractor shall, as part of his work under his contract, store such equipment in approved storage.

(b) Contractor shall promptly unload all such equipment received and shall be responsible for and pay any demurrage resulting from his failure to promptly do so.

(c) Where required, Contractor shall design and furnish and install any supplementary structural steel framing for the support of plant processing equipment. Two prints of all such designs shall be submitted to the Owner for approval. Owner will promptly return such drawings marked "approved" or "approved as noted", in which case Contractor shall make the necessary corrections and return two prints to Owner for approval.

28.01 EQUIPMENT TO BE FURNISHED BY OWNER

(a) Vertical Mills

Two - Raymond No. 5448 High Side Roller Mill Units including; feeder with overhung shaft, 5'-2" diameter, single whizzer type separator with Reeves variable speed transmission and all required Vee belt drives and motors, No. RF 26 exhauster with base and flexible coupling, 9'-0" cyclone type dust collector with discharge valve, 8'-0" diameter tubular collector with cloth tubes 6" diameter by 20 ft. long, all necessary ducts to connect the roller mill, separator, exhauster, cyclone and collector together, pneumatic feed control device without piping.

(b) Kettles

Two - 15-ton capacity, 10'-0" diameter by 12'-11-3/4", suspended type self-contained gypsum calcining kettles with overall dimensions of 14'-11" diameter by 21'-0" high, with the following parts:

1 - 3/8" fire box steel kettle shell with steel angle bottom ring, baffle angles, 20" diameter flue and steel flanges.

1 - Kettle cover with doors and vent connections.

1 - 1-1/4" thick pressed fire box steel kettle bottom.

28.01 EQUIPMENT TO BE FURNISHED BY OWNER (Cont.)

1 - Kettle jacket with 6 flue cleanout doors.

1 - Vent pipe to hot pit with damper.

1 - Butterfly type kettle gate with operators.

1 - 5-15/16" upright kettle shaft with flue sweeps.

1 - Bottom sweep with chains and scrapers.

1 - Main bearing with split bearing bushing and ball thrust at top end of upright shaft.

1 - 3-15/16" countershaft with bearings and stack connection to jacket.

1 - Bevel gear drive with high stength cast iron gear and cast steel pinion.

1 - Stack connection to jackets.

1 - Set supporting steel for jacket, sheal and driving parts. Vertical supports built into jacket.

1 - Burner plate and lintel for oil or gas burner.

Two - kettle drives, each as follows:

1 - 13" P.D. 10 "D" groove motor sheaves.

1 - 84" x 18" C.I. straight face, single arm, heavy rim pulley 3-15/16" bore.

10 - #D360 "V" belts.

1 - 40 HP, 570 RPM motor with base.

Two - stack and induced draft, dry type, collector systems, stack approximately 74 ft. high from bottom of jacket to top of stack, each as follows:

1 - Double cyclone induced draft, dry type, collector unit with outlet connection for water collector. Connection from outlet of water collector to be made in field.

1 - Lower stack section, 36" diameter with damper, also vent pipe from collector to kettle.

1 - Upper stack section, 44" diameter.

1 - Vapor stack 30" diameter from kettle top to collector.

28.01 EQUIPMENT TO BE FURNISHED BY OWNER (Cont.)

Two - steel hot pits with discharge spouts, also tapered screw emptiers and drive, including motor and supports for motor and reducer.

One - special 14" collecting screw conveyor about 50 ft. long with gear motor and chain drive. 10 gauge trough, 3/16" sectional flights on 3" pipe with 2-7/16" couplings, #27 expansion type hangers, 14 gauge dust-tight cover. Hot pit emptier spouts will be fitted to conveyor in shop of vendor.

Two - Ehrsam double screw kettle feeders, complete with drives and 7-1/2 HP motors.

Two - #10 gauge spouts from feeders to kettles with plain slide gates. The kettle shell and bottom will be shipped assembled. All other pieces will be shipped loose or boxed.

Shipping weights as shown on shop detail drawings.

(c) Screens

One - 4' x 5', single deck, Type 38 Hum-mer electric vibrating screen, enclosed type construction with V-16 vibrator, dust covers, steel plate balanced gate feeder with extension, standard welded fines hopper, with wire cloth screen.

One - 4' x 8', single deck, Type 38 Hum-mer electric vibrating screen, enclosed type construction with two V-16 vibrators, dust covers, steel plate balanced gate feeder with extension, standard welded fines hopper, with wire cloth screen.

One - 4' x 6', single deck, Type 72 Hum-mer electric screen, enclosed type construction with V-50 vibrator, steel plate balanced gate with extension and fines hopper for bolting to the body, dust covers and screen cloth.

One - Model 618D Tyler Thermionic Power converter for operation on 220 volt, 1 phase, 60 cycle current with capacity for three V-16 vibrators.

One - Model 218D Tyler Thermionic Power converter for operation on 220 volt, 1 phase, 60 cycle current with capacity for one V-50 vibrator only.

(d) Tube Mill

One - Marcy 4'-6" I.D. x 16'-7-1/4" long between flanges, tube mill with liners, grates, trunnion bearings, main gear, pinion gear, pinion shaft, shaft bearings, mill bearings, Vee belt drive complete, 75 HP, 870 RPM wound rotor motor, motor base and peripheral discharge housing with spout.

One - charge of grinding balls, 3/4" and 7/8".

28.01 EQUIPMENT TO BE FURNISHED BY OWNER (Cont.)

Shipping weights:	Tube Mill	32,500 pounds
	Motor	23,000 pounds
	Grinding Balls.	11,000 pounds

(e) Mixing and Sacking Station

Two - Ehrsam No. 2, 34 cu. ft. double barrel mixers with countershaft, complete with gate and operator, and Vee belt drive.

Two - 15 HP, 1800 RPM squirrel cage motors.

Two - Charging hoppers with butterfly valve and Fairbanks 2,000 pound pipe lever scale and supporting steel framing for hopper and scale.

Two - Retarding hoppers with interlocks to valve of charging hopper.

Two - Sacking hoppers with connections for St. Regis packer.

Two - Steel extensions from sacking hopper to packer approximately 3'-6" long.

Two - St. Regis 4-tube No. 107-FC packers.

Two - Spill elevators approximately 27'-0" high from bottom of boot to center of head shaft with connection to mixer body and driven from mixer countershaft. The unit shall extend 8'-2" below the floor.

Two - Gravity spill hoppers approximately 6' x 5' by 7' deep, with grating at hopper opening.

Two - Ehrsam, single hair pickers connected to 5 HP, 1200 RPM motor, all mounted on cast iron base.

Shipping weight for all equipment at mixer station except St. Regis baggers . . . . . 22,100 pounds.

(f) Stucco and Sawdust Feeding Station

Two - Ehrsam, double screw stucco feeders, one 7'-6" long, one 10'-0" long, from center of hopper to center of discharge and with common discharge. Feeders will have 10" diameter half pitch screws in 10" pipe, flow trap, 32" x 48" hopper opening with rack and pinion gate, 3 HP motor and drive.

Two - Ehrsam, double screw sawdust feeders, 5'-4" long from center of hopper to center of discharge, otherwise same as stucco feeder.

One - Stucco spill elevator, 55 ft. from bottom of boot to center of head shaft, 10" x 6" M.I., Style A cups, 16" centers complete with 13-3/4" x 48" casing, boot and head sections and 5 HP gearmotor and chain drive with enclosure.

28.01 EQUIPMENT TO BE FURNISHED BY OWNER (Cont.)

One - 2-way 12 gauge steel spout from elevator, with pan valve and spouts to stucco bins. Pan valve operator will be equipped with electric interlocks for stucco screw feeders.

Shipping weight for Stucco and Sawdust feeding station . . . 22,000 lbs.

(g) Potassium Sulphate Grinder

One - Williams Laboratory 9" hammer mill with 3/4 HP motor and V-belt variable speed drive and base and reversing switch for grinding Potassium Sulphate ($K_2 SO_4$)

(h) Fiberglas Rovings Cutter

One - I. G. Benner, Fiberglas rovings cutter with 1/3 HP motor and drive.

(i) Weighing Feeders

One - Jeffery No. 330 Waytrol Feeder with screw feed for stucco.

One - Jeffery No. 220 A.C. Waytrol Feeder with screw feed for sawdust.

One - Jeffery No. 118 Waytrol Feeder with screw feed for flour.

The three Waytrol units will be furnished with variable speed belt, position adjusting type control, totalizing equipment, recording equipment and master and slave unit designed for a total of six units.

Shipping weight for three feeders . . . . . 8,400 pounds.

(j) Paper Pulping Station

One - Williams Hammermill No. GP 1512, complete with fabricated steel base for mill, blower and motor; fan and duct connections to mill and blast gate and 15 HP, 3600 RPM motor and flexible coupling.

One - Paper slitter with friction rolls and slitter knives complete and including metal chute into hammermill, chain drives and chain drive guards, Reeves variable drive, Vee belt drive and 2 HP motor with base.

Shipping weight approximately 3,500 pounds.

(k) Wallboard Machine

One - Gypsum Wallboard machine, 351 ft. long from center of forming rolls to center of punch and including the following:

(1) Paper Equipment

Upper and lower racks with shafts and adjusters.

Upper paper guide and tension device for wallboard paper or three streams of lath paper.

28.01 EQUIPMENT TO BE FURNISHED BY OWNER (Cont.)

(2) Pallet and Forming Sections

Forming rolls with stands and safety release and stop pilot switch, glue wheels and pan, plate between lower roll and tail pulley, pivoted plate between pallet and lower roll, removable sections on lower roll for production of taper edge wallboard.

Pallet with structural supports and cast iron pallet plates.

One set of four scoring wheels with one horsepower motors and sliding bases with supports, for making one stream of 1/4", 3/8" and 1/2" wallboard; and 1/2" tongue and groove.

One extra set of stones on sleeves for above.

One set of two buffing wheels with 1-1/2 HP motors with sliding bases and supports.

One set of creasing rolls with supports; and flanged pulleys and tapes for making recessed edge board.

One lower paper tension device.

One set of mud dams, edging bars and edge smoothers to make 1/4", 3/8" lath, 3/8" and 1/2" wallboard; and 1/2" tongue and groove.

(3) Belt Sections

Two Standard belt sections, 126 ft. long each, including steel supports, head and tail pulleys, horizontal take-ups, bearings, speed reducers, vari-pitch "V" belt drives, necessary shafting; and 3" steel tubular rolls with ball bearing pillow blocks mounted on separate 3" channel racks.

(4) Live Roll Section

One Live roll section, 95 ft. long to center of punch, including steel supporting members, 3" steel tubular rolls with ball bearings, sprockets, chains, chain track and speed reducer.

(5) Lath Punch

One Ehrsam low type reciprocating lath punch, complete with counter-shaft and clutch, and one set of punches and dies as per Vendor's Drawing #1698.

One Wad conveyor and elevator. Conveyor with 16" belt, approximately 20 ft. long, elevator about 30 ft. high, one 3 HP, 190 RPM, 220/440 volt, 3 phase, 60 cycle, Class 2 gear motor.

28.01 EQUIPMENT TO BE FURNISHED BY OWNER (Cont.)

(6) Cut-off Knife

One Ehrsam high speed cut-off machine arranged for cutting any length from 4 ft. minimum to 16 ft. maximum to the fraction of an inch.

(7) Accelerating Section

One one-speed accelerating section, 80 ft. long, 3" brass or stainless steel rolls, sprockets, roller chain, chain track and drive and steel supporting members.

(8) Drive Equipment

Mechanical drive equipment for Reeves drive and transmitter and for punch, also drive from punch to knife, including dead rolls between punch and knife, also synchronizing device for increasing accuracy of knife and for adjusting cuts between punched holes.

(9) Wet Mixer

One Ehrsam combination pin type slurry mixer and distributor for wallboard and three streams of lath.

One Drive for pin mixer, including right angle reducer, shaft with coupling and "V" belt drive.

One 1200 RPM, 25 HP motor, open drip-proof for 220/440 volt, 3 phase, 60 cycle, A.C. with rails.

One Inclined feeder screw conveyor and mixer inlet cleaning device, also drive motor.

(10) Electric Drive

One 50 HP synchro-speed drive for board machine as follows:

1 - 50 HP standard general purpose, squirrel cage motor, 1200 RPM, with double shaft extension and base.

1 - Electric brake for above motor.

1 - #6-3/4, 3 to 1 ratio, enclosed Reeves variable speed drive with electric remote control.

1 - Wound rotor type synchro-speed generator or transmitter with a primary rated 440 volt, 3 phase, 60 cycle and with an electrical output to match the requirements of the receivers.

3 - Receivers rated at 22.5 lbs. ft. for two belt sections and live roll section.

1 - Receiver rated at 33.6 lbs. ft. for accelerating section.

28.01 EQUIPMENT TO BE FURNISHED BY OWNER (Cont.)

1 - Receiver rated at 90 pounds ft. for punch cut-off drive.

(11) An operator's panel will be included with indicating ammeter for each of the receivers, also volt meter, speed selector and start, stop and jog push buttons.

(12) An alternating current controller will be provided for operation on 440 volt, 3 phase, 60 cycle, with 2 pole contactor for energizing the receivers and the synchro-speed transmitter starters on single phase and with a second 2 pole contactor to apply 3 phase after a time delay. Individual overload relays will be provided for each receiver and for the transmitter.

(13) No other controls nor any wiring will be furnished.

Shipping weights as shown on shop detail drawings.

(1) Continuous Dryer

(1) One Coe continuous Wallboard Dryer, 8 decks, 9 ft. wide steam heated type rollers with overhead duct system and complete with automatic transfer, feeder, and gravity unloader section.

The lengths of the sections will be as follows:

Transfer	26'-0"
Tipple	23'-5"
Feed End 4 Sections	28'-0"
Enclosed Dryer 38 Sections	230'-0"
Cooling End 3 Sections	20'-0"
Gravity Unloader (16 Ft.)	17'-0"
Total Length -	344'-5"

The overall width of the dryer proper will be approximately 11'-2" and at manifolds 18'-9".

The greatest height over the reheaters will be approximately 17'-6".

The height over the recirculating air duct will be about 14'-7".

These dimensions include insulation.

The dryer will be left hand, that is, the drive chains for the rolls will be on left side when facing in direction of board travel through the machine.

(2) Rolls

The rolls will be made up of special welded steel tubes 3" outside diameter, 9'-0" long with gudgeons at each end running in 1-1/4"

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28.01 EQUIPMENT TO BE FURNISHED BY OWNER (Cont.)

I.D. Coe standard ball bearings. Gudgeon shanks on the sprocket end of each roll will be cold rolled steel. Rolls will be spaced vertically and horizontally on 12" centers.

(3) Dryer Frame

The dryer frame will be built to form sections 6'-0" long, arranged in expansion units anchored to the foundation at one point on each side. The frame work will rest on rollers to allow free movement due to change in length from temperature. Uprights and cross members will support the air system on top of the dryer frame.

The cages on the feed section will be sloped for forming decks tangent to the dryer decks and to the tipple. Provision will be made for the rolls in the feed section to have individual motors on each deck to selectively drive at high (tipple) speed when board is being received. No motor controls will be supplied. A 2 HP Independent Variable Low Speed Drive will be provided to keep adjacent boards butted endwise to minimize calcination.

(4) Driving Device

The rolls in the dryer will be driven by steel roller chain running tangentally over 8 tooth hooked tooth sprockets mounted on the gudgeon ends of the tube rollers. The chain will be driven by a totally enclosed drive rig, having forced feed oil lubrication fed from an oil reservoir in the base.

The drive rig will be equipped with a Reeves variable speed transmission for speed control. A base will be provided on the top of the variable speed drives for mounting the drive rig motors. The drive rig will be equipped with an indicating electric tachometer calibrated to dryer speed and equivalent speed of forming belt.

Electric remote control for operating the variable speed drives at a point adjacent to the transfer controls and at the dry end of the dryer as well, will be furnished.

(5) Steam Coils

Above and below each of the dryer decks in the coil sections will be a return bend radiator made up of 1-1/4" standard, 250# wrought iron pipe. The individual pipes will be set on 2-1/2" centers and connected together with heavy duty close center return bends. Radiators will be connected into vertical welded steel supply and return heaters with 3/4" ground seat unions. The coils and headers will be shipped knocked down for field assembly and testing by the Contractor.

28.01 EQUIPMENT TO BE FURNISHED BY OWNER (Cont.)

(6) Air System

The dryer will be divided into three circulation systems. Each system will consist of special design double ball bearing multi-bladed fan, air reheater, exhaust and supply manifolds with nozzles, as required, exhaust stack with damper, and connecting duct made up of insulated metal covered panels.

The direction of air flow in the first system will be against the travel of board; the other two being with the travel of board.

The temperature of the air introduced into the third zone will be under automatic temperature control to constantly and automatically regulate the rate of drying in this zone.

The double fans will be provided with oil lubricated ball bearings designed for continuous operation in temperatures up to 400°F. Each fan will be equipped with a sheave and matched cable core "V" belts, motor sheave and base.

Supply and exhaust manifolds will be of the hinged type for quick access to supply and exhaust sections. Distributing cross nozzles at each deck will be furnished for the air supply sections where needed.

At the wet end of the enclosed dryer where boards enter, there will be supplied a set of exhaust nozzles designed to pick up and exhaust through a small fan all vapor spilling out from the dryer at this point. At the dry end a 6'-0" seal section will be provided to minimize inward air leakage and between zones similar seals will be provided to restrict inter-zone air flow.

(7) Heaters

The air reheaters will be of the extended surface type made up of standard steel pipe with 1/2" copper fins wound on the pipe. These pipes will be connected with extra heavy car heater return bends to form units of not more than six pipes per unit. Unions and connecting nipples shall be field welded directly into the supply and return headers.

Each unit will be removable through the end of the heater frame. The frame of the heater will be made of welded structural steel, which will be attached directly to the framework of the dryer.

These heaters will be shipped knocked down to be assembled and tested at erection by the Contractor. Access to the heaters for inspection and cleaning will be obtained by the use of a large hinged door provided in the heater casing.

28.01 EQUIPMENT TO BE FURNISHED BY OWNER (Cont.)

(8) Insulation

The dryer will be completely insulated. The top of the dryer and the air ducts will be made up of Coe design insulated panels, 3" thick covered with galvanized or enameled iron sheets and filled with glass or rockwool. The fans and heaters will be insulated with a 3" layer of glass or rockwool blanket covered with galvanized sheet metal. The exhaust stacks beyond the control dampers will not be insulated.

(9) Dryer Doors

The dryer doors will be hinged to the dryer uprights and fitted with roller cam locks for holding doors tightly against Coe stainless steel seals where doors fit up against dryer frame.

Hinged reflectors for mounting electric bulbs will be mounted in line with the observation doors along the left hand side of the dryer.

(10) Instruments

Three two-pen recording thermometers for recording the incoming and outgoing air temperatures on the three zones of the dryer.

A dual control for the temperatures of the air in the dry end zone, automatically operating from thermocouples in the dryer. The controllers furnished will be of the proportioning type, acting on a motorized valve in the steam supply to the heater in the third zone.

(11) Drainage System

The wet end and intermediate zones will be supplied with steam at boiler pressure to discharge directly into a high pressure return system. The dry end zone heater operating at variable pressure will discharge into a low pressure return near the dryer from which it can be pumped directly to the boiler. The complete condensate drainage system pumps, motors, and tanks will be supplied by the Owner under paragraph heading "Steam Generator". An individual trap for each coil section will be furnished.

(12) Painting

Necessary heat resisting aluminum paint will be furnished so that after erection, all sheet metal shall receive a coat of aluminum paint, and all exposed steel and metal parts one coat of black enamel furnished and applied by the Contractor.

28.01 EQUIPMENT TO BE FURNISHED BY OWNER (Cont.)

Automatic Transfer and Tipple

A Model 46, completely motorized, electrically actuated transfer and tipple, including all motors and enclosed control panel housing, all automatic switches and relays.

The transfer will be of the belt type, adapted to handle boards 6 feet or larger, in multiples up to 24 foot maximum at a setting belt speed of 100 feet per minute. The machine will be arranged to handle 48", 32" or 24" wide boards or two or three streams of 16" wide standard lath, the operator selecting one or the other of any two, by the setting of suitable switches and adjustments. The center distance between the setting belt and the dryer will be 14'7".

The feed section will be equipped with an independent variable low speed drive.

(13) Gravity Roll Section

An 8 deck, 16'-0" sloping gravity roll section will be located behind the cooling section. Each deck will be made up of 6-12" wide roller sections, pivoted at the rear end, the front end of each section resting on a horizontal support to enable free adjustment to enable positioning for greatest convenience in removing lath. The gravity roll section will be constructed as an independent unit and not anchored to the foundation.

(14) Motors

All necessary motors and starters required for the equipment covered by this contract will be supplied as indicated below. Current characteristics are 440 volt, 3 phase, 60 cycle.

3 - 60 HP, 1800 RPM Main Fan Motors

1 - 10 HP, 1200 RPM Dryers Drive Motor

1 - 7-1/2 HP, 1800 RPM Wet End Exhaust Fan Motor

1 - 5 HP, 1200 RPM Transfer Cross Belt Motor

1 - 5 HP, 1200 RPM Tipple Hoist Motor

1 - 2 HP, 1200 RPM Tipple Roll Motor

1 - 1 HP, 900 RPM Transfer "Off" Rolls and Motor

1 - 2 HP, Reeves Motodrive Feed Section Drive

28.01 EQUIPMENT TO BE FURNISHED BY OWNER (Cont.)

(15) Incidentals

All necessary belts, keys, fittings, etc. for assembling dryer and transfer, except as specified.

Shipping weight of Dryer . . . . . 750,000 pounds.

(m) Wallboard Oil Additive System

One - Proportioneers No. 3XSE, Type 1858 Adjust-O-Feeder, with 1/2 HP motor and one gallon accumulator, 3/4" relief valve, stroke counting contactor and 6 digit reset counter.

(n) Steam Generating Equipment

One - Water Tube Steam Generator Package Unit, shop assembled, complete with burners, refractory, insulation, casing, soot blowers, piping, boiler trim, controls, and following associated equipment:

1 - Worthington Style 3 GA Rotary Pump with cast iron base direct connected by flexible coupling to

1 - 1 HP, 850 RPM, 440 volt, 3 phase, 60 cycle, NEMA design B, 40°C rise, continuous rated drip-proof motor.

1 - Magnetic push button starter with overload and undervoltage protection incorporated therein.

1 - Worthington Type VC Duplex Steam Pump, 4-1/2 x 2-3/4 x 4, fitted for oil and provided with ONE quart size, single feed, McCord mechanical lubricator.

1 - 1/2", No. 87, Chas. M. Bailey Steam Pump Governor with bypass.

1 - Air Chamber.

1 - #118 Chas. M. Bailey Relief Valve for Steam.

1 - #20 Chas. M. Bailey Diaphragm Operated Relief Valve with by-pass for rotary pump.

2 - #11 Powers Temperature Regulator Valves complete.

2 - Pressure Gauges.

2 - Thermometers.

1 - 2", #2CO Chas. M. Bailey Suction Strainer.

2 - #376 Manning & Lewis Fuel Oil Heaters.

1 - Frame, base and necessary interconnecting piping to make the unit a completely integrated fuel oil set.

28.01 EQUIPMENT TO BE FURNISHED BY OWNER (Cont.)

One - Cochrane Becker Model CBA, Size 7-1/2, Condensate Return Pump, rated capacity 60 GPM with a 50 p.s.i. differential, otherwise as specified in Kaiser Engineers' Specification No. 5340-1 and furnished complete with thermometer, pressure gauge, inlet strainer, air relief valve, differential regulating valve, push-button magnetic motor starter, with overload and undervoltage protection incorporated therein, and 7-1/2 HP, 3450 RPM, 440 volt, 3 phase, 60 cycle, NEMA design B, 40°C rise, continuous rated drip-proof motor.

One - Wyatt and Kipper Deaerating Feed Water Heater as specified in Kaiser Engineers' Specification 5340-1 and as shown on Wyatt and Kipper Sketch No. 10453, and complete with all fittings and accessories specified and shown and including an external float cage and float for the deaerating heater level control.

One - Boiler Water Treatment System as specified in Kaiser Engineers' Specification 5340-1, rated 4 GP Hr. at 250 p.s.i. and consisting of:

1 - Milton Roy MD1-24-48 Controlled Volume Pumping Unit complete with 1/4 HP, single phase, 110 volt drip-proof motor. Pump to be furnished with standard screw adjustment of plunger stroke length. Liquid end to be cast iron construction with S.S. trim.

1 - 1/2" Cast Steel Relief Valve.

1 - 100 Gallon Chemical Tank complete with gauge and stand.

One - Steam Driven Duplex Boiler Feed Pump, Worthington Type VC, Size 7-1/2 x 5 x 6, complete with Mason Neilon No. 515 pump governor and McCord, one quart size, single feed mechanical lubricator.

One - Turbine Type Booster Feed Pump, Worthington Type 1-1/4 TH-2, with base, flexible coupling and 10 HP, 340 RPM, 440 volt, 3 phase, 60 cycle, NEMA design B, 40°C rise, continuous rated motor and pushbutton magnetic starter, with overload and undervoltage protection incorporated therein, and including pressure relief valve and suction line strainer.

One - Condensate Surge Tank as specified in Kaiser Engineers' Specification No. 5340-1.

Shipping weight steam generator and accessories approximately 66,000 pounds.

28.01 EQUIPMENT TO BE FURNISHED BY OWNER (Cont.)

(o) Wet Cyclones

Two - wet cyclones, 30" diameter, 24" high, 22" bottom cone with water sprays - Rees blow pipe special.

Two - exhausters, Rees Blow Pipe Company, No. 9 H.E. with V-belt drive.

(p) Raw Materials Feed and Control System

(1) Countershaft assembly for Raw Materials Control system complete with bearings, couplings, clutch, tachometer and roller chain drives to feeders, screw conveyor and vane feeders complete with chain guards.

(2) One - 15 HP Reeves motor drive with motor, remote speed control and speed indicator and coupling.

(3) One - main collecting screw conveyor, 16" diameter, approximately 79'-11" long with tramp iron catcher.

(4) Three - Builders Iron Foundry Roto dip feeders with stainless steel dippers and tank and detached rate setters.

(5) One - Omega indicator recorder with Selsyn receiver and transmitter to each feeder.

(6) Three - Draver feeders and
One - Jeffery vane feeder complete with drives.

(q) Machine Shop Equipment Consisting of:

One - 25" x 12' LeBlond Heavy Duty or Axelson Model "E" Engine Lathe, or equal, with taper attachment, face plate and steady rest with 30 HP motor.

One - 16" x 8" LeBlond or Axelson Model B Heavy Duty Engine Lathe, or equal, with taper attachment, universal 3 jaw chuck, follow rest, with 15 HP motor.

One - 24" Smith and Mills Standard Shaper with plain table, or equal, complete with 5 HP motor.

28.01 EQUIPMENT TO BE FURNISHED BY OWNER (Cont.)

One - 14" No. 14-208 Drill Press, Delta or equal, motor driven, floor type with 1/2 inch chuck, standard tilt table and 1/2 HP single phase, 100 volt, 60 cycle motor.

One - Horizontal Universal Milling Machine, Cincinnati No. 2 dial type or equal.

One - 5" diameter Metal Cutting Band Saw, Wells Manufacturing Company Model 5 M or equal.

One - No. 3F 1 HP Heavy Duty Ball Bearing Floor Grinder, Queen City Machine Tool Company or equal, complete with two carborundum wheels, safe enclosed guards with built-in exhaust provision, pushbutton switch with overload protection, adjustable and safe work rests, tool tray and water pot, adjustable shatterproof glass eye shields.

One - 100 Ton Shop Press, Rodgers or equal, complete with V blocks and 4 speed hydraulic hand pump.

One - No. 12B 1 HP Heavy Duty Buffer, Queen City Machine Tool Company or equal, complete tool tray, water pot and pushbutton station with overload protection.

One - 250 Pound Anvil, forged from new solid ingot steel; faced with one solid piece of special high grade tool steel with tempered edges to prevent chipping; long smooth shaped horn and long heel; non-tip base. Trenton-American, or equal, with Pritchel and Hardie.

One - No. 517 Hauck Manufacturing Company or equal, Diesel Oil Fired Forge complete with burner.

One - 21" Power Drive Upright Drill, Royersford-Excelsior or equal, motor driven, back geared with V-belt power feed and 1 HP motor.

One - 300 Amp Wilson "Hornet" DC Motor Generator Portable Arc Welding Machines or equal, 60-375 Amp 20-40 Volts for 440 volt, 3 phase, 60 cycle.

One - 2 Ton Capacity Ball Bearing Spur Geared Chain Hoist with Model "T" plain trolley, Yale & Towne or equal.

(r) Primary Crusher

One - Pennsylvania Hammermill No. T-3-34, direct connected to 75 HP motor with flexible coupling.

Shipping weight of mill . . . . . 6,550 pounds.
Shipping weight of motor. . . . . 1,200 pounds.

28.01 EQUIPMENT TO BE FURNISHED BY OWNER (Cont.)

(s) Car Spotters

Two - Clyde Iron Works, Catalog No. 5907, Model A Capstan Type Car Pullers with 10 HP motor.

Shipping weight for two . . . . . 3,500 pounds.

One - Clyde No. 10267, 14" Double Guide Sheave.

Shipping weight . . . . . 315 pounds.

(t) Wallboard Inverter for Coe Dryer

One - Wallboard Wet End Inverter complete with 3 HP drive and motor for installation in the 26 ft. transfer section of Coe dryer.

(u) Belting for Conveyors and Wallboard Machine

2685 Lin. ft. of Belting for Conveyors No. 1, 2, 3, 5, 6, and 7, 5-ply, 28 oz.

775 Lin. ft. Belting, 6-ply, 32 oz. for Conveyor No. 4.

Two - 272 ft. long endless Belts, 57" wide, 6-ply, 28 oz., for Wallboard machine.

(v) Sawdust Feeder, 10" Diameter, Double Screw Feeder, 3 HP, 1800 RPM motor reducer and roller chain drive (Ehrsam) sawdust overflow blower.

(w) Paper Pulper and Blower

One - Hammermill (Williams No. GP-1512) Bed Plate, fan mounted on mill shaft, 15 HP, 3600 RPM motor and couplings, and one pulp paper feeder with 1 HP variable speed drive and paper feed rolls.

(x) Laboratory Equipment

The laboratory equipment will consist of approximately the following:

Two - Cabinets with sink and drainboard.

Five - Tables and desks and cabinets without attached utilities.

Chairs as required.

MATERIAL FURNISHED AND INSTALLED BY THE CONTRACTOR

29.00 SCOPE

(a) The work under this section covers equipment to be furnished and installed by Contractor.

(b) Contractor shall, prior to purchase, furnish detailed dimensioned drawings and complete specifications of all equipment which he proposes to furnish for approval of the Owner. Manufacturer's standard guarantees, and operating and maintenance manuals shall also be furnished for all equipment purchased by Contractor.

29.01 SCREW CONVEYORS

Screw Conveyors Nos. 1 to 17 and 19 to 23 inclusive shall be the product of Link Belt Company, Stephens Adamson Manufacturing Company, Jeffery Manufacturing Company or J. B. Ehrsam and Sons as shown on the drawings.

Sectional flights shall be at least 3/16 inch thick, single pitch, lap or butt welded together and continuously welded on one side to the pipe shaft. Conveyor drive shafts shall be fastened by bolts with self-locking nuts. Hangers shall be Link Belt Style 26B or equal, spaced not more than 12 ft. centers for 12 inch and larger conveyors and 10 ft. centers for 10 inch and smaller conveyors. Steel plate trough ends shall be furnished. Bearings shall be double race roller bearing end thrust with mechanical seal. Covers shall be dust seal trough type except as shown on the drawings with spring clip or drop bolt and bar retainer. Slide gates shall be as shown on the drawings.

29.02 RACK AND PINION GATES

Rack and pinion gates on screw conveyors shall be single rack with curved slide plate. Gates at the discharge of bins shall be double rack and pinion with flat plate. Gates shall be furnished with hand or chain wheels and chain as shown on the drawings. Gates shall be the product of Link Belt Company, Stephens Adamson Manufacturing Company, Jeffery Manufacturing Company or J. B. Ehrsam and Sons.

29.03 BUCKET ELEVATORS

Bucket Elevators Nos. 1 and 2 shall be the product of Link Belt Company, Stephens Adamson Manufacturing Company, Jeffery Manufacturing Company or J. B. Ehrsam and Sons. Elevators shall be the equivalent of Link Belt Types 2 and 7, single or double chain, centrifugal discharge, Style A malleable buckets, Class SS chain, screw take-up at head shaft, double row roller bearings at head, graphite bronze bushed bearings at boot, and mechanical backstop. Machinery platforms will not be required.

29.03 BUCKET ELEVATORS (Cont.)

	Elevator No. 1	Elevator No. 2
Link Belt No.	781	217
Size of Bucket	16 x 8	12 x 7
Chain Speed	150	268
Cu. Ft./Hr.	2080	1536
Head Shaft Diameter	4-7/16	2-15/16
Boot Shaft Diameter	2-3/16	1-15/16
Chain No.	SS110	SS110
Gauge of Casing:		
Hood	12 ga.	12 ga.
Intermediate Sections	10 ga.	10 ga.
Boot	3/16 pl.	3/16 pl.
Discharge Spout	10 ga.	10 ga.
Motor H.P.	15	10
Gear Output Speed	125	125
Lift	92-5"	97-0"
Center to Center of Shafts	97'-4" approx.	100'-6" approx.
Capacity - T.P.H.	54	27

29.04 BELT CONVEYORS

(a) The following belt conveyors shall be furnished less belting and installed:

Conveyor No.	Belt Width	Approx. Length Ft.	Approx. Lift Ft.	Cap T.P.H.	Speed F.P.M.	H.P.
1	30	111.875	3.875	250	175	5
2	30	50.0	5.31	250	175	5
3	30	434.33	18.67	500	349	30
4	30	374.64	76.31	500	356	60
5	30	199.73	19.36	50	151	5
6	30	126.16	26.92	50	151	5
7	30	115.61	35.625	50	160	5

(b) Conveyor idlers, head, tail and bend pulley and take-up assemblies shall be the product of Link Belt Company, Stephens Adamson Manufacturing Company, Jeffery Manufacturing Company, Hewitt-Robins, Incorporated or Chain Belt Company. Conveyor idlers shall have 5-inch diameter rolls, anti-friction roller bearings, grease pipe extension for lubrication from one side, Link Belt Series 100, Stephens Adamson No. 235 or Chain Belt No. 32 is representative of acceptable type. Impact rolls shall be the equivalent of Link Belt Rubber Tread Rolls. Contractor shall furnish all supports for conveyor drives and pulleys required in addition to the structural framing shown on structural drawings.

(c) Pulley sets for conveyors shall consist of standard steel pulleys keyed to steel shafts mounted on babbitt bearing pillow blocks.

29.04 BELT CONVEYORS (Cont.)

Head pulleys shall be lagged with 3-ply, 28 oz., 1/8" cover belting fastened with self-tapping flat head screws and special washers.

Magnetic pulley on Conveyor No. 5 shall be Stearns Code No. 3030 electro-magnetic pulley or equal, complete with rectifier for operation on 440 volt, 3 phase, 60 cycle current.

29.05 CHAIN DRIVES

Chain drives shall be manufactured in accordance with the American Standards Association Specifications for precision steel roller chains and wheels of single or multiple widths as required. All chain drives shall be provided with sheet metal safety cover.

29.06 REDUCTION GEARS

Reduction gear on Belt Conveyor No. 4 shall be parallel shaft herringbone type as manufactured by Westinghouse Electric, Falk Corporation or Western Gear Works, 1.5 AGMA service factor complete with safety type all metal flexible coupling.

Gearmotors on all other belt and screw conveyors shall be helical concentric shaft, Falk, all motor type, Class II AGMA service rating, complete with safety type all metal flexible coupling. Motors shall be NEMA design B, 40°C rise, continuous rated, drip-proof, open type, 440 volt, 3 phase, 60 cycle, except Screw Conveyors Nos. 15, 16 and 17 which shall be totally enclosed fan cooled, ribbed yoke, NEMA design B, continuous rated motors.

Back stops on Belt Conveyors Nos. 4, 6 and 7 shall be Stephens Adamson Normal Duty Roller Type Hold Back.

29.07 PAPER HOIST

(a) Paper roll hoist and monorail shall have a rated capacity of 2 tons. Provide 8" Arch Beam weighing not less than 14 lbs. per lin. ft. monorail with one 90° 5"-0" radius turn as indicated on the drawings. Beam shall be suspended by means of suitable flexible suspension fittings which will not induce bending strain in the hanger rods. Beam shall have carrying rail with a minimum Brinnell hardness of 225 and a flat wearing rail tread surface. The beam shall be designed of such proportions that the maximum beam deflection shall not exceed 1/450 of the span nor exceed the safe allowable stress in either tension or compression members under full load at any point.

(b) The electric hoist and carrier shall be Cleveland Tramrail, Catalog No. WHEL-4030-A, or approved equal, with 3 HP single speed providing 18 FPM hoisting speed. The hoist carrier shall be motor driven and have a travel speed of 150 FPM.

29.07 PAPER HOIST (Cont.)

(c) The travel motors control shall be automatic accelerating type and of sufficient capacity to permit plugging in reverse. The hoist lift shall be 19 feet. Hoist wheels shall be at least 5" in diameter and shall be heat treated hardened tread forged steel. Bearings shall be anti-friction 15000 hour life type and dust sealed. Control shall be from one common pendant pushbutton station located approximately 4 feet above the floor and mounted on a 3 ft. radius swinging arm mounted on the carrier. Pilot circuit shall not exceed 110 volts. Shock proof grounded pendant station shall also incorporate a strain chain running parallel to the superservice rubber covered cable.

(d) Provide Saf-Powr-Bar or equal enclosed conductor bar with off web supports. The hoist shall be able to lift a 5'-0" diameter roll of paper over another roll allowing a 3" clearance between the rolls of paper and 6" depth of load bar.

29.08 AIR COMPRESSORS

Furnish and install two (2) Worthington Type HB horizontal air compressors, rated 89 CFM displacement, 66.7 CFM at 100 psi, 6" bore 7" stroke with 15 HP, 1800 RPM, NEMA design B, open type, 40°C rise, continuous rated motor with sliding base for 440 volt, 3 phase, 60 cycle current.

Provide V belt drive, compressor unloader, intake air filter, aftercooler, separator, automatic drain, 18" x 72" vertical air receiver, control and drain piping and valves, pressure gauge and relief valves.

29.09 WEIGHTOMETER

Furnish and install one 30" Merrick Type E Weightometer in Conveyor No. 6 to handle 50 tons per hour, complete with totalizer and all necessary equipment for reading weights at the machine.

Controls or transmission equipment for remote control or operating other equipment will not be required.

29.10 RECLAIM APRON FEEDERS

Furnish and install in the reclaim tunnel, three 24" wide x 6'-8" long Link Belt Modified Type "C" Pan Feeder with structural steel frame, 3/8 inch plate skirt boards and hopper and structural steel supports. Drive shall be 3 HP, Falk, all motor type, Class II, Motoreducer with approximately 3 to 1 ratio roller chain drive and sheet metal chain drive cover.

29.11 CONCENTRATE MIXER

Provide a "Lightnin" or equal portable gear drive mixer, Model D-1, with stainless (18-8 MO) shaft and propeller and 1/3 HP totally enclosed 110 volt, 1 phase, 60 cycle motor.

29.12 EDGE PASTE MIXER

Provide two "Lightnin" or equal portable direct drive mixers, Model C-2, with stainless steel shaft and propeller and 1/8 HP totally enclosed 110 volt, 1 phase, 60 cycle motor.

29.13 CONCENTRATE PUMP

Provide an Allis Chalmers "Electrifugal", 1-1/2 x 1-1/2L, or approved equal, stainless steel (18-8-MO) centrifugal pump, rated 50 gpm, 35 ft. T.D.H., sp. gr. 1.25, direct connected to 1-1/2 HP, 1740 RPM, NEMA design B, 40°C rise, continuous rated, open drip-proof motor.

29.14 WATER PUMP FOR PIN MIXER

Provide a Worthington Regenerative Turbine No. 1-1/2 TH 3 or approved equal pump, iron body bronze mounted, rated 30 GPM, @ 200 psi T.D.H., direct connected to 10 HP, 440 volt, 3 phase, 60 cycle, NEMA design B, 40°C rise, continuous rated, open drip-proof motor.

29.15 WATER SURGE TANK

Provide a 10.2 lb. plate open top tank with bolted 10 gauge cover and hinged access plate, 60" I.D. by 48" straight shell, with drain, overflow and fill connections and with Chas. M. Bailey No. 27P bronze body float valve and bell crank float assembly. Provide 14-inch sight glass set with bronze automatic valves, Penberthy Model 34 or equal.

29.16 200,000 GALLON OIL STORAGE TANK

(a) Furnish and erect a 200,000 gallon, all welded steel oil storage tank, 30 foot diameter by 38 ft. shell height, in accordance with the City of Seattle "Fire and Explosion Hazard Ordinance", as amended, Relating to Aboveground Oil Storage Tanks and the American Petroleum Institute specifications for "All Welded Oil Storage Tanks", No. 12-C, and complete with all nozzles, shell and roof manholes, sump, vents, gauge hole, heater connection nozzle, Shand and Jurs Figure ST 730 or equal, level indicator, and ladder with safety cage and handrailing if required under State of Washington, General Safety Standards of the Department of Labor and Industries.

All welding shall be done by welders certified under Part VII of specification No. 12C and Contractor shall furnish current qualification test reports for each welder.

Tank shall be installed on a 4" sand base with concrete ring wall as indicated on drawings.

(b) Provide an aluminum sulphate-licorice foam type fire extinguishing system as approved by the City of Seattle.

29.17 BINDICATORS

Provide Model A Bindicator with two micro-switches set with one normally open and one normally closed at low level line established by the Owner in the field on the following bins in the wallboard building only: Raw stucco, Sawdust, Accelerator, Flour hopper, Spare hopper, K_2SO_4 hopper, Perlite hopper.

29.18 SAWDUST UNLOADING AND CONVEYING SYSTEM

Provide live bottom screw conveyor system with hopper in which the screw conveyor system operates and gates for bottom of primary storage bin.

29.19 BOILER STACK

Provide 30" diameter x 20 ft. boiler stack and transition of 10 gauge steel for steam generating unit conforming to code requirements of City of Seattle and/or State of Washington.

29.20 SALT WATER SUPPLY PUMP

Pump shall be a deepwell turbine type, having a capacity of 100 GPM @ 160' T.D.H. Discharge connection shall be 3" - 125# flanged. Pump bowls and impellers shall be of zinc-free bronze construction suitable for continuous service pumping sea water. Pump shall be fitted with zinc free bronze suction strainer. Pump column length including bowls shall be 22'-0". Electric motor shall be ball bearing equipped, vertical hollow shaft type with impeller adjusting nut at top of shaft, weather proof enclosure with space heater, for 440 volt, 3 phase, 60 cycle power.

29.21 EDGE PASTE TANKS - Two required, 24" diameter, 18" high steel tanks with 12" lower cone, open top, as shown on drawing.

29.22 CONCENTRATE MIXING TANK - One required, 42" diameter, 32" high, 18-8 Type 316 stainless steel, 3" lower cone, open top, as shown on drawing.

29.23 SOLUTION TANKS - Four required, 6 ft. diameter, 6 ft. high, 18-8 Type 316 stainless steel, open top with agitators and line shaft drive as shown on drawing.

29.24 FUEL OIL PUMP AND HEATER - Provide one Worthington pump, 4 GA with built-in relief valve and 1-1/2 HP, 1150 RPM, weatherproof motor.

One oil heater, Coen Style 19-282, 9'-0" lg.

To heat 14 GPM from 40° to 150°F with 40 psi steam, maximum pressure drop 3/4 psi - 20% cleanliness factor.

Provide temperature control valves, strainers, and pressure and temperature indicators as shown on drawings.

29.25 CALCINING KETTLE THERMOMETERS - Two Indicating Thermometers, Bristol Model 340M, 12 inch diameter chart, bottom connected, 110 volt, 60 cycle, 24 hour. 0 to 600°F chart with stop for over temperature. No. 4710 protection with mounting. 20 feet double bronze armored tubing, plain copper bulb No. 302, 3/4 x 10 and 100 charts.

29.26 Two - 10 HP, 1800 RPM Totally Enclosed, Fan Cooled, Ribbed Yoke, NEMA electric motor, 440 volt, 3 phase, 60 cycle with sliding base for exhausters on Wet Cyclone system.

29.27 Safety Covers on countershaft of Raw Materials Control System.

29.28 Counterweight, hinges, sheaves and operating equipment for retractable stair.