

TEEDLES & THATCHER

CITY OF NEWBERG
CITY RECORDER INDEX NO. 1078

FILE COPY (P)

CONTRACT DOCUMENTS
FOR THE CONSTRUCTION OF THE

WATER TREATMENT PLANT EXPANSION

CITY OF NEWBERG
OREGON

JULY 1970

CORNELL, HOWLAND, HAYES & MERRYFIELD
Engineers and Planners

SEATTLE

CORVALLIS

BOISE

PORTLAND

Contractor: Teeples & Thatcher Contr., Inc.
8850 S.E. Otty Road
Portland, Oregon

Project No. C5508.2
Project: Water Treatment Plant
Expansion
Owner: City of Newberg, Oregon
Change Order No. 2
Date: 22 November 1971

CHANGE ORDER NO. 2 TO CONTRACT
FOR
the construction of
WATER TREATMENT PLANT EXPANSION
CITY OF NEWBERG, OREGON

This Change Order covers the changes indicated below to the subject Contract, and the Contractor is hereby directed to perform the work in accordance with the provisions of this Change Order.

1. Addition of a 2-inch diameter air release valve and associated piping at the filter backwash pump discharge.

Addition \$ 278.97

2. Thicken pump room floor slab to provide adequate encasement of electrical conduit.

Addition \$ 135.00

3. Provide imported pipe base and pipe zone material for pipe under asphalt pavement.

Addition \$ 99.00

4. Extra concrete block work at entrance to control room.

Addition \$ 57.74

5. Delete door between existing plant and hallway outside chlorine room.

Deletion \$ 89.00

6. Paint clearwell and filter basins with City furnished paint.

Addition \$1,262.80

7. Excavating and relaying the drain line from the existing settling basin.

Addition \$ 600.00

8. Blocking air duct into existing chlorine room.

Addition \$ 44.00

9. Pressure reducing and pressure relief valve, air release valve, and associated piping on backwash line.

Addition \$ 383.42

10. Two relief valves at air compressor discharge piping.

Addition \$ 20.77

11. Move conduit in chlorine room, repull wires, and install junction boxes.

Addition \$ 530.13

12. Change location of settling basin level sensor.

Addition \$ 278.00

The amount of the basic Contract will be increased in the sum of THREE THOUSAND SIX HUNDRED AND 83/100 DOLLARS (\$3,600.83), and it is agreed that this amount constitutes full payment for work added and credit for all work deleted by this Change Order.

The Contract time will not be increased.

Except as herein modified, the terms of the basic Contract shall remain in full force and effect.

Approved:

CORNELL, HOWLAND, HAYES & MERRYFIELD

By *Archie Meadows*
Date 11/23/71

Receipt acknowledged and terms and conditions agreed to this 29 day of November, 1971.

Authorized for the CITY OF NEWBERG OREGON, this ____ day of _____, 19__.

TEEPLES & THATCHER CONTR., INC.

By *Michael Lubars*
Title *Mgr.*

By _____
Title _____

Contractor: Teeples & Thatcher Contr., Inc.
8850 S.E. Otty Road
Portland, Oregon

Project No. C5508.2
Project: Water Treatment Plant
Expansion
Owner: City of Newberg, Oregon
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CORNELL, HOWLAND, HAYES & MERRYFIELD

By

Date

Archie Meadows
11/23/71

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Authorized for the CITY OF NEWBERG OREGON, this ____ day of _____, 19__.

TEEPLES & THATCHER CONTR., INC.

By

Title

Michael Lubars
mgr.

By

Title

Contractor: Teeple & Thatcher Contr., Inc.
8850 S.E. Otty Road
Portland, Oregon

Project No. C5508.2
Project: Water Treatment Plant
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Owner: City of Newberg, Oregon
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Approved:

CORNELL, HOWLAND, HAYES & MERRYFIELD

By

Date

Archie Meadows
11/23/71

Receipt acknowledged and terms and conditions agreed to this 29 day of November, 1971.

Authorized for the CITY OF NEWBERG OREGON, this ____ day of _____, 19__.

TEEPLES & THATCHER CONTR., INC.

By

Title

Michael Dubanks
Mgr.

By

Title

Contractor: Teeples & Thatcher Contr., Inc.
8850 S.E. Otty Road
Portland, Oregon

Project No. C5508.2
Project: Water Treatment Plant
Expansion
Owner: City of Newberg, Oregon
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Approved:

CORNELL, HOWLAND, HAYES & MERRYFIELD

By

Date

Arthur Meadows
11/23/71

Receipt acknowledged and terms and conditions agreed to this 29 day of November, 1971.

Authorized for the CITY OF NEWBERG OREGON, this ____ day of _____, 19__.

TEEPLES & THATCHER CONTR., INC.

By

Title

Michael Dubonche
Mgr.

By

Title

Contractor: Teeples & Thatcher Contr., Inc.
8850 S.E. Otty Road
Portland, Oregon

Project No. C5508.2
Project: Water Treatment Plant
Expansion
Owner: City of Newberg, Oregon
Change Order No. 2
Date: 22 November 1971

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Except as herein modified, the terms of the basic Contract shall remain in full force and effect.

Approved:

CORNELL, HOWLAND, HAYES & MERRYFIELD

By

Date

Archie Howland
11/23/71

Receipt acknowledged and terms and conditions agreed to this 29 day of November, 1971.

Authorized for the CITY OF NEWBERG OREGON, this ____ day of _____, 19__.

TEEPLES & THATCHER CONTR., INC.

By

Title

Michael Dubanks
mgr.

By

Title

Signature Copy

CITY OF NEWBERG
CITY RECORDER INDEX NO. 1070

Contractor:
Teeples & Thatcher Contractors, Inc.
8850 S.E. Otty Road
Portland, Oregon

Project No. C5508.2
Project: Water Treatment Plant
Expansion
Owner: City of Newberg, Oregon
Change Order No. 1
Date: 17 September 1970

CHANGE ORDER NO. 1 TO CONTRACT
FOR
THE CONSTRUCTION OF THE
WATER TREATMENT PLANT EXPANSION
CITY OF NEWBERG, OREGON

This Change Order covers the changes indicated below to the subject Contract, and the Contractor is hereby directed to perform the work in accordance with the provisions of this Change Order.

1. Delete the new 24-inch concrete cylinder pipeline from well supply line and one 24-inch butterfly valve with underground operator and valve box; change all exterior new concrete cylinder, ductile iron, and welded steel plant influent and effluent pipelines to cast iron, as indicated on Drawing No. C5508-1, Sheets 2, 5, 24 of the Plans.

Deduction \$ 2,430.00

2. Change new 2'-0" x 2'-6" reinforced concrete settled water flume to 30-inch diameter ASTM C 76-65T Class III reinforced concrete pipe with rubber gasket joints as indicated on Drawing No. C5508-1, Sheets 6, 20, 30 of the Plans.

Deduction \$ 1,203.00

3. Change all redwood baffle boards to Construction Grade Douglas fir S4S. Move pond location as shown on Drawing No. C5508-1, Sheet 3 of the Plans.

Deduction \$ 450.00

4. Delete all filter surface wash agitators, together with piping, supports, and control valves, as indicated on Drawing No. C5508-1, Sheet 25.

Deduction \$ 3,968.00

Teeple & Thatcher Contractors, Inc.
Project No. C5508.2
Change Order No. 1
Date: 17 September 1970

5. Delete new 4-inch building service waterline and 4-inch surface wash header. Install new 2-inch building service waterline with pressure reducing valve assembly and revise building service water piping as indicated on Drawing No. C5508-1, Sheets 24, 31, 33. Valve shall be a 2-inch Mueller Series H-9300, pressure range No. 2, or as approved.

Deduction \$ 1,190.00

6. Change reinforced concrete inlet structure and bypass structure for wastewater settling pond to precast manhole structures as indicated on Drawing No. C5508-1, Sheet 4.

Deduction \$ 500.00

7. Delete all sheet piling and substitute shoring and/or bracing as required to prevent damage to the existing structure. Shoring or bracing shall be either temporary or permanent, but shall be constructed of permanent materials if to be left in place permanently.

Deduction \$ 2,580.00

8. Change all Class I finish concrete surfaces to ordinary wall finish.

Deduction \$ 3,000.00

9. Change butterfly valve bodies from short body type to wafer type.

Deduction \$ 4,348.00

10. Reduce minimum horsepower requirement for high-service pump No. 2 from 400 hp to 350 hp.

Deduction \$ 600.00

11. Adjust price for high-service pump control valves.

Deduction \$ 900.00

12. Adjust price for furnishing and installing Wallace and Tiernan Chlorine Feed Equipment.

Deduction \$ 611.00

Teeple & Thatcher Contractors, Inc.
Project No. C5508.2
Change Order No. 1
Date: 17 September 1970

13. Change roofs over pump room and control room from reinforced concrete to wood beam and decking with built-up roofing. Construct as indicated on Sheets 9, 10, 15, 16 of Drawing No. C5508-1 and as specified in the Special Specifications and the Supplemental Special Specifications for Change Order No. 1 attached herewith.

Deduction \$ 1,202.00

14. Delete southwest portion of clearwell as indicated on Sheets 10, 13, 14, 16, 18, 21, 22, 26, 28, 29 of Drawing No. C5508-1.

Deduction \$ 3,112.00

15. Delete gravel for pipe base and imported backfill material for pipe zone, and substitute native material containing no rock, frozen soil, or other pieces of material larger than 3/4-inch. Material shall also be reasonably loose and workable, but not muddy or plastic. Compact pipe zone material to at least 95 percent of maximum density as determined by AASHTO T 99, Method A.

Deduction

\$ 1004.00
~~\$ (see below)~~ aEm

16. Mount the lighting panel "LA" and the 25 kva transformer on the wall instead of in the Motor Control Center.

Deduction

\$ 330.00
~~\$ (see below)~~ aEm

17. Delete the ground fault protection on the 3 motor branch circuits.

Deduction

\$ 570.00
~~\$ (see below)~~ aEm

18. Delete space in Motor Control Center for future 400 hp motor.

Deduction - (Items 15, 16, 17, & 18, inclusive)

\$ 200.00
~~\$ 1,004.00~~ aEm

19. Delete ammeter from utility enclosure.

Deduction

\$ 235.00
~~\$ 1,335.00~~ aEm

Teeple & Thatcher Contractors, Inc.
Project No. C5508.2
Change Order No. 1
Date: 17 September 1970

20. Delete two Fixtures No. 3 and one Fixture No. 4 in the control room and respace accordingly.

Deduction \$ 122.00

21. Delete exterior lights (Fixture No. 7) from the parking lot side of building.

Deduction \$ 317.00

22. Delete seven Fixtures No. 2 from pump room and respace accordingly on beams.

Deduction \$ 376.00

23. Delete the specified Outplant Supervisory Control System and replace the tone portion with a D.C. system. The system shall perform the following functions:

- a. Turn each well pump ON or OFF with a HAND-OFF-AUTO selector switch in the plant control panel at the water treatment panel. See Drawing No. E5508-2, Sheet 1 of 1.
- b. Have automatic shutdown of either well pump No. 3 or well pump No. 4 when backwashing.
- c. Provide a level Indicator-Recorder in the plant control panel at the Water Treatment Plant for the reservoir, with appropriate equipment at the reservoir. Utilize pressure tap in sump at the reservoir and send information to WTP via a pulse width modulated D.C. signal. The Indicator-Recorder shall have individually adjustable switches for control of High Service Pump No. 1, High Service Pump No. 2, high level shutdown of well pumps, high level alarm, and low level alarm.

The system shall be supplied by Martig's, Inc. and shall meet the original Specifications on system performance as well as Indicator-Recorder performance. Provide wiring diagrams and elementary control diagrams to the Engineer prior to fabrication of the equipment.

Deduction \$ 8,600.00

Teeples & Thatcher Contractors, Inc.
Project No. C5508.2
Change Order No. 1
Date: 17 September 1970

24. Adjust price for Bond and Insurance.

Deduction \$ 850.00

The amount of the basic Contract will be decreased in the sum of THIRTY-EIGHT THOUSAND SIX HUNDRED NINETY-EIGHT DOLLARS (\$38,698.00), and it is agreed that this decrease constitutes full credit for all work deducted by this Change Order. The Performance and Payment Bond shall be decreased to reflect the above change.

The Contract time will be Increased 30 calendar days.

Except as modified, the terms of the basic Contract shall remain in full force and effect.

Approved:
Cornell, Howland, Hayes & Merryfield

By Archie Macdonald
Date 17 September 1970

Receipt acknowledged and terms and conditions agreed to this 22nd day of September, 1970.

TEEPLES & THATCHER CONTRACTORS, INC.

By [Signature]
Title Vice Pres. Texas

Authorized for the CITY OF NEWBERG, OREGON this 22nd day of September, 1970.

By [Signature]
Title Mayor

SUPPLEMENTAL SPECIAL SPECIFICATIONS
FOR
CHANGE ORDER NO. 1

Due to changes covered in Item 12, add the following to MATERIALS under Section CARPENTRY AND RELATED WORK:

LUMBER. Pressure treat lumber in contact with masonry and/or concrete.

<u>Use</u>	<u>Grade</u>
Sills	Standard or Better
Plates	Standard or Better
Studs	Standard or Better
Beams, Girders, and Joists	Construction Grade
Cant Strips	Standard or Better Pressure Treated
Fascia, Millwork, and Other Finish Material	
Not Designated	"C" or Better VG-KD
Miscellaneous Material	Standard or Better - for repairs, match existing, unless otherwise specified.

STRUCTURAL, GLUED, LAMINATED TIMBER.

FABRICATION. Structural, glued, laminated timbers shall be manufactured in conformance with the information on the Plans and AITC 103-65 and other parts of AITC Timber Construction Manual, except as modified hereinafter. The manufacturer shall visit the project site, check conditions, and take measurements as required. He shall submit shop drawings in quadruplicate to the Contractor for the Engineer's review, and receive the reviewed shop drawings back appropriately stamped by the Engineer prior to starting fabrication of the timbers.

LUMBER AND ADHESIVES. Lumber for laminating shall be Douglas fir (Coast Region) and meet the structural requirements and laminating specifications of CS253 and shall be of such stress grade to provide glued, laminated timbers with allowable stress values of 2,200 psi in bending, 1,800 psi in tension, and 1,300 psi in compression parallel to the grain. Adhesives shall meet the requirements for Dry Condition of service. Laminated timbers shall be Industrial Appearance Grade. Timbers shall be constructed under the supervision of properly qualified personnel with adequate plant and equipment to perform the operation.

FINISH AND WRAPPING. Smooth and sand surfaces of glued, laminated timbers at the mill in conformance with the specified grade requirements and leave in satisfactory condition for the painter's finish. A coat of sealer shall be applied to the ends of the laminated timbers.

Protect each laminated timber from damage that would impair its structural strength, appearance, or durability. Wrap timbers with a moisture-resistant paper before shipment.

GRADE MARKING. Finished, glued, laminated timbers shall be stamped with an AITC quality mark indicating conformance with CS253-63 and applicable job Plans and Specifications.

ROOF DECKING. 2" x 6", T & G, V-joint hemlock, as specified in Paragraph 226 graded in accordance with 126-b of the Grading and Dressing Rules of the WCLIB.

ANCHORS AND JOIST HANGERS. Framing anchors shall be TECO Trip-L-Grip, and joist hangers TECO-U-Grip hangers, as manufactured by Timber Engineering Company, San Francisco, California. Provide manufacturer's special nails in sufficient quantity for securing the anchors and hangers in place.

Due to changes covered in Item 12, add the following to WORKMANSHIP under Section CARPENTRY AND RELATED WORK:

ANCHORS AND HANGERS. Install framing anchors and joist hangers in accordance with details shown and manufacturer's recommendations. Use nails provided by the manufacturer for attachment.

TREATMENT FOR CUT SURFACES OF PRESERVATIVE TREATED LUMBER. All cut or damaged surfaces of preservative treated lumber, regardless of use, shall be prepared and treated with a preservative as specified in AWP4 M4.

ERECTION OF STRUCTURAL, GLUED, LAMINATED TIMBERS. Deliver the glued, laminated timbers to the site by means of suitable equipment that will not overstress or damage the timbers in any manner. Store timbers on level blocking and protect if erection is not to be done upon arrival.

Install laminated timbers in conformance with Plans. Be careful to prevent overstressing the timbers. Leave the protective paper wrapping in place until such time as the removal is directed by the Engineer. Secure timbers in place as shown and as directed.

INSTALLATION OF ROOF DECKING. Store roof decking under cover until required for use. Stagger joints and arrange so that at least one board is continuous between joints. Make all joints over bearing surfaces. Drive the decking tight and securely nail at each bearing with two 16-penny nails. Drive nailheads flush or slightly below the surface.

CERTIFICATE OF INSURANCE

This is to Certify, that policies in the name of

NAMED
INSURED
and
ADDRESS

Teeple & Thatcher Contractors, Inc.
8850 S.E. Otty Road
Portland, Oregon

THIS CERTIFICATE OF INSURANCE NEITHER AFFIRMATIVELY NOR
NEGATIVELY AMENDS, EXTENDS OR ALTERS THE COVERAGE
AFFORDED BY ANY POLICY DESCRIBED HEREIN.

are in force at the date hereof, as follows:

KIND OF INSURANCE	POLICY NUMBER	POLICY PERIOD	LIMITS OF LIABILITY	
			BODILY INJURY	PROPERTY DAMAGE
WORKMEN'S COMPENSATION		Eff. Exp.	Provided by Workmen's Compensation Law—State of	NIL
COMPREHENSIVE GENERAL LIABILITY	ACL 02 61 19	Eff. 3-15-69 Exp. 3-15-72	\$ 100 ,000 Each person \$ 300 ,000 Each occurrence \$ 300 ,000 Aggregate	\$ 10 ,000 Each occurrence \$,000 Aggregate
MANUFACTURERS' AND CONTRACTORS' LIABILITY		Eff. Exp.	\$,000 Each person \$,000 Each occurrence	\$,000 Each occurrence \$,000 Aggregate
OWNERS', LANDLORDS' AND TENANTS' LIABILITY		Eff. Exp.	\$,000 Each person \$,000 Each occurrence	\$,000 Each occurrence \$,000 Aggregate
CONTRACTUAL LIABILITY		Eff. Exp.	\$,000 Each person \$,000 Each occurrence	\$,000 Each occurrence \$,000 Aggregate
AUTOMOBILE LIABILITY ☐ Owned Automobiles ☐ Hired Automobiles ☐ Non-Owned Automobiles		Eff. Exp.	\$,000 Each person \$,000 Each accident	\$,000 Each accident
COMPREHENSIVE AUTO- MOBILE LIABILITY		Eff. Exp.	\$,000 Each person \$,000 Each occurrence	\$,000 Each occurrence
OTHER:	L 79263 L 79264	Eff. 7-1-70 Exp. 7-1-71		*100,000. each occurrence ~100,000. aggregate

* Subject to 250. ded. Miscellaneous and \$10,000. Auto
City of Newberg, Oregon

In the event of any material change in, or cancellation of, said policies, the undersigned company will endeavor to give written notice to the party to whom this certificate is issued, but failure to give such notice shall impose no obligation nor liability upon the company.

Dated: September 18, 1970
Name of American Star Insurance Company
Company: Lloyd's of London

AUTHORIZED REPRESENTATIVE

CERTIFICATE ISSUED TO:

NAME
and
ADDRESS

City of Newberg
Newberg, Oregon

ENDORSEMENT

This endorsement, effective M. September 18, 1970, forms a part of
policy No. ACL 02 61 19 issued to Teeples & Thatcher Contractors, Inc.
by The American Star Insurance Company

It is agreed that The City of Newberg, Oregon, its officers, agents and employees and Cornell, Howland, Hays & Merryfield are added as additional insureds hereunder solely as respects any occurrence arising out of or in connection with work being performed by Teeples & Thatcher Contractors, Inc. under their contract with the City of Newberg, Oregon for water treatment plant expansion.

It is further agreed that, notwithstanding anything contained herein to the contrary, as respects the additional insured Cornell, Howland, Hays & Merryfield this policy does not cover any claim for breach of professional duty in their capacity as engineers by reason of any negligent act, error or omission.

It is further agreed that the policy may not be cancelled by the Company or reduced in coverage by the Company until 10 days after written notice of such cancellation or reduction in coverage has been given in accordance with the conditions of the policy to:

The City of Newberg
Newberg, Oregon

and

Cornell, Howland, Hays & Merryfield
1600 Western Boulevard
Corvallis, Oregon 97330



ENDORSEMENT

#24

Attached to and forming part of Policy/Certificate No. L 79263 L 79264

Issued to Teeples & Thatcher Contractors, Inc.

Endorsement effective September 18, 1970

It is understood and agreed that City of Newberg, Oregon and/or Cornell, Howland, Hays & Merryfield, 1600 S.W. Western Boulevard, Corvallis, Oregon are named as additional Assureds with respects to the work being performed by Teeples & Thatcher Contractors, Inc. under their contract with the City of Newberg, Oregon for water treatment plant expansion.

It is further understood and agreed, notwithstanding anything contained herein to the contrary, as respects the additional Assured Cornell, Howland, Hays & Merryfield, this Policy/Certificate does not cover any claim for breach of professional duty in their capacity as Engineers by reason of any negligent act, error or omission.

It is further understood and agreed that prior to the cancellation or change of this Policy/Certificate ten (10) days' written notice will be given by Rathbone, King & Seeley on behalf of Underwriters to The City of Newberg, Newberg, Oregon and to Cornell, Howland, Hays & Merryfield, 1600 S.W. Western Boulevard, Corvallis, Oregon.

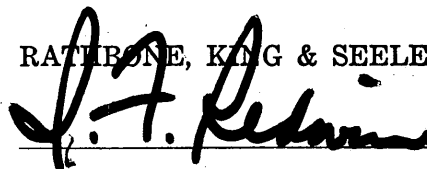
The foregoing shall not act to increase Underwriters' limit of liability under this Policy/Certificate.

ALL OTHER TERMS, CONDITIONS AND EXCLUSIONS REMAIN UNCHANGED.

DATED: September 18, 1970

LLOYD'S

RATHBONE, KING & SEELEY



ADDENDUM NO. 1
to the
CONTRACT DOCUMENTS
for the construction of the
WATER TREATMENT PLANT EXPANSION
CITY OF NEWBERG, OREGON

CITY OF NEWBERG
CITY RECORDER INDEX NO. 1078

To All Planholders:

28 July 1970

Gentlemen:

Project No. C5508.1

The following changes, additions, and/or deletions are hereby made a part of the Contract Documents for the construction of the Water Treatment Plant Expansion, dated July 1970, as fully and completely as if the same were fully set forth therein:

1. ADVERTISEMENT FOR BIDS

Page 1, Paragraph 1, Line 4. Change the date of bid opening from the "3rd day of August" to the "10th day of August" 1970.

2. SPECIAL SPECIFICATIONS

a. Page 29, SHEET PILING, Line 2. Delete "ASTM A 328" and substitute "ASTM A 569".

b. Page 79, B. MATERIALS. Delete Paragraph 3 as written and substitute as follows:

"Each of the 2 filter beds shall be equipped with four 7'-6" diameter filter agitators (or rotary surface washers). The filter bed agitators shall be self-propelling, revolving, Straight Line type, as manufactured by F. B. Leopold Company, Inc., Zelionople, Pennsylvania, or as approved. The units shall consist of a central stainless steel bearing assembly, a bronze tee having a nozzle affixed to emit a stream directly below and from the center of this tee, and arms extending laterally from the tee.

"Arms shall be constructed of a straight section extending in opposite directions from the central tee, terminating in a straight-end section at each end. Pipe sections shall be of red brass pipe, with bronze or brass nozzles located at double-angled positions on straight pipe in such a manner as to most effectively cover the area of the filter to be cleaned by each unit.

"Straight-end sections shall be equipped with bronze nozzles. End nozzles on the end section of the arm shall be sized by the manufacturer for most efficient operation. All nozzles shall be equipped with synthetic rubber caps slitted to act as check valves to exclude filter media from the washer arms (Stuart Flex-I-Jet, or equal)."

*SUBMIT WITH
BID / SIGNED
& DATED.*

- Paragraph 2. Delete "Handwheel shall be ARMCO HB-18."

- "One spare transmitter and receiver (of each type), and power supply plug-in unit shall be furnished."

Paragraph 4. Add to the list of audio-tone equipment: "Femco, Inc."

- a. Drawing No. C5508-1, Sheet 36 of 43. On the PLANT CONTROL PANEL ELEVATION, add an annunciator panel between the electric clock and recorder on the Outplant Supervisory Control Panel. The size shall be as required by the functions to be alarmed.
- b. Drawing No. C5508-1, Sheet 39 of 43. On the WATER TREATMENT PLANT -- ONE LINE DIAGRAM change the main circuit breaker to a 1600 amp frame with an adjustable trip unit.
- c. Drawing No. C5508-1, Sheet 43 of 43. Add the following to the note below the TELEMETRY BLOCK DIAGRAM:

All bidders shall acknowledge receipt and acceptance of this Addendum No. 1 by signing in the space provided and submitting the signed Addendum with the bid. Bids submitted without this Addendum will be considered informal.

Archie E. Meadows
Archie E. Meadows

By

-2-

CITY OF NEWBERG

OREGON

CONTRACT DOCUMENTS

for the construction of the
WATER TREATMENT PLANT EXPANSION

Consisting of:
Form of Bid Bond
Advertisement for Bids
Form of Proposal
Form of Contract
Form of Performance and Payment Bond
Information for Bidders
Special Provisions
General Conditions
Special Specifications
Standard Specifications
Plans

Cornell, Howland, Hayes & Merryfield
Engineers-Planners-Economists
Corvallis, Oregon

July 1970

Project No. C5508.1

Copy No. 61

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STANDARD SPECIFICATIONS FOR REINFORCED CONCRETE

PLANS

KNOW ALL MEN BY THESE PRESENTS:

That the UNITED PACIFIC INSURANCE COMPANY, a corporation of the State of Washington, having its principal offices in the city of Tacoma, Washington, pursuant to authority granted by By-Law No. 37-A of its By-Laws, which reads as follows:

"The President, any Executive Vice-President, any other Vice-President, any Assistant Vice-President, or any Resident Vice-President of this Corporation, shall have authority to appoint in writing such attorneys-in-fact as the business of the Company may require, and to authorize such attorneys-in-fact, and each of them, to execute on behalf of the Company, any bonds, recognizances, stipulations, contracts of indemnity and other undertakings of like character, or to exercise any lesser number of said powers as hereinbefore set forth.

"Said appointments shall be attested by the Secretary or an Assistant Secretary of this Corporation under its seal. The signature of the Secretary or any Assistant Secretary to certified copies of such powers of attorney may be original or facsimile, and when the corporate seal is affixed thereto, any third party may rely on said certified copies of powers of attorney as the act and deed of this Corporation. The President, any Executive Vice-President, any other Vice-President, any Assistant Vice-President, or any Resident Vice-President may revoke any appointment made pursuant hereto, and revoke any and all authority conferred by any such appointment."

does hereby nominate, constitute and appoint W. R. REED of PORTLAND, OREGON- - - - -

its true and lawful Attorney-in-Fact, to make, execute, seal and deliver for and on its behalf, as surety, and as its act and deed,
ANY AND ALL BONDS AND UNDERTAKINGS OF SURETYSHIP.

The execution of such bonds or undertakings in pursuance of these presents, shall be as binding upon said Company, as fully and amply, to all intents and purposes, as if they had been duly executed and acknowledged by the regularly elected officers of the Company at its office in Tacoma, Washington, in their own proper persons.

IN WITNESS WHEREOF, the UNITED PACIFIC INSURANCE COMPANY has caused these presents to be signed
 by its _____ Vice-President and its corporate seal to be hereto affixed, duly attested by its Assistant Secretary,
 this 12th day of December, 1967.

UNITED PACIFIC INSURANCE COMPANY

Attest: s/ RUTH ENSTONE
 Assistant Secretary

By s/ MORRIS E. BROWN (SEAL)
 Vice-President

STATE OF WASHINGTON }
 County of PIERCE } ss.

On this 12th day of December, 1967, personally appeared MORRIS E. BROWN

and RUTH ENSTONE, to me known to be the _____ Vice-President and Assistant Secretary, respectively, of UNITED PACIFIC INSURANCE COMPANY, and acknowledged that they executed and attested the foregoing instrument and affixed the seal of said corporation thereto, and that By-Law No. 37-A, set forth therein, is still in full force.

Witness my hand and seal hereto affixed the day and year first above written.

My Commission Expires January 15, 1970.

s/ Bertha M. Barragar
 Notary Public in and for the State of Washington
 Residing at Tacoma

STATE OF WASHINGTON }
 County of PIERCE } ss.

I, GERRY L. WHITE Assistant Secretary of the UNITED PACIFIC INSURANCE COMPANY, do hereby certify that the foregoing instrument is a true copy of a Power of Attorney duly and regularly issued by said Company, and that the same is still in full force and effect.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed the seal of said Company at the City of TACOMA
 this 10th day of AUGUST, 1970 Gerry L. White (SEAL)
 Assistant Secretary

ADVERTISEMENT FOR BIDS

Sealed proposals for the construction of the Water Treatment Plant Expansion, addressed to the Finance Officer, City of Newberg, Oregon, will be received in the Council Chamber until 7:30 p.m., Pacific Daylight Time, on the 3rd day of August, 1970 and then will be publicly opened and read.

The work contemplated consists of expansion of the existing water treatment plant from 2.16 mgd to 3.75 mgd. Major new units consist of 2 filters, a clear well, chlorine room and chlorine equipment, polyelectrolyte feed equipment, pump room and pumps, control room and plant controls, and miscellaneous piping and electrical work.

Plans and Specifications may be examined in the office of M. C. Gilbert, Finance Officer, or at the office of Cornell, Howland, Hayes & Merryfield, Engineers-Planners-Economists, 1600 S.W. Western Boulevard, Corvallis, Oregon 97330. A copy of said Documents may be obtained at the Engineer's office at 1600 S.W. Western Boulevard, Corvallis, Oregon, upon a deposit of Fifty Dollars (\$50.00) for each Document. The full amount of the deposit will be refunded if said Documents are returned in good condition within ten (10) days after bid opening.

Bidders must be prequalified in compliance with applicable parts of Chapter 279 of Oregon Revised Statutes. Prequalification forms, completely filled out, shall be mailed to Cornell, Howland, Hayes & Merryfield, 1600 S.W. Western Boulevard, Corvallis, Oregon, at least ten (10) days prior to the bidding date.

No bid will be received or considered by the public body or any officer of the public body unless the bid contains a statement by the Bidder as a part of his bid that the provisions required by ORS 279.350 shall be included in his Contract.

Each proposal must be submitted on the prescribed form and accompanied by a certified check or bid bond executed on the prescribed form payable to the City of Newberg, Oregon, in an amount not less than ten percent (10%) of the amount bid.

The successful Bidder will be required to furnish a bond for faithful performance of the Contract in the full amount of the Contract price.

The right is reserved to reject any or all proposals, to postpone the award of the Contract for a period not to exceed thirty (30) days, and to accept that proposal which is to the best interests of the City of Newberg, Oregon.

Dated this 9th day of July, 1970.

CITY OF NEWBERG, OREGON

By _____
M. C. Gilbert, Finance Officer

PROPOSAL

To: Mayor and City Council
City of Newberg
Newberg, Oregon

The undersigned, hereinafter called the Bidder, declares that the only persons or parties interested in this Proposal are those named herein; that this Proposal is, in all respects, fair and without fraud; that it is made without collusion with any official of the Owner; and that the Proposal is made without any connection or collusion with any person making another proposal on this Contract.

The Bidder further declares that he has carefully examined the Contract Documents for the construction of the project; that he has personally inspected the site; that he has satisfied himself as to the quantities involved, including materials and equipment, and conditions of work involved, including the fact that the description of the quantities of work and materials, as included herein, is brief and is intended only to indicate the general nature of the work and to identify the said quantities with the detailed requirements of the Contract Documents; and that this Proposal is made according to the provisions and under the terms of the Contract Documents, which Documents are hereby made a part of this Proposal. The Bidder further declares that the provisions required by ORS 279.350 relating to prevailing wage rates shall be included in his Contract.

The Bidder further agrees that he has exercised his own judgment regarding the interpretation of subsurface information and has utilized all data which he believes pertinent from the Engineer, Owner, and other sources in arriving at his conclusions.

The Bidder agrees that if this Proposal is accepted, he will, within seven (7) calendar days after notification of acceptance, execute the Contract with the Owner in the form of Contract annexed hereto; and will, at the time of execution of the Contract, deliver to the Owner the Performance and Payment Bond required herein; and will, to the extent of his Proposal, furnish all machinery, tools, apparatus, and other means of construction and do the work and furnish all the materials necessary to complete the work in the manner, in the time, and according to the methods as specified in the Contract Documents and required by the Engineer thereunder.

The Bidder further agrees to begin work within ten (10) calendar days after the date of the execution of the Contract and to complete the construction, in all respects, on or before 1 August 1971.

In the event the Bidder is awarded the Contract and shall fail to complete the work within the time limit or extended time limit agreed upon, as more particularly set forth in the Contract Documents, liquidated damages shall be paid to the Owner at the rate of ONE HUNDRED DOLLARS (\$100.00) per day until the work shall have been finished as provided by the Contract Documents. Sundays and legal holidays shall be excluded in determining days in default.

The Bidder agrees to accept as full payment for the proposed construction, as defined herein, and as shown on the Plans, based on the undersigned's own estimate of quantities and costs, not including the cost of furnishing and installing the equipment listed under Sections IIA, IIB, and IIE listed in the Special Specifications, the following lump sum of:
 Four hundred fifty-one thousand and

one hundred Dollars
 and - no - Cents \$ 451,100.00

To facilitate monthly progress payments, the following breakdown of the total lump sum bid is to be given, and it is agreed that these are the actual prices upon which said lump sum is based; and that, if so requested by the Engineer, the Contractor will substantiate any price or prices with further information.

BIDDER BREAKDOWN OF LUMP SUM BID

(The Bidder must submit with his Proposal the figures called for below.)

<u>Section No.</u>	<u>Title</u>	<u>Amount</u>
	Bond and Insurance	\$ <u>12,000.00</u>
2A.	Move In and Site Preparation	\$ <u>30,000.00</u>
2B.	Cutting, Demolition, and Salvage	\$ <u>7,000.00</u>
2C.	Excavation, Fill, Backfill, and Riprap	\$ <u>25,000.00</u>
2D.	Cleanup	\$ <u>1,500.00</u>
2E.	Replacement of Pavement and Curbs and Settling Pond Liner	\$ <u>4,000.00</u>
2F.	Concrete Pipe, Drain Tile, and Manholes	\$ <u>15,000.00</u>
2G.	Sheet Piling	\$ <u>4,000.00</u>
2H.	Chain Link Fence	\$ <u>1,000.00</u>
3A.	Concrete	\$ <u>85,000.00</u>
3B.	Reinforcing Steel	\$ <u>22,000.00</u>
4A.	Masonry	\$ <u>1,100.00</u>
5A.	Fabricated Metalwork and Castings	\$ <u>14,000.00</u>
6A.	Carpentry and Cabinetwork	\$ <u>5,500.00</u>
7A.	Roofing and Sheet Metalwork	\$ <u>1,500.00</u>

<u>Section No.</u>	<u>Title</u>	<u>Amount</u>
8A.	Doors, Windows, and Glazing	\$ 2,000.00
9A.	Painting	\$ 6,000.00
IIC.	Filter Agitators	\$ 3,000.00
IID.	Filter Media	\$ 16,000.00
IIF.	Laboratory Equipment	\$ 1,000.00
IIG.	Filter Aid Feeding Equipment	\$ 6,000.00
I3A.	Sterilization	\$ 500.00
I3B.	Operational Test	\$ 1,000.00
I4A.	Electric Hoist and Chlorine Scale	\$ 3,000.00
I5A.	Cast and Ductile Iron Pipe and Fittings	\$ 12,000.00
I5B.	Welded Steel Pipe and Fittings	\$ 30,000.00
I5C.	Large and Special Valves	\$ 32,000.00
I5D.	Plumbing and Miscellaneous Piping Systems	\$ 17,000.00
I5E.	Ventilating System	\$ 1,600.00
I5F.	Plant Instrumentation and Control System	\$ 33,000.00
I5G.	Concrete Cylinder Pipe	\$ 5,000.00
I5H.	Corrugated Metal Pipe	\$ 1,400.00
I6A.	Electrical	\$ 38,000.00
I6B.	Supervisory Control System	\$ 14,000.00
TOTAL LUMP SUM		\$ 451,100.00

The Bidder further proposes to furnish and install in accordance with the Special Specifications, bound herewith, the items of mechanical equipment specified in Sections IIA, IIB, and IIE, listed below. The equipment under each section is to be furnished and installed in operating condition by the Bidder for the total price as shown under each respective item in the Proposal and is to be described by information furnished to the Engineer by the equipment manufacturer prior to bid opening.

The Bidder shall list a separate price proposal for at least two (2) manufacturers of suitable equipment for Section IIA and for at least the particular manufacturer's equipment specified for Sections IIB and IIE, including cost of installation, complete. Selection of the equipment to be furnished will be made by the Owner.

Section IIA. CLEARWELL PUMPS AND DRIVING MOTORS

(a) - High Service Pump No. 1

<u>Name of Manufacturer</u>	<u>Type or Model</u>	<u>High Service Pump No. 1</u>
Byron-Jackson		
for		
<u>Four Thousand Five Hundred</u> Dollars		
and	<u>-no-</u> Cents	\$ <u>4,500.00</u>

OR

<u>Name of Manufacturer</u>	<u>Type or Model</u>	<u>High Service Pump No. 1</u>
for		
<u></u> Dollars		
and	<u></u> Cents	\$ <u></u>

OR

<u>Name of Manufacturer</u>	<u>Type or Model</u>	<u>High Service Pump No. 1</u>
for		
<u></u> Dollars		
and	<u></u> Cents	\$ <u></u>

(b) - High Service Pump No. 2

<u>Name of Manufacturer</u>	<u>Type or Model</u>	<u>High Service Pump No. 2</u>
Byron-Jackson		
for		
<u>Nine Thousand Six Hundred</u> Dollars		
and	<u>-no-</u> Cents	\$ <u>9,600.00</u>

OR

High Service
Pump No. 2

Name of Manufacturer _____ Type or Model _____
for _____ Dollars _____
and _____ Cents \$ _____
OR _____

High Service
Pump No. 2

Name of Manufacturer _____ Type or Model _____
for _____ Dollars _____
and _____ Cents \$ _____

(c) - Wash Water Pump

Allis-Chalmers
Name of Manufacturer _____ Type or Model _____ Wash Water Pump
for Four Thousand Four Hundred Dollars _____
and -no- Cents \$ 4,400.00
OR _____

Wash Water Pump
Name of Manufacturer _____ Type or Model _____
for _____ Dollars _____
and _____ Cents \$ _____
OR _____

Wash Water Pump
Name of Manufacturer _____ Type or Model _____
for _____ Dollars _____
and _____ Cents \$ _____

Section IIB. FILTER UNDERDRAIN SYSTEM

F. B. Leopold Co., Inc.	Filter Tile	Filter Underdrain System - 2 filters
Name of Manufacturer	Type or Model	

for

Dollars

and

Cents, Complete

\$

OR (ALTERNATE)

HYDROCONE

Filter Underdrain
System - 2 filters

Name of Manufacturer	Type or Model
----------------------	---------------

for

Seven Thousand One Hundred Dollars

and

-no-

Cents, Complete

\$ 7,100.00

Section IIE. CHLORINE FEED EQUIPMENT

Wallace & Tiernan	Series V-800	Chlorine Feed Equip- ment - 2 feeders
Name of Manufacturer	Type or Model	

for

Six Thousand Nine Hundred Dollars

and

-no-

Cents, Complete

\$ 6,900.00

OR

Chlorine Feed Equip-
ment - 2 feeders

Name of Manufacturer	Type or Model
----------------------	---------------

for

Dollars

and

Cents, Complete

\$

OR

Chlorine Feed Equip-
ment - 2 feeders

Name of Manufacturer	Type or Model
----------------------	---------------

for

Dollars

and

Cents, Complete

\$

TOTAL (Lump Sum, Plus Lowest
Priced Equipment Listed Above)

\$ 483,600.00

DEDUCTIVE ALTERNATE NO. 1 FOR OMISSION OF SUPERVISORY CONTROL SYSTEM

The Bidder further proposes that if the Owner elects to omit the construction of the supervisory control system as specified in Section 16B and shown on the Plans, with necessary changes in construction as required to complete the work with this omission, based on undersigned's own estimate of quantities and cost, the lump sum bid will be reduced in the amount of:

Fourteen Thousand Dollars
and -no- Cents \$ 14,000.00

The right is reserved to accept or reject the Proposal for Deductive Alternate No. 1 as is to the best interests of the Owner.

DEDUCTIVE ALTERNATE NO. 2 FOR OMISSION OF BACKWASH SETTLING POND

The Bidder further proposes that if the Owner elects to omit the construction of the backwash settling pond as specified and shown on the Plans, with necessary changes in construction as required to complete the work with this omission, based on undersigned's own estimate of quantities and cost, the lump sum bid will be reduced in the amount of:

Twenty Six Thousand Dollars
and -no- Cents \$ 26 000.00

The right is reserved to accept or reject the Proposal for Deductive Alternate No. 2 as is to the best interests of the Owner.

The Bidder further certifies that the following subcontracting firms or businesses will be awarded subcontracts in the event that the Bidder is awarded the Contract:

CONTROL SUPPLIER

Martig
Name

Street City

BUTTERFLY VALVE MANUFACTURER

Pratt & Centerline
Name

Street City

Tice Electric

Name _____

Street _____ City _____

If the Bidder is awarded a construction Contract on this Proposal, the Surety who will provide the Performance and Payment Bond will be

The name of the Bidder who is submitting this Proposal is

which is the address to which all communications concerned with this Proposal and with the Contract shall be sent.

<u>Wilford E. Thatcher</u>	<u>President</u>
<u>Harry Pajutee</u>	<u>Vice President - Treasurer</u>
<u>Grace Krueger</u>	<u>Secretary</u>

(If Sole Proprietor or Partnership)

In witness hereto the undersigned has set his (its) hand this _____
day of _____, 19____.

Signature of Bidder

Title

(If Corporation)

In witness whereof the undersigned corporation has caused this instru-
ment to be executed and its seal affixed by its duly authorized officers
this 10th day of August, 1970.

Teeples & Thatcher Contractors, Inc.
Name of Corporation

By /s/ Harry Pajutee

Vice President - Treasurer
Title

Attest /s/ Grace Krueger
Secretary

CONTRACT FOR CONSTRUCTION

THIS CONTRACT, made and entered into this _____ day of _____, 19____, by and between the City of Newberg, Oregon, a municipal corporation, hereinafter called the "Owner," and Teeples & Thatcher
Contractors, Inc.
of 8850 S. E. Otty Road, Portland, Oregon
hereinafter called the "Contractor."

WITNESSETH:

Said Contractor, in consideration of the sum to be paid him by the said Owner and of the covenants and agreements herein contained, hereby agrees at his own proper cost and expense to do all the work and furnish all the materials, tools, labor, and all appliances, machinery, and appurtenances for construction of the water treatment plant expansion to the extent of the Proposal made by the Contractor on the 10th day of August, 1970, all in full compliance with the Contract Documents referred to herein.

The "Advertisement for Bids," the signed copy of the "Proposal" made by the Contractor on the 10th day of August, 1970, the fully executed "Performance and Payment Bond," the "Information for Bidders," the "Special Provisions," the "General Conditions," the "Specifications," and the "Plans," which consist of 43 sheets entitled "City of Newberg, Oregon, Water Treatment Plant Expansion," Drawing No. C5508-1, dated July 1970, are hereby referred to and by reference made a part of this Contract as fully and completely as if the same were fully set forth herein and are mutually cooperative therewith.

In consideration of the faithful performance of the work herein embraced, as set forth in these Contract Documents, and in accordance with the direction of the Engineer and to his satisfaction to the extent provided in the Contract Documents, the Owner agrees to pay to the Contractor the amount bid as adjusted in accordance with the Proposal as determined by the Contract Documents, or as otherwise herein provided, and based on the said Proposal made by the Contractor, and to make such payments in the manner and at the times provided in the Contract Documents.

The Contractor agrees to complete the work within the time specified herein and to accept as full payment hereunder the amounts computed as determined by the Contract Documents and based on the said Proposal.

The Contractor agrees to indemnify and save harmless the Owner from any and all defects appearing or developing in the materials furnished and the workmanship performed under this Contract for a period of one (1) year after the date of acceptance of the work in the Contract by the Owner.

The provisions required by ORS 279.350 relating to prevailing wage rates are made a part of this Contract as completely as if the same were fully set forth herein.

It is agreed that the time limit for the completion of the Contract, based upon the Proposal, shall be the 1st day of August, 1971. In the event that the Contractor shall fail to complete the work within the time limit or the extended time limit agreed upon, as more particularly set forth in the Contract Documents, liquidated damages shall be paid at the rate of ONE HUNDRED DOLLARS (\$100.00) per day. Sundays and legal holidays shall be excluded in determining days in default.

IN WITNESS WHEREOF, we, the parties hereto, each herewith subscribe the same this 22 day of SEPTEMBER, A.D., 1970.

CITY OF NEWBERG, OREGON

By Orville Belanger
Title MAYOR

Teeples & Thatcher Contractors Inc.
Contractor

By Wm. R. Pinter
Title Vice Pres. - Treasurer

Approved as to form:

City Attorney

Bond No 629707

PERFORMANCE AND PAYMENT BOND

KNOW ALL MEN BY THESE PRESENTS, that we Teeples & Thatcher

Contractors, Inc.

as Principal, and UNITED PACIFIC INSURANCE COMPANY, a Washington
Corporation, having its principal place of business at
Tacoma, Washington.

a corporation, duly authorized to do a general surety business in Oregon, as
Surety, are jointly and severally held and bound unto The City of Newberg,
Oregon

the Obligee herein, in the sum of Four Hundred Forty Four Thousand
Nine Hundred Two and no/100ths (Dollars) (\$ 444,902⁰⁰), for
the payment of which we jointly and severally bind ourselves, our heirs, ex-
ecutors, administrators, successors, and assigns, firmly by these presents:

THE CONDITION OF THIS BOND IS SUCH THAT

WHEREAS, Teeples & Thatcher Contractors, Inc.
Contractor

the Principal herein, on the _____ day of _____, 19____,
entered into a Contract with the Obligee, which Contract Documents consist of
the Advertisement for Bids, the Proposal, the Contract, the Performance and
Payment Bond, the Information for Bidders, the Special Provisions, the General
Conditions, the Specifications, and the Plans, all as hereto attached and made
a part hereof, whereby said Principal undertakes to do all labor, furnish all
plant and equipment, and furnish all material, in accordance with all the
terms and conditions set forth in said Contract Documents; and to promptly
make payment for all labor, services, material, and sums due the Workmen's
Compensation Board, or equivalent, the Collector of Internal Revenue, and the
Treasurer of the State of Oregon; and to save harmless the Obligee from any
claim for damages or injury to property or persons arising by reason of said
work, as set out more fully in said Contract Documents; and to do and perform
all things in said Contract Documents required, in the time and manner and
under the terms and conditions therein set forth; and in conformity with all
laws, State and national, applicable thereto.

Now, therefore, if said Principal herein shall promptly pay all persons
furnishing labor, services, and material, and Workmen's Compensation Insur-
ance or equivalent, and Social Security and Unemployment Compensation, to him
and to his subcontractor, or to their assigns, on or about said work; and
shall, commencing with the date hereof and continuing for one (1) year after

the complete performance of the Contract and the final acceptance of the work in the Contract, save harmless the Obligees, its officers and agents, from all claims therefor, or from any claim for damages or injury to property or persons arising by reason of said work; and shall, in the time and manner, and under the terms and conditions prescribed, well and faithfully do, perform, and furnish all matters and things as by them in said Contract undertaken, and as by law, State and National, prescribed, then this obligation shall be void; but otherwise it shall remain in full force and effect.

PROVIDED, HOWEVER, that this Bond is subject to the following further conditions.

(a) All materialmen, and all persons who shall supply such laborers, mechanics, or subcontractors with material, supplies, or provisions for carrying on such work, shall have a direct right of action against the Principal and Surety on this Bond, second only to the right of the Obligee under this Bond, which right of action shall be asserted in proceedings instituted in the appropriate court of the State of Oregon, and insofar as permitted by the laws of Oregon, such right of action shall be asserted in a proceeding instituted in the name of the Obligee to the use and benefit of the person, firm, or corporation instituting such action and of all other persons, firms, or corporations having claims hereunder, and any other person, firm, or corporation having a claim hereunder shall have the right to be made a party to such proceeding (but not later than one (1) year after the complete performance of said Contract and final acceptance of the work in the Contract) and to have such claim adjudicated in such action and judgment rendered thereon.

(b) In no event shall the Surety be liable for a greater sum than the penalty of this Bond.

(c) The said Surety, for the value received, hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the Contract or to the work to be performed thereunder or the Specifications accompanying the same shall in any way affect its obligations on this Bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the Contract or to the work or to the Specifications.

(d) The Principal herein shall faithfully and truly observe and comply with the terms of the Contract and shall well and truly perform all matters and things by him undertaken to be performed under said Contract upon the terms proposed therein and shall promptly make payments to all persons supplying labor or material for any prosecution of the work provided for in such Contract and shall not permit any lien or claim to be filed or prosecution against the obligees, on account of any labor or material furnished, and shall promptly pay all contributions or amount due the Workmen's Compensation Board or equivalent and all contributions or amounts due the State Employment Compensation Trust Fund incurred in the performance of said Contract, and shall also pay all sums of money withheld from the employees and payable to the State Tax Commission pursuant to ORS 316.711 and shall promptly, as due, make payment to any person, copartnership, association or corporation furnishing medical, surgical and hospital care or other needed

UNITED PACIFIC



INSURANCE COMPANY

A MEMBER OF UNITED PACIFIC INSURANCE GROUP

HOME OFFICE: TACOMA, WASHINGTON 98401

FIDELITY AND SURETY DEPARTMENT

POWER OF ATTORNEY

KNOW ALL MEN BY THESE PRESENTS:

That the UNITED PACIFIC INSURANCE COMPANY, a corporation of the State of Washington, having its principal offices in the city of Tacoma, Washington, pursuant to authority granted by By-Law No. 37-A of its By-Laws, which reads as follows:

"The President, any Executive Vice-President, any other Vice-President, any Assistant Vice-President, or any Resident Vice-President of this Corporation, shall have authority to appoint in writing such attorneys-in-fact as the business of the Company may require, and to authorize such attorneys-in-fact, and each of them, to execute on behalf of the Company, any bonds, recognizances, stipulations, contracts of indemnity and other undertakings of like character, or to exercise any lesser number of said powers as hereinbefore set forth.

"Said appointments shall be attested by the Secretary or an Assistant Secretary of this Corporation under its seal. The signature of the Secretary or any Assistant Secretary to certified copies of such powers of attorney may be original or facsimile, and when the corporate seal is affixed thereto, any third party may rely on said certified copies of powers of attorney as the act and deed of this Corporation. The President, any Executive Vice-President, any other Vice-President, any Assistant Vice-President, or any Resident Vice-President may revoke any appointment made pursuant hereto, and revoke any and all authority conferred by any such appointment."

does hereby nominate, constitute and appoint EMMA M. KEMP of PORTLAND, OREGON - - - - -

its true and lawful Attorney-in-Fact, to make, execute, seal and deliver for and on its behalf, as surety, and as its act and deed,

ANY AND ALL BONDS AND UNDERTAKINGS OF SURETYSHIP.

The execution of such bonds or undertakings in pursuance of these presents, shall be as binding upon said Company, as fully and amply, to all intents and purposes, as if they had been duly executed and acknowledged by the regularly elected officers of the Company at its office in Tacoma, Washington, in their own proper persons.

IN WITNESS WHEREOF, the UNITED PACIFIC INSURANCE COMPANY has caused these presents to be signed by its Executive Vice-President and its corporate seal to be hereto affixed, duly attested by its Assistant Secretary, this 6th day of February, 1970.

UNITED PACIFIC INSURANCE COMPANY

Attest: s/ GERRY L. WHITE
Assistant Secretary

By s/ MORRIS E. BROWN (SEAL)
Executive Vice-President

STATE OF WASHINGTON }
County of PIERCE } ss.

On this 6th day of February, 1970, personally appeared MORRIS E. BROWN

and GERRY L. WHITE, to me known to be the Executive Vice-President and Assistant Secretary, respectively, of UNITED PACIFIC INSURANCE COMPANY, and acknowledged that they executed and attested the foregoing instrument and affixed the seal of said corporation thereto, and that By-Law No. 37-A, set forth therein, is still in full force.

Witness my hand and seal hereto affixed the day and year first above written.

My Commission Expires January 15, 1974

STATE OF WASHINGTON }
County of PIERCE } ss.

s/ Bertha M. Barragar
Notary Public in and for the State of Washington
Residing at Tacoma

I, GERRY L. WHITE Assistant Secretary of the UNITED PACIFIC INSURANCE COMPANY, do hereby certify that the foregoing instrument is a true copy of a Power of Attorney duly and regularly issued by said Company, and that the same is still in full force and effect.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed the seal of said Company at the City of TACOMA

this _____ day of _____, 19____

Gerry L. White (SEAL)
Assistant Secretary

care and attention incident to sickness or injury to the employees of such Principal, pursuant to the laws of this State and any contract entered into pursuant thereto or collected or deducted from the wages of said employees pursuant to any law, contract, or agreement for the purpose of providing or paying for such services, and shall do all things required of said Principal by the laws of this State.

This Bond is given and received under the authority of ORS Chapter 279, the provisions of which hereby are incorporated into this Bond and made a part hereof.

IN WITNESS WHEREOF, the parties hereto have caused this Bond to be executed in _____, this 22 day of SEPTEMBER 1990.

Donell Delong (SEAL)

(SEAL)

Teeples & Thatcher Const. Inc. (SEAL)

Walter Papantza Vice Pres. (SEAL)
Principal

Witnesses:

Margaret C. Beer

UNITED PACIFIC INSURANCE COMPANY

(SEAL)

Marcel A. Mc Carver

By Thomas M. [Signature] (SEAL)
Attorney in Fact

Sharon A. Stone

(SEAL)

Surety

Countersigned:

By

[Signature]
Resident Agent

The Attorney-in-Fact (Resident Agent), who executes this Bond in behalf of the Surety Company, must attach a copy of his power-of-attorney as evidence of his authority.

To each executed original of this Bond there must be attached a complete set of the "Contract Documents," as the term is defined in the General Conditions, with all corrections, interlineations, signatures, etc., completely reproduced therein.

P & P Bond -3-

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INFORMATION FOR BIDDERS

1. General Description of the Project. A general description of the work to be done is contained in the Advertisement for Bids. The scope is indicated on the accompanying Plans and specified in applicable parts of these Contract Documents.

2. Contract Documents. The Contract Documents under which it is proposed to execute the work consist of the material bound herewith. These Contract Documents are intended to be mutually cooperative and to provide all details reasonably required for the execution of the proposed work. Any person contemplating the submission of a proposal and being in doubt as to the meaning or intent of said Contract Documents should request of the Engineer, in writing, an interpretation thereof. Any interpretation or change in said Contract Documents will be made only in writing, and a copy of such interpretation or change will be mailed or delivered to each person receiving a set of the Documents. The Owner will not be responsible for any other explanation or interpretations of said Documents.

3. Plans. When the Plans are photographic reductions of the original tracings, the amount of reduction is indicated by a note on the Plans. Full-scale prints of reduced Plans may be obtained for the amount stated in the Special Provisions.

4. Type of Proposal.

a. Unit Price. When the Proposal for the work is to be submitted on a unit price basis, unit price proposals will be accepted on all items of work set forth in the Proposal, except those designated to be paid for as a lump sum. The estimate of quantities of work to be done is tabulated in the Proposal and, although stated with as much accuracy as possible, is approximate only and is assumed solely for the basis of calculation upon which the award of Contract shall be made. Payment to the Contractor will be made on the measurement of the work actually performed by the Contractor as specified in the Contract Documents. The Owner reserves the right to increase or diminish the amount of any class of work as may be deemed necessary, unless otherwise specified in the Special Provisions.

b. Lump Sum. When the Proposal for the work is to be submitted on a lump sum basis, a single lump sum price shall be submitted in the appropriate place. The total amount to be paid the Contractor shall be the amount of the lump sum Proposal as adjusted for additions or deletions resulting from changes in construction. The Bidder shall furnish, in the space provided in the Proposal, a breakdown of his lump sum bid.

c. Lump Sum with Equipment Selected By Owner. When the Proposal for the work is to be submitted on a lump sum basis with equipment to be selected by the Owner, a lump sum price shall be submitted in the appropriate place and separate price proposals shall be submitted for listed items of equipment as produced by different manufacturers and shall include the cost of installation. The lump sum Proposal shall not include these listed items or cost of their installation. The total amount to be paid the Contractor

shall include the price bid for the listed items of equipment to be furnished as selected by the Owner, plus the amount of the lump sum Proposal, as adjusted for additions and deletions resulting from changes in construction. Bidder shall provide a breakdown of the lump sum as specified hereinbefore in b.

5. Preparation of Proposals. All blank spaces in the Proposal form must be filled in, in ink, in both words and figures where required. No changes shall be made in the phraseology of the forms. Written amounts shall govern in cases of discrepancy between the amounts stated in writing and the amounts stated in figures.

Any proposal shall be deemed informal which contains omissions, erasures, alterations, or additions of any kind, or prices uncalled for, or in which any of the prices are obviously unbalanced, or which in any manner shall fail to conform to the conditions of the published Advertisement for Bids.

The Bidder shall sign his Proposal in the blank space provided therefor. Proposals made by corporations or partnerships shall contain names and addresses of the principal officers or partners. If the Proposal is made by a corporation, it must be acknowledged by one of the principal officers thereof; if made by a partnership, by one of the partners.

6. Submission of Proposals. All proposals must be submitted at the time and place and in the manner prescribed in the Advertisement for Bids. Proposals must be made on the prescribed Proposal forms, bound herewith, and submitted intact with the Contract Documents. Each proposal must be submitted in a sealed envelope, so marked as to indicate its contents without being opened, and addressed in conformance with the instructions in the Advertisement for Bids. The Bidder is wholly responsible to see that his Proposal is submitted at the time and place named for the opening of bids.

7. Telegraphic Modification or Withdrawal of Proposal. Any bidder may modify his bid by telegraphic communication at any time prior to the scheduled closing time for receipt of bids, provided such telegraphic communication is received by the Owner prior to the closing time. The telegraphic communication should not reveal the bid price but should state the addition or subtraction or other modification so that the final prices or terms will not be known by the Owner until the sealed bid is opened.

Any proposal may be withdrawn prior to the scheduled time for the opening of proposals either by telegraphic or written request, or in person. No proposal may be withdrawn after the time scheduled for opening of proposals, unless the time specified in Paragraph 12 of this Information for Bidders shall have elapsed.

8. Bid Security. Proposals must be accompanied by a certified check or cashier's check drawn on a bank in good standing, or a Bid Bond issued by a surety company authorized to issue such bonds in the State of Oregon, in an amount not less than ten percent (10%) of the total amount of the Proposal submitted. This check or Bid Bond shall be given as a guarantee that if awarded the Contract, the successful Bidder will execute the attached Contract and furnish a properly executed Performance Bond in the full amount of the Contract price within the time specified.

If the Bidder elects to furnish a Bid Bond, he shall use the Bid Bond form bound herewith, or one conforming substantially to it in form and content.

The Owner reserves the right to retain the bid security of the three (3) lowest bidders until the successful Bidder has signed and delivered the Contract and furnished a one hundred percent (100%) Performance Bond. Upon failure of the successful Bidder to sign and deliver said Contract and Performance Bond within the specified time, the next lowest bid may be accepted at the Owner's discretion, whereupon the above instructions and requirements will apply to the said second bidder.

Bid security in the form of a certified check or cashiers check will be returned promptly after the canvass of bids, except those of the three (3) lowest bidders, which will be retained and returned within seven (7) days after the Contract has been executed or other disposition made in accordance with the provisions stated herein.

9. Prequalification of Bidders for Public Work. Bidders for public work in Oregon must be prequalified in conformance with Oregon Law ORS, Chapter 279. A prequalification form is bound inside the front cover of the Documents, and must be completed by the prospective Bidder and submitted to the Owner at least ten (10) days prior to the bid opening date. The form shall be detached and filled out by the prospective Bidder and mailed to the office designated in the Advertisement for Bids. Prequalification forms should not be submitted with the bid.

10. Conditions of Work. Each bidder must inform himself of the conditions relating to the execution of the work, and it is assumed that he will inspect the site and make himself thoroughly familiar with all the Contract Documents. Failure to do so will not relieve the successful Bidder of his obligation to enter into a Contract and complete the contemplated work in strict accordance with the Contract Documents.

Each bidder must inform himself on all laws and statutes, both Federal and State, relative to the regular execution of the work, the employment of labor, protection of public health, the protection of private property, fire protection regulations, access to the work, and similar requirements.

11. Payments. Monthly payments for the work performed will be made by the Owner as specified in the General Conditions, unless otherwise modified in the Special Provisions.

12. Award of Contract. Within thirty (30) calendar days after the opening of proposals, the Owner will accept one of the proposals or will act in accordance with Paragraph 13 of this Information for Bidders. The acceptance of the Proposal will be by notice, in writing, mailed or delivered to the office designated in the Proposal.

13. Basis of Award. The award will be made by the Owner on the basis of that Proposal from the lowest responsible Bidder which, in the Owner's sole and absolute judgment, will best serve the interest of the Owner. When projects are paid for in part by Federal aid, the award will be made on the basis of that Proposal submitted by the responsible Bidder submitting the lowest acceptable Proposal.

The Owner reserves the right to accept or reject any or all proposals, and to waive any informalities and irregularities in said proposals.

14. Execution of Contract. The successful Bidder shall, within seven (7) days after receiving notice of award, execute the Contract hereto attached.

15. Performance Bond. The successful Bidder shall file with the Owner at the time of execution of the Contract, a Performance Bond of the form bound herewith in the full amount of the Contract price, as security for the faithful performance of the Contract and the payment of all persons supplying labor and materials for the construction of the work, and to cover all guarantees against defective workmanship or materials, or both, for a period of one (1) year after the date of final acceptance of the work by the Owner. The surety company furnishing this bond shall have a sound financial standing and a record of service satisfactory to the Owner and shall be authorized to do business in the State of Oregon.

The Attorney-in-Fact (Resident Agent) who executes this Performance Bond in behalf of the surety company must attach a copy of his power-of-attorney as evidence of his authority. A notary shall acknowledge the power as of the date of the execution of the surety bond which it covers.

16. Failure to Execute Contract and Furnish Bond. The Bidder who has a Contract awarded to him and who fails to promptly and properly execute the Contract and furnish the bond shall forfeit the bid security that accompanied his bid, and the bid security shall be retained as liquidated damages by the Owner; and it is agreed that this said sum is a fair estimate of the amount of damages the Owner will sustain in case the Bidder fails to enter into a Contract and furnish bond as hereinbefore provided. Bid security deposited in the form of a certified check or cashiers check shall be subject to the same requirement as a Bid Bond.

17. Time of Completion. The time of completion of the work to be performed under this Contract is the essence of the Contract. Delays and extensions of time may be allowed in accordance with the provisions of the General Conditions. The time allowed for the completion of the work is stated in the Proposal.

SPECIAL PROVISIONS

The Contractor's attention is directed to GENERAL REQUIREMENTS, Section IA of the Special Specifications, containing other directions pertinent to the project.

SPECIFICATION FORMAT. "Command" type sentences are used in the Contract Documents; these refer to and are directed to the Contractor.

LOCATION AND PLANS.

LOCATION. The location of the work is shown on Drawing No. C5508-1, Sheet 1 of 43 of the Plans.

PLANS. The Plans for the construction of the water treatment plant expansion consist of 43 sheets, each entitled "City of Newberg, Oregon, Water Treatment Plant Expansion," and dated July 1970.

REVISIONS TO INFORMATION FOR BIDDERS. The Information for Bidders is hereby revised as follows:

General. On Pages 1, 2, 3, and 4 wherever the words "Performance Bond" are used, delete the words and substitute "Performance and Payment Bond."

Page 1, after 3. Plans, insert the following:

3.a. Full-Scale Plans Available. The Plans bound in the Documents are photographic reductions of the original tracings. Full-scale Plans are available from Cornell, Howland, Hayes & Merryfield, 1600 S.W. Western Boulevard, Corvallis, Oregon 97330, at a cost of Forty Dollars (\$40.00) per set, Twenty Dollars (\$20.00) of which will be refunded if Plans are returned within ten (10) days after bidding date.

Page 3, 9. Prequalification of Bidders for Public Work. The Bidder's prequalification form is to be mailed to the Corvallis office of the Engineer as designated in the Advertisement for Bids.

REVISIONS TO THE GENERAL CONDITIONS. The General Conditions are hereby revised as follows:

Page 4, Article C-6. Lines and Grades. Add the following:

The Engineer will establish the center lines of principal structures, roads, pipelines, and facilities, and set bench marks convenient for the Contractor's use as necessary to establish the basic layout. All labor and stakes for these base lines and bench marks will be provided by the Owner. It will be the Contractor's responsibility to lay out the work from the lines set by the Engineer and to transfer elevations from bench marks. Where new construction connects to existing facilities, the Contractor shall check and establish the exact location prior to construction of the facilities.

The Contractor shall provide a competent man in his employ during normal working hours to assist the Engineer, when required, in checking lines and elevations in the Contractor's layout and for measuring quantities for payment purposes as the work proceeds. The Contractor shall cooperate with the Engineer so that the checking and measuring may be accomplished with the least interference to the Contractor's operations.

Page 5, Article D-2. Performance Bond. Change to read: "D-2. Performance and Payment Bond" in all places.

Page 7, Article D-3. Insurance. At end of Article add the following:

D-3.g. Builders All Risk Insurance. Contractor shall purchase and maintain "Builders All Risk" insurance, coverage for the Contract period, and such insurance shall include coverage for loss caused by earthquake, landslide, and flood. In addition, the policy shall include coverage for damage resulting from faulty workmanship. The insurance shall be equal to one hundred percent (100%) of the Contract amount.

Insurance will be evidenced by the original policy or a certified copy thereof. The named insured shall include the Contractor, the Owner, and the Engineer as agent of the Owner, as their respective interests may appear.

Page 8, Article D-10. Safety Precautions. Add the following:

In addition to the above provisions, the Contractor shall comply with the following requirements:

a. Comply with the safety standards provisions of applicable laws, building and construction codes, and the "Manual of Accident Prevention in Construction" published by the Associated General Contractors of America, except where these are in conflict with State laws, in which case the more stringent requirement shall be followed.

b. Exercise every precaution at all times for the prevention of accidents and the protection of persons (including employees) and property.

c. Maintain at his office or other well-known place at the jobsite, all articles necessary for giving first aid to the injured, and shall make standing arrangements for the immediate removal to a hospital or a doctor's care of persons (including employees) who may be injured on the jobsite. In no case shall employees be permitted to work at a jobsite before the employer has made a standing arrangement for removal of injured persons to a hospital or a doctor's care.

Page 12, Article E-7. Delays and Extension of Time. Add the following:

In addition to the conditions for extension of time as set forth in Article E-7 of the General Conditions, no extension of time will be considered for weather conditions known to have previously occurred in the area in which the work is being performed, unless the total precipitation during any two (2) month period exceeds the recognized normal for these months by twenty percent (20%) or more as determined by the U.S. Weather Bureau Climatological Data.

Page 13, Article E-10. Use of Premises. At the end of the first paragraph add the following:

The Contractor shall not utilize the property of the Publishers Paper Company adjacent to the settling pond for access, equipment, or storage of materials without the express approval of the property owner. Access to property of the company for the purpose of relocating the boundary fence shall be with the owner's approval.

Page 15, Article F-2. Extra Work. At the end of the Article add the following:

F-2.d. Claims. In any case where the Contractor deems extra compensation is due him for work or materials not clearly covered in the Contract or not ordered by the Engineer as an extra as defined herein, the Contractor shall notify the Engineer, in writing, of his intention to make claim for such compensation before he begins the work on which he bases the claim. If such notification is not given or the Engineer is not afforded proper facilities by the Contractor for keeping strict account of actual cost, then the Contractor hereby agrees to waive the claim for such extra compensation. Such notice by the Contractor, and the fact that the Engineer has kept account of the cost as aforesaid, shall not in any way be construed as proving the validity of the claim. In case the claim is found to be just, it shall be allowed and paid for as an extra as provided herein for extra work, or it shall be allowed and paid under a supplemental agreement to be entered into between the parties to the Contract.

F-2.e. Notice of Claim for Delay. If the Contractor intends to file a claim for additional compensation for a delay caused by the Owner at a particular time, he shall file a Notice of Claim with the Engineer within seven (7) days of the beginning of the occurrence. The Notice of Claim shall be in duplicate, in writing, and shall state the circumstances and the reasons for the claim, but need not state the amount. No claim for additional compensation will be considered unless a Notice of Claim has been filed with the Engineer in writing, as stated above.

Page 16, Article F-4. Final Payment. At the end of the Article add the following:

F-4.a. No Waiver of Rights. Neither the inspection by the Owner, through the Engineer or any of his employees, nor any order by the Owner for payment of money, nor any payment for, or acceptance of, the whole or any part of the work by the Owner or Engineer, nor any extension of time, nor any possession taken by the Owner or its employees, shall operate as a waiver of any provision of this Contract, or any power herein reserved to the Owner, or any right to damages herein provided; nor shall any waiver of any breach in this Contract be held to be a waiver of any other or subsequent breach.

SUBSTITUTION OF MATERIALS. All workmanship, equipment, materials, and articles incorporated in the work are to conform to the Specifications. Whenever any material, article, device, product, fixture, form, type of construction, or process is indicated or specified by patent or proprietary name, by name of manufacturer, or by catalog number, such Specifications shall be deemed to be used for the purpose of establishing a standard of quality and facilitating the description of the material or process desired. This procedure is not to be construed as eliminating from competition other products of equal or better quality by other manufacturers where fully suitable in design, and shall be deemed to be followed by the words "or as approved" or "approved equal." The Contractor may, in such case, submit complete data to the Engineer for consideration of another material, type, or process, and if the Owner's approval is obtained (in writing), purchase and use the item, type, or process, which shall be substantially equal in every respect to that so indicated or specified. The Owner will be the sole judge of the substituted article or material. No substitute materials shall be used unless approved in writing.

NO PERSONAL LIABILITY OF PUBLIC OFFICIALS. In carrying out any of the provisions hereof in exercising any authority granted by the Contract, there will be no personal liability upon any public official, it being understood that in such matters they act as agent and representative of the Owner.

ARBITRATION. Any controversy arising out of or relating to this Contract, or the breach thereof shall be settled by arbitration in accordance with the Rules of the American Arbitration Association and judgment upon the award rendered by the arbitrator or arbitrators may be entered in any Court having jurisdiction thereof.

The Contractor shall not delay the work because arbitration proceedings are pending unless he shall have written permission from the Engineer to do so. Such delay shall not extend beyond the time when the arbitrators shall have opportunity to determine whether the work shall continue or be suspended pending decision by the arbitrators of such a dispute. Any demand for arbitration shall be in writing and shall be delivered to the Engineer and any adverse party either by personal delivery or by registered mail addressed to the last known address of each within ten (10) days of receipt of the Engineer's decision, and in no event after final payment has been made and accepted, subject, however, to any express stipulation to the contrary in the Contract Documents.

TERMINATION BECAUSE OF A NATIONAL EMERGENCY. If work on this project is terminated by order of a competent Governmental authority because of a national emergency, the Owner or the Contractor, each at his option, with or

without the consent of the other, may, upon seven (7) days' written notice, stop work or terminate the Contract. The Contractor shall recover payment from the Owner for all work executed, but in no event shall the Contractor be allowed any sum or sums in addition to those above specified, except that a reasonable profit may be allowed upon the work actually executed. In no event shall the Contractor be allowed any damages or any anticipated profits whatsoever.

MANUFACTURERS OF OWNER-SELECTED EQUIPMENT LIABLE FOR COMPLIANCE WITH SAFETY REQUIREMENTS. Certain equipment is to be Owner-selected and/or approved as stated in the Contract Documents. In selecting and/or approving equipment for installation in the project, the Owner assumes no responsibility for injury or claims resulting from failure of the equipment to comply with applicable National, State, and local safety codes or requirements, or the safety requirements of a recognized agency, or failure due to faulty design concepts, or defective workmanship and materials. Equipment manufacturers will be held responsible for compliance with the requirements included herein.

LOWEST ACCEPTABLE PROPOSAL. The lowest acceptable Proposal will be determined on the basis of the lowest total of the lump sum bid plus the lowest prices for each item of equipment to be selected. The Owner reserves the right, before a contract is executed, to select for installation any manufacturer's equipment listed regardless of price as will best suit the interests of the Owner, and the Contract amount will be adjusted accordingly.

If the items of equipment to be selected are obviously unbalanced and, in the opinion of the Engineer, are not realistic prices for the particular equipment, the Engineer may request additional information to substantiate the prices or reject the bid as provided in the Information for Bidders.

If, at the time this Contract is to be awarded, the lowest bid, as determined above exceeds the amount of funds then estimated by the Owner as available to finance the Contract, the Owner may reject all bids.

Bureau of Labor
Public Contracts Wage Administrator
1400 S. W. Fifth
State Office Building
Portland, Oregon

Prevailing Journeyman Wage Rates in Oregon
for Basic Building Trades
(as determined by the Labor Commissioner
pursuant to ORS 279.348 to 279.356)

The following prevailing journeyman wage rates apply to the basic construction trades -- Carpenters, Piledrivers, Cement Masons, Ironworkers, Laborers, Operating Engineers, and Teamsters; applicable to all counties in the State of Oregon for the effective period indicated.

BUILDING AND CONSTRUCTION TRADES

Effective 5-1-70 to 6-1-71

CARPENTERS

Group I

\$6.03

Carpenters (journeymen), including but not limited
to Acoustical & Drywall applicators
Automatic Nailing Machine Operators (all types)
Form Strippers (in accordance with Int. Agree.)
Manhold Builders (Concrete Form Construction)
Riggers, Burners, and Welders
Saw Filers, Instrument Men and Fiberglas Specialists

Group II

\$6.155

Caulkers (Boat construction)
Floor Layers, Finishers
(The laying of all hardwood flooring, nailed and mastic set, parquet and wood-type tiles, and block floors, the sanding and finishing of floors, the preparation of old and new floors where the materials mentioned above are to be installed.)
Insulators (Fiberglass and similar irritating materials)
Working on Charred Material (Building construction only)
Working on Swinging, Hanging Nonrigid Scaffolding, Bos'n Chairs, or suspended from a rope or cable or from a safety belt.
(Men working on scaffolding attached to form panels or forms which are hanging or swinging are entitled to premium pay so long as the forms are hanging; after such panels are firmly attached to make them rigid, premium pay is no longer applicable)
Stationary Power Saw Operators

Foremen

\$6.53

Apprentice Rates

1st 6-mo. period	65% of Journeyman rate	5th 6-mo. period	85% of Journeyman rate
2nd "	" 70%	6th "	" 90%
3rd "	" 75%	7th &	" "
4th "	" 80%	8th "	" 95%

Overtime - All work performed before and/or after any scheduled shift hours, and all work performed on Saturdays, Sundays and holidays shall be paid at double the straight time hourly rate.

CARPENTERS FRINGE BENEFITS

H & W	Pension	Vacation	Apprentice Fund	Industry Fund
\$.25	.25	.25	.03	.01

PILEDRIVERS

Effective 5-1-70 to 6-1-71

Piledrivermen, Bridge, Dock & Wharf Builders	\$6.13
Piledrivermen Riggers	6.13
Burnermen and Welders	6.13
Instrument Men	6.13
Boom Men	6.23
Foremen	6.63

Overtime - All work performed before and/or after any scheduled shift hours, and all work performed on Saturdays, Sundays and holidays shall be paid at double the straight time hourly rate.

15¢ premium allowance working with creosote material.

PILEDRIVERS FRINGE BENEFITS

H & W	Pension	Vacation	Apprentice Fund	Industry Fund
\$.25	.25	.25	.03	.01

MILLWRIGHTS

Effective 5-1-70 to 6-1-71

Millwrights and Machine Erectors	\$6.28
(Journeyman Riggers, Burners and Welders)	
Instrument Men	6.28
Foreman	6.78

MILLWRIGHTS FRINGE BENEFITS

H & W	Pension	Vacation	Apprentice Fund	Industry Fund
\$.25	.25	.25	.03	.01

CEMENT MASONS

Effective 8-1-70 to 8-1-71

Journeyman Cement Mason	\$6.01
Journeyman Mastic Worker, Composition Worker, Guniting Man, Power Machinery Operator	6.135
Overtime - Double time for overtime shall be paid for all overtime after ten (10) hours per day Monday through Friday <u>and</u> double time for all Saturday work. Time and one-half if notified seven days in advance for Saturday work; double time for Sundays and holidays.	
Foreman - 25% above Journeyman rate	

CEMENT MASONS' FRINGE BENEFITS

H & W	Pension	Apprenticeship and Training	Industry Fund
\$.25	.20	.09	.01

IRON WORKERS

Effective 7-21-70 to 7-21-71

Structural Ironworkers	\$6.83
Ornamental Ironworkers	6.83
Machinery Mover, Machinery Erector	6.83
Riggers	6.83
Signal Men	6.83
Welders and Burners	6.83
Fence Erectors	6.83
Sheeters	6.83
Reinforcing Ironworkers	6.72
Foreman - 3 men or less - not less than 30¢/hr. over Journeyman rate	
4 men or more - not less than 55¢/hr. over Journeyman rate	
Overtime - Double time	
Apprentice - 1st year 80% of Journeyman Ironworker rate	
2nd year 90% of Journeyman Ironworker rate	
3rd year 95% of Journeyman Ironworker rate	

IRONWORKERS' FRINGE BENEFITS

H & W	Pension	Apprenticeship
\$.43	.27	.01

HOISTING AND PORTABLE ENGINEERS' WAGE RATES

Group #	Effective 6-1-70 to 6-1-71
1	\$5.66
2	5.78
3	5.90
4	6.04
5	6.08
6	6.14

HOISTING AND PORTABLE ENGINEERS' WAGE RATES - contd.

<u>Group #</u>	<u>Effective 6-1-70 to 6-1-71</u>
7	6.22
8	6.30
9	6.38
10	6.42
11	6.46
12	6.50
13	6.60
14	6.74
15	6.92
16	7.08
17	7.24
18	7.40
19	7.56

HOISTING AND PORTABLE ENGINEERS' FRINGE BENEFITS

<u>H & W</u>	<u>Pension</u>	<u>Vacation</u>	<u>Industry Fund</u>
\$.35	.40	.10	.03

HOISTING AND PORTABLE ENGINEERS' GROUP CLASSIFICATION

<u>Group</u>	<u>Asphalt</u>
6	Asphalt Plant Operator, (Assistant to Engineer required)
1	Plant Oiler
3	Plant Fireman
3	Pugmill Operator
8	Diesel - Electric engineer, Plant
3	Truck-mounted Asphalt Spreader, with screed
4	Screed Operator
5	Curb Machine Operator, mechanical berm, curb and/or curb and gutter
6	Asphalt Paver Operator, (Screed man required)
7	Roller Operator, asphalt or finish
	<u>Blade</u>
2	Blade Operator, pulled type
12	Blade Operator
13	Blade Operator, finish (Working with either red or blue tops)
13	Blade Operator, electronically controlled by wire or laser beams
13	Blade Operator, multiengine
16	Auto Grader (i.e. CMI) or "Trimmer" Operator (grade checker required)

HOISTING AND PORTABLE ENGINEERS' GROUP CLASSIFICATION - contd.

<u>Group</u>	<u>Bulldozers</u>
9	Bulldozer Operator
9	Drill Cat Operator
9	Side-Boom Cat Operator
10	Bulldozer Operator, twin engine. (TC 12 and similar type)
16	Tandem Bulldozer Operator, Quad-nine and similar type
10	Cable - Plow Operator
	<u>Compactors, Self-Propelled</u>
4	Compactor Operator, including vibratory
5	Wagner pactor Operator or similar type (without blade)
9	Compactor Operator, with blade
10	Compactor Operator, multiengine
	<u>Compressors</u>
3	Compressor Operator, any power, under 1,000 cu.ft. total capacity
4	Compressor Operator, over 1,000 cu.ft. total capacity
	<u>Concrete</u>
1	Plant Oiler
3	Mixer Box Operator, concrete plant
4	Concrete Mixer Operator, single drum, under five (5) bag capacity
5	Batch Plant Material Control Operator
7	Concrete Mixer Operator, single drum, five (5) bag capacity and over (Assistant to Engineer required)
8	Batch Plant and/or Wet Mix Operator, one and two drum (Assistant to Engineer required)
9	Concrete Cooling Machine Operator
12	Batch Plant and/or Wet Mix Operator, three (3) units or more (Assistant to Engineer required)
11	Mixer Mobile Operator
1	Assistant Conveyor Operator
3	Concrete Conveyor Operator
7	Beltcrete Operator
7	Pumpcrete Operator
7	Cement Pump Operator, Fuller-Kenyon and similar
4	Combination Mixer and Compressor Operator, gunite work
7	Grouting Machine Operator
7	Concrete Pump Operator
3	Cement Hog Operator
3	Concrete Saw Operator, self-propelled unit
3	Wire Mat Machine Operator, or Brooming Machine Operator
3	Concrete Curing Machine Operator, self-propelled

HOISTING AND PORTABLE ENGINEERS' GROUP CLASSIFICATION - contd.

Group Concrete - contd.

- 4 Screed Operator
- 6 Maginnis Internal Full Slab Vibrator Operator
- 6 Concrete Finishing Machine Operator, Clary, Johnson,
 Bidwell, Burgess bridge deck or similar type
- 6 Curb Machine Operator, mechanical berm, curb and/or
 curb and gutter
- 6 Concrete Joint Machine Operator
- 6 Concrete Planer Operator
- 6 Cast-in-place Pipe Laying Machine Operator
- 7 Tower Mobile Operator
- 6 Concrete Paving Machine Operator (Assistant to Engineer
 required)
- 6 Concrete Finishing Machine Operator
- 6 Concrete Spreader Operator
- 13 Concrete Paving Road Mixer Operator
- 16 Automatic Concrete Slip Form Paver Operator (Assistant
 to Engineer required)
- 5 Power Jumbo Operator setting slip forms, etc., in tunnels
- 5 Slip Form Pumps, power driven hydraulic lifting device
 for concrete forms.
- 16 Concrete Canal Liner Operator (Assistant to Engineer
 required)

Crane

- 1 Oiler
- 2 Truck Crane Oiler-driver, 25 ton capacity or over
- 2 Fireman, all equipment
- 2 A-Frame Truck Operator, single drum
- 7 A-Frame Truck Operator, double drum
- 2 Tugger or Coffin Type Hoist Operator, any power
- 7 Boom Truck Operator
- 5 Hoist Operator, single drum
- 12 Hoist Operator, two drum
- 12 Hoist Operator, three (3) or more drums
- 4 Helicopter Hoist Operator
- 5 Elevator Operator
- 13 Bridge Crane Operator, locomotive, gantry, overhead
- 9 Chicago Boom and similar types
- 9 Lift Slab Machine Operator
- 9 Boom Type Lifting Device, five (5) ton capacity or less
- 9 Cherry Picker or similar type crane-hoist, five (5) ton
 capacity or less
- 13 Derrick Operator, under one-hundred (100) ton. [Two (2)
 operators required when swing control is remote from
 hoist]
- 13 Hoist Operator, stiff leg, Guy Derrick or similar type,
 fifty (50) ton and over
- 13 Cableway Operator, up to twenty-five (25) ton

HOISTING AND PORTABLE ENGINEERS' GROUP CLASSIFICATION - contd.

Group Crane - contd.

- 16 Cableway Operator, twenty-five (25) ton and over
- 11 Crane Operator, twenty-five (25) ton and under (Assistant to Engineer required) (except for rough terrain)
- 13 Crane Operator, over twenty-five (25) ton and including forty (40) ton. (Assistant to Engineer required)
- 16 Crane Operator, over forty (40) ton and including one-hundred (100) ton (Assistant to Engineer required)
- 17 Crane Operator, over one-hundred (100) ton and including two-hundred (200) ton (Assistant to Engineer required)
- 18 Crane Operator, over two-hundred (200) ton (Assistant to Engineer required)
- 13 Tower Crane Operator
- 16 Whirley Operator, eighty (80) ton and under (Assistant to Engineer required)
- 17 Whirley Operator, over eighty (80) ton and including one-hundred fifty (150) ton (Assistant to Engineer required)
- 18 Whirley Operator, one-hundred fifty (150) ton and over (Assistant to Engineer required)
- 19 Helicopter Operators, when used in erecting work

Crusher

- 1 Crusher Oiler
- 1 Crusher Feeder
- 8 Generator Operator
- 8 Diesel - Electric Engineer
- 9 Grizzly Operator
- 9 Crusher Plant Operator (Assistant to Engineer and Feeder required)

Drilling

- 2 Drill Helper
- 2 Auger Oiler
- 7 Churn Drill and Earth Boring Machine Operator (Assistant to Engineer)
- 9 Drill Doctor
- 9 Boring Machine Operator (Assistant to Engineer)
- 10 Driller - Percussion, Diamond, Core, Cable, Rotary and similar types (Assistant to Engineer required)

Floating Equipment

- 1 Deckhand
- 4 Fireman
- 2 Boatman
- 8 Diesel - Electric Engineer
- 13 Piledriver Operator (not crane type) (Deckhand required)

HOISTING AND PORTABLE ENGINEERS' GROUP CLASSIFICATION - contd.

Group Floating Equipment - contd.

- 13 Floating Clamshell, etc., Operator, under one (1) cu.yd.
 (Fireman or Diesel - Electric Engineer required)
- 16 Floating Clamshell, etc. Operator, three (3) cu.yd. and
 over (Fireman or Diesel - Electric Engineer required)
- 10 Jack Operator, elevating barges
 Barge Operator, self-unloading (Assistant to Engineer
 required)
- 13 Floating Crane (Derrick Barge) Operator, less than
 thirty (30) ton (Assistant to Engineer required)
- 16 Floating Crane (Derrick Barge) Operator, thirty (30) ton
 but less than eighty (80) ton (Assistant to Engineer)
- 17 Floating Crane (Derrick Barge) Operator, eighty (80) ton
 but less than one-hundred fifty (150) ton (Assistant
 to Engineer and Deckhand required)
- 18 Floating Crane, one-hundred fifty (150) ton but less
 than two-hundred fifty (250) ton (Assistant to Engineer
 and Deckhand required)
- 19 Floating Crane, two-hundred fifty (250) ton and over
 (Assistant to Engineer and Deckhand required)

Forklift

- 1 Self-propelled Scaffolding Operator, construction job site
- 2 Fork Lift or Lumber Stacker Operator, construction job site
- 3 Ross Carrier Operator, construction job site
- 4 Fork Lift Operator, over five (5) ton
- 15 Rock Hound Operator
- 4 Lull Hi-Lift Operator or similar type [twenty (20) ft. or
 over]

Generators

- 8 Diesel - Electric Engineer (Generator Operator)

Heating Plant

- 2 Temporary Heating Plant Operator
- 9 Surface Heater and Planer Operator

Hydraulic Hoes

- 7 Hydraulic Backhoe Operator, wheel type 3/8 cu.yd. and
 under with or without front end attachments 2-1/2
 cu.yd. and under (Ford, John Deere, Case, type)
- 9 Hydraulic Backhoe Operator, track type 3/8 cu.yd.
 NOTE: Over 3/8 cu.yd. takes Shovel classification rate

HOISTING AND PORTABLE ENGINEERS' GROUP CLASSIFICATION - contd.

<u>Group</u>	<u>Loaders</u>
3	Bucket Elevator Loader Operator, Barger Greene and similar types
6	Loaders, rubber-tired type, 2-1/2 cu.yd. and under
7	Elevating Grader Operator, tractor towed requiring operator or grader
8	Belt Loaders, Kolman and Ko Cal types
9	Loader Operator, front end and overhead, 2-1/2 cu.yd. and under 4 cu.yd.
13	Elevating Grader Operator, operated by tractor operator, Sierra, Euclid or similar types
15	Loader Operator, 4 cu.yd. but less than 6 cu.yd.
16	Loader Operator, 6 cu.yd. but less than 8 cu.yd.
16	Loader Operator, 8 cu.yd. but less than 12 cu.yd.
17	Loader Operator, 12 cu.yd. and over
12	Elevating Loader Operator, Athey and similar types

Oilers

1	Oiler
2	Truck Crane Oiler - Driver, 25 ton or over
2	Auger Oiler
1	Guard Rail Punch Oiler
4	Service Oiler (Greaser)
2	Grade Oiler, required to check grade
2	Grade Checker

Piledrivers

	NOTE: Crane rates apply when driving or pulling piling.
12	Piledriver Operator (not crane type) (Assistant to Engineer required)

Pipeline - Sewer Water

2	Tar Pot Fireman
2	Tar Pot Fireman (power agitated)
3	Hydraulic Pipe Press Operator
4	Hydra Hammer or similar types
4	Pavement Breaker Operator
9	Pipe Cleaning Machine Operator
9	Pipe Doping Machine Operator
9	Pipe Bending Machine Operator
9	Pipe Wrapping Machine Operator
9	Boring Machine Operator (Assistant to Engineer)
13	Back Filling Machine Operator (Assistant to Engineer required)

HOISTING AND PORTABLE ENGINEERS' GROUP CLASSIFICATION - contd.

Group Pumps

- 1 Pump Operator, under 4"
- 3 Pump Operator, any power, 4" and over
- 3 Hydrostatic Pump Operator
- 4 Pump Operator, more than 3 any size
- 7 Pot Rammer Operator

Railroad Equipment

- 1 Brakeman
- 1 Oiler
- 3 Motorman
- 4 Locomotive Operator, under 40 tons (Assistant to Engineer required)
- 3 Ballast Jack Tamper Operator
- 7 Ballast Regulator Operator
- 7 Ballast Tamper Multipurpose Operator
- 7 Track Liner Operator
- 7 Tie Spacer Operator
- 7 Shuttle Car Operator
- 7 Locomotive Operator, 40 tons and over (Assistant to Engineer required)
- 1 Switchman

Remote Control

- 19 Remote Controlled Earth Moving Equipment (no one operator shall operate more than two pieces of earth-moving equipment at one time)

Repairmen, H. D.

- 2 H. D. Repairman Helper
- 2 Welders Helper
- 1 Parts Man (Tool Room)
- 8 Diesel - Electric Engineer (Plant or Floating)
- 9 Bolt Threading Machine Operator
- 9 Drill Doctor (Bit Grinder)
- 9 H. D. Mechanic
- 9 H. D. Welder
- 10 Combination H. D. Mechanic-Welder, when dispatched and/or when required to do both
- 10 Welder - Certified, when dispatched and/or required
- 9 Machine Tool Operator

Rubber-Tired Scrapers

- 12 Rubber-Tired Scraper Operator, single engine, single scraper

HOISTING AND PORTABLE ENGINEERS' GROUP CLASSIFICATION - contd.

Group Rubber-Tired Scrapers - contd.

- 12 Self-Loading, paddle wheel ladder type
- 12 Rubber-Tired Scraper Operator, twin engine
- 12 Rubber-Tired Scraper Operator, with push-pull attachments
- 14 Rubber-Tired Scraper Operator, with tandem scrapers
- 16 Rubber-Tired Scraper Operator, with tandem scrapers, multiengine

Shovel, Dragline, Clamshell, Backhoe, Skooper, etc., Operator

- 1 Oiler
- 1 Guard Rail Punch Oiler
- 2 Grade Oiler, (required to check grade)
- 2 Grade Checker
- 2 Fireman
- 8 Diesel-Electric Engineer
- 9 Stationary Drag Scraper Operator
- 11 Shovel, Dragline, Clamshell, Hoe, etc., Operator, under 1 cu.yd. (Assistant to Engineer required)
- 11 Gradeall Operator, under 1 cu.yd. (Assistant to Engineer required)
- 16 Shovel, etc., 3 cu.yd. but less than 5 cu.yd. (Assistant to Engineer required)
- 13 Gradeall, 1 cu.yd. and over (Assistant to Engineer required)
- 17 Shovel, etc., 5 cu.yd. and over (Assistant to Engineer required)

Signalman

- 3 Bell Boy, Phones, etc., Operator
- 2 Helicopter Radioman (ground)

Surfacing (Base) Material

- 2 Roller Operator, rock
- 4 Roller Operator, oiling, CTB.
- 3 Tamping Machine Operator, mechanical self-propelled
- 3 Hydrographic seeder Machine Operator, straw, pulp or seed
- 6 Rock Spreader, self-propelled
- 12 Blade Mounted Spreaders, Ulrich and similar types
- 5 Chip Spreading Machine Operator
- 5 Lime Spreading Operator, construction job site

Sweepers

- 3 Broom Operator, self-propelled, construction job site
- 5 Sweeper Operator (Wayne type) self-propelled, construction job site

HOISTING AND PORTABLE ENGINEERS' GROUP CLASSIFICATION - contd.

Group Tractor - Rubber-Tired

- 5 Tractor Operator, rubber-tired 50 H.P. Flywheel and under
- 9 Tractor Operator, rubber-tired over 50 H.P. Flywheel
- 9 Tractor Operator, rubber-tired with boom attachment
- 10 Rubber-Tired Dozers and Pushers (Michigan, Cat, Hough type)

Trenching Machines

- 1 Oiler
- 2 Grade Oiler (required to check grade)
- 5 Trenching Machine Operator, maximum digging capacity 3 ft. depth (any assistance in the operation shall be performed by any assistant to Engineer)
- 9 Trenching Machine Operator, maximum digging capacity over 3 ft. depth (Grade Oiler required)
- 13 Back Filling Machine Operator (Assistant to Engineer)
- 16 Wheel Excavator, under 750 cu.yd. per hour (Grade Oiler required)
- 17 Canal Trimmer (Grade Oiler required)
- 18 Wheel Excavator, over 750 cu.yd. per hour (Two operators and at least one Grade Oiler required)
- 18 Band Wagons (in conjunction with wheel excavator)

Tunnel

- 11 Mucking Machine Operator
- 12 Shield Operator
- 3 Air Filtration Equipment Operator

Welding Machines

- 3 Welding Machine Operator

Underwater Equipment

- 19 Underwater Equipment Operator, remote or otherwise, when used in construction work

LABORERS - Heavy, Highway, Utility and Building Construction Work

Group I

Effective 6-1-70 to 6-1-71

Includes General Laborers and the following:

\$4.85

Asphalt Plant Laborers

Asphalt Spreaders

Batch Weighmen

Broomers

Brush Burners and Cutters

LABORERS - Heavy, Highway, Utility and Building Construction Work - contd.

Group I - contd.

Effective 6-1-70 to 6-1-71

Car and Truck Loaders	\$4.85
<u>Carpenter Tender</u>	
Change-House Man or <u>Dry Shack Man</u>	
Choker Setters	
<u>Clean Up Laborers</u>	
<u>Concrete Laborers</u>	
Crusher Feeders	
Culvert, Hand Labor	
Curing, Concrete	
Demolition, Wrecking, and Moving <u>Laborers</u>	
<u>Driller Helpers</u>	
Dumpers, road oiling crew	
Dumpmen (for grading crew)	
Elevator Feeders	
Fence Builder (Including Guard Rail, Median Rail, Reference Post, Guide Post, Right-of-Way Marker)	
Fine Graders	
Flagmen, Traffic	
Form Strippers (not swinging stages)	
Landscaping or Planting <u>Laborers</u>	
Leverman on Aggregate Spreader (Flaharty and similar types)	
Loading Spotters	
Material Yard Man (including electrical)	
<u>Powderman Helper</u>	
Pittsburgh Chipper Operator or similar types	
<u>Railroad Track Laborers</u>	
Ribbon Setters (including steel forms)	
Riprap Man (hand placed)	
Road Pump Tender	
Sewer Labor	
Signalman	
Skipmen	
Slopers	
Spraymen	
Stake Chaser- <u>Stake</u> Setter- <u>Grade</u> Checker	
Stockpiler	
Timber Faller and Bucker (<u>hand labor</u>)	
Toolroom Man (at job site)	
Tunnel Bull Gang (above ground)	
Weigh Man-Crusher Aggregate (when used)	

Group II

Effective 6-1-70 to 6-1-71

Applicator (including Pot Tender for same), applying protective material by hand or nozzle on utility lines or storage tanks on project	\$5.00
<u>Burners</u>	
Choker Splicer	

LABORERS - Heavy, Highway, Utility and Building Construction Work - contd.

Group II - contd.

Effective 6-1-70 to 6-1-71

Clary Power Spreader and similar types \$5.00
Clean Up Nozzlemen-Greencutter (concrete Rock, etc.)
Concrete Power Buggyman
Demolition and Wrecking Charred Materials
Gunitite Nozzleman Tender
Gunitite or Sand Blasting Pot Tender
Handlers or Mixers of all insulating material of an irritating
nature (including cement and lime)
Power Tool Operators, includes but not limited to:
 Jackhammer
 Chipping Guns
 Paving Breakers
 Vibrators (less than 4" in diameter)
 Post Hole Digger, Air, Gas or Electric
 Vibrating Screed
 Tampers
Ribbon Setter, head
Riprap Man (head, hand placed)
Sand Blasting (wet)
Sewer Timberman
Timber Buckers and Fallers, Brush Cutters (power saw)
Tunnel-Muckers, Brakemen, Concrete Crew, Bull Gang (underground)

Group III

Effective 6-1-70 to 6-1-71

Asphalt Rakers \$5.15
Bit Grinder
Drill Doctor
Drill Operators, Air Tracks, Cat Drills, Wagon Drills,
 Rubber-Mounted Drills, and other similar types
Concrete Saw Operator
Gunitite Nozzleman
High Scalars, Strippers and Drillers (cover work in swinging
 stages, chairs or belts under extreme conditions unusual to
 normal drilling, blasting, barring-down, or sloping and
 stripping)
Powdermen
Power Saw Operators (bucking and falling merchantable logs)
Pumpcrete Nozzleman
Sand Blasting (dry)
Sewer Pipe Layers
Track Liners, Anchor Machines, Ballast Regulators,
 Multiple Tampers, Power Jacks
Tugger Operator
Tunnel--Chuck Tenders, Nippers, and Timbermen
Vibrators (4" and larger)

LABORERS - Heavy, Highway, Utility and Building Construction Work - contd.

Group III - contd.

Effective 6-1-70 to 6-1-71

<u>Water Blaster</u>	\$5.15
<u>Welder</u>	
<u>Tunnel Miners</u>	
<u>Tunnel Powdermen</u>	

Any Laborers working in live sewers shall receive \$5.00 per day in addition to his regular pay.

Group IV

Effective 6-1-70 to 6-1-71

Tunnel Miners	\$5.30
Tunnel Powderman	

LABORERS FRINGE BENEFITS

<u>H & W</u>	<u>Pension</u>	<u>Vacation</u>	<u>Training</u>	<u>Industry Fund</u>
\$.35	.40	.10	.02	.03

TEAMSTERS - Building and Highway and Heavy Construction Work

Effective 6-1-70 to 6-1-71

A-Frame or Hydra-lift Truck w/load bearing surface	\$5.53
Battery Rebuilder	5.48
Bus or Man-haul Driver	5.48
Concrete Buggies (power operated)	5.48
Drivers & Helpers handling sacked cement add 15¢ per hour	
Dump Truck, side, end and bottom dumps, incl. semitrucks and trains or combinations thereof:	
6 cu.yd. & under	5.48
Over 6 cu.yd. & inc. 10 cu.yd.	5.58
Over 10 cu.yd. & inc. 20 cu.yd.	5.78
Over 20 cu.yd. & inc. 30 cu.yd.	5.88
Over 30 cu.yd. & inc. 40 cu.yd.	5.98
Over 40 cu.yd. & inc. 50 cu.yd.	6.08
Over 50 cu.yd. & inc. 60 cu.yd.	6.25
Over 60 cu.yd. & inc. 70 cu.yd.	6.35
Over 70 cu.yd. & inc. 80 cu.yd.	6.45
Over 80 cu.yd. & inc. 90 cu.yd.	6.55
Over 90 cu.yd. & inc. 100 cu.yd.	6.65
Dumpsters or similar equipment - all sizes	5.68
Flaherty Spreader Driver or Leverman	5.63
Lift Jitneys, Fork Lifts - all sizes - used in loading, unloading and transporting material on job site	5.48
Loader and/or Leverman on concrete dry batch plant, manually operated	5.48
Low Bed Equipment, Flat Bed Semitrailer, Truck and Trailer or Doubles transporting equipment or wet or dry materials	5.63

TEAMSTERS - Building and Highway and Heavy Construction Work - contd.

Effective 6-1-70 to 6-1-71

Lubrication Man, Fuel Truck Driver, Tiremen, Wash Rack, Steam Cleaner Combination	5.53
Lumber Carrier Driver-straddle carrier--used in loading, unloading and transporting of materials on job site	5.63
Oil Distributor Driver or Leverman	5.63
Pilot Car	5.48
Slurry Truck Driver or Leverman	5.58
Solo Flat Bed and Misc. Body Trucks 0-10 tons	5.48
Transit Mix and Wet or Dry Mix Trucks:	
5 cu.yd. and under	5.58
Over 5 cu.yd. & inc. 7 cu.yd.	5.68
Over 7 cu.yd. & inc. 9 cu.yd.	5.78
Over 9 cu.yd. & inc. 11 cu.yd.	5.88
Over 11 cu.yd. & inc. 13 cu.yd.	5.98
Over 13 cu.yd. & inc. 15 cu.yd.	6.08
Team Drivers	5.53
Tireman, full-time basis	5.58
Truck Helper	5.48
Truck Mechanic-welder-body repairman	5.78
Truck Mechanic Helper	5.48
Warehouseman (warehouse parts, tool men and parts chaser, checkers and receivers)	5.48
Water Wagons (rated capacity)	
Up to 1600 gallons	5.48
1600 to 3000 gallons	5.58
3000 to 5000 gallons	5.63
5000 to 7000 gallons	5.78
7000 to 10,000 gallons	5.88
10,000 to 15,000 gallons	5.98
Winch Truck--takes classification of truck on which winch is mounted	

TEAMSTERS FRINGE BENEFITS

<u>H & W</u>	<u>Pension</u>	<u>Vacation</u>	<u>Industry Fund</u>
\$.30	.30	.05	.02

ORS 279.316 Condition concerning hours of labor.

Every public contract shall also contain a condition that no person shall be employed for more than eight hours in any one day, or 40 hours in any one week, except in cases of necessity, emergency, or where the public policy absolutely requires it, and in such cases the laborer shall be paid at least time and a half pay for all overtime in excess of eight hours a day and for work performed on Saturday and on any legal holiday specified in ORS 187.010, except Veterans Day. However, when specifically agreed to under a written labor-management negotiated labor agreement, a laborer may be paid at least time and a half pay for work performed on Veterans Day or on any legal holiday specified in ORS 187.020.

(Amended by 1967 c.167 §1)

ORS 279.334 Maximum hours of labor on public contracts.

In all cases where labor is employed by the state, county, school district, municipality, municipal corporation, or subdivision, through a contractor, no person shall be required or permitted to labor more than eight hours in any one day, or 40 hours in any one week, except in cases of necessity, emergency, or where the public policy absolutely requires it, in which event, the person or persons so employed for excessive hours shall receive at least time and a half pay for all overtime in excess of eight hours a day, and for work performed on Saturday and on any legal holiday specified in ORS 187.010, except Veterans Day. However, when specifically agreed to under a written labor-management negotiated labor agreement, a laborer may be paid at least time and a half pay for work performed on Veterans Day or on any legal holiday specified in ORS 187.020. This section shall not apply to labor performed in the prevention or suppression of fire under contracts and agreements made pursuant to the authority of the State Forester or State Board of Forestry, under ORS 477.406. (Amended by 1963 c.241 §1; 1967 c.167 §2)

ORS 187.010 Legal holidays; acts deferred to next business day.

(1) The following days are legal holidays in this state:

- (a) Each Sunday.
- (b) New Year's Day on January 1.
- (c) Memorial Day on May 30.
- (d) Independence Day on July 4.
- (e) Labor Day on the first Monday in September
- (f) Veterans Day on November 11.
- (g) Thanksgiving Day on the fourth Thursday in November.
- (h) Christmas Day on December 25.

If any of such holidays, other than Sunday, at any time fall on Sunday, the succeeding Monday shall be a holiday in that year.

(2) Any act authorized, required or permitted to be performed on a holiday as designated in this section may be performed on the next succeeding business day; and no liability or loss of rights of any kind shall result from such delay.

(Amended by 1955 c.4 §1)

ORS 187.020 Additional legal holidays.

In addition to those specified in ORS 187.010, the following days are legal holidays in this state:

- (1) Lincoln's Birthday on February 12.
- (2) Washington's Birthday on February 22.
- (3) Every day on which an election is held throughout the state.
- (4) Every day appointed by the President of the United States or by the Governor as a holiday.

If any of such holidays at any time fall on Sunday, the succeeding Monday shall be a holiday in that year.

Prevailing Journeyman Wage Rates in Oregon
for Specialty Building Trades

as determined by the Commissioner of Labor
pursuant to ORS 279.348 thru 279.356, and
ORS 369, 1969

The following prevailing journeyman wage rates, including fringe benefits, apply to the specialty construction trades in Newberg, Oregon, and vicinity, as of 6 July 1970, and for the effective period designated by the Commissioner of Labor:

<u>Craft Classification</u>	<u>Minimum Rate Per Hour Including Fringe Benefits</u>
Electrical Workers Journeyman	Not Available
Glass Workers Journeyman	Not Available
Painters Journeyman Brush High	\$ 6.325 6.825
Plumbers Journeyman	Not Available
Roofers Journeyman	Not Available
Sheet Metal Workers Journeyman	6.75
Tile Setter (Ceramic Tile) Journeyman	7.61

In the event it is necessary to employ workmen in a classification not listed, the Contractor shall make application to the Commissioner of Labor for the determination of the prevailing wage rate for such workmen. If a dispute arises as to what is the prevailing wage rate for any class of workmen, and, if the dispute cannot be settled by the parties involved, it may be referred to the Commissioner of Labor, State of Oregon, for final determination.

In some cases the minimum wage rates for certain crafts are not available at this time. The Contractor, in making a bid, hereby agrees to pay not less than the minimum wage rates established by the governmental agency having jurisdiction over the wage rates for these crafts.

The Owner does not guarantee that labor can be procured for the wages set forth in the above Prevailing Journeyman Wage Rates. The rates of wages listed are minimum only, below which the Contractor cannot pay, and they do not constitute a representation that labor can be procured for the minimum listed.

TRADE OR OCCUPATION CLASSIFICATION			BASIC HOURLY WAGE	FRINGE BENEFITS PAYMENTS				
				H&W	PENSIONS	VAC. & HOLIDAY	APP. OR TR.	OTHERS
APPRENTICE NAME	TRADE	PERIOD	BASIC HOURLY WAGE	H&W	PENSIONS	VAC. & HOLIDAY	APP. OR TR.	OTHERS

OVERTIME PROVISIONS

Before payment is made of any sum due on account of a contract for a public work, the state treasurer or the treasurer of the county, city, district, authority, public corporation or entity or of any of their instrumentalities organized and existing under charter or law, or other officer charged with the disbursement of funds applicable to the contract under and pursuant to which payment is made, shall require the contractor or his surety and every subcontractor or his surety to file a statement in writing in form prescribed by the State Labor Commissioner, certifying the hourly rate of wage paid each classification of workmen employed by him upon such public work, and further certifying that no workman employed by him upon such public work has been paid less than the prevailing rate of wage or less than the minimum hourly rate of wage specified in the contract, which certificate and statement shall be verified by the oath of the contractor or his surety or subcontractor or his surety that he has read such statement and certificate and knows the contents thereof and that the same is true to his knowledge.

AFFIDAVIT

Being first duly sworn, I hereby certify that the hourly rate of wages shown on this form was paid each classification of workmen employed by me (my principal) upon the public work project specified above. I further certify that no workmen employed by me (my principal) upon said public work has been paid less than the prevailing rate of wage or less than the minimum hourly rate of wage specified in the contract for said public work. I have read this statement and certificate and know the contents thereof and the same is true to my knowledge.

SIGNATURE

TITLE

☐

CONTRACTOR

☐

SUBCON-
TRACTOR

☐

CONTRACTOR'S
SURETY

☐

SUBCONTRACTOR'S
SURETY

SUBSCRIBED AND SWORN TO BEFORE ME

NOTARY PUBLIC

DATED

COMMISSION EXPIRES

GENERAL CONDITIONS

A. DEFINITIONS

A-1. Contract Documents. The "Contract Documents" consist of the Advertisement for Bids, the Proposal, the Contract, the Performance Bond, the Information for Bidders, the Special Provisions, the General Conditions, the Specifications, and the Plans, including all modifications thereof incorporated into the Documents before their execution. These form the Contract.

A-2. Owner, Contractor, Bidder. The "Owner," "Contractor," and "Bidder" are those named as such in the Contract Documents.

A-3. Engineer. Wherever the word "Engineer" occurs in these Contract Documents, the word shall signify the firm of Cornell, Howland, Hayes & Merryfield, which has been designated by the Owner to be the Engineer for the work.

A-4. Written Notice. The term "Written Notice" shall signify a written communication delivered in person or by certified or registered mail to the individual, or to a member of the firm, or to an officer of the corporation for whom it is intended. Certified or registered mail shall be addressed to the last business address known to him who gives the notice.

A-5. Work. The word "Work" within these Contract Documents shall include all material, labor, tools, and all appliances, machinery, transportation, and appurtenances necessary to perform and complete the Contract, and such additional items not specifically indicated or described which can be reasonably inferred as belonging to the item described or indicated and as required by good practice to provide a complete and satisfactory system or structure.

B. CONTRACT DOCUMENTS

B-1. Intent of Contract Documents. The Contract Documents are complementary, and what is called for by any one shall be as binding as if called for by all. The intent of the Documents is to include all work (except specific items to be furnished by the Owner), necessary for completion of the Contract. Materials or work described in words which so applied have a well-known technical and trade meaning shall be held to refer to such recognized standards.

B-2. Discrepancies and Omissions. Any discrepancies or omissions found in the Contract Documents shall be reported to the Engineer immediately. The Engineer will clarify discrepancies or omissions, in writing, within a reasonable time.

In resolving inconsistencies among two (2) or more sections of the Contract Documents, precedence shall be given in the following order:

Contract
Special Provisions
General Conditions
Special Specifications
Plans
Standard Specifications

Figure dimensions on Plans shall take precedence over scale dimensions; detailed Plans shall take precedence over general Plans.

B-3. Alterations. The Owner, without invalidating the Contract, may order extra work or make changes by altering, adding to, or deducting from the work, the Contract being adjusted accordingly. All such work shall be executed under the conditions of the original Contract, except as specifically adjusted at the time of ordering such change.

In giving instructions, the Engineer may order minor changes in the work not involving extra cost and not inconsistent with the purposes of the structure; but otherwise, except in an emergency endangering life or property, extra work or deductions from the work shall be performed only in pursuance of a written order from the Owner, signed or countersigned by the Engineer, or a written order from the Engineer stating that the Owner has authorized the deduction, extra work, or change; and no claim for additional payment shall be valid unless so ordered.

If the work is reduced by alterations, such action shall not constitute a claim for damages based on loss of anticipated profits.

B-4. Verification and Warranty. The Contractor shall determine the nature and location of the work, the general and local conditions, and all other matters which can in any way affect the work under this Contract. Failure to make an examination necessary for this determination shall not release the Contractor from the obligations of this Contract. The Contractor warrants that no verbal agreement or conversation with any officer, agent, or employee of the Owner, either before or after the execution of this Contract, has affected or modified any of the terms or obligations herein contained.

B-5. Copies to be Kept on the Work. The Contractor shall keep one (1) copy of the Contract Documents on the work, in good order, available to the Engineer and to his representatives.

B-6. Copies to be Furnished. The Engineer will furnish to the Contractor, on request and free of charge, six (6) copies of the Contract Documents and six (6) sets of full-size Plans or a sepia of the tracings. Additional copies of Contract Documents or Plans may be obtained on request by paying the actual cost of reproducing the Contract Documents or Plans.

B-7. Ownership of Drawings. All Plans, Drawings, Specifications, and copies thereof furnished by the Engineer are his property. They are not to be used on other work and, with the exception of the signed Contract set, are to be returned to him on request at the completion of the work. All models are the property of the Owner.

C. THE ENGINEER

C-1. Authority of the Engineer. The Engineer shall be the Owner's representative during the construction period. His authority and responsibility shall be limited to the provisions set forth in these Contract Documents. The Engineer shall have the authority to reject all work and materials and to stop the work whenever such rejection and/or stoppage may be necessary to insure execution of the Contract in accordance with the intent of the Contract Documents.

C-2. Duties and Responsibilities of the Engineer. The Engineer shall make periodic visits to the site of the project to observe the progress and quality of the work and to determine, in general, if the work is proceeding in accordance with the intent of the Contract Documents. He shall not be required to make comprehensive or continuous inspections to check quality or quantity of the work, and he shall not be responsible for construction means, methods, techniques, sequences, or procedures, or for safety precautions and programs in connection with the work. Visits and observations made by the Engineer shall not relieve the Contractor of his obligation to conduct comprehensive inspections of the work and to furnish materials and perform acceptable work, and to provide adequate safety precautions, in conformance with the intent of the Contract.

The Engineer shall make decisions, in writing, on all claims of the Owner or the Contractor arising from interpretation or execution of the Contract Documents. Such decision shall be necessary before the Contractor can receive additional money under terms of the Contract. Changes in work or extra work ordered by the Engineer shall be made in compliance with Article B-3 of the General Conditions.

One or more inspectors may be assigned to observe the work and to act in matters of construction under this Contract. It is understood that such inspectors shall have the power to issue instructions and make decisions within the limitations of the authority of the Engineer. Such inspection shall not relieve the Contractor of his obligations to conduct comprehensive inspections of the work and to furnish materials and perform acceptable work, and to provide adequate safety precautions, in conformance with the intent of the Contract.

C-3. Rejected Material. Any material condemned or rejected by the Engineer or his authorized inspector because of nonconformity with the Contract Documents shall be removed at once from the vicinity of the work by the Contractor at his own expense, and the same shall not be used on the work.

C-4. Unnoticed Defects. Any defective work or material that may be discovered by the Engineer before the final acceptance of work, or before final payment has been made, or during the guarantee period, shall be removed and replaced by work and materials which shall conform to the provisions of the Contract Documents. Failure on the part of the Engineer to condemn or reject bad or inferior work or materials shall not be construed to imply acceptance of such work or materials.

C-5. Right to Retain Imperfect Work. If any part or portion of the work done or material furnished under this Contract shall prove defective and not in accordance with the Plans and Specifications, and if the imperfection in the same shall not be of sufficient magnitude or importance as to make the work dangerous or undesirable, or if the removal of such work will create conditions which are dangerous or undesirable, the Owner shall have the right and authority to retain such work but shall make such deductions in the final payment therefor as may be just and reasonable.

C-6. Lines and Grades. Lines and grades shall be established as provided in the Special Provisions. The Contractor shall make every effort to notify the Engineer at least three (3) days in advance of the time when the line and grade will be needed. The Contractor will not be allowed extensions of time because of delays caused by insufficient line and grade. All stakes, marks, and other information shall be carefully preserved by the Contractor; and in cases of their careless or unnecessary destruction or removal by him or his employees, such stakes, marks, and other information shall be replaced by the Engineer at the Contractor's expense. The Contractor shall be responsible for the transfer to the structure of the lines and grades as set by the Engineer.

C-7. Shop Drawings. The Contractor shall submit, in quadruplicate, to the Engineer for his review, such shop drawings and/or catalog cuts for fabricated items and manufactured items (including mechanical and electrical equipment) required for the construction. Drawings shall be submitted in sufficient time to allow the Engineer not less than ten (10) regular working days for examining the drawings.

These drawings shall be accurate, distinct, and complete, and shall contain all required information, including satisfactory identification of items, units, and assemblies in relation to the Contract drawings and Specifications.

Unless otherwise approved by the Engineer, shop drawings shall be submitted only by the Contractor, who shall indicate by a signed stamp on the drawings, or other approved means, that he (the Contractor) has checked the shop drawings, and that the work shown is in accordance with Contract requirements and has been checked for dimensions and relationship with work of all other trades involved. The practice of submitting incomplete or unchecked shop drawings for the Engineer to correct or finish will not be acceptable; and shop drawings which, in the opinion of the Engineer, clearly indicate that they have not been checked by the Contractor will be considered as not complying with the intent of the Contract Documents and will be returned to the Contractor for resubmission in the proper form.

When the shop drawings have been reviewed by the Engineer, two (2) sets of submittals will be returned to the Contractor appropriately stamped. If major changes or corrections are necessary, the drawing may be rejected and one (1) set will be returned to the Contractor with such changes or corrections indicated, and the Contractor shall correct and resubmit the drawings, in quadruplicate, unless otherwise directed by the Engineer. No changes shall be made by the Contractor to resubmitted shop drawings other than those changes indicated by the Engineer.

The review of such drawings and catalog cuts by the Engineer shall not relieve the Contractor from responsibility for correctness of dimensions, fabrication details and space requirements, or for deviations from the Contract drawings or Specifications, unless the Contractor has called attention to such deviations in writing by a letter accompanying the drawings and the Engineer approves the change or deviations in writing at the time of submission; nor shall review by the Engineer relieve the Contractor from the responsibility for errors in the shop drawings. When the Contractor does call such deviations to the attention of the Engineer, the Contractor shall state in his letter whether or not such deviations involve any deduction or extra cost adjustment.

C-8. Detail Drawings and Instructions. The Engineer will furnish, with reasonable promptness, additional instructions by means of drawings or otherwise, if, in the Engineer's opinion, such are required for the proper execution of the work. All such drawings and instructions will be consistent with the Contract Documents, true developments thereof, and reasonably inferable therefrom.

D. THE CONTRACTOR AND HIS EMPLOYEES

D-1. Subcontracting. The Contractor shall, as soon as practicable after the execution of the Contract, notify the Engineer, in writing, of the names of the subcontractors proposed for the principal parts of the work and for such others as the Engineer may direct, and shall not employ any that the Engineer may within a reasonable time object to as lacking the capability to properly perform work of the type and scope specified.

The Contractor agrees that he is as fully responsible to the Owner for the acts and omissions of his subcontractors and of persons either directly or indirectly employed by them as he is for the acts and omissions of persons directly employed by him.

Nothing contained in the Contract Documents shall create any contractual relation between any subcontractor and the Owner.

D-2. Performance Bond. The Contractor shall furnish a surety bond of the form included herewith, in an amount at least equal to the total amount of the Proposal, as security for the faithful performance of the Contract and the payment of all persons supplying labor and materials for the construction of the work, and to cover all guarantees against defective workmanship or materials, or both, for a period of one (1) year after the date of final acceptance of the work by the Owner. Said bond shall be issued by a surety company authorized to issue such bonds in the State of Oregon and must, in all respects, be satisfactory and acceptable to the Owner.

D-3. Insurance. The Contractor shall provide the insurance coverage designated hereinafter and pay all costs.

a. Contractor's and Subcontractor's Insurance. The Contractor shall not commence work under this Contract until he has obtained all the insurance required hereunder and such insurance has been approved by the Owner, nor shall the Contractor allow any subcontractor to commence work on

his subcontract until all similar insurance required of the subcontractor has been so obtained and approved. Approval of the insurance by the Owner shall not relieve or decrease the liability of the Contractor hereunder.

b. Compensation and Employer's Liability Insurance. The Contractor shall take out and maintain during the life of this Contract the statutory Workmen's Compensation and Employer's Liability Insurance for all of his employees to be engaged in work on the project under this Contract and, in case any such work is sublet, the Contractor shall require the subcontractor similarly to provide Workmen's Compensation and Employer's Liability Insurance for all of the latter's employees to be engaged in such work.

c. Public Liability and Property Damage Liability Insurance. The Contractor shall take out and maintain during the life of this Contract such Public Liability and Property Damage Liability Insurance and Automobile Public Liability and Property Damage Liability Insurance as shall protect him, the Owner, the Engineer, and any subcontractor performing work covered by this Contract from claims for damages for personal injury, including accidental death, as well as from claims for property damage, which may arise from operations under this Contract, whether such operations be by himself or by any subcontractor or by anyone directly or indirectly employed by either of them, and the amounts of such insurance shall be not less than:

- (1) Public Liability Insurance in an amount not less than One Hundred Thousand Dollars (\$100,000.00) for injuries, including wrongful death to any one person, and subject to the same limit for each person in an amount not less than Three Hundred Thousand Dollars (\$300,000.00) for each occurrence.
- (2) Property Damage Liability Insurance in an amount not less than One Hundred Thousand Dollars (\$100,000.00) for damages for each occurrence.

The Contractor's Public Liability Insurance and Property Damage Liability Insurance shall provide the primary coverage on all claims arising out of the performance of the Contract, and shall name the Owner, its officers, agents, and employees, and the Engineer as additional named insureds therein.

d. State Highway Department Insurance Coverage. When the construction is to be accomplished within the right-of-way of the Oregon State Highway Department or on lands over which they have direct or indirect control, the Contractor's Liability Insurance Policy shall contain the following endorsement:

"The State of Oregon, the State Highway Commission and members thereof, its officers, agents, and employees are hereby included as named insureds in the herein numbered policy, except as to claims against the primary named insured for injury to their persons or damage to any of its or their property.

"Cancellation of this endorsement or of the policy to which it is attached may be effected by agreement of the parties hereto, or by the company or the primary named insured giving not less than thirty (30) days' notice in writing and by certified mail to the Director of Permits, Room 121, State Highway Building, Salem, Oregon; said notice to commence to run from the date notice is actually received at said office.

"The limits of liability of the company for the operations of the insured in construction operations on the right-of-way of State Highways shall be as follows:

Bodily Injury Liability ----	Each Person -----	\$100,000
	Each Accident ----	\$300,000
Property Damage Liability --	Each Occurrence --	\$100,000

"Limits provided herein are the minimum limits required by the Oregon State Highway Commission and shall in no way be considered a reduction in limits as originally provided in this policy."

e. Fire Insurance. Fire insurance coverage shall be provided as set forth in the Special Provisions.

f. Certificates of Insurance. Before commencing work under this Contract, Contractor shall furnish the Owner with certificates of insurance specified herein showing the type, amount, class of operations covered, effective dates, and date of expiration of policies, and containing substantially the following statement:

"The insurance covered by this certificate will not be cancelled or materially altered, except after ten (10) days' written notice has been received by the Owner."

D-4. Permits and Licenses. The Contractor shall keep himself fully informed of all local ordinances, State and Federal laws in any manner affecting the work herein specified. He shall at all times comply with said ordinances, laws, and regulations, and protect and indemnify the Owner and its officers and agents against any claim or liability arising from or based on the violation of any such laws, ordinances, or regulations. All permits, licenses, and inspection fees necessary for prosecution and completion of the work shall be secured and paid for by the Contractor, unless otherwise specified.

D-5. Superintendence. The Contractor shall keep on the work, during its progress, competent supervisory personnel. The Contractor shall give efficient supervision to the work, using his best skill and attention. The Contractor shall be solely responsible for all construction means, methods, techniques, and procedures, and for providing adequate safety precautions and coordinating all portions of the work under the Contract.

D-6. Reception of Engineer's Directions. The superintendent, or other duly authorized representative of the Contractor, shall represent the Contractor and all directions given to him by the Engineer shall be binding. Such directions of major importance will be confirmed in writing. Any direction will be so confirmed in each case on written request from the Contractor.

D-7. Sanitation. Sanitary conveniences shall be erected and maintained by the Contractor at all times while men are employed on the work; and the use of such sanitary conveniences shall be strictly enforced. The location of such conveniences shall be approved by the Engineer.

D-8. Employees. The Contractor shall employ only competent, skillful men to do the work; and whenever any person shall appear to be incompetent or to act in a disorderly or improper manner, such person shall be removed from the work.

D-9. Requirements of Oregon Law for Public Contracts. When the Contract Documents concern public works of the State or any County, municipality, or political subdivision created by its laws, the applicable statutes of the State of Oregon shall apply. For this reason Sections 279.310 through 279.356 of the Oregon Revised Statutes, as amended or superseded, including the latest additions and revisions, are incorporated by reference as parts of these Contract Documents.

These sections define the requirements of Oregon law for public contracts:

a. Concerning payment of laborers and materialmen, contributions to Workmen's Compensation Board, preventions of liens, payment of withholding taxes.

b. Concerning the maximum hours of labor, payment of not less than the prevailing rate of wages, payment of medical care and attention to employees, certification of wages by contractors and subcontractors, liability to workmen for violation of minimum wage rate requirements.

c. Concerning payment of claims by public officers, termination of Contract because of a national emergency, conditions concerning the forfeiture of Contract.

It is understood and agreed that all parties to this Contract shall determine the contents of these applicable statutes and comply with their provisions throughout the performance of the Contract.

D-10. Safety Precautions. The Contractor shall take all necessary precautions for the safety of employees on the work and shall comply with all applicable provisions of Federal, State, and municipal safety laws and building codes to prevent accidents or injury to persons on, about, or adjacent to the premises where the work is being performed. The Contractor shall, without further order, provide and maintain at all times during the progress or temporary suspension of the work, suitable barricades, fences, signs, signal lights, and flagmen as are necessary or required to insure the safety of the public and those engaged in the work. The operations of the Contractor, for the protection of persons, and the guarding against hazards from machinery and equipment, shall meet the requirements of the applicable State laws and the current safety regulations as set forth in the Oregon Safety Codes adopted and published by the Workmen's Compensation Board, Salem, Oregon.

The Contractor shall be solely and completely responsible for condition of the premises on which the work is performed and for safety of all persons and property on the site during performance of the Contract. This requirement shall not be limited to normal working hours, but shall apply continuously. The Contractor shall conform with all governing safety regulations.

D-11. Protection of Property.

a. Protection of Work and Property. The Contractor shall at all times safely guard the Owner's property from injury or loss in connection with this Contract. He shall at all times safely guard and protect his own work, and that of adjacent property (as provided by law and the Contract Documents) from damage. All passageways, guard fences, lights, and other facilities required for protection by State or municipal laws and regulations and local conditions, must be provided and maintained.

b. Responsibility of Contractor to Act in Emergency. In case of an emergency which threatens loss or injury of property, and/or safety of life, the Contractor shall act, without previous instructions from the Owner or Engineer, as the situation may warrant. He shall notify the Engineer thereof immediately thereafter. Any compensation claimed by the Contractor, together with substantiating documents in regard to expense, shall be submitted to the Owner through the Engineer and the amount of compensation shall be determined by agreement or arbitration.

D-12. Materials and Appliances. Unless otherwise stipulated, the Contractor shall provide and pay for all materials, labor, water, tools, equipment, light, power, transportation, and other facilities necessary for the execution and completion of the work.

Unless otherwise specified, all materials shall be new, and both workmanship and materials shall be of good quality. The Contractor shall, if required, furnish satisfactory evidence as to the kind and quality of materials.

D-13. Access for Inspection. The Contractor shall furnish, without extra charge, the necessary test pieces and samples, including facilities and labor for obtaining the same, as requested by the Engineer. When required, the Contractor shall furnish certificates of tests of materials and equipment made at the point of manufacture by a recognized testing laboratory.

The Engineer and his representatives shall at all times have access to the work wherever it is in preparation or progress, and the Contractor shall provide facilities for such access and for inspection, including maintenance of temporary and permanent access.

If the Specifications, the Engineer's instructions, laws, ordinances, or any public authority require any work to be specially tested or approved, the Contractor shall give timely notice of its readiness for inspection. Inspections to be conducted by the Engineer will be promptly made, and where practicable, at the source of supply. If any work should be covered up without approval or consent of the Engineer, it shall, if required by the Engineer, be uncovered for examination at the Contractor's expense.

Re-examination of questioned work may be ordered by the Engineer; and, if so ordered, the work shall be uncovered by the Contractor. If such work be found in accordance with the Contract Documents, the Owner will pay the cost of re-examination and replacement. If such work be found not in accordance with the Contract Documents, the Contractor shall correct the defective work at no additional cost to the Owner.

D-14. Royalties and Patents. The Contractor shall pay all royalty and license fees, unless otherwise specified. He shall defend all suits or claims for infringement of any patent rights and shall save the Owner and the Engineer harmless from loss on account thereof.

D-15. Indemnity. The Contractor shall indemnify, save harmless, and defend the Owner and the Engineer from and against all costs, expenses, and losses and all claims, demands, payments, suits, actions, recoveries, and judgments of every nature and description made, brought, or recovered against the Owner by reason of any act or omission of the Contractor, his agents or employees, in the execution of the work or in guarding the same.

D-16. Taxes and Charges. The Contractor shall withhold and pay any and all withholding taxes, whether State or Federal; and pay all Social Security charges and also all State Unemployment Compensation charges; and pay or cause to be withheld, as the case may be, any and all taxes, charges, or fees or sums whatsoever, which are now or may hereafter be required to be paid or withheld under any laws.

D-17. Unforeseen Difficulties. The Contractor shall protect his work and materials from damage due to the nature of the work, the elements, carelessness of other contractors, or from any cause whatever until the completion and acceptance of the work. All loss or damages arising out of the nature of the work to be done under these Contract Documents, or from any unseen obstruction or defects which may be encountered in the prosecution of the work, or from the action of the elements shall be sustained by the Contractor.

D-18. Contractor's Right to Stop Work or Terminate Contract. If the work should be stopped under an order of any court or other public authority for a period of three (3) months, through no act or fault of the Contractor or of anyone employed by him; or if the Engineer should fail to issue any estimate for payment within fifteen (15) days after it is due; or if the Owner should fail to pay the Contractor within thirty (30) days after the time specified in Article F-1 of these General Conditions any sum certified by the Engineer, then the Contractor may, upon fifteen (15) days' written notice to the Owner and the Engineer, stop work or terminate this Contract and recover from the Owner payment for all work executed and any loss sustained upon any plant or material and reasonable profit, unless said default has been remedied within said time.

D-19. Correction of Defective Work After Final Acceptance. All work, including the design of mechanical and electrical components of equipment and/or design of packaged control systems which are furnished as a component of equipment, shall be guaranteed for a period of one (1) year against defects in materials and workmanship. The Contractor hereby agrees to make, at his own expense, all repairs or replacements necessitated by defects in materials or workmanship supplied by him that become evident within one (1) year after the date of final acceptance of the work. The Contractor also agrees to hold the Owner harmless from liability of any kind arising from damage due to said defects. The Contractor shall make all repairs and replacements promptly upon receipt of written orders for same from the Owner. If the Contractor fails to make the repairs and replacements promptly, the Owner may do the work, and the Contractor and his Surety shall be liable for the cost thereof. Any additional requirements for the project relative to correction of defective work after final acceptance are set forth in the Special Provisions.

E. PROGRESS OF THE WORK

E-1. Beginning of the Work. Before work shall be started and materials ordered, the Contractor shall meet and consult with the Engineer relative to materials, equipment, and all arrangements for prosecuting the work.

E-2. Schedules and Progress Reports. Prior to starting the construction, the Contractor shall furnish the Engineer for his approval, if requested, a schedule or schedules of expected progress of the work under the Contract

showing approximately the dates on which each part or division of the work is expected to be started and finished. The progress schedules shall be submitted regularly and shall cover a time period satisfactory to the Engineer. The Contractor shall also forward to the Engineer, if requested, as soon as practicable after the first day of each month, a summary report of the progress of the various parts of the work under the Contract in the shops and in the field, stating the existing status, rate of progress, estimated time of completion, and cause of delay, if any.

E-3. Prosecution of the Work. It is expressly understood and agreed that the time of beginning, rate of progress, and time of completion of the work are of the essence of this Contract. The work shall be prosecuted at such time, and in or on such part or parts of the project as may be required, to complete the project as contemplated in the Contract Documents and the approved construction schedule.

If the Contractor desires to carry on work at night or outside the regular hours, he shall give timely notice to the Engineer to allow satisfactory arrangements to be made for inspecting the work in progress.

E-4. Assignment. Neither party to the Contract shall assign the Contract or sublet it as a whole without the written consent of the other; nor shall the Contractor assign any monies due or to become due to him hereunder without the previous written consent of the Owner.

E-5. Owner's Right to Do Work. If the Contractor should, in the opinion of the Engineer, neglect to prosecute the work properly or should neglect or refuse at his own cost to take up and replace work as shall have been rejected by the Engineer, then the Owner shall notify the surety company of the condition, and after ten (10) days' written notice to the Contractor and the surety company, or without notice if an emergency or danger to the work or public exists, and without prejudice to any other right which the Owner may have under the Contract, take over that portion of the work which has been improperly executed and make good the deficiencies and deduct the cost thereof from the payments then or thereafter due the Contractor.

E-6. Owner's Right to Transfer Employment. If the Contractor should be adjudged a bankrupt; or if he should make a general assignment for the benefit of his creditors; or if a receiver should be appointed on account of his insolvency; or if he should persistently or repeatedly refuse or should fail, except in cases for which extension of time is provided, to supply enough properly skilled workmen or proper materials; or if he should fail to make prompt payment to subcontractors or for material or labor; or persistently disregard laws, ordinances, or the instructions of the Engineer; or otherwise be guilty of a substantial violation of any provision of the Contract or any laws or ordinance; then the Owner, if sufficient cause exists to justify such action, may without prejudice to any other right or remedy, and after giving the Contractor and Surety seven (7) days' written notice, transfer the employment for said work from the Contractor to the Surety. Upon receipt of such notice, such Surety shall enter upon the premises and take possession of all materials, tools, and appliances thereon for the purpose of completing the work included under this Contract and employ, by contract or otherwise, any

person or persons to finish the work and provide the materials therefor without termination of the continuing full force and effect of this Contract. In case of such transfer of employment to such Surety, the Surety shall be paid in its own name on estimates according to the terms hereof without any right of the Contractor to make any claim for the same or any part thereof. In lieu of the foregoing, if the Owner so elects, he may terminate the employment of the Contractor and take possession of the premises and of all materials, tools, and appliances thereon and finish the work by whatever method he may deem expedient. In such case, the Contractor shall not be entitled to receive any further payment until the work is finished. If the expense of completing the Contract, including compensation for additional managerial and administrative services, shall exceed such unpaid balance, the Contractor shall pay the difference to the Owner.

E-7. Delays and Extension of Time. If the Contractor be delayed at any time in the progress of the work by any act or neglect of the Owner or the Engineer, or of any employee of either; or by any separate contractor employed by the Owner; or by changes ordered in the work; or by strikes, lockouts, fire, unusual delay in transportation, unavoidable casualties, or any causes beyond the Contractor's control which justifies the delay, then the date for completion of the work shall be extended. Within a reasonable period after the Contractor submits to the Engineer a written request for an extension of time, the Engineer will present his written opinion to the Owner as to whether an extension of time is justified; and, if so, the number of days extension due the Contractor. The Owner will make the final decision on all requests for extension of time.

No such extension shall be made for delay occurring more than seven (7) days before claim therefor is made in writing to the Engineer. In the case of a continuing cause of delay, only one claim is necessary.

E-8. Liquidated Damages. Should the Contractor fail to complete the work, or any part thereof, in the time agreed upon in the Contract or within such extra time as may have been allowed for delays by extensions granted as provided in the Contract, the Contractor shall reimburse the Owner for the additional expense and damage for each calendar day, Sundays and holidays excluded, that the Contract remains uncompleted after the Contract completion date. It is agreed that the amount of such additional expense and damage incurred by reason of failure to complete the work is the per diem rate stipulated in the Contract. The said amounts are hereby agreed upon as liquidated damages for the loss to the Owner on account of expense due to the employment of engineers, inspectors, and other employees after the expiration of the time of completion, and on account of the value of the operation of the works dependent thereon. It is expressly understood and agreed that this amount is not to be considered in the nature of a penalty, but as liquidated damages which have accrued against the Contractor; and the Owner is authorized to deduct the amount of such damages from any monies due the Contractor for work performed or material furnished under this Contract; and the Contractor and his Sureties shall be liable for any excess.

E-9. Other Contracts. The Owner reserves the right to let other contracts in connection with this work. The Contractor shall afford other contractors reasonable opportunity for the introduction and storage of their

materials and the execution of their work and shall properly connect and coordinate his work with theirs.

If any part of the Contractor's work depends, for proper execution or results, upon the work of any other contractor, the Contractor shall inspect and promptly report to the Engineer any defects in such work that render it unsuitable for such proper execution and results. His failure to so inspect and report shall constitute an acceptance of the other contractor's work as fit and proper for the reception of his work, except as to defects which may develop in the other contractor's work after execution of his work.

E-10. Use of Premises. The Contractor shall confine his equipment, the storage of materials, and the operation of his workmen to limits shown on the Plans or indicated by law, ordinances, permits, or directions of the Engineer, and shall not unreasonably encumber the premises with his materials. The Contractor shall provide, at his own expense, the necessary rights-of-way and access to the work which may be required outside the limits of the Owner's property.

The Contractor shall not load or permit any part of the structure to be loaded with a weight that will endanger its safety.

E-11. Use of Completed Portions. The Owner shall have the right to take possession of and use any completed or partially completed portions of the work, notwithstanding the time for completing the entire work, or such portions, may not have expired, but such taking possession and use shall not be deemed an acceptance of any work not completed in accordance with the Contract Documents. If such prior use increases the cost of the work, or delays the completion of the work, the Contractor shall be entitled to extra compensation or an extension of time, or both. The Contractor's attention is directed to Articles E-7 and F-2.

E-12. Cutting and Patching. The Contractor shall do all cutting, fitting, or patching of his work that may be required to make its several parts come together properly and fit it to receive or be received by work of other contractors shown upon or reasonably implied by the Plans. Any defective work or material, performed or furnished by the Contractor, that may be discovered by the Engineer before the final acceptance of the work or before final payment has been made shall be removed and replaced or patched, in a manner as approved by the Engineer, at the expense of the Contractor.

E-13. Cleaning Up. The Contractor shall, at all times, at his own expense, keep property on which work is in progress and the adjacent property free from accumulations of waste material or rubbish caused by employees or by the work. Upon completion of the construction, the Contractor shall, at his own expense, remove all temporary structures, rubbish, and waste materials resulting from his operations.

F. PAYMENT

F-1. Partial Payment. On or about the last two (2) days of each calendar month, the Engineer will make an estimate of the value of the work satisfactorily completed, including acceptable material delivered. The amount of said

estimate, after deducting ten percent (10%) as provided hereinafter and all previous payments, shall be due and payable to the Contractor not more than ten (10) days after the last day of said month, except where the Owner is a municipality whose laws require the approval of each payment by a council or similar body; in which case, the amount of said estimate shall become due and payable ten (10) days after the first meeting in the following month scheduled for approval of such payments.

When the Contract price for public work exceeds Twenty-Five Thousand Dollars (\$25,000.00), the Owner will deduct ten percent (10%) of all progress payments for the work completed until five percent (5%) of the total Contract price has been retained. No additional retainage will be withheld unless otherwise provided in the Special Provisions. The amount retained as provided above will be withheld by the Owner until completion of the Contract to insure faithful completion of the work under the terms of the Contract Documents.

To receive partial payment for materials delivered, but not incorporated in the work, it shall be necessary for the Contractor to submit to the Engineer at least seven (7) days prior to the end of said month a list of such materials, with costs supported by invoices of suppliers. Proper storage and protection shall be provided by the Contractor. Final payment shall be made only for materials actually incorporated in the work and, upon acceptance of the work, all materials remaining for which advance payments had been made shall revert to the Contractor, unless otherwise agreed, and partial payments made for these items shall be deducted from the final payment for the work.

Monthly partial payments shall be conditional upon prosecution of the work in accordance with the provisions of the Contract and, on contracts for any public work in the State of Oregon except Federal projects, upon filing with the Owner by the Contractor the Wage Certification Form required by ORS Chapter 279, 1963, as amended.

Nothing contained in this article shall be construed to affect the right, hereby reserved, to reject the whole or any part of the aforesaid work should such work be later found not to comply with the provisions of the Contract Documents. All estimated quantities of work for which progress payments have been made are subject to review and correction on the final estimate. Payment by the Owner and acceptance by the Contractor of progress payments based on periodic estimates of quantities of work performed shall not, in any way, constitute acceptance of the estimated quantities used as the basis for computing the amounts of the progress payments.

F-2. Extra Work. Any work necessary or required to carry out the intent of these Contract Documents by changes clearly not indicated in the Contract Documents or which cannot reasonably be implied from the intent and meaning of the Contract Documents shall be considered as extra work. Payment for any ordered extra work or changes shall be determined by:

a. Unit prices used in the Contract Documents or agreed upon for the extra work or changes; or

b. Lump sum agreement, in writing, between the Contractor and the Owner; or

c. Force Account Work. If the method of payment cannot be agreed upon prior to the beginning of the work, and the Owner or the Engineer directs that the work be done on a force account basis, then the Contractor shall furnish labor, equipment, and materials at costs and rates in effect at the time the work is accomplished plus percentage allowances as designated hereinafter:

<u>Items of Cost on Which Payments Will Be Allowed</u>	<u>Percentage Allowance**</u>
(1) Payroll, for jobsite personnel*	15%
(2) Delivered costs of materials and supplies actually used on the designated work.	10%
(3) Rental on each piece of equipment, not owned by the Contractor, having a value in excess of \$100 actually used on the work.	15%
Rental on each piece of equipment, owned by the Contractor, having a value in excess of \$100 actually used on the work.	15%
(Rental rates shall not exceed those of the State Highway Department for comparable equipment.)	
(4) Subcontractors' bills (if any).	10%

For equipment rented on a day or hour basis, rental will be allowed for only those days or hours during which the equipment is in actual use. The rentals allowed for equipment will in all cases be understood to cover all fuel, supplies, repairs, and renewals, and no further allowances will be made for those items unless specific agreement to that effect is made.

If the latter method of payment is used, a breakdown of the Contractor's costs involved in any approved extra work shall be submitted to the Engineer within thirty (30) days after said extra work has been performed.

No payment will be made for extra work billed and submitted to the Engineer after the thirty (30) day period has expired. No extra work shall be performed by the Contractor, except in an emergency endangering life or property, unless in pursuance of a written order, as provided in Article B-3 of these General Conditions.

* Including documented actual wages and fringe benefits, labor insurance, taxes, and any other labor burdens.

**Includes all other overhead and profit.

F-3. Release of Liens or Claims. The Contractor shall submit, by a means acceptable to the Owner, evidence that provisions have been made to satisfy all liens or claims growing out of lawful demands for materials, labor, and incidentals in connection with the work before the final payment or any part of the retained percentage shall become due. Such means may include, but are not limited to, one or more of the following:

- a. Receipts in full for all items out of which a lien or claim could arise.
- b. Complete release of all liens and claims.
- c. Affidavit by Contractor that receipts or releases account for all labor, materials, or incidentals used in the work.
- d. A bond to indemnify Owner against any lien or claim.

If any lien or claim remains unsatisfied after all payments are made, the Contractor shall refund to the Owner all monies that the latter may be compelled to pay in discharging such a lien or claim, including all costs and a reasonable attorney's fee.

F-4. Final Payment. Upon completion of the work, the Contractor shall notify the Engineer, in writing, that he has completed his part of the Contract and shall request final payment. If the work has been completed to the intent of the Contract Documents, the Engineer shall recommend acceptance of the completed work and submit a final estimate of the amount due the Contractor under this Contract. Upon approval of this final estimate by the Owner and compliance with provisions in Article F-3 of these General Conditions, and other provisions as may be applicable, the Owner shall pay to the Contractor all monies due him under the provisions of these Contract Documents.

On contracts for public works, final payment of the retained percentage will not be made until the Contractor has also furnished the Wage Certification required by ORS Chapter 279, 1963, as amended.

SPECIAL SPECIFICATIONS

Foreword: The Contractor shall furnish all labor, materials, and equipment necessary or required to complete the work, in all respects, as shown on the Plans or as hereinafter specified, or both. The numbering system employed in these Special Specifications is used throughout the Contract Documents. Each section is divided, where applicable, into A, Scope; B, Materials; C, Workmanship; and D, Payment. This method is employed to facilitate the work of the Contractor in preparing his Proposal, and in following the Special Specifications during the construction.

When references to the following capitalized abbreviations are made, they refer to Specifications, Standards, or Methods of the respective national association. Abbreviations listed herein but not mentioned in the Special Specifications shall be disregarded.

AASHO	American Association of State Highway Officials
ACI	American Concrete Institute
AFBMA	Anti-Friction Bearing Manufacturers Association
AGA	American Gas Association
AGMA	American Gear Manufacturer's Association
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AMCA	Air Moving and Conditioning Association
ANSI	American National Standards Institute
(USAS)	References to USA and ASA Standards shall be deemed to
(ASA)	refer to Standards of the American National Standards Institute. There is no change in the index identification on previously printed <u>current</u> ASA or USA Standards or their technical content, and they shall be considered to be ANSI Standards regardless of the designation.
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
AWWA	American Water Works Association
AWS	American Welding Society
AWPA	American Wood Preservers' Association
CBMA	Certified Ballast Manufacturers Association
DFPA	Division for Product Approval of the American Plywood Association
Fed.	
Spec.	Federal Specifications
IEEE	Institute of Electrical and Electronics Engineers, Inc.
IPCEA	Insulated Power Cable Engineers Association
JIC	Joint Industry Conferences of Hydraulic Manufacturers
NEC	National Electrical Code
NEMA	National Electrical Manufacturers Association
NESC	National Electric Safety Code
NFPA	National Fire Protection Association
NLMA	National Lumber Manufacturers Association

OEI	Overhead Electrical Crane Institute
RLM	RLM Standards Institute, Inc.
SSPC	Steel Structures Painting Council
TEMA	Tubular Exchanger Manufacturer's Association
UBC	Uniform Building Code
UL	Underwriters' Laboratories, Inc.
WCLIB	West Coast Lumber Inspection Bureau

The numbers and letters following the abbreviations denote the Association's serial designation for the Specification or Standard to which reference is made. Unless a particular issue is designated, all references to the above Specifications, Standards, or Methods shall, in each instance, be understood to refer to the issue in effect (including all amendments) on the date of the Advertisement for Bids or the Invitation for Bids.

Standard Specifications, when referred to herein, except the above, are found at the end of the Special Specifications.

Sp. Specs. -2-

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IA. GENERAL REQUIREMENTS

The Contractor's attention is directed to the SPECIAL PROVISIONS, which contain other special requirements that are pertinent to this project.

SUBSURFACE AND SITE INFORMATION. Test pits or test holes have been excavated to indicate subsurface materials at particular locations. The Engineer and Owner will make available to all prospective bidders, upon request, prior to the receipt of Proposals, all information that they may have as to subsurface conditions and surface topography at the work site. Investigations conducted by the Engineer of subsurface conditions are for the purpose of study and design, and neither the Owner nor the Engineer assumes any responsibility whatever in respect to the sufficiency or accuracy of the borings thus made, or of the log of test borings, or of other investigations, or of the interpretations made thereof, and there is no warranty or guarantee, either expressed or implied, that the conditions indicated by such investigations are representative of those existing throughout such area, or any part thereof, or that unforeseen developments may not occur.

A log of test borings showing a record of the data obtained by the Engineer's investigations of subsurface conditions is included as a part of the Contract Documents, said log represents only the opinion of the Engineer as to the character of the materials encountered by him in his test borings and is included only for the convenience of the bidders.

Information derived from inspection of logs of test borings, of topographic maps, or from Plans showing location of utilities and structures will not in any way relieve the Contractor from any risk, or from properly examining the site and making such additional investigations as he may elect, or from properly fulfilling all the terms of the Contract Documents.

The submission of a Proposal shall be conclusive evidence that the Bidder has investigated and is satisfied as to the conditions to be encountered, as to the character, quality, and quantities of work to be performed and materials to be furnished, and as to the requirements of the Contract Documents.

AS-BUILT PLANS OF EXISTING FACILITIES. As-built Plans of the existing facilities are available for inspection at the office of the Engineer, 1600 S.W. Western Boulevard, Corvallis, Oregon. No responsibility is assumed by the Engineer or the Owner for the completeness or accuracy of said Plans, or the interpretation thereof.

UNDERGROUND UTILITIES. Known utilities and structures expected to be adjacent to or encountered in the work are shown on the Plans. It is expected that there may be some discrepancies and omissions in the locations and quantities of utilities and structures shown. Those shown are for the convenience of the Contractor only, and no responsibility is assumed by either the Owner or the Engineer for their accuracy or completeness.

FIRE PREVENTION AND PROTECTION. The Contractor shall perform all work in a fire-safe manner. He shall supply and maintain adequate first-aid and fire fighting equipment on the site, capable of extinguishing incipient fires. The Contractor shall comply with applicable local and State fire prevention

regulations and where the regulations do not cover, with applicable parts of the National Fire Prevention Standard for SAFEGUARDING BUILDING CONSTRUCTION OPERATIONS (NFPA No. 241).

TEMPORARY WATER. The Owner will provide a connection for temporary water at the site. The Contractor shall provide all temporary piping required to bring the water to the point of use and remove it when no longer needed. The Contractor shall pay for the water used at the current rate.

TEMPORARY ELECTRIC POWER. Electric power is available at the site. Make arrangements for obtaining a separate electric power service and pay all costs for the electric power used during the construction.

Electric power for performance and acceptance tests at completion of the project will be provided by the Owner.

SEQUENCE OF OPERATIONS. Plan the construction work and carry out with a minimum of interference with the operation of the existing facilities. Prior to starting the construction, confer with the Engineer and representatives of the Owner and develop an approved construction schedule which will permit the plant to function as normally as practical during the construction period. It may be necessary to do certain parts of the construction work outside normal working hours in order to avoid undesirable conditions, and it shall be the obligation of the Contractor to do this work at such times at no additional cost to the Owner. Do not make connections between existing piping and new piping until necessary inspection and tests have been completed on the new work and it is found to conform in all respects to the requirements of the Plans and Specifications.

For work on existing structures and facilities, operate on a schedule which will permit the existing plant to operate continuously at its present capacity and degree of treatment during the months of May through October and at other periods with 5 days' notice. The Contractor shall provide necessary materials to construct temporary partitions or bulkheads in the new weir troughs to allow the plant to operate at least its present capacity and degree of treatment until the expansion is completed. The existing high service pumps shall not be removed until the new pumps are in operation.

All work which requires a plant shut-down to accomplish shall be performed during months when the plant will not normally be in operation. Written approval for such shut-downs shall be obtained from the Engineer at least 7 days prior to the commencement of such work. The Contractor shall submit with his request a detailed time schedule for the work and arrange in advance for delivery of all necessary material and availability of equipment and personnel required to accomplish the work within the shortest reasonable plant shut-down time.

SANITARY FACILITIES. The Contractor shall provide one or more chemical toilets of approved type, as required, and shall maintain the facility in a proper sanitary condition at all times. The chemical toilet shall be of watertight construction so that no contamination of the area can result from its use. The facilities provided shall conform to code requirements and be

acceptable to the Engineer and sanitary authorities. Upon completion of the work, the sanitary facilities shall be removed and the area restored to its original condition.

RESIDENT ENGINEER'S OFFICE. The Contractor shall provide an office for the Resident Engineer having at least 80 square feet of floor space. The office shall be equal in quality to that provided for the Construction Superintendent. If the Resident Engineer's office is to be located in the same building as the Superintendent's office, it shall be partitioned off and provided with a separate entrance. Facilities for heating and lighting shall be provided. Provide with window, doors with locks, table, bench, and drawing rack. Provide access to job telephone.

ACCESS TO EXISTING FACILITIES. Provide and maintain continuous access at all times to the existing treatment units and building.

INTERFERING STRUCTURES. Take necessary precautions to prevent damage to existing structures whether aboveground or underground. An attempt has been made to show major structures on the Plans. While the information has been compiled from the best available sources, its completeness and accuracy cannot be guaranteed. It shall be the Contractor's responsibility to do the exploratory work necessary to confirm conditions prior to proceeding with all phases of the work.

SITE RESTORATION AND CLEANUP. At all times during the work, keep the premises clean and orderly, and upon completion of the work, leave the project free of rubbish or excess materials of any kind.

Upon completion of pipe laying and backfilling operations in any section, hand-rake and drag the completed backfill surfaces leaving all disturbed areas free from rocks, gravel, clay, or any other foreign material. The finished surface shall conform to the original surface, and shall be free-draining, free from holes, rough spots, or other surface features detrimental to seeding the area.

DUST PREVENTION. Give all streets, roads, or detours used for hauling material to or from the construction area an oil dust preventive treatment or continually water to prevent dust.

Dust prevention measures shall be continuous until final acceptance by the Owner.

OPERATION OF VALVES IN WATER SYSTEM PROHIBITED. At no time undertake to close off any lines or open valves or take any other action which would affect the operation of the existing water system, except as specifically required by the Plans and Specifications and after approval is granted by the Owner. Request approval well in advance of the time that the interruption of the existing service is required.

RESPONSIBILITY FOR DAMAGE TO EXISTING STRUCTURES. Where any existing structures or facilities which are intended to remain are damaged by the Contractor during demolition or construction, the Contractor shall promptly repair or replace the damaged portion or facility at no additional cost to the Owner.

SHOP DRAWINGS AND OPERATING AND MAINTENANCE DATA. In order to comply with the requirements of C-7, Shop Drawings, of the GENERAL CONDITIONS, the Contractor must submit the following information, as applicable, on all electrical, mechanical, plumbing, and process equipment to be installed in the project:

1. Shop drawings and/or catalog information and cuts.
2. Manufacturer's specifications.
3. Manufacturer's parts lists, wiring diagrams, and equipment drawings.
4. Complete lubrication maintenance and operating instructions, including initial start-up instructions.
5. Other technical, installation, and maintenance data as applicable.

Four complete sets of all information shall be furnished in compliance with Section C-7. In addition, 3 additional copies shall be furnished for final operation and maintenance manuals.

All information submitted shall be specifically for the equipment installed in the project and all extraneous sheets shall be removed or deleted from catalogs and other preprinted material.

Shop drawings on any piece of equipment will not be acceptable until all information listed in 1 through 5, above, has been submitted where applicable.

PREPARATION OF OPERATION AND MAINTENANCE MANUALS. Written operation and maintenance manuals will be prepared by the Owner from equipment information furnished by the Contractor.

At least 60 days prior to completion of the project, the Engineer will provide the Contractor with a list of equipment items for which additional information is required to properly prepare an operation and maintenance manual. Three copies of this additionally-required information shall be furnished by the Contractor prior to the Engineer's recommendation for project acceptance.

Three copies of the following information shall also be furnished by the Contractor without specific request prior to a recommendation for project acceptance:

1. Complete as-built elementary wiring and outline diagrams and other information as requested in Section ELECTRICAL.
2. Maintenance Summaries in the format of the form bound at the end of this section and described below.

An individual Maintenance Summary for each equipment item listed below must be compiled following the outline provided and 3 copies submitted for review by the Engineer. The manufacturer's standard form will not be acceptable as a substitute for the Maintenance Summary.

The term "maintenance operation" as used in the Maintenance Summary bound herewith is understood to mean any routine operation required to insure the satisfactory performance and longevity of the equipment. Examples

of some typical "maintenance operations" are lubrication, belt tensioning, adjustment of pump packing glands, routine adjustments, etc.

The Maintenance Summary may take as many pages as required; however, the order and format shown must be adhered to. Only 8-1/2" x 11" paper will be accepted.

The following equipment items must be furnished with Maintenance Summary Forms:

<u>Section</u>	<u>Item</u>
I 1A	High-service pump No. 1 High-service pump No. 2 Washwater pump Driving motors
I 1E	Chlorinators
I 1G	Portable mixer Filter aid feed pumps
I 4A	Electric hoist
I 5C	Mud valves and operators Butterfly valves and operators High-service pump control valves
I 5D	Air compressors Air receiver Air cooler Oil removal filter
I 5E	Roof-mounted centrifugal exhaust fan Wall-mounted centrifugal exhauster
I 5F	Applicable items in the plant control and instrumentation system
I 6A	Motor control centers Unit heaters
I 6B	Control and indicating audio tone system

STORAGE OF MATERIALS. Materials shall be so stored as to insure the preservation of their quality and fitness for the work. When considered necessary, they shall be placed on wooden platforms or other hard, clean surfaces, and not on the ground, and/or they shall be placed under cover. Stored materials shall be located so as to facilitate prompt inspection. Private property shall not be used for storage purposes without the written permission of the owner or lessee.

CLEANUP. The Contractor shall at all times during the work keep the premises clean and orderly. He shall promptly remove all waste materials and rubbish. All directions from the Engineer and other authorized public officials having jurisdiction over health and safety shall be obeyed.

Upon completion of the work, all materials, equipment, and appurtenances not required as a part of, or appurtenant to, the completed structure or facility shall be completely removed from the Owner's property. All slop-over from concreting operations and scatterings of unused concrete aggregates shall be removed.

PAYMENT. The work specified in this section shall be considered incidental to the project cost, and the expense shall be included in the lump sum bid or unit price bids, as applicable.

(see next page)

MAINTENANCE SUMMARY

1. EQUIPMENT ITEM: _____
2. MANUFACTURER: _____
3. SERIAL NO. (if applicable): _____
4. NAMEPLATE DATA (horsepower, voltage, speed, etc.): _____
5. MANUFACTURER'S LOCAL REPRESENTATIVE:

Name: _____

Address: _____

Telephone No.: _____

6. MAINTENANCE REQUIREMENTS:

<u>Maintenance Operation</u>	<u>Frequency</u>	<u>Lubricant</u> (if applicable)	<u>Comments</u>
List briefly each maintenance operation required and refer to specific information in manufacturer's standard Maintenance Manual, if applicable.	List required frequency of each maintenance operation.	Refer by symbol to lubricant list as required.	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

7. LUBRICANT LIST:

Reference Symbol

List symbols used in Item 6, above. List equivalent lubricants, as distributed by each manufacturer for the specific use recommended.

_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

8. SPARE PARTS: Include your recommendations regarding what spare parts, if any, should be kept on the job.

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2A. MOVE IN AND SITE PREPARATION

A. SCOPE. This section covers the work necessary to move in the equipment, set up facilities, and prepare the site for construction, complete.

B. MATERIALS. Provide all materials, suitable and in adequate quantity, required to accomplish the work as specified herein.

C. WORKMANSHIP.

GENERAL. Set up construction facilities in a neat and orderly manner within area adjacent to the proposed construction at location of choice subject to Engineer's approval. Accomplish all required work in accordance with applicable portions of these Specifications or as approved by the Engineer. Confine operations to work area shown.

Accomplish the erection of partitions, bulkheads, or other protective devices to prevent damage to portions of the existing structures in a manner that will provide dust-tight closures, unless otherwise approved.

PARKING FACILITIES. Provide parking facilities for personnel working on the project. No parking will be permitted on existing paved areas, and truck and vehicle travel on existing paved roadways will be strictly limited. Do not haul excess excavated materials over paved roadways; provide temporary roadways outside the area for this purpose.

CLEARING. Clear the area outlined of all trees, roots, brush, and other waste material. Burn waste materials from clearing or haul from the Owner's property, unless otherwise directed by the Engineer. Obey all rules and regulations pertaining to burning issued by agencies having jurisdiction over such matters.

DISPOSAL OF WASTE MATERIAL. Pile all trees, stumps, brush, roots, and similar combustible material resulting from the clearing within the cleared area and dispose of by burning. Remove material which is not combustible or not practicable to burn from the site. Accomplish burning in accordance with all Federal, State, and local laws relating to fire prevention and restrictions in regard to burning materials.

"NO BURNING" PERIODS. During periods when burning operations are prohibited by State or Federal authorities, haul the cleared debris away or pile where it will not interfere with other work, and burn when prohibition against burning is removed. Do no clearing or other work on private property before obtaining approval from the property owner.

TREE PROTECTION. Use care in preparing the clearing operation to protect from damage all trees outside the limits of clearing. Stake out the areas to be cleared and obtain the approval of the Engineer prior to starting the clearing operation.

ACCESS ROAD. Provide and maintain an access road from the nearest existing road. Upon completion of work, restore it to a condition equal or better than its original condition.

D. PAYMENT. Payment for the work in this section will be included as part of the lump sum bid.

Sp. Specs. 2A - 1

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2B. CUTTING, DEMOLITION, AND SALVAGE

A. SCOPE. This section covers the work necessary for the demolition and salvage of materials and equipment, complete.

B. MATERIALS. Provide all materials, suitable and in adequate quantity, required to accomplish the work as specified herein.

GENERAL. Demolition of concrete work, masonry, and other materials shall be done in such a manner that adjacent parts of the structure are not damaged. All cutting required to fit the new work to the old shall be done in a neat manner by mechanics skilled in the various types of construction and with suitable equipment that meets with the approval of the Engineer. Materials designated by the Engineer to be salvaged shall be removed so as to avoid damage.

SALVAGEABLE MATERIAL. Care shall be taken in removal of all salvageable material. Such materials shall be delivered by the Contractor to the Owner's shop. Reuse by the Contractor of salvaged material will not be permitted, except as specifically directed in the Specifications, and as shown on the Plans. The following materials or equipment are to be salvaged and delivered to the Owner:

Existing High Service Pumps
Basin Overflow Troughs
Chemical Hoist and Monorail
Existing Chlorinator

This list is not intended to be all-inclusive and the Contractor shall obtain the Owner's permission before destroying any salvageable materials not specifically mentioned herein.

In the event that the Owner refuses any of the above materials, the Contractor shall dispose of them off the site without additional cost to the Owner.

DISPOSAL OF WASTE MATERIAL. All materials resulting from the cutting and demolition, except those specified to be salvaged or placed in specified areas, shall be removed from the site by the Contractor.

RESPONSIBILITY FOR SALVAGE AND PROTECTION OF EQUIPMENT AND MATERIALS. The equipment and material to be salvaged from the existing plant, as the alteration work proceeds, shall be removed with extreme care so as not to damage it for future use. Equipment shall be cleaned and protected from dirt and the elements and delivered to the City as hereinbefore specified. Prior to dismantling equipment or piping, the Contractor shall confer with the plant operator and the Engineer; the Engineer will indicate the locations where equipment is to be disconnected. Damage caused by the Contractor to equipment or material indicated on the Plans to be salvaged shall be repaired by the Contractor at no additional expense to the Owner. The Contractor shall deliver and unload the salvaged material, not to be reused, at the City shops as directed.

CUTTING AND DEMOLITION. Cutting and demolition shall be done by skilled mechanics using sharp tools of suitable type that will not damage parts of the structure not intended to be removed. If, in the opinion of the Engineer, the method of cutting used may endanger or damage parts of the structure or affect the satisfactory operation of the plant, promptly change the method when so notified by the Engineer. Accomplish all cutting required regardless of whether or not such cutting is indicated. Examine the existing structures and make an estimate of cutting required and other conditions to be coped with in order to accomplish the work. No blasting will be permitted in connection with any demolition.

PRESERVING EXISTING REINFORCING. Where holes or openings are to be cut in existing concrete, every effort shall be made to preserve, intact, existing steel reinforcing. Where existing reinforcing must be removed, and where directed by the Engineer, new bars of sufficient size shall be spliced in around the objects to be inserted in the opening. Such bars shall be welded to the ends of existing bars. Welds shall be of such size and length as to develop the full strength of the existing bars.

D. PAYMENT. Payment for the work in this section will be included as part of the lump sum bid.

2C. EXCAVATION, FILL, BACKFILL, AND RIPRAP

A. SCOPE. This section covers the work necessary for the excavation, fill, backfill, and riprap, complete.

B. MATERIALS.

UNCLASSIFIED EXCAVATION. Excavation is unclassified. Complete all excavation regardless of the type, character, nature, or condition of the materials encountered. The Contractor shall make his own estimate of the kind and extent of the various materials to be excavated in order to accomplish the work.

EARTH BACKFILL. Excavated material free from roots, trash, and other deleterious materials.

DIKE FILL. Material shall be selected native sandy clay or sandy silt, free from roots, trash, or other organic matter.

IMPORTED GRAVEL BACKFILL. River-run or pit-run gravel free from clay, clay balls, roots, and vegetable matter. The material shall have reasonably uniform gradations from coarse to fine and shall contain sufficient fines for compaction as specified. Maximum size shall be 3 inches.

CRUSHED GRAVEL FOR BACKFILL UNDER FOOTINGS AND CONCRETE SLABS. One-inch minus, clean, hard, crushed gravel or crushed rock, free from foreign material uniformly graded from coarse to fine and containing sufficient fines for proper compaction. Crushed gravel or crushed stone shall conform to the applicable State Highway Standard for such material.

UNDERDRAIN GRAVEL. Provide as shown on the Plans along the entire length of the concrete underdrain tile. Minimum of 4 cubic feet per linear foot of underdrain. Material shall be clean, well-graded 1-1/2-inch minus gravel, having the following gradation:

<u>Sieve Size</u> <u>(Square Opening)</u>	<u>Total Passing</u> <u>(Percent by Weight)</u>	
	<u>Max.</u>	<u>Min.</u>
1-1/2-inch		95
3/4-inch	96	- 80
3/8-inch	84	- 62
No. 4	66	- 44
No. 16	32	- 16
No. 100	4	- 0

TRENCH EXCAVATION. Trench excavation is unclassified, and the Contractor shall remove all material regardless of the nature, type, or condition of the material encountered.

GRAVEL FOR PIPE BASE. Gravel for pipe base shall be clean, 3/4-inch minus crushed gravel. Base for plastic pipe, copper tubing, and heating pipes shall be 1/4-inch minus pea gravel or reject sand.

IMPORTED BACKFILL MATERIAL FOR PIPE ZONE. Imported backfill material for pipe zone for asbestos-cement, concrete, cast iron, steel, and galvanized iron pipe shall be 3/4-inch minus clean pea gravel, or 3/4-inch minus crushed rock, of suitable gradation for satisfactory compaction. Imported backfill material for pipe zone for plastic pipe, copper tubing, electrical conduit, and heating pipe 1/4-inch minus clean pea gravel or reject sand.

BACKFILL ABOVE THE PIPE ZONE. Backfill above the pipe zone shall be materials from the excavation containing no particles larger than 6 inches in diameter. Backfill material shall be free from roots and construction debris.

WATER FOR COMPACTION. Water for compaction and settling fill and backfill will be furnished the Contractor as specified in Section GENERAL REQUIREMENTS.

COMPACTION EQUIPMENT. Compaction equipment shall be of suitable type and adequate to obtain the densities specified and approved. Provide manually operated mechanical tampers also as required and approved.

RIPRAP. Riprap shall consist of clean, hard quarry stone with not more than 35 percent wear when subjected to the Standard Los Angeles Abrasion Test (ASTM C 131) and as approved by the Engineer. Bulk density shall be not less than 160 pounds per dry cubic foot. Riprap shall be 8 to 12 inches in size. Smaller pieces will be allowed only as required to fill voids in larger rock. Obtain Engineer approval before delivery to site.

GRAVEL SURFACING AND BASE COURSE. Provide as shown on the Plans, all dike tops and the new access road to the pond. Gravel surfacing and base course material shall be the same as the leveling course and base course material specified in Section REPLACEMENT OF PAVEMENT AND CURBS AND SETTLING POND LINER.

C. WORKMANSHIP.

STRIPPING ORGANIC MATERIAL. Strip all grass, surface vegetation, and existing topsoil to a point not less than 6 inches below existing grade within the grading limit as directed by the Engineer. Complete stripping before commencement of any excavation or filling. Dispose of stripped material and do not include it in material to be used for fill.

SITE GRADING. Perform accurately to lines and grades established by the Engineer and in accordance with those indicated on the Plans. Place fill in maximum 8-inch layers and compact in a manner approved by the Engineer. When no special compaction is specified, compaction equivalent to 2 passes of a loaded 5-yard truck will be acceptable.

LIMITS OF EXCAVATION. Excavate to the required depths and widths with proper allowance made for forms, working space, gravel base, and similar items. Allowances shall be made in excavations for the placing of the final topsoil when required. Every effort shall be made to carry excavation for bottoms of footings and slabs no deeper than the elevation shown on the Plans. All excavation carried below the grade lines shown on the Plans or

established by the Engineer shall be replaced with thoroughly compacted gravel at the Contractor's expense, except excavations under footings which shall be filled up with concrete of equal strength to that of the footing. If cuts below grade are made, they shall be corrected by similarly cutting adjoining areas and creating a smooth transition. The Contractor shall bear all costs for correcting overexcavated areas.

SHORING, SHEETING, AND BRACING EXCAVATIONS. Furnish and install all shoring, sheeting, and bracing required to support adjacent earth banks and structures, and for the protection and safety of all personnel working in the excavations. All material shall be suitable, of adequate size, and properly installed. All shoring, sheeting, and bracing shall conform to the requirements of the State or local agencies having jurisdiction over such matters. Remove shoring, sheeting, and bracing in a manner that will protect the workmen and prevent injurious caving as the excavations are backfilled. Sheet piles required along the existing settling basin are to be left in place and shall be as specified in Section SHEET PILING.

REMOVAL OF WATER. Excavations and trenches shall be kept free of water by equipment furnished and operated by the Contractor. Remove all water during periods when concrete is being deposited, when pipe is being laid, or other work is being done, during the placing of backfill, unless water settling is required; and at such other times as required for efficient and satisfactory construction. Furnish adequate dewatering equipment and operate such equipment to keep the water level down to permit the construction. Dispose of water pumped out of the excavations and trenches in a manner that will not damage adjacent property.

BACKFILL.

PREPARATIONS FOR PLACING BACKFILL. Do not backfill around concrete structures until the concrete has obtained a compressive strength equal to $\frac{2}{3}$ of the specified compressive strength. Remove all form materials and trash from the excavation before placing any backfill. Obtain the Engineer's approval of concrete work and conditions prior to backfilling.

Do not operate any heavy earth-moving equipment within 5 feet of walls of concrete structures for the purpose of depositing or compacting backfill material unless approved by the Engineer. Compact backfill adjacent to concrete walls with pneumatic tampers or other approved equipment that will not damage the structure.

Do not backfill water-holding basins until satisfactory leakage tests have been conducted as specified in Section CONCRETE and paragraph C-14 of the Standard Specifications for Reinforced Concrete, bound herewith.

GRAVEL BACKFILL UNDER FOOTINGS AND SLABS. Grade and prepare natural ground to receive CRUSHED GRAVEL FOR BACKFILL, and obtain Engineer's approval prior to placing backfill. Provide a minimum 6-inch depth under concrete footings, slabs, sidewalks, and structures, and in other areas where shown. Deposit material in horizontal layers not exceeding a loose thickness of 6 inches and compact each layer to 100 percent of maximum density at optimum

moisture content as determined by AASHTO T 99, Method D, before placing the next layer. Finished surface shall be at the proper elevation for the concrete.

PLACING IMPORTED GRAVEL BACKFILL UNDER FACILITIES. Provide IMPORTED GRAVEL BACKFILL to replace disturbed earth for the full depth of the excavation in previously excavated areas under piping, slabs, walks, curbs, structures, and other areas where subsequent settlement will be harmful, or as shown. Loose depth of lifts shall not exceed that recommended by the equipment manufacturer for the particular model of machine used to obtain the specified density. Compact each layer to 100 percent of maximum density at optimum moisture content as determined by AASHTO T 99, Method D. IMPORTED GRAVEL BACKFILL shall be stopped 6 inches below the surface at the finished grade in all areas where topsoil is to be replaced.

Any subsequent damage to slabs, piping, concrete structures, or other appurtenances caused by settlement of fill material shall be corrected and repaired by the Contractor at no cost to the Owner.

EARTH BACKFILL AROUND STRUCTURES. Place EARTH BACKFILL in all areas not designated to be gravel. Deposit material from the excavation in horizontal layers not exceeding a loose thickness of 6 inches and compact each layer to 95 percent of maximum density at optimum moisture content as determined by AASHTO T 99, Method A, before placing the next layer. Material shall be at optimum moisture content for compaction. All material shall be free of roots, vegetable matter, and trash and rocks larger than 4 inches in diameter. Bring backfill to the proper grade to allow for placing of topsoil when required.

DIKE FILL. Place and compact in 8-inch maximum lifts to a minimum density of 95 percent of maximum density as determined by AASHTO T 99, Method A. Compaction of each lift shall be accomplished as specified for structural fill and backfill around structures.

GRAVEL BACKFILL AROUND UNDERDRAINS. Place gravel of the type hereinbefore specified simultaneously on both sides of pipe in 6-inch layers for full width of trench. Slice with shovel to work the gravel around the lower part of the pipe. Tamp with 1" x 2" tamping sticks if Engineer approved hand tamping method of compaction. Pay particular attention to underside of pipe and fittings to insure solid backing. Pipe zone extends 6 inches above top of pipe and for full width of trench.

PREPARATION OF SUBGRADE FOR GRAVEL SURFACING. Shape subgrade to the grades shown and roll with an approved power roller weighing approximately 10 tons and of a type approved by the Engineer. As the rolling of the subgrade proceeds, dig out all soft or spongy areas and fill the resulting holes with suitable material satisfactory to the Engineer. At the Contractor's option, use base course material to refill the holes resulting from the removal of soft or spongy material. Dispose of excess materials resulting from the road grading on the site as directed. Do not use rollers adjacent to structures where such use may cause damage. Where the base course abuts the structure and compaction with a roller is not possible for practicable reasons, compact the area with pneumatic tampers or other approved equipment.

BASE COURSE. Place gravel in a uniform layer over the entire area to receive base course, without segregation of size, to such loose depth that when compacted with the power roller the course shall have the required thickness. Blade the gravel base with a grader and roll, while damp, with the power roller specified above until the course is thoroughly and uniformly compacted and until its surface is smooth and conforms accurately with grade requirements specified. Maintain the surface in its finished condition until the succeeding layer is placed.

GRAVEL SURFACING. The cross section of the finished surface shall be subject to reasonable variation by the Engineer to meet the varying conditions encountered where the new surfacing is adjacent to the existing road. Spread the 3/4-inch minus rock to such a loose depth that when compacted, it will have a minimum compacted depth of 2 inches. Compact the surface material in a manner similar to that specified for the base and blade and roll with a power roller until the top surface is smooth and conforms to the grade and crown requirements shown, with any minor adjustments hereinbefore specified. Sprinkle surface material as required for maximum compaction.

TRENCH EXCAVATION AND BACKFILL.

EXCAVATION. Trench excavation shall be performed as required for the installation of piping, utilities, and appurtenances. Obstructions to the construction of the trench, such as tree roots, stumps, abandoned concrete structures, and debris of all types, shall be removed by the Contractor at his own expense without additional compensation from the Owner.

TRENCH WIDTH. Minimum width of unsheeted trenches in which pipe is to be laid shall be 18 inches greater than the inside diameter of the pipe, except by permission of the Engineer. The maximum clear width will not be limited, except in cases where excess width of excavation would cause damage to adjacent structures; the maximum allowable clear width shall be as determined by the Engineer for the respective locations.

GRADE. The bottom of the trench shall be carried to the lines and grade shown on the Plans or as established by the Engineer, with proper allowance for pipe thickness and for gravel cushion or special bedding when required. Any part of the trench excavated below grade shall be corrected with approved granular material and thoroughly compacted.

SHORING, SHEETING, AND BRACING OF TRENCHES. Shoring, sheeting, and bracing of trenches shall be accomplished as specified hereinbefore.

REMOVAL OF WATER. Removal of water shall be accomplished as specified hereinbefore.

BASE FOR PIPE. GRAVEL FOR PIPE BASE of the type hereinbefore specified for all pipe shall be a minimum of 4 inches thick. The base shall be placed for the full width of the trench with the top of the gravel base at flow line grade for the pipe. The gravel base shall be placed and raked to grade ahead of the pipe laying operation.

TRENCH BACKFILL AT PIPE ZONE. Backfill material for the pipe shall be of the gradation specified hereinbefore. The pipe zone shall be considered to extend 6 inches above the outside of the pipe and for the full width of the trench. The entire width of the trench for the full depth of the pipe zone shall be backfilled with backfill material conforming to IMPORTED BACKFILL MATERIAL FOR PIPE ZONE. The material shall be placed in the trench in layers not exceeding 6 inches on both sides of the pipe and thoroughly tamped with tamping sticks, supplemented by "walking in" the material and slicing with shovels. Particular attention shall be paid to the underside of the pipe to provide a solid backing and to prevent lateral movement during the final backfilling procedure.

TRENCH BACKFILL ABOVE PIPE ZONE. Push all earth, gravel, or other material used in backfilling first onto the slope of the backfill previously placed and allow to roll down into the trench. Do not push the backfill material into the trench in such a way as to permit free fall of the material into the open trench until at least 2 feet of cover is provided over the pipe. Under no circumstances allow sharp, heavy pieces of material to drop directly onto the pipe or the tamped material around the pipe. Do not use backfill material of consolidated masses 1/3 of a cubic yard and greater.

TRENCH BACKFILL IN PAVED AREAS. Backfill the entire trench above the pipe zone with clean fill sand, pit-run gravel, or crushed rock with a maximum size of 3 inches and reasonably even gradation. Compact the entire trench depth by water settling or compact in suitable lifts with vibratory compactors, pneumatic or gasoline powered tampers, or hydraulic hammers. Determine the type of equipment and method to use and amount of compaction required to prevent subsequent settlement.

Maintain the surface of the backfilled trench level with the existing grade with 3/4-inch minus gravel or crushed rock until pavement replacement is completed or the entire project is accepted by the Owner.

Any subsequent settlement of the finished surfacing during the warranty period shall be promptly repaired by the Contractor at no cost to the Owner.

TRENCH BACKFILL IN UNPAVED AREAS. After the completion of the backfilling of the pipe zone, the excavated trench material may be pushed back into the trench by mechanical means.

The Contractor shall make his own estimate of the amount of backfill material required at the trench so that after normal settlement has occurred, the finished surface will meet the existing grade. Neatly windrow the material over the trench and remove all excess. Any excess or deficiency of backfill material which becomes apparent after settlement and within the guarantee period shall be corrected by regrading, disposal of excess material, and adding additional material where required.

DISPOSAL OF EXCESS EXCAVATION. Dispose of all excess excavated materials from the work not required for backfill or fills. The Contractor shall make his own arrangements for the disposal of the excavated material and shall bear all costs and retain any profit incidental to such disposal.

SETTLEMENT. Any settlement noted in backfill, fill, or in structures built over the backfill or fill within the one-year guarantee period in accordance with the General Conditions will be considered to be caused by improper compaction methods and shall be corrected at no additional cost to the Owner. Any structures damaged by excessive settlement shall be restored to their original condition by the Contractor, also, at no additional cost to the Owner.

PLACING RIPRAP. Place riprap with suitable equipment to avoid disturbing or damaging the pipe. Riprap layer shall be as shown on the Plans. Intermix the sizes of riprap material to provide uniform gradation between fine and coarse material. Any damage to the pipe shall be repaired by the Contractor at no additional cost to the Owner.

D. PAYMENT. Payment for the work in this section will be included as part of the lump sum bid.

2D. CLEANUP

A. SCOPE. This section covers the work necessary to clean up the project, including periodic cleanup as the work progresses, and final cleanup of the work area at completion.

C. WORKMANSHIP. Upon completion of the work, sweep all structures clean and remove all rubbish and trash. Rake the exterior work area. Remove all waste material from the site. Remove slopover from concrete operations and excess aggregate. The site and buildings, when the project is completed, shall present a neat and tidy appearance. Clean and polish all glass in windows and doors and lighting fixtures. Clean the interior of the buildings with a vacuum cleaner, hand dust all ledges and similar locations, and leave the entire buildings perfectly clean and ready for use. Broom clean all sidewalks and paved surfaces.

Remove and dispose of debris and waste materials that may cause a safety or fire hazard at reasonable intervals as the work proceeds or as directed by the Engineer.

Restore to their original condition all areas that are disturbed by the construction.

D. PAYMENT. Payment for the work in this section will be included as part of the Lump sum bid.

2E. REPLACEMENT OF PAVEMENT AND CURBS AND SETTLING POND LINER

A. SCOPE. This section covers the work necessary for all required replacement of pavement and curbs, and installation of the new settling pond liner, complete.

B. MATERIALS.

ROCK FOR SURFACE REPLACEMENT AND BASE. Rock shall be crushed gravel or rock meeting the following quality standards:

Abrasion (AASHO T 96)	maximum wear	35%
Liquid Limit (AASHO T 89)	not greater than	30%
Plasticity Index (AASHO T 91)	not greater than	6%
Sand Equivalent (AASHO T 176)	not less than	35%
Fractured Face	min. of particles	50%

The aggregate shall consist of uniform quality, clean, tough, durable fragments of rock or gravel, free from flat, elongated, soft or disintegrated pieces, and other objectionable matter occurring either free or as a coating on the stone.

The sizes of the aggregates to be furnished shall be as indicated below and shall be furnished mixed to the proportions shown therein:

GRADATION

<u>Sieve Size</u>	<u>Designated Size</u>	
	<u>Base Course</u> <u>1-1/2" Minus</u>	<u>Leveling Course</u> <u>3/4" Minus</u>
2" to 1-1/2" size	0-5%	
1-1/2" to 3/4" size	20-40%	
Passing 1/4" sieve	35-50%	
Passing 200 sieve	0-5%	
1" to 3/4" size		0-10%
3/4" to 3/8" size		20-40%
Passing 1/4" sieve		40-60%
Passing 200 sieve		0-5%

Submit proof in the form of test results from an approved commercial testing laboratory or other evidence satisfactory to the Engineer to show that the materials meet the quality and gradation requirements.

ASPHALT CONCRETE. Hot-plant mix with maximum 3/4-inch aggregate, conforming to the Standard Specifications for Highway Construction of the Oregon State Highway Department.

ASPHALT PRIME. Liquid asphalt for use as a prime coat under asphalt concrete shall be RC-70 or MC-70 liquid asphalt conforming to AASHO M 81 or M 82.

CONCRETE. Concrete for curbs shall conform to ASTM C 94, Alternate 2, and shall have a design mix proportioned for 3,000 pounds per square inch compressive strength at 28 days. Concrete mix shall contain no less than 5-1/2 sacks of cement per cubic yard.

C. WORKMANSHIP.

REMOVAL OF PAVEMENT AND CURBS. Removal of pavement and curbs as required shall conform to Section EXCAVATION, FILL, BACKFILL, AND RIPRAP, and payment for removal shall be included in that section.

ASPHALT CONCRETE PLACEMENT.

SUBGRADE. Bring the trench or pond bottom and wall to a smooth, even grade at the correct distance below the top of the pavement surface so as to provide adequate space for the base and/or 2-inch leveling course. Where new pavement joins existing pavement, trim existing pavement to a straight line to remove any pavement which has been damaged or which is broken and unsound to provide a smooth, sound edge for joining the new pavement.

Compact trench subgrade to 100 percent of the maximum density obtained in the Standard Proctor Test, AASHTO T 99, Method A, and pond to 95 percent as hereinbefore specified. Accomplish supplementary compaction where required with approved mechanical vibrating or power tampers.

BASE COURSE. Place base course on the previously conditioned and compacted subgrade to the specified thickness. The finished thickness of the base course shall be 8 inches. Compact the base course to 100 percent of maximum density, AASHTO T 99, Method D. Place and process as required to provide a smooth surface without segregation.

LEVELING COURSE. Place, without segregating, enough leveling course material to obtain a thickness of 2 inches after compaction. Compact to the required depth of finished pavement and for proper matching with the adjacent existing pavement. Place the leveling course for the full width of the trench where pavement was disturbed, including bituminous surfaced shoulders.

Compact the leveling course to 100 percent of maximum density, AASHTO T 99, Method D.

PRIME COAT. After the leveling course has been compacted, apply an asphalt prime coat, specified above, at 0.25 to 0.40 gallons per square yard to the surface of the leveling course and to the edges of the existing pavement. Also, tack coat cast iron manhole covers and valve boxes and similar appurtenances.

ASPHALT CONCRETE. After the prime coat has set, but before it loses its adhering properties, place the hot plant-mix asphalt concrete on the prepared subgrade over the trench to a depth of not less than 2 inches or the depth of the adjacent pavement, whichever is greater, but not for more than 4 inches. If the thickness is greater than 2-1/2 inches, place the surfacing in 2 lifts. Spread and level the asphalt concrete with hand tools or by use of a mechanical spreader, depending upon the area to be paved. In general, method of handling and placing shall conform to applicable parts of the Oregon State Standard Specifications for Highway Construction modified as required for the patching. Bring the asphalt concrete to the proper grade and compact by rolling or the use of hand tampers where rolling is impossible.

Roll with power rollers capable of providing compression of 350 pounds per linear inch. Begin the rolling at the edges of the patch overlapping the existing surface at least 1/2 the width of the roller and progress toward the center of the resurfaced area. Overlap each preceding track by at least 1/2 the width of the roller and make sufficient passes over the entire area to produce the desired result, as determined by the Engineer.

The finished surface of the new paving shall be flush with the existing surface and shall conform to the grade and crown of the adjacent pavement.

SURFACE SMOOTHNESS. The surface smoothness of the replaced pavement shall be such that when a straightedge is laid across the patched area between the edges of the old surfacing and the surface of the new pavement, the new pavement shall not deviate from the straightedge more than 1/4 inch.

WEATHER CONDITIONS. Resurfacing will be permitted only during favorable weather and while the trench conditions are satisfactory for pavement replacement. Exceptions will be permitted only in special cases and only with prior written approval of the Engineer.

PROTECTION OF STRUCTURES. Provide whatever protective coverings may be necessary to protect the exposed portions of bridges, culverts, curbs, gutters, posts, guard fences, road signs, and any other structures from splashing oil and asphalt from the paving operations. Remove any oil, asphalt, dirt, or any other undesirable matter that may come upon these structures by reason of the paving operations.

CONCRETE CURBS. Replace concrete curbs to the same section as that removed or damaged. Prior to replacing the sections, properly backfill and compact the trench and subgrade to prevent subsequent settlement.

D. PAYMENT. Payment for the work in this section will be included as part of the lump sum bid.

2F. CONCRETE PIPE, DRAIN TILE, AND MANHOLES

A. SCOPE. This section covers the work necessary to furnish and install all concrete pipe, drain tile, and manholes, complete.

B. MATERIALS.

CONCRETE PIPE 18-INCH AND SMALLER. Pipe 18 inches and smaller shall be bell-and-spigot nonreinforced concrete pipe, conforming to ASTM C 14, extra strength. Joints shall be approved rubber gasketed type conforming to ASTM C 443, and shall be furnished by the pipe manufacturer. Bends for pipe 18 inches and smaller shall be shop fabricated.

CONCRETE PIPE 21-INCH AND LARGER. Pipe 21 inches and larger shall conform to ASTM C 76, Class III, with tongue-and-groove or bell-and-spigot joints. Joints shall be approved rubber-gasketed type conforming to ASTM C 433. Bends for pipe 21 inches and larger may be shop fabricated of the same material, joint design, and of equal strength as the pipe with which they are used, or field fabricated. Field-fabricated fittings shall be constructed by forming a smooth bend with a sheet metal form and pouring the fittings. The interior sheet metal form shall be removed and the fitting grouted smooth.

DRAIN TILE. Underdrain tiles shall be square-end concrete pipe of the diameter indicated and conforming to ASTM C 14, extra strength pipe. All fittings shall be bell-and-spigot concrete pipe, ASTM C 14 extra strength. Furnish square-end pipe in 2-foot lengths.

JOINT PAPER. 30-pound asphalt-saturated asbestos felt, conforming to ASTM D 250.

UNDERDRAIN GRAVEL. Underdrain gravel shall be as specified in Section EXCAVATION, FILL, BACKFILL, AND RIPRAP.

CONCRETE AND REINFORCING STEEL. Concrete for fittings, collars, and manholes shall be 3,000 psi concrete. All materials, methods of proportioning, mixing, transporting, placing, finishing, and curing shall conform to the applicable portions of Section CONCRETE. Reinforcing steel shall conform to Section REINFORCING STEEL.

MANHOLES.

FORMS. Exposed surfaces shall be plywood; others shall be matched boards, plywood, or other approved material. Form all vertical surfaces. Trench walls, large rock, or earth will not be approved form material.

PRECAST MANHOLE SECTIONS. Precast manhole sections shall be 42 inches in diameter, conforming to ASTM C 478. Minimum wall thickness shall be 4 inches. Provide eccentric cones for all manholes. Cones shall have the same wall thickness and reinforcement as the manhole section.

MANHOLE EXTENSIONS. Concrete risers for extensions shall be a maximum of 6 inches high and of similar quality as the manhole sections. Submit sample for approval before ordering risers. Extensions will be limited to a stacked height of 12 inches.

MORTAR. Proportion 1 part portland cement to 2 parts clean, well-graded sand which will pass a 1/8-inch screen. Admixtures may be used not exceeding the following percentages of weight of cement: hydrated lime, 10 percent; diatomaceous earth or other inert materials, 5 percent. Consistency of mortar shall be such that it will readily adhere to concrete surfaces. Mortar mixed for longer than 30 minutes shall not be used.

MANHOLE FRAMES AND COVERS. Cast iron of size and shape detailed on the Standard Manhole Details, bound herewith, and shall be as specified in Section FABRICATED METALWORK AND CASTINGS.

C. WORKMANSHIP.

EXCAVATION AND BACKFILL, PIPE BASE, AND PIPE ZONE. Specified in Section EXCAVATION, FILL, AND BACKFILL.

PIPE PREPARATION AND HANDLING. Inspect all pipe and fittings prior to lowering into trench to insure no cracked, broken, or otherwise defective materials are being used. Clean ends of pipe thoroughly. Remove foreign matter and dirt from inside of pipe and keep clean during and after laying.

Use proper implements, tools, and facilities for the safe and proper protection of the work. Lower pipe into the trench in such a manner as to avoid any physical damage to the pipe. Remove all damaged pipe from the jobsite. Do not drop or dump pipe into trenches under any circumstances.

LINE AND GRADE.

GRAVITY PIPE. Do not deviate from line or grade, as established by the Engineer, more than 1/2 inch for line and 1/4 inch for grade, provided that such variation does not result in a level or reverse sloping invert.

Measure for grade at the pipe invert -- NOT AT THE TOP OF THE PIPE -- because of permissible variation in pipe wall thickness.

Establish grade for pipe by transferring the cut from the offset stakes established by the Engineer to batter boards set in the trench at maximum intervals of 25 feet. Maintain a minimum of 3 sets of batter boards with string line ahead of the pipe laying at all times. If batter boards in the trench prove impractical because of trench conditions, submit other methods of grade and alignment control to the Engineer for approval.

CLOSURE COLLARS. Use closure collars only when approved by the Engineer, and then only to make connections between dissimilar pipe or where standard rubber-gasketed joints are impractical. Before the closure collars are poured, wash pipe to remove all loose material and soil from the surface on which the concrete will be placed. Wet nonmetallic pipe thoroughly prior to pouring the collars. Wrap and securely fasten a light gauge of sheet metal or building felt around the pipe to insure that no concrete shall enter the line. Make entire collar in one pour and extend a minimum of 12 inches on each side of the joint. The minimum thickness around the outside diameter of the pipe shall be 6 inches. No collar shall be poured in water. After the collars are poured and have taken their initial set, cure by covering with well-moistened earth.

LAYING AND JOINTING PIPE AND FITTINGS. After a section of pipe has been lowered into the prepared trench, the end of the pipe to be jointed, the inside of the joint, and the rubber ring, if used, shall be wiped clean immediately before jointing the pipe. Extreme care shall be taken to insure that the inside surfaces of the ends are smooth and free from any projections that would interfere with the assembly or watertightness of the joints. The Contractor shall provide all special tools and appliances required for the jointing assembly. Joints shall be made in strict accordance with the recommendations of the pipe manufacturer, as approved by the Engineer.

After the joint has been made, check pipe for alignment and grade. The trench bottom shall form a continuous and uniform bearing and support for the pipe at every point between joints. Apply sufficient pressure in making the joint to assure that the joint is "home," as defined in the standard installation instructions provided by the pipe manufacturer. To assure proper pipe alignment and joint make-up, place sufficient pipe zone material to secure the pipe from movement before the next joint is installed.

Place markings on reinforced concrete pipe indicating the minor axis of the elliptical reinforcement in a vertical plane when pipe is laid.

Take the necessary precautions required to prevent excavated or other foreign material from entering the pipe during the laying operation. At all times, when laying operations are not in progress, at the close of the day's work, or whenever the workmen are absent from the job, close and block the open end of the last laid section of pipe to prevent entry of foreign material or creep of the gasketed joints.

Take all precautions necessary to prevent the "uplift" or floating of the line prior to the completion of the backfilling operation.

Where nonreinforced pipe is connected to manholes or concrete structures, make connection so that the standard pipe joint is located not more than 1.5 feet from the outside edge of the structure.

FIELD-FABRICATED FITTINGS. Field-fabricated fittings shall be constructed after the straight pipelines are laid. All forming, mixing, placing, and curing of concrete shall conform to applicable parts of Section CONCRETE. Care shall be taken in constructing the sheet metal form to provide good flow characteristics. All field-fabricated fittings shall be constructed as indicated on the Plans and as directed by the Engineer.

HYDROSTATIC TEST OF CONCRETE PIPE. All pipe not encased in concrete, except drain tile, shall be given an exfiltration test after backfilling. The exfiltration test may consist of filling the entire pipe to a hydrostatic head 24 inches greater than the existing groundwater table or, on large size pipe, individual joints may be tested internally with an approved individual joint testing device. Maximum allowable leakage for pipe 24 inches and smaller shall be 8 gallons per hour per 100 feet, and for pipe 27 inches and larger, 12 gallons per hour per 100 feet.

ALLOWANCE FOR ABSORPTION. At the Contractor's option, pipe may be filled up to 24 hours prior to time of exfiltration testing to permit normal absorption into the pipe walls to take place.

TESTING EQUIPMENT AND PROCEDURE. The Contractor shall furnish all necessary testing equipment, including hose, temporary piping, approved pipe plugs, equipment, and flow measurement facilities, and shall perform the tests in a manner satisfactory to the Engineer. Any arrangement of testing equipment which will provide readily observable and reasonably accurate measurements of leakage under the specified conditions will be permitted.

TIME OF TESTING. Concrete pipe installed under this section of the Special Specifications shall be tested for approval after backfilling has been completed; however, the Contractor, at his option and expense, may make other earlier tests to insure compliance.

SUBSEQUENT FAILURE. Infiltration of groundwater in an amount greater than herein specified, following a successful hydrostatic test as specified, shall be considered as evidence that the original test was in error or that subsequent failure of the pipeline has occurred. The Contractor will be required to correct such failures should they occur within the warranty period.

The Contractor, in contracting to do this work, agrees that the leakage allowances as indicated herein are fair and practical.

FINAL CLEANING. Prior to final acceptance of the concrete pipelines, all lines shall be flushed out and all accumulated construction debris and other foreign matter removed.

DRAIN TILE. The locations of the underdrain tiles are indicated on the Plans. Bring the gravel to a true grade at the proper elevation and lay the square-end pipe or tile in true alignment on the prepared gravel bed. Cover over the top and sides of the joints with a strip of asphalt-saturated 30-pound roofing felt. Draw the roofing felt tightly over the top and bring down the sides to prevent the entrance of gravel into the tile. Gravel backfill for use around the drain tile shall be as specified under Section EXCAVATION, FILL, BACKFILL, AND RIPRAP. Place the gravel fill alongside the underdrains with care to keep the material approximately even on each side of the tile and to prevent knocking the tile out of alignment.

MANHOLES.

EXCAVATION AND BACKFILL. Complete work in conformance with applicable portions of Section EXCAVATION, FILL, BACKFILL, AND RIPRAP. Backfill of manholes shall conform to highest trench class immediately adjacent.

CONCRETE BASE. Remove water from excavation. Under manholes provide 6-inch minimum layer compacted base rock of type specified hereinbefore. Construct concrete base so that first section of precast manhole has uniform bearing throughout full circumference.

Deposit sufficient mortar on base to assure watertight seal between base and manhole wall. Place first precast section of manhole in concrete base before concrete has set if preferred. First section shall be properly located and plumb.

PLACING PRECAST MANHOLE SECTIONS. Clean ends of sections of foreign materials. Thoroughly wet joint with water prior to placing mortar. Place mortar on groove of lower section. Set next section in place. Fill joint completely with mortar. Trowel interior and exterior surfaces smooth.

Mortar shall be prevented from drying out and shall be cured by applying an approved curing compound or comparable approved method. All cracked or defective mortar shall be chipped out and replaced. Completed manholes shall be rigid and watertight.

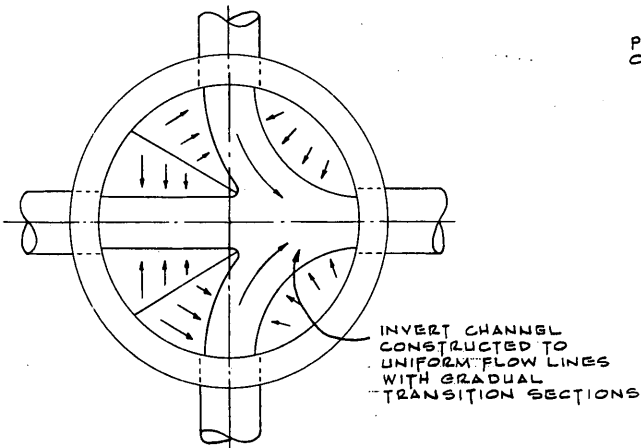
MANHOLE INVERT. Construct manhole inverts in conformance with Standard Manhole Details, bound herewith, and with smooth transitions to insure an unobstructed flow through manhole. All sharp edges or rough sections which tend to obstruct flow shall be removed. Where a full section of pipe is laid through a manhole, break out the top section as indicated and cover exposed edge of pipe completely with mortar. Trowel all mortar surfaces smooth.

MANHOLE EXTENSIONS. Install extensions as shown on Standard Manhole Details, bound herewith, and to height determined by Engineer. Add extensions to manholes in existing paved areas and where otherwise directed by the Engineer. Lay rings in mortar with sides plumb and tops level. Seal joints with mortar as specified for manhole sections.

MANHOLE RINGS AND COVERS. Install rings and covers on top of manholes to positively prevent all infiltration of surface or groundwater into manholes. Rings shall be set so tops of covers are flush with surface of adjoining pavement or ground surface, unless otherwise shown or directed.

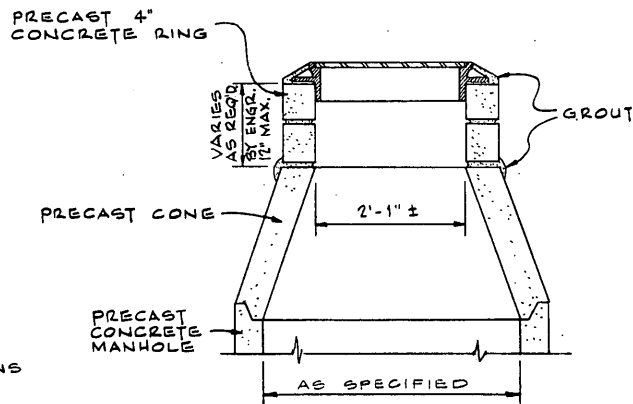
D. PAYMENT. Payment for the work in this section will be included as part of the lump sum bid.

STANDARD MANHOLE DETAILS



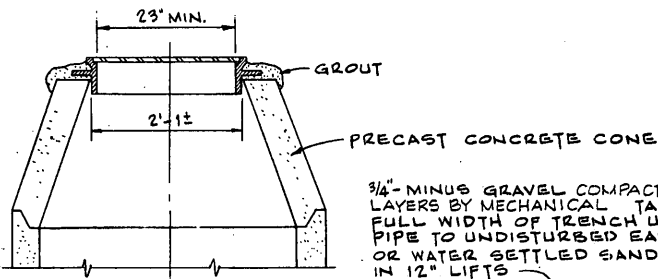
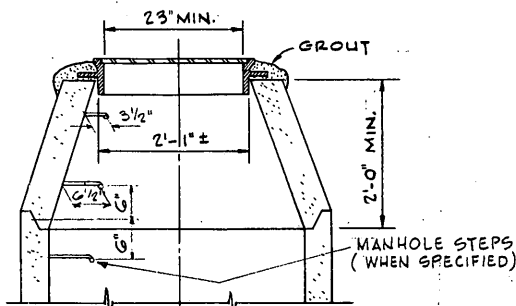
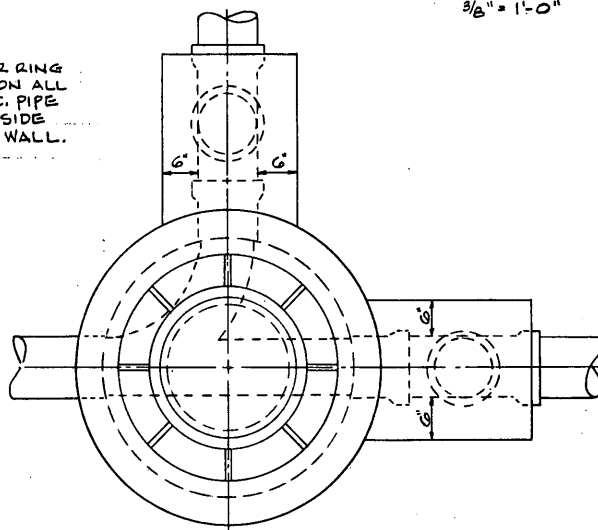
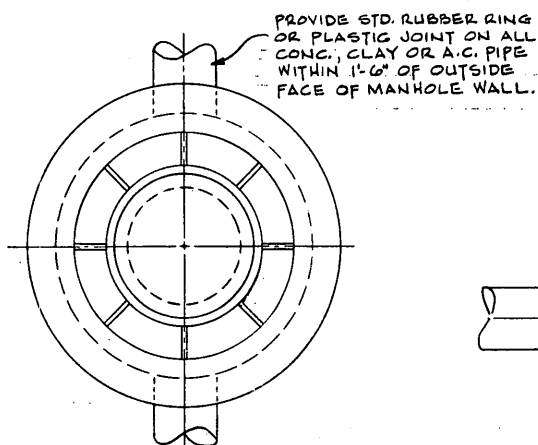
GENERAL PLAN OF
CHANNEL INTERSECTION

$\frac{3}{8}" = 1'-0"$

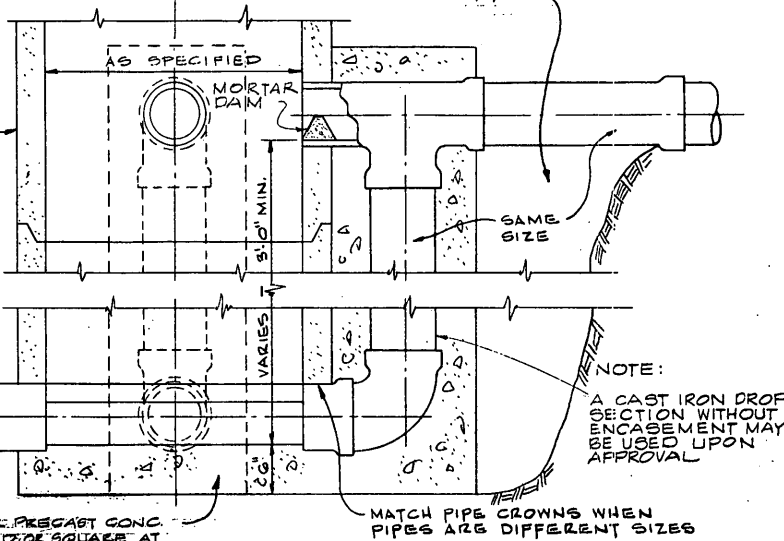
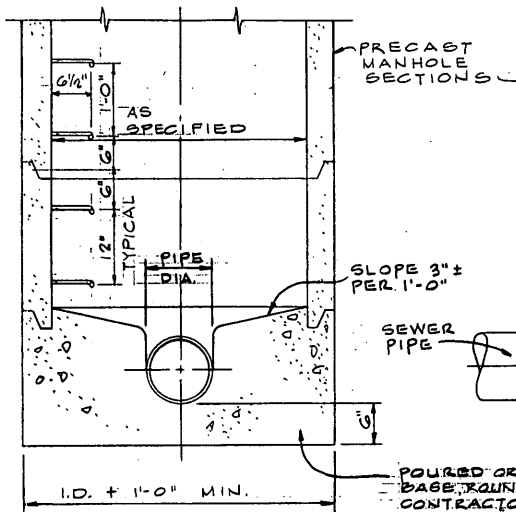


PRECAST RING EXTENSION
FOR TYPICAL MANHOLE

$\frac{3}{8}" = 1'-0"$



3/4" MINUS GRAVEL COMPACTED IN 6"
LAYERS BY MECHANICAL TAMPERS
FULL WIDTH OF TRENCH UNDER
PIPE TO UNDISTURBED EARTH;
OR WATER SETTLED SAND LAID
IN 12" LIFTS

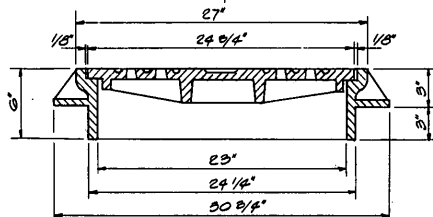
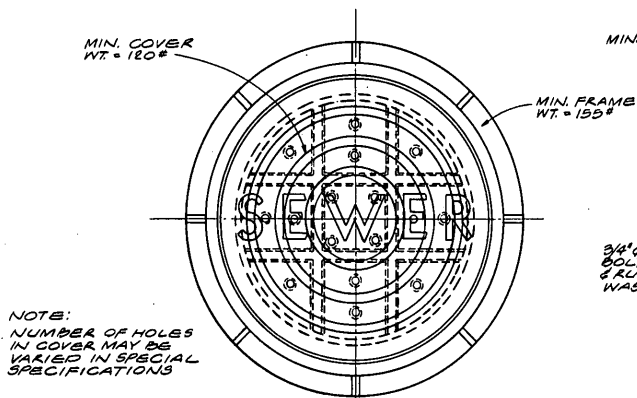


TYPICAL MANHOLE - 6" TO 21" PIPE

$\frac{3}{8}" = 1'-0"$

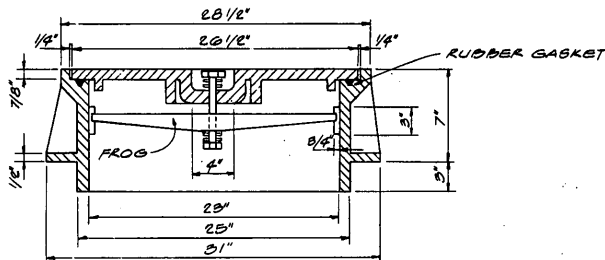
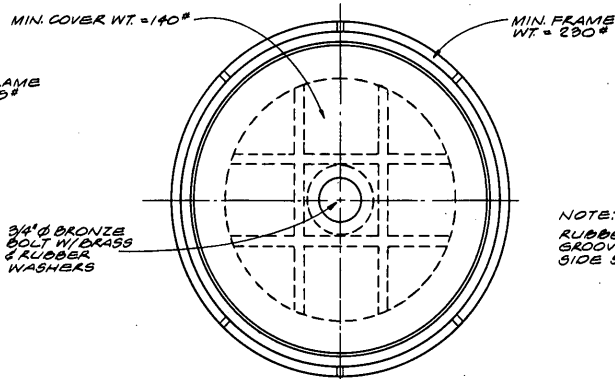
TYPICAL DROP MANHOLE

$\frac{3}{8}" = 1'-0"$



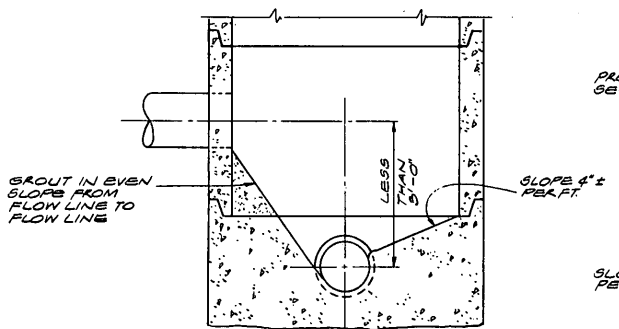
STANDARD MANHOLE RING & COVER

N.T.S.



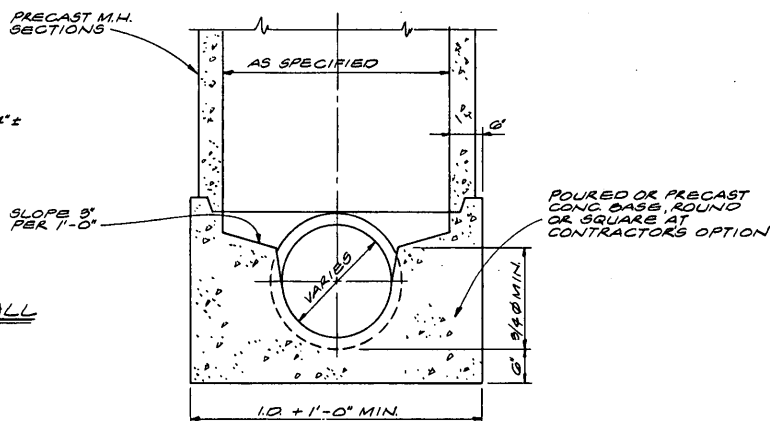
WATERTIGHT MANHOLE RING & COVER

N.T.S.



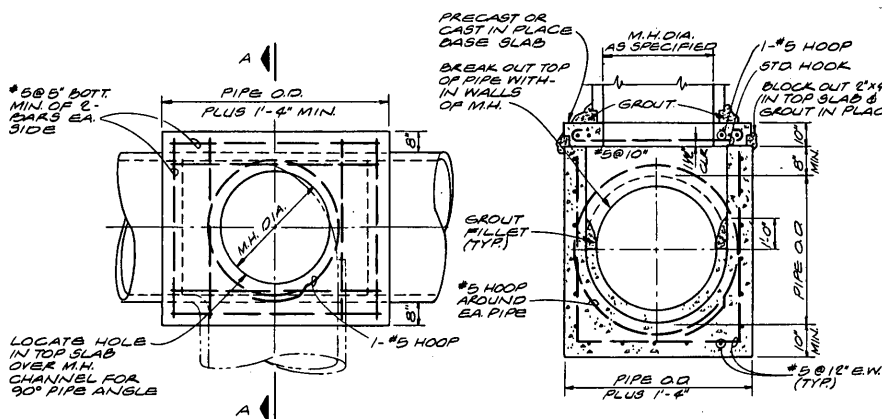
TYPICAL MANHOLE HAVING FALL LESS THAN 3'-0"

N.T.S.



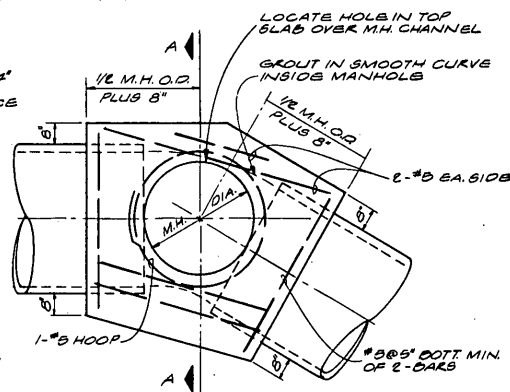
TYPICAL MANHOLE - 24" TO 36" PIPE

N.T.S.



STRAIGHT PIPE & 90° PIPE ANGLE OR 3-PIPE 90° JUNCTION

SECTION 'A-A'



0° TO 90° PIPE ANGLE

STANDARD MANHOLE FOR 42" TO 54" PIPE

N.T.S.

2G. SHEET PILING

A. SCOPE. This section covers the work necessary for furnishing and installing the sheet piling, complete.

B. MATERIALS.

SHEET PILING. All steel sheet piling shall be Grade A and conform to ASTM A 328, latest edition. The section modulus shall be based on the individual whole piece and shall not be dependent on the interlock friction between pile sections to obtain the required section modulus. The steel sheet piling shall be 12-gauge with a section equivalent to Armco sheeting, as manufactured by Armco Steel Corporation.

C. WORKMANSHIP.

DRIVING. The location of the sheet piles shall be as shown.

To facilitate driving and maintain alignment or verticality, suitable guide members shall first be set. A suitable driving head of sufficient size and type to move the sheeting easily shall be used to keep deformation of the driving end to a minimum. Design of the pile driver shall be approved by the Engineer prior to operation.

PENETRATION. Penetration shall be not less than that shown on the Plans. If the Engineer specifically directs the Contractor to drive piling beyond the minimum penetration specified, the Contractor will not be required to remove and replace a pile at his own expense should problems occur from such overdriving. All piles which are raised during the process of driving adjacent piles shall be driven down again.

If obstructions are encountered before the specified penetration for the piles is obtained, move the pile, put in an additional pile, or remove the obstruction as directed by the Engineer. The cost of such additional work shall be considered as part of the pile driving.

DAMAGED PILES. Any pile which is damaged or destroyed during handling or driving shall be removed from the jobsite and replaced by the Contractor.

D. PAYMENT. Payment for the work in this section will be included as part of the lump sum bid.

2H. CHAIN LINK FENCE

A. SCOPE. This section covers the work necessary for the chain link fence, complete.

B. MATERIALS.

GENERAL. Materials shall be new and products of recognized, reputable manufacturers or producers and shall conform to these Specifications, except that materials salvaged from the removal of existing fence may be used for a portion of the fencing. Materials shall carry a tag identifying the manufacturer and, in the case of fabric and barbed wire, class of zinc coating. Used, rerolled, regalvanized finish, or open-seam posts will not be acceptable. All materials shall be hot-dip galvanized after fabrication. Posts and other appurtenances shall have a minimum zinc coating of 2.0 ounces per square foot of surface.

FABRIC. Conform to ASTM A 392. Chain link 72 inches high, woven of No. 9 gauge wire in 2-inch diamond mesh pattern, selvages twisted and barbed, galvanized after weaving with Class II coating.

POSTS. Federal Specification RR-F-183, except as hereinafter modified. Standard lengths for setting in ground in concrete and as required for special conditions shown.

LINE POSTS. Galvanized H-columns, 2" x 2-1/4", weight 4.1 pounds per linear foot or 2-1/2-inch outside diameter steel pipe, weight 3.65 pounds per linear foot.

END, CORNER, ANGLE, AND PULL POSTS. 2.875-inch outside diameter standard steel pipe, weight 5.79 pounds per linear foot.

BOTTOM REINFORCING WIRE. Bottom reinforcing wire shall be coil spring wire not less than 0.177 inch in diameter. Provide tie clips of approved type for attaching the wire to the fabric at intervals not exceeding 24 inches.

TOP RAIL. Tubular, 1-5/8-inch outside diameter, weight 2.27 pounds per linear foot. Couplings to be outside-sleeve type and at least 7 inches long. Provide springs to permit expansion in rail as recommended by the manufacturer. Top rail to extend through line post tops to form continuous brace from end-to-end of each stretch of fence.

FITTINGS. Malleable steel, cast iron, or pressed steel, as required. Fittings to include extension arms for barbed wire, stretcher bars and clamps, clips, tension rods, brace rods, hardware, fabric bands, and fastenings and all accessories. Provide 45-degree bracket type supports for the barbed wire.

BRACKET SUPPORTS. For line posts shall be of pressed steel attached to malleable iron bases with rivets; those for corner posts shall be malleable iron throughout. Bracket supports that are not rigid and substantially constructed to withstand the stresses will not be accepted. All fittings and accessories shall meet the requirements of Federal Specification RR-F-183, except as modified herein.

BARBED WIRE. Four-point pattern composed of 2 strands of No. 12-1/2-gauge wire; 4-point barbs 4 inches apart conforming to Federal Specification RR-F-221, Type A.

CONCRETE. Materials as specified in Section CONCRETE.

C. WORKMANSHIP.

INSTALLATION. Erect fencing in straight lines between angle points by skilled mechanics experienced in this type of construction. Erect in accordance with the manufacturer's recommendations as approved and with these Special Specifications. Post holes shall be a minimum depth of 3 feet below finished grade; holes for line posts shall be 12 inches in diameter; holes for gate, corner, and pull posts shall be 16 inches in diameter. Space posts not more than 10 feet on centers and in true lines. Set posts plumb and to a depth of 2'-10". The top rail of the fence shall be 6 feet above the ground surface. Fill remainder of hole with concrete to extend around the posts to a point 2 inches above finished grade. The top surface shall have a crown watershed finish. Proportion concrete to provide at least 2,000 psi at 28 days. Materials, method of proportioning, mixing, transporting, and placing are covered in Section CONCRETE. After concrete has set, install accessories; fasten chain link fabric to end posts with stretcher bars and clamps and to line posts and top rail with wire or bands at approximately 14-inch centers. Install 3 strands of barbed wire on the brackets, draw taut, and secure at each bracket. Brace gate posts diagonally to adjacent line posts to insure stability. Hang gates and adjust all hardware so that gates operate satisfactorily from open or closed position.

CLEANUP. Upon completion of the fence installation, clean up all waste material resulting from the operation. Spread excavated earth from post holes on the surface and grade smooth.

D. PAYMENT. Payment for the work in this section will be included as part of the lump sum bid.

Sp. Specs. 2H - 2

-31-

3A. CONCRETE

A. SCOPE. This section covers the work necessary for the concrete, complete.

B. MATERIALS.

STANDARD SPECIFICATIONS. Materials shall conform to the Standard Specifications for Reinforced Concrete, bound herewith, except as modified herein-after.

The item numbers that follow refer to the item numbers of the Standard Specifications, and the changes or additions modify and supplement the respective paragraphs.

B-1. Cement. Type I or Type III for use at the Contractor's option when high-early-strength concrete is desired.

B-2. Water. See Section GENERAL REQUIREMENTS.

B-5. Dry Pack Grout. Nonshrinking type for water-holding basins and where shown; all other shall be ordinary type.

B-5.a. Nonshrinking Type (Grout). Form tie holes shall be patched with nonshrinking grout proportioned and mixed as specified herein.

B-6. Steel Reinforcement. Covered in separate section.

B-7. Forms. New plywood or steel for exposed surfaces. Used plywood permitted only if condition acceptable to Engineer, or forms are lined with commercial hardboard.

B-8. Concrete Admixtures. Use Pozzolich 3L in all concrete. Do not use Pozzolich high-early in any concrete.

B-9. Bonding Agent. In addition to the specified requirements, the manufacturer must guarantee, in writing, that his product meets the Specifications and, in addition, will provide satisfactory service when continuously submerged in the structures.

B-14 thru B-16. Not required.

B-17. Plastic Water Stop. In addition to these requirements, all plastic water stops shall be the center bulb type. The size of the water stop and the size of the center bulb shall be as shown.

B-18. Not required.

ASPHALT SATURATED FELT. 15-pound ASTM D 250.

THIOKOL SEALANT. Thiokol Sealant shall be Hornflex Thiokol LP-32, as manufactured by A. C. Horn Company, Inc., or as approved. Primer shall be as recommended by the manufacturer.

REGLETS. Precaulked type formed of 20-gauge galvanized steel; Burke Cushion Lock reglets, Type A, as manufactured by W. J. Burke and Company, Seattle, Washington, or as approved.

LOCAL MATERIALS. It is intended that local materials for concrete be used insofar as practicable. The proportions and general design of the concrete mixture and the cement content given in Table I hereinafter are suitable for the use of materials available in the vicinity and are based upon use of local aggregates. Other sources of materials may be used. This statement does not relieve the Contractor from the requirements of the Standard Specifications for Reinforced Concrete, as to quality, even though some local materials may not meet these Standards.

C. WORKMANSHIP.

STANDARD SPECIFICATIONS. Conform to the Standard Specifications for Reinforced Concrete, bound herewith, except as modified hereinafter.

The item numbers which follow refer to the item numbers in the referenced Standard Specifications, and the changes or additions modify and supplement the respective paragraphs.

C-1.b. Proportions. Delete as written and substitute the following:

Before beginning any concrete work, have the concrete mix designed and proper proportions of the various ingredients determined as specified.

Mix design shall be prepared at the Contractor's expense by a recognized inspection and testing laboratory approved by the Engineer and shall show the expected strengths and corresponding slumps and all ingredient weights and other physical properties necessary to check the design mix. Mix design shall be checked by the laboratory by the preparation of trial batches from each of which 4 standard test cylinders shall be cast, cured, and tested, as specified for the job concrete. Certified copies of all laboratory reports, stating whether the items reported pass Specifications, shall be sent promptly to the Engineer directly from the testing laboratory.

Do not place concrete until mix designs have been approved by Engineer.

TABLE I

Design mix to meet the following requirements:

	<u>Columns</u>	<u>Concrete</u>
Min. compressive field strength at 28 days	3,000 psi	3,000 psi
Cement factor (sacks of cement/cu.yd.) min.	5-1/2	5-1/2
Pozzololith 3L added per sack of cement (lbs.)	.25	.25
	(or as recommended by mfr.)	
Max. water per 94-lb. sack of cement (gals.)	5-1/2	5-1/2
Fine aggregate, percentage total aggregate by weight (range)	40-48	35-45
Slump range (inches)	2-4	2-4
Max. size coarse aggregate (inches)	3/4	1-1/2
Entrained air (% by volume) (range)	3-5	3-5

(Strength determinations will be made as specified under C-8 of this referenced Standard.) Field strength shall be assumed as equal to 85 percent of the strength of laboratory-cured cylinders.

In addition to the strength requirements indicated above, the concrete shall be dense and impermeable.

C-2.a. Weight Measurement. Batching plant shall be of adequate capacity and acceptable to the Engineer. The equipment for weighing the aggregate shall be suitably designed and constructed for the purpose. Provide bins with adequate separate compartments for fine aggregates and for each required size of coarse aggregate in the batching plant. Each compartment shall be designed to discharge efficiently and freely into the weighing hopper. Provide means of control so that, as the quantity desired in the weighing hopper is approached, the material may be added slowly and shut off with precision. Provide a port or other opening for removing an overload and sampling materials from the hopper. Construct weighing hoppers so as to eliminate accumulations of tare materials and to discharge fully.

C-2.b. Volumetric Measurements. Volumetric measurements will not be permitted.

C-3.g. Air-Entraining Admixture. Use air-entraining admixture for all concrete, unless exception is approved or directed by the Engineer.

C-4. Forms. Pour all concrete foundations and walls against plywood or steel forms, except those surfaces that will be covered with backfill in the completed structure. Forms for surfaces that will be covered with backfill may be constructed of dressed matched boards.

C-5.b.(1). Water Stops in Construction Joints. Provide galvanized steel water stops in all construction joints, except as otherwise indicated.

C-5.b.(2) thru C-5.b.(4). Not required.

C-5.b.(5). Expansion Joints with Plastic Water Stop. To the Standard Specification, add the following:

Join water stops at all intersections so that a continuous seal is provided against passage of water.

Position the water stop correctly in the forms so that the center of the water stop is centered on the joint. In cases where preformed expansion joint material is used in conjunction with the water stop, make allowance for equal water-stop embedment on each side in the concrete. Hold water stop in place in the forms by use of a split form or other approved method that will positively hold the water stop in correct position. The water stop may be held in place in the forms by driving nails at about 12-inch intervals adjacent to, but not through, the water stop, unless written approval is granted by the Engineer. Nails may be driven into the form and then bent over the water-stop strip to hold it in position.

In the event of damage during the construction of the forms and concreting operations, remove the damaged portion and repair to the satisfaction of the Engineer. During any concrete pour around the water stop, rigidly support the half which is being embedded in the concrete in an approved manner so that the final position of the water stop will be in a straight line. Vibrate concrete being placed around the water stops in order to obtain impervious concrete in the vicinity of all joints. During the placing of concrete in horizontal joints, insure that the area below the water stop is completely filled with concrete. The Contractor shall make a visual inspection of the entire water-stop area during the concrete placement. The method of installation of the water stop and the method to hold the water stop in proper position during and after the pouring of concrete shall be approved by the Engineer before the concrete pour is begun.

C-6. Covered in another section.

C-7.a. General. Thoroughly wet the gravel backfill below the base slab prior to placing concrete.

C-7.c. Handling. Add the following:

When placing concrete by pumping, the discharge line from the pump shall be steel pipe. The use of aluminum pipe or aluminum chutes will not be permitted.

Erect the wall form panels for one side of the wall sections to full height of the finished wall prior to the start of the wall pour. Brace the forms properly and secure as specified, or as directed by the Engineer. Partially erect the wall form panels for the opposite side of the core wall prior to the start of the pour with the remainder of the panels erected as the concrete is being deposited into the forms. The maximum height of the form panels on one side of the wall shall be 10 feet above the level of the freshly compacted concrete in the forms. The method of forming the wall sections shall be approved by the Engineer prior to the erection of the wall forms. Once started, the pour shall be continuous to the full wall height.

C-7.h. Depositing in Cold Weather. Do not use calcium chloride or high-early Pozzolite in any concrete.

C-9.b. Patching. Use nonshrinking aggregate grout for patching holes in water-holding basins; grout around pipes, sleeves, and plugs in water-holding and belowground walls or slabs, and elsewhere as shown. In areas exposed to view, stop dry packing with nonshrinking grout 3/8 of an inch from the surface of walls and fill remainder with ordinary grout. Patch exposed surfaces which are to be left unpainted with material of the same type and proportions as the original pour.

C-9.d. Ordinary Wall Finish. Give all concrete surfaces poured against forms, not specifically indicated as receiving a Class I finish, an ordinary wall finish as specified.

C-9.e.(1). Rubbed Wall Finish, Class I. Give a Class I finish to all exterior exposed surfaces of walls aboveground and all interior exposed concrete surfaces within buildings and all exposed interior surfaces of water-holding tanks, channels, and appurtenances to a point 10 inches below the normal low water elevation.

C-9.e.(2). Not required.

C-9.f.(1). Monolithic Finish. Give all concrete floors within buildings and structures a monolithic floor finish as specified herein.

C-10. Curing of Concrete. Cure all concrete by the application of water to keep all concrete surfaces continuously wet for 7 days. Begin curing immediately after initial concrete set has occurred. Do not allow alternate wetting

and drying of concrete surfaces during the curing period.
Do not use curing compounds.

C-11. Not required.

C-12. Blockouts for Pipe and Conduits. Cast-in-place all pipe, conduits, fabricated metalwork, and wood intended to be embedded in the base slab, wall, or roof slab at the time of pouring the slabs, wall, or roof.

C-14. Leakage Tests. Leakage test is required for the new clearwell, filters, basins, and flumes, and all existing concrete basins and flumes where openings are cut for new piping connections. Water for one leakage test will be furnished by the Owner. The Contractor shall pay for the water required for any additional leakage tests which may be required.

PATCHING OF CONCRETE. The Contractor shall patch all holes cut in the concrete for installation of equipment and materials, all holes resulting from removal of materials or equipment, and all defects in surfaces specified to be painted. Areas to be repaired shall be thoroughly cleaned and roughened. The surfaces to be patched shall be thoroughly washed with water. Patching shall be done with regular concrete or nonshrinking concrete as directed by the Engineer. Concrete for patching shall be as specified in this item, except that the maximum size of coarse aggregate shall be reduced and the proportions of the mix varied as directed by the Engineer. The surfaces of old concrete to be patched shall be coated with a special bonding agent, applied in strict conformance with the manufacturer's printed directions. Concrete shall be placed and processed as specified in C-12 of the Standard Specifications for Reinforced Concrete. Exposed surfaces of the patches shall be finished to match the texture of the adjacent wall. All patches shall be cured as specified for new concrete and as approved by the Engineer. Where concrete patching is necessary to accomplish the work in the existing structure, extreme care shall be taken to obtain quality work. Every effort shall be made to avoid a patched appearance. All finishes shall match those of the adjacent surfaces.

BOND PREVENTION MATERIAL. Nonstaining type, which may be used on wet concrete and which will provide a positive bond prevention such as Williams Tilt-Up Compound, as manufactured by Williams Tilt-Up Compound, Inc., Seattle, Washington. Submit technical data and samples to Engineer for approval.

D. PAYMENT. Payment for the work in this section will be included as part of the lump sum bid.

3B. REINFORCING STEEL

A. SCOPE. This section covers the reinforcing steel, complete.

B. MATERIALS. All reinforcing steel shall conform to the specifications for reinforcing steel, as set forth in the Standard Specifications for Reinforced Concrete, bound herewith.

C. WORKMANSHIP.

SUBMISSION OF SHOP DRAWINGS. Prior to cutting or fabrication of any reinforcing, submit bending lists and placing drawings to the Engineer for review in accordance with the provisions of the General Conditions. Bending lists and placing drawings shall indicate the number provided and location for all bars, including straight bars.

FABRICATION AND PLACEMENT. Store, handle, fabricate, and place reinforcing steel in conformance with the Plans, approved shop drawings, Standard Specifications for Reinforced Concrete, bound herewith, and the WCRSI Manual of Standard Practice for Reinforced Concrete Construction, current edition. Tying of bars shall be done in conformance with CRSI Recommended Practice for Placing Reinforcing Bars (current edition), except as modified in the Specifications or on the Plans and as approved. Where the referenced Standards are at variance, the higher Standard shall apply.

Where it is necessary to cut bars for pipe or openings in the structural members, place an equivalent area of steel around the pipe or opening and extend on each side sufficiently to develop bond on each bar, unless otherwise shown. Minimum lap shall be 24 bar diameters.

If it is desired to locate construction joints at points not shown, do so subject to approval of the Engineer, and detail the reinforcing steel accordingly. The extra cost of steel to provide splices at these additional construction joints shall be at no additional cost to the Owner.

D. PAYMENT. Payment for the work in this section will be included as part of the lump sum bid.

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4A. MASONRY

A. SCOPE. This section covers the work necessary for the masonry, complete.

B. MATERIALS.

CONCRETE MASONRY UNITS. ASTM C 90, Grade U-1, (with the added requirement that the aggregate shall be Shalex or Haydite, or as approved). Provide special shapes for corners, jambs, lintel fillers, and as otherwise required.

MORTAR. ASTM C 270, Type N. Add to the mortar Hydratite plus integral waterproofing, manufactured by A. C. Horn Company, Inc., or as approved. Add waterproofing in strict accordance with the manufacturer's printed instructions. Do not use setting accelerators or antifreeze compounds.

GROUT. Grout for poured vertical cells shall be 1 part portland cement to not over 5 parts aggregate, of 1/2-inch maximum size. Twenty-eight day strength shall be at least 2,000 psi. Slump shall not exceed 6 inches.

CAULKING COMPOUND. Dow Corning 780, or as approved, and color approved by Engineer.

JOINT REINFORCEMENT. Horizontal reinforcement shall be standard Dur-O-Wall Reinforcement, as manufactured by the Cedar Rapid Block Company, Cedar Rapids, Iowa, or as approved. Provide in 10-foot lengths and suitable widths.

Vertical reinforcing shall be No. 4 deformed steel reinforcing rods conforming to ASTM A 615, Grade 40.

MISCELLANEOUS. Provide all miscellaneous materials as required for connection to existing concrete wall and installation of windows.

C. WORKMANSHIP.

HANDLING, STORAGE, AND PROTECTION. Store, handle, and protect all masonry materials, both before and during installation, so that there will be no damage to the units. Stack units on platforms and cover in a manner that will protect the materials from contact with the soil and exposure to the weather. Take care to prevent chipping and breakage. Chipped and damaged units will be rejected. Protect exposed surfaces, corners, sills, and similar areas in the finished work from damage.

MIXING MORTAR. Proportion mortar by volume and mix in a standard mortar mixer operated in accordance with the manufacturer's recommendations. Mix ingredients thoroughly in dry form and add water to bring the mixture to the proper consistency for use. Do not hand mix mortar, except with the approval of the Engineer.

LAYING CONCRETE MASONRY UNITS. Lay in straight, true, level courses with vertical joints in line and each course breaking joints with the course below. Determine actual widths of joints, not exceeding 1/2 inch, by spacing the masonry units both vertically and horizontally so as to meet the dimensions shown and obtain joints of uniform thickness. Space courses accurately with a story rod.

Provide and place such special units as corner block, door jamb block, lintel block fillers, and similar blocks as may be required. Use the required shapes and sizes to work to corners and openings maintaining a proper bond throughout the wall.

Concrete masonry units shall be wet before placing only in warm weather and only when specifically directed by the Engineer. Adjust each unit to its final position while the mortar is soft and plastic. Remove any unit which is disturbed after mortar has stiffened and replace with fresh mortar. Fill spaces around built-in items solidly with mortar as the walls are laid up. Items required to be built in with masonry shall be built in as the masonry work progresses. Cutting and fitting of masonry required to accommodate the work of others shall be done by masonry mechanics with masonry saws. Bond beams shall conform to the special details shown and shall be filled with concrete of not less than 3,000 psi strength at 28 days.

REINFORCEMENT. Reinforcement shall be of proper width; longitudinal wires shall rest in the approximate centers of the mortar beds and shall have at least a 5/8-inch mortar cover on the exposed face of the wall. Lap reinforcement 6 inches or more, the lap containing at least 1 cross wire of each piece of reinforcement. Form joint reinforcement accurately around corners at wall intersections.

Place reinforcement for horizontal joints in every third course in concrete block walls.

Provide vertical reinforcing bars in all masonry walls at a maximum of 4 feet on centers and at other locations as indicated. Cells in which vertical bars are to be installed shall have vertical alignment sufficient to maintain a clear, unobstructed flue not less than 2 inches in dimension as measured along the wall. Reinforcing bars shall be centered in the cells and shall be solidly bedded in concrete mixed as hereinbefore specified. Where bars are spliced, the splice shall be as specified for concrete reinforcing steel.

POINTING DEFECTIVE JOINTS. At the completion of the masonry work, the joints shall be inspected and all holes or defects in mortar joints of exposed surfaces shall be suitably enlarged and completely filled with mortar.

CLEANING CONCRETE MASONRY UNITS. Clean exposed concrete block of excess mortar with a trowel and soft brush as the work proceeds. Upon completion, thoroughly clean the work by scrubbing with a stiff fiber brush and washing with clean water. The use of steel brushes and acid solution will not be permitted.

WATERPROOFING MASONRY WALLS. The waterproofing with water repellant is specified on the Plans. Coordinate the work so that the application of water repellant can be made as soon as the final cleaning of the masonry is completed. Waterproofing required on exterior masonry only.

D. PAYMENT. Payment for the work in this section will be included as part of the lump sum bid.

Sp. Specs. 4A - 2

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5A. FABRICATED METALWORK AND CASTINGS

A. SCOPE. This section covers the work necessary for fabricated metalwork and castings, complete.

B. MATERIALS. Unless otherwise indicated, all materials shall conform to the latest issue of the following ASTM Specifications:

<u>Item</u>	<u>ASTM Specification</u>
Bolts, Nuts, Anchor Bolts, and Rods	A 307
Steel Plates	A 36, A 283
Structural Steel	A 36
Cast Iron	A 48 (Class 20)
Aluminum Alloy	B 221, Alloy 6061-T6

GENERAL. The miscellaneous metalwork and castings indicated on the Plans, or as may be required to secure the various parts together and provide a complete installation, shall be included under this section. The tabulation or listing of items herein is not intended to be all-inclusive, and it shall be the Contractor's responsibility to provide all metalwork and castings shown, specified, or which can reasonably be inferred as necessary to complete the project.

STEEL ITEMS.

STEEL ANCHOR BOLTS AND FASTENINGS. 1/2-inch minimum diameter with hex nuts, or as shown. Bolts and nuts shall be galvanized.

MACHINE ANCHOR BOLTS. For equipment with motors 3 hp or greater, fabricate as shown, or galvanize DECO concrete insert anchor assembly, as manufactured by Decatur Engineering Company, Decatur, Illinois. Size of fastening stud and anchor bolts as required by equipment manufacturer. Length - not less than 9 inches.

EXPANSION ANCHORS. Phillips Red Head self-drilling flush anchors for installation with power hammer, or Phillips Red Head stud anchors, as approved.

PIPE SLEEVES. ASTM A 120 standard weight galvanized steel pipe. Where shown, fabricate seepage rings of 1/4-inch steel plate extending 2 inches from the pipe and weld continuously to pipe around complete circumference.

Sleeves for one-inch through 2-inch pipe passing through walls of water-holding basins shall be pipe sleeves with half Dresser Style 90 (galvanized) compression couplings welded to each end as indicated on the Plans.

STEEL GRATING. Irving Gripweld, Type IWA, or approved, 1" x 3/16", unless otherwise shown. Band all edges and cutouts. Angle supports as indicated. Galvanize all grating and angle supports after fabrication. Maximum width of any single grating section shall be 2 feet unless otherwise shown. No grating acceptable which is over 1/2 inch shorter than the dimensions of the grating frame.

STEEL STAIR TREADS. Irving Gripweld, Type IWA, 1" x 3/16", unless otherwise shown with cast iron abrasive nosing. Galvanize after fabrication.

FASTENERS. All bolts, inserts, and miscellaneous steel fasteners shall be proper size and type. Fasteners for embedment in concrete shall be galvanized, unless otherwise indicated.

PIPE HANDRAILS. Construct handrails of 1-1/2-inch Schedule 40 pipe and stanchions of 1-1/2-inch Schedule 80 steel pipe. Weld all connections. Stanchions shall have a maximum spacing of 6'-0". Grind all welds smooth. Base support details shall be as shown. Hot-dip galvanize all handrails after fabrication; field cutting will not be permitted. Safety chain shall be as specified.

CHLORINE CYLINDER LIFT BEAM. Furnish one lift beam similar to Mansaver Style III8, as manufactured by Mansaver Industries, Inc., New Haven, Connecticut; or Allied Steel Company, Inc., Los Angeles, California. The device shall be no more than 13 inches from the top of the cylinder to hook hole. Hot-dip galvanize after fabrication.

CHLORINE HOIST BEAM. Provide a steel I-beam for the chlorine storage room hoist of the size and weight indicated. Support beam as shown. Provide stops at each end of the beam.

WEIR TROUGHS AND COLLECTOR TROUGHS. Fabricate in accordance with details shown on the Plans. All welds shall be continuous so as to provide a watertight installation.

BAFFLE AND TROUGH SUPPORTS. Fabricate of structural steel members and steel plates in conformance with the Plans. Supports shall be drilled for the required fastenings, and where indicated, shall be hot-dip galvanized after fabrication.

CLEARWELL HATCH. Fabricate of steel plate, and weld angle stiffeners to the plate as indicated. Hot-dip galvanize after fabrication.

HOSE RACKS. Fabricate hose racks of steel shapes in accordance with the details shown. Hot-dip galvanize hose racks after fabrication.

SURFACE WASH SUPPORTS. Fabricate supports as indicated. All V-bolts, washers, through bolts, and accessories shall be furnished as shown; galvanize.

CLEARWELL OBSERVATION PORT. Fabricate the clearwell observation port complete with accessories as indicated.

ALUMINUM ITEMS.

GATES AND GATE GUIDES. Fabricate all gates, gate guides, rests, and anchors of aluminum alloy similar and equal to Aluminum Association 6061-T6 alloy. Welding wire shall be Alcoa No. 4043 filler wire.

ALUMINUM ANCHOR BOLTS AND FASTENINGS. 2024-T4 alloy with same or 6061-T6 nuts, 1/2-inch minimum or as shown.

ALUMINUM CHECKERED PLATE. Tread plate, as manufactured by Aluminum Company of America. Thickness as indicated. Fasten all accessories by welding or aluminum bolts or screws.

MANHOLE STEPS AND STEP RUNGS. Forged aluminum drop-front type, Alcoa No. 15295, or approved.

ALUMINUM PIPE HANDRAILS. Fabricate pipe handrails from 1-1/2-inch diameter Alcoa aluminum alloy 63S-T832, weighing not less than 0.90 pound per foot. Maximum post spacing shall be 6 feet. Brackets and fittings, except floor, fascia, and angle flanges, shall be Alcoa alloy B-214. Fascia flanges shall be cast from Alcoa alloy 356-T6. Floor and angle flanges shall be forged from Alcoa alloy 61S-T6. Sleeve filler shall be Leadite (caution: do not use lead). The exposed surfaces of exterior handrails shall have mill finish, and exposed surfaces of interior handrails shall have satin finish. Fabricate railings in the shop insofar as possible in accordance with approved shop drawings and measurements obtained at the project site. Weld all joints and splices or make with flat head screws as approved. Grind all exposed welds smooth. Provide slip joints at expansion joints in the structure. Posts in concrete shall be set to a minimum depth of 4 inches.

OVERFLOW WEIR PLATES. Fabricate of aluminum alloy 6061-76 as shown.

CASTINGS.

MANHOLE FRAMES AND COVERS. Manhole frames and covers shall be as shown in Standard Manhole Details bound in Section CONCRETE PIPE, DRAIN TILE, AND MANHOLES. Manholes in paved areas shall have heavy-weight frame and cover and shall be of watertight design where shown.

MISCELLANEOUS FABRICATED METAL. The following additional items of fabricated items are listed for the benefit of the Contractor, but no guarantee is given as to the completeness of the list. The Contractor shall make his own final determination of the items required.

- Gate Racks
- Pipe Supports, Hangers, and Fasteners
- Steel Stairways
- Vent Hoods

RUBATEX GASKET. Unless otherwise indicated, Rubatex No. R-411-N, soft, closed-cell, neoprene gasket material, as manufactured by Rubatex Division of Great American Industries. Thickness shall be as indicated, but in no case less than 1/4 inch. Gaskets shall be furnished without skin coat on either side.

C. WORKMANSHIP.

SUBMISSION OF SHOP DRAWINGS. Prior to ordering any fabricated or manufactured metalwork, submit to the Engineer complete shop drawings and

erection diagrams of the work, in accordance with requirements of the General Conditions. Execute the work in accordance with the shop drawings appropriately stamped by the Engineer.

FABRICATION. Workmanship and finish of all metalwork specified under this section shall be of the highest grade and equal to the best practice of modern shops for the respective work. Exposed surfaces shall have smooth finish and sharp, well-defined lines. Provide all necessary rabbets, lugs, and brackets so that the work can be assembled in a neat, substantial manner. Conceal fastenings where practical. Drill metalwork and countersink holes as required for attaching hardware or other materials. Fabricate materials as specified. Weld connections except where bolting is directed. Items requiring special fabrication methods are mentioned herein; fabrication of all other items shall be of equal quality. Methods of fabrication not otherwise specified or shown shall be adequate for the stresses and as directed by the Engineer.

Fabricate aluminum as shown and in accordance with the manufacturer's recommendations as approved. Grind smooth sheared edges exposed in the finished work.

WELDING. The technique of welding employed, appearance and quality of weld made, and the methods of correcting defective work shall conform to Codes for Arc and Gas Welding in Building Construction of the AWS and to AISC Specifications. Surfaces to be welded shall be free from loose scale, rust, grease, paint, and other foreign material, except that mill scale which will withstand vigorous wire brushing may remain. A light film of linseed oil may likewise be disregarded. No welding shall be done when the temperature of the base metal is lower than zero degrees F. Finished members shall be true to line and free from twists.

Weld aluminum in accordance with the manufacturer's recommendations as approved. Grind smooth all exposed aluminum welds.

INSTALLATION OF FABRICATED METALWORK. Install in accordance with the Plans and these Specifications. Perform field welding and erection work by skilled mechanics. Install fabricated metalwork plumb or level as applicable. The completed installation shall, in all cases, be rigid, substantial, and neat in appearance. Erect structural steel in accordance with the applicable portions of AISC Code of Standard Practice, except as modified. Install commercially manufactured products in accordance with manufacturer's recommendations as approved.

ALUMINUM GATES AND GATE GUIDES. Finish the edges of all aluminum gates to a smooth true edge, and insure a uniform bearing on the angle gate rest. Weld aluminum guides continuously to the aluminum gate rests, and cross-brace the completed unit prior to shipment to assure true alignment. Cast aluminum guides in place.

ANCHOR BOLTS. Place all anchor bolts accurately with templates at the time the concrete is poured, except where expansion anchors are designated or approved by the Engineer.

GALVANIZING. Ferrous metalwork to be galvanized is indicated or specified. All closed or blind pipe sections shall be properly vented to permit the escape of gases. Provide 1/4-inch drilled holes in all closed or blind sections of pipe to vent gases or as otherwise required by the galvanizer. Galvanize all bolts, nuts, washers, and similar fastenings. Materials used for galvanizing and methods of application shall conform to ASTM A 384, A 385, A 386, and A 123. Hot-dip galvanize all items indicated to be galvanized after fabrication, except that parts bolted together shall be galvanized before final assembly.

PAINTING. Thoroughly clean all ferrous metal items not galvanized and give a shop coat in conformance with Section PAINTING. Preparation of surfaces and application of primer shall be in accordance with the paint manufacturer's printed directions and recommendations as approved. Field painting is covered under Section PAINTING.

D. PAYMENT. Payment for the work in this section will be included as part of the lump sum bid.

Sp. Specs. 5A - 5

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6A. CARPENTRY AND CABINETWORK

A. SCOPE. This section covers the work necessary for the carpentry and cabinetwork, complete.

B. MATERIALS.

LUMBER. Grading in conformance with WCLIB Book No. 15, or similar standard for species not included therein. All dimension lumber S4S Douglas fir, unless otherwise indicated.

Dimension lumber not otherwise specified shall be Standard Grade or Better.

PRESERVATIVE TREATMENT. Preservative treatment shall be one of the following materials subject to the approval of the Engineer: Tanalith (Wolman Salts), ammoniacal copper arsenite (Chemonite), chromated zinc arsenate (Boliden Salt), chromated copper arsenate (Greensalt or Erdalith), or pentachlorophenol in mineral solvent conforming to Federal Specification TT-W-572, Composition A. The quantity retained per cubic foot shall be not less than that specified in AWPA C2 for the service conditions. The method of application shall be in conformance with AWPA C1 and C2. Wood treated with water-borne preservatives shall be kiln-dried to a moisture content not exceeding 19 percent prior to shipment from treating plant.

CABINETWORK. Shop-fabricate cabinetwork in conformance with the information and details shown. Exterior surfaces that will be exposed in the finished work shall be of birch veneer plywood. Birch veneer plywood shall be free from imperfections and defects, and of a suitable grade for painting or natural finishing as indicated. All other parts of the cabinets shall be constructed of Interior Grade Douglas fir plywood INT-DFPA, A-B or A-D, as required, depending upon whether one or both sides will be exposed. Provide louvers for ventilation where indicated. Louvers shall be of sizes indicated, polished chrome finish, U.S. 26, as manufactured by Washington Steel Products, Inc., Tacoma, Washington. Provide all rough framing, blocking, and nailing cleats required for rigid, substantial construction. The various parts shall be housed out or rabbeted or otherwise milled as necessary, and shall be glued and nailed or screwed in an approved manner. Construct counters and splashbacks with a plywood top suitable to receive the Formica covering. Band edges of exposed plywood shelves and similar parts. Sand wood surfaces of all cabinetwork to a smooth surface ready for the finish treatment.

LAMINATED PLASTIC. Laminated plastic shall be Melamine surfaced, paper base, Standard Grade, 1/16 inch, high pressure decorative laminate meeting or exceeding NEMA Standards. Material shall be Formica. Color shall be as selected by Engineer.

NAILS, FASTENINGS, AND ROUGH HARDWARE. Nails, bolts, washers, spikes, and similar fasteners and rough hardware shall be of the best commercial grade, products of recognized manufacturers, and suitable for the intended use. Galvanize bolts, nuts, and washers. Provide all rough hardware required to complete the work.

PLYWOOD FOR CABINETS. Unless otherwise specified, INT-DFPA A-B, except A-D where one side is concealed from view.

TIMBER BAFFLES. Distribution baffles shall be of Construction Heart Grade redwood dimension lumber. Grading of redwood lumber shall be in accordance with the requirements of the Standard Specifications for Grades of California Redwood Lumber of the California Redwood Association.

MISCELLANEOUS MATERIALS. Provide all miscellaneous materials required to complete the work as shown and for the alterations to the existing structures. All materials shall be of the best quality and entirely suitable for the intended use. Materials for repairs to existing work shall match existing materials as required to avoid a patched appearance. Materials shall be acceptable to the Engineer.

C. WORKMANSHIP.

SHOP DRAWINGS. Submit shop drawings for items as requested in accordance with the provisions of the General Conditions.

TEMPORARY CONSTRUCTION AND FACILITIES. Provide as necessary for purposes of handling materials; permit access to various parts of the work to accomplish the required construction. Provide all hoists, rigging, scaffolding, and similar equipment required for the prosecution of the work.

PROTECTION AND STORAGE. Perform work necessary to cover and protect all new work or material from damage. Make good any carpentry work damaged through neglect or failure to provide the proper protection, without extra cost. Provide temporary partitions and facilities as required for protection.

LUMBER AND MILLWORK. Protect lumber and millwork from damage and dampness both during and after delivery at the site. Store finishing lumber and millwork in weathertight, well-ventilated area and do not install until concrete or masonry is completed and dry.

FABRICATION OF CABINETS. Construct and assemble at the mill insofar as practicable. Install cabinet hardware at the mill. All work shall be done by skilled mechanics in accordance with the details shown, and where not shown in accordance with the approved shop drawings. Make joints by mortise and tenon, dowels, glued blocks, screws, and similar standard methods that will produce a rigid construction. Conceal nails and screws insofar as possible. Fit all joints in materials properly so that they are as inconspicuous as possible. Set all nails and countersink screws for filling. Install cabinet hardware neatly and securely with fasteners matching the hardware. Sand all exposed surfaces to remove all marks and irregularities and provide a smooth finish ready for the painters' finish specified.

PLASTIC COUNTER TOP. Apply Formica to the counter in strict accordance with the manufacturer's recommendations. Take special care to insure that the plastic is thoroughly bonded to the surface on which it is applied and that the edges and corners are neat and true. Protect all cabinetwork against damage until final completion and acceptance of the building.

STORAGE SHELVES. Construct in accordance with the details shown. Scribe facing members to insure a neat fit against the adjacent walls.

CHLORINE CYLINDER SUPPORTS. Cut chlorine cylinder supports from clear Douglas fir; drill and sand, ready for installation. The supports shall be pressure preservative treated after fabrication and before installation. Pressure treatment shall conform to PRESERVATIVE TREATMENT above.

TIMBER BAFFLES. Baffles shall be of slotted construction and strongly braced as indicated. Bolts, nuts, washers, and all iron or steel attachment members, braces, stiffeners, and other ferrous fasteners shall be heavily galvanized after fabrication. Accurately cut and securely fasten all parts together.

MISCELLANEOUS CARPENTRY. Perform all miscellaneous carpentry as shown or as required to fasten the various parts of the structure in place. Recoat all damaged areas, abrasions, and cut ends of pressure treated wood with the same wood preservative. Perform the recoating of damaged and cut surfaces in accordance with AWWA M4, Standard Instructions for the Care of Pressure Treated Wood After Treatment.

D. PAYMENT. Payment for the work in this section will be included as part of the lump sum bid.

7A. ROOFING AND SHEET METALWORK

A. SCOPE. This section covers the work necessary for the roofing and sheet metalwork, complete.

B. MATERIALS. Deliver materials to the jobsite in original packages with the manufacturer's labels thereon. Labels on bitumen must show composition and melting point.

ROOFING, FLASHING, AND EDGING. Materials as specified in the following Johns-Manville Specifications:

BUILT-UP ROOF. J-M Specification No. 100-P, 150-P, 151-P.

FLASHINGS. J-M Specification FE-40-P.

EDGINGS. J-M Specification FE-30-P.

SHEET METAL.

GENERAL. Metal material shall be plainly marked with weight or thickness of material and manufacturer's name. Gauges of nonferrous sheet metal shall be Brown and Sharp (B & S), and gauges for ferrous sheet metal shall be manufacturer's standard gauge of the American Iron and Steel Institute.

GALVANIZED IRON. Copper bearing, galvanized steel sheets, conforming to ASTM A 525, 26-gauge, unless otherwise indicated or specified.

SOLDER AND FLUX. Best commercial quality of type most suited for metal to be soldered.

FASTENERS. Suitable type and of same metal and finish. Sheet metal screws and fasteners shall be equipped with neoprene or lead washers as required. All fasteners for sheet metalwork shall be of best commercial grade and of proper sizes and types, and approved.

METAL EDGE STRIPS. 26-gauge galvanized sheet steel fabricated in accordance with details shown.

ROOF DRAINS AND PIPING. Specified in Section PLUMBING AND MISCELLANEOUS PIPING SYSTEMS.

CAULKING COMPOUND. Sonolastic, as manufactured by L. Sonneborn Sons, Inc., New York, New York; or Dow-Corning No. 780, as manufactured by Dow-Corning Corporation, Los Angeles, California; or as approved.

C. WORKMANSHIP.

WEATHER CONDITIONS. Do not lay built-up roofing when atmospheric temperatures at job are below 40 degrees F. or when rain is falling.

EQUIPMENT. Equipment shall be suitable and in satisfactory working condition. Provide melting kettles with suitable thermometers suspended in the asphalt to permit rapid, accurate reading of temperature at all times.

ROOF DECK. Insure that deck is firm, dry, free of foreign materials, and reasonably smooth. Report immediately to the Engineer all cracks, breaks, holes, or other unusual irregularities in the surface. Application of the roofing constitutes acceptance of the roof deck, and its condition cannot be used as an excuse for any subsequent failures should difficulties arise.

ROOFING, FLASHING, AND EDGING. Apply in strict accordance with the following Johns-Manville Specifications:

BUILT-UP ROOF. J-M Specification No. 100-P, 150-P, 151-P.

FLASHING. J-M Specification FE-40-P.

EDGING. J-M Specification FE-30-P.

SHEET METALWORK. All work shall be done by skilled mechanics in a suitable shop with modern equipment. Form all work accurately to dimensions and shapes detailed or as required. Make bends on brake or forming machine as applicable. Turn back (hem) all exposed edges of sheet metalwork 1/2 inch, unless otherwise indicated. All manufactured items shall be products of acceptable manufacturers and meet the Specifications.

Form, fabricate, and install the sheet metalwork to adequately provide for expansion and contraction in the completed work, and to provide a watertight and weathertight installation. Make all lock seam work flat and true to line and sweat full of solder. Make all soldered flat lock seams at least 1/2 inch wide. Before soldering, prepare the metal to accept the solder. Place the solder evenly and wash with a soda solution to remove the acid flux when the work is complete. Make lap seams a minimum of 4 inches and cover contact surfaces with Thiokol type caulking compound.

Store all sheet metalwork in clean, dry storage area. Prevent contact with ground and corrosive or staining materials before installation.

EDGE FLASHING. Install edge flashing before flood coat is applied to the built-up roof. Form edge flashing of 26-gauge galvanized steel in 10-foot lengths. Longitudinal seams will not be permitted. Form bends on a brake; the completed flashing shall conform to the details shown. Corners shall be shop-fabricated. Make joints in direction away from normal wind. End joints shall be neatly made with a simple clinch lock or a 4-inch lap joint, and shall be soldered or sealed with Dow-Corning 780. Secure edge flashing in place in accordance with the details shown. Seal joint between edge flashing and roofing in accordance with the requirements of Johns-Manville Specification No. FE-30-P, or as approved.

MISCELLANEOUS SHEET METALWORK. Provide as indicated or required for watertight construction. Materials and methods of fabrication shall be as specified for similar items and as approved.

SHOP PRIMING. Shop priming of sheet metalwork shall be done as specified in Section PAINTING.

CLEANUP. Upon completion of the built-up roofing installation, clean up all waste material and debris resulting from this operation and dispose of such waste material off the site. Remove all spots and smears of asphalt from flashings, gravel stops, and other surfaces not intended to be coated with such material. During removal insure that no damage will be done to the surfaces; use solvents, if necessary, to satisfactorily clean the materials.

D. PAYMENT. Payment for the work in this section will be included as part of the lump sum bid.

Sp. Specs. 7A - 3

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8A. DOORS, WINDOWS, AND GLAZING

A. SCOPE. This section covers the work necessary for the doors, windows, and glazing, complete.

B. MATERIALS.

STEEL FOR HOLLOW METALWORK. Best quality, open-hearth sheet steel furniture stock, full pickled, full cold-rolled, double annealed, patent leveled, free from scale, pitting, rust, surface or internal defects. Gauges as specified for the respective materials and uses.

HOLLOW METAL DOORS AND FRAMES. Hollow metal doors shall be Type II, Style 2, of sizes shown and shall conform to the Steel Door Institute Standard Specification S.D.I. 100, except as modified by these Specifications and the Plans. Make provision for glass, where indicated, in conformance with S.D.I. 100. If required, provide manufacturer's fixed type, standard louvers factory installed in accordance with the Plans and the referenced Standard.

Frames shall be combination type of the design and sizes for the above doors and shall conform to the requirements of S.D.I. 100, except as modified herein. Cross sections of frames shall be as shown on the Plans.

Frames shall be 16-gauge for exterior doors and 18-gauge for interior doors. Provide 4 anchors for each jamb.

ALUMINUM WINDOWS. Windows shall be of the type and dimensions shown. All sections to be of depth specified, fabricated of extruded aluminum Alloy 6063-T5, free from defects impairing strength, durability, or appearance. Windows shall meet the quality requirements for "Quality Approved" Aluminum Windows of the Aluminum Window Manufacturer's Association Master Specification for the applicable type. Windows shall be designed for outside glazing, unless otherwise indicated. All screws, bolts, and fasteners shall be of aluminum or other nonferrous material not harmful to aluminum. Furnish manufacturer's standard anchors and fasteners. Furnish windows with lacquered finish. Provide all accessories and hardware as listed on the Plans or required for a complete installation. Approved manufacturers: Soule' Steel Company, William Bayley Company, CECO.

SCREENS. Equip windows with manufacturer's standard screens of approved type. Construct with aluminum tubular frames of rewirable type and cover with 14 x 18 mesh aluminum screen cloth. Construct screen with a horizontally sliding wicket to provide access to the handle fastener. Screens shall be provided for all exterior opening sash as shown on the Window Schedule.

GLASS. Each light of glass shall bear manufacturer's label showing strength and quality or be delivered to the job in original labeled boxes. Glass shall conform to requirements of Federal Specification DD-G-451 as applicable to type required. Glass shall be manufactured by Libbey-Owens-Ford, Pittsburgh Plate Glass Company, Mississippi Glass Company, or as approved.

Glass shall be of the thickness indicated. In cases where thickness is not indicated, provide glass consistent with recommendations of manufacturers and FGJA as related to maximum glass sizes for various thickness of glass.

CLEAR SHEET GLASS. Double-strength B quality or 3/16-inch heavy sheet Grade B, for use as indicated.

GLAZING ACCESSORIES. Provide all glazing clips, points, and accessories required for a complete installation. Accessories shall be of the highest quality, of suitable type, and approved.

GLAZING COMPOUND. Glazing compound shall be metal-sash elastic glazing compound suitable for use with metal glazing beads. Glazing compound for aluminum sash shall be of a type which does not require painting to prevent it from drying out and becoming brittle. The compound shall be colored by the manufacturer to match the finish sash. Glazing compound shall be Horn Glazing Compound produced by A. C. Horn Company; Tremglaze Mastic Glazing Compound, produced by the Tremco Manufacturing Company, Cleveland, Ohio; DAP Glazing Compound No. 1012, produced by DAP, Inc., Richmond, California; or as approved.

CAULKING COMPOUND. Caulking compound shall not react with or stain the adjacent aluminum sections. Caulking compound shall be Dow-Corning 780, as manufactured by the Dow-Corning Corporation, Midland, Michigan, or as approved. Color shall be the manufacturer's standard as approved.

HARDWARE. Provide hardware for doors and windows in accordance with the Hardware Schedule.

C. WORKMANSHIP.

SUBMISSION OF SHOP DRAWINGS. Prior to ordering any hollow metalwork, submit to the Engineer shop drawings and manufacturer's cuts in conformance with the General Conditions.

ELECTROLYTIC PROTECTION. Where materials dissimilar in galvanic range are in contact, or aluminum is in contact with concrete, paint contact surfaces with primer and body coats of bituminous paint such as American Tar Company's No. 2221, Farwest Vitamic, Fuller's No. 6530, or as approved. Allow paint to become thoroughly dry before installing the metalwork.

STORAGE OF DOORS AND FRAMES. Doors and frames shall be stored under cover on the building site on wood sills or on floors in a manner that will prevent rust and damage. Care shall be taken to avoid creating a humidity chamber by using a plastic or canvas shelter and not venting the area covered.

INSTALLATION OF METAL DOOR FRAMES. Set frames plumb, rigid, and in true alignment, and fasten so as to retain their position and clearance during the construction of the wall or partitions. Install spreaders to prevent distortion of the frame during the construction. Fill frames in masonry walls with mortar and build jamb anchors into the masonry courses as the work proceeds. When temperature conditions necessitate an additive to be used in the mortar

to prevent freezing as the frames are installed, the inside of the frames shall be coated in the field with a corrosion-inhibiting bituminous material and permitted to dry before installation of the frames. Do not remove temporary bracing until frames are securely built into the masonry. In frame construction, secure with approved fasteners.

INSTALLATION OF HOLLOW METAL DOORS. Hang doors in the frames and apply hardware in a neat, secure manner so that the doors will operate without dragging or binding. Upon completion of the project and before the work is turned over to the Owner, check the hardware and make any necessary adjustments so that the doors operate smoothly and satisfactorily. Turn all keys over to the Owner at the completion of the work.

INSTALLATION OF WINDOWS. Install windows in true line and plumb in openings as shown and in accordance with manufacturer's recommendations as approved. Secure in place with fasteners of suitable type for wall materials. Adjust ventilators and attach hardware before glazing.

DELIVERY AND STORAGE OF GLASS. Deliver glass to site in containers that will protect glass from weather and breakage.

GLAZING. Permit primed sealing surfaces of wood and steel sash to become thoroughly dry before glazing. Clean sealing surfaces at perimeter of glass before applying any glazing compound. Use only approved solvents and cleaning agents recommended by compound manufacturer.

Glass shall be of the type specified or as designated. Bed glass in glazing compound and secure glass in place with clips, glazing points, or other applicable method suitable for the rabbet material. Face-putty except where metal glazing beads are supplied. Install glass in strict accordance with the recommendations of the compound manufacturer and applicable parts of FGJA Manual. Secure ventilating sash temporarily to permit the compound to set. Take care to prevent smearing the glazing compound on frames and adjacent surfaces. Remove any smears without damaging the finish of the material.

Where glass is secured with metal glazing beads, take care to fit beads properly to secure uniform bearing on glass. Tighten screws uniformly.

Plate glass shall be installed in vinyl glazing beads in strict conformance with the manufacturer's recommendations.

CAULKING. Thoroughly clean all joints to be caulked. Caulk joints between all door or window frames, or both, and all frames in masonry or concrete completely with caulking compound. Caulking compound shall be of approved color and type as specified and shall be a product recommended by the manufacturers for use in contact with aluminum.

CLEANING. After glazing is completed, clean off all excess glazing compound and smears on adjacent surfaces. Glass that is cracked or broken prior to final acceptance of the completed work shall be replaced at no additional cost to the Owner.

D. PAYMENT. Payment for the work in this section will be included as part of the lump sum bid.

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9A. PAINTING

A. SCOPE. This section covers the work necessary for the painting, complete.

It is the intent that all new, interior and exterior exposed wood, concrete, and metal and submerged metal surfaces be painted, whether specifically mentioned or not, except as modified herein. Exterior horizontal concrete surfaces shall be sealed, but not painted, as specified hereinafter.

Architectural painting is specified on the Plans; equipment and appurtenances to be painted are specified herein.

Paint all exposed interior electrical conduit and mechanical pipe and tubing, both insulated and noninsulated; ductwork; and similar miscellaneous items as required for satisfactory completion of the work. Existing piping and conduit which is to be utilized in the operation of the plant shall be painted.

SURFACES NOT TO BE PAINTED. The following surfaces are not to be painted:

- Material with factory finish other than those noted
- Roofing
- Bronze
- Chromium plate
- Nickel
- Stainless steel
- Aluminum shapes
- Monel metal
- Glass
- Redwood baffles
- Items specified for galvanizing in Section FABRICATED METALWORK AND CASTINGS

B. MATERIALS.

GENERAL. All materials shall conform to the requirements hereinafter specified. The term "paint" as used herein includes all protective coatings and incidental materials as required.

Paints shall be of the highest quality, type specified, and products of manufacturers approved by the Engineer. The following are approved:

- Bryte Paint Manufacturing Company, Portland, Oregon
- W. P. Fuller Paint Company
- Koppers Company, Inc., Pittsburgh, Pennsylvania
- Sherwin-Williams Company, Cleveland, Ohio
- National Lead Company

No paints, other than those specified or approved, shall be brought on the jobsite. Oils, thinners, and driers delivered to the jobsite shall be only those approved for use by the paint manufacturer. No paint shall be

reduced, nor shall faster drying be induced by the addition of any product designed for such purposes, except as recommended by the paint manufacturer and approved by the Engineer.

PAINT DELIVERY AND STORAGE. All materials for painting shall be delivered to the jobsite in unopened containers that plainly show at the time of use, the designated name, formula, color, date of manufacture, manufacturer's directions, and name of manufacturer. Paints shall be stored in a suitable protected area. Paint material shall be kept sealed or covered when not in use.

COLOR SCHEDULE. Colors to be used for the new equipment, and interior and exterior wall and ceiling surfaces, will be selected by the Engineer. All pipe, valves, and fittings to be painted shall be color coded in accordance with the following schedule: The code color is to be used on the entire surface area of the exposed lines (rather than only color banding), plus banding at 10-foot intervals where specified.

PIPING COLOR CODE SYSTEM

<u>Description</u>	<u>Koppers Color</u>	
	<u>Solid Color</u>	<u>Bands</u>
Potable Water		
Cold Water	Dawn Blue 328	None
Wash Water	Dawn Blue 328	None
Surface Wash	Dawn Blue 328	None
Filter Effluent	Dawn Blue 328	None
High-Service Discharge Lines	Dawn Blue 328	None
Hot Water	Dawn Blue 328	Vermillion 314
Nonpotable Water		
Filter Influent	Vermillion 314	None
Waste Water		
Wash Water Drain	Light Brown 334	None
Exposed Waste and Drain Piping	Light Brown 334	None
Sanitary Sewers	Dark Brown 318	None
Chlorine Gas	Light Yellow 319	None
Chlorine Solution	Light Yellow 319	Dawn Blue 328
Filter Aid	Buff 381	None
Compressed Air		
Instrument Quality	Orange 324	Light Yellow 319

All exposed piping shall be color-coded as noted above.

Paint manufacturers' names and color numbers are listed only for exact identification of each color.

PAINT MATERIALS. Materials for painting are specified on the Plans under BUILDING PAINT APPLICATION. Substitutions will be permitted only with the Engineer's approval.

FERROUS METAL. The words "ferrous metal" shall be understood to include wrought iron, cast iron, malleable iron, and all steel except stainless steel.

ABBREVIATIONS.

MDFT = Minimum dry film thickness.

DFT = Dry film thickness.

SUBMERGED METAL. All submerged ferrous metal shall be painted as follows:

SUBMERGED METAL.

Shop Prime Coat	1 brush coat Koppers 654 Epoxy Primer or as approved; MDFT 1.5 mils.
Spot Primer	Same as above.
Finish Coat	2 or more spray coats Koppers Petropoxy, or as approved; MDFT 7 mils per coat; TOTAL DFT of complete system 15.5 mils.

Color Black.

NONSUBMERGED FERROUS METAL. Paint all nonsubmerged ferrous metal except galvanized nonpipe surfaces. Galvanized surfaces, other than pipe, in general, will not be painted except when so specified or required to provide a finished appearance in painted areas. Galvanized surfaces to be painted and all asphalt coated cast iron pipe shall be coated with a metal conditioner or sealer as specified under SPECIAL COATINGS.

NONSUBMERGED METAL.

Shop Prime Coat	1 brush coat Koppers Pug Primer, or as approved; MDFT 1.5 mils.
Spot Primer	Same as above.
Finish Coat	2 brush, roller, or spray coats Koppers Glamourtex 501 Enamel or as approved; MDFT 1.5 mils. TOTAL DFT of complete system 4.5 mils.

SPECIAL COATINGS.

SEALER FOR USE OVER COAL-TAR OR ASPHALT COATED CAST IRON PIPE.

Sealer-Primer	2 brush coats Koppers Tar-Stop or as approved; MDFT 4 mils total.
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GALVANIZED METAL CONDITIONER.

Conditioner

1 brush coat Koppers Metal
Conditioner, or as approved.

MACHINERY AND EQUIPMENT. All new mechanical equipment, except the switchgear and plant control panel, shall have all abraded surfaces cleaned and touched up and then given 1 coat of Koppers Glamourtex Enamel in color selected by the Engineer.

EXTERIOR HORIZONTAL CONCRETE. All exterior horizontal concrete surfaces shall be sealed with one brush coat of Barrier, as manufactured by Barrier Pacific Corporation.

C. WORKMANSHIP.

GENERAL. It is the intent of these Specifications that all trades employed on the jobsite will leave the surfaces of their work in such a condition that only minor cleaning, sanding, and filling is required by the painting trade.

It is the responsibility of the Contractor and the painting trade to see that all surfaces are prepared in accordance with the printed directions and recommendations of the paint manufacturer whose product is to be applied to a given surface. All surface preparation and paint application shall conform to the printed specifications and recommendations of the paint manufacturer as approved and to the highest standards of the trade.

SURFACE PREPARATION.

GENERAL. Before beginning application of any coating, the surface shall be thoroughly inspected and any defects which would cause a paint failure or result in any unsightly surface shall be brought to the attention of the Engineer in writing. If the Contractor elects to ignore an unsuitable surface condition and applies his coating(s), he will be held responsible for any resulting unsatisfactory surface finish, and will be required to refinish the work at his own expense.

Prepare surfaces for architectural painting in strict conformance with the paint manufacturer's printed directions and recommendations. Surfaces shall be dry and thoroughly cleaned of foreign materials. Defects shall be filled or removed so that the surfaces are in proper condition for painting.

Remove, mask, or otherwise protect hardware, lighting fixtures, switch-plates, aluminum surfaces, machined surfaces, nameplates on machinery, and other surfaces not intended to be painted. Provide drop cloths to prevent paint materials from falling on or marring any adjacent surfaces. Cleaning and painting shall be so programmed that dust and other contaminants from the cleaning process will not fall on wet or newly painted surfaces. Protect working parts of all mechanical and electrical equipment from damage during surface preparation and painting process.

Special preparations for painting metal surfaces to meet particular conditions are specified hereinafter.

CLEANING FERROUS METAL. All workmanship for metal surface preparation shall be in strict conformance with the following Steel Structures Painting Council Specifications:

Solvent Cleaning	SP 1
Hand Tool Cleaning	SP 2
Power Tool Cleaning (Wire Brush)	SP 3
White Metal Blast Cleaning	SP 5
Commercial Blast Cleaning (as specified in Para. 2.2 using a dry abrasive in accordance with Para. 3.1.3.1)	SP 6
Brush Off Blast Cleaning	SP 7
Near-White Blast Cleaning	SP 10

Wherever the words "solvent cleaning," "hand tool cleaning," "wire brushing," or "blast cleaning," or similar words of equal intent are used in these Specifications or in paint manufacturers' specifications, they shall be understood to refer to the applicable SSPC Specifications listed above.

Hand tool clean areas that cannot be cleaned by power tool cleaning in conformance with SSPC-SP 2. Protect all electric motors and other equipment from abrasive materials. Remove all loose materials from the cleaning operation by brush or industrial vacuum cleaner prior to the application of the primer.

Coat all power tool cleaned or blasted surfaces within 6 hours of cleaning and in no case permit the surface to begin rusting before priming.

SHOP PRIMING OF FERROUS METAL.

SUBMERGED METAL. Commercial blast clean all new submerged ferrous metal, except machined and galvanized surfaces, in conformance with SSPC-SP 6 as specified above, and the paint manufacturer's printed directions and recommendations.

Submerged metal shall be sandblasted as specified and primed in the shop before shipment, unless otherwise approved. The primer is specified under the applicable material specification. Units to be bolted together in the field shall be sandblasted, primed, and painted before being assembled.

Previously painted surfaces of existing ferrous metal do not require sandblast cleaning, except along new welding seams and at rust spots.

When field sandblasting is necessary to clean unprimed (or previously painted) ferrous metal, insofar as possible, it shall be done outside of the structure before the materials are installed.

NONSUBMERGED METAL (EXCEPT AS OTHERWISE SPECIFIED). All exterior nonsubmerged metal shall be thoroughly cleaned of all rust, scale, grease,

oil, and foreign substances by Power Tool Cleaning or Commercial Blast Cleaning as necessary to satisfactorily prepare the surfaces for painting in accordance with the manufacturer's recommendations. Units to be bolted together in the field shall be cleaned by wire brushing, primed, and painted before being assembled. Interior nonsubmerged metal shall be wire brushed to remove all loose paint, rust, and mill scale.

WELDED STEEL PIPING. Exterior surfaces of all new welded steel piping, except those buried underground, shall be given a Commercial Blast Cleaning and primed before delivery. Any pipe delivered with coal-tar remaining on exterior shall be sandblasted and reprimed before installation.

INTERIOR AND EXTERIOR WOOD. Sand smooth wood surfaces that are to be painted. Fill holes and cracks in surfaces to be painted with putty after the surface has been primed. Sand all surfaces or otherwise prepare between coats in accordance with the paint manufacturer's recommendations as approved.

MACHINERY AND EQUIPMENT. Mask nameplates and cover machined surfaces and areas not intended to be painted. Clean all surfaces with solvent and prepare in conformance with the paint manufacturer's recommendations. Clean rust spots and abraded areas. Clean all rust and dirt from abraded areas. Sand edges of existing paint around abraded areas to feather the edge so that the prime coat and finish coats will blend with existing paint and produce a smooth surface.

REPAIRS TO DAMAGED COATINGS ON MANUFACTURER'S FINISHED PANELS. Abraded areas in switchgear, main control panel, and other panels furnished with manufacturer's finish shall be prepared in strict accordance with the manufacturer's directions. Repaired areas shall be equal to original finish and shall not be visible.

APPLICATION OF PAINT. Paint manufacturers whose products are specified herein have very definite recommendations for the preparation of surfaces and application of their products and these recommendations are to be followed as specified. Manufacturer's written instructions for applying each type of paint or protective coating shall be furnished the Resident Inspector before application is begun. Apply all coatings in strict accordance with the paint manufacturer's recommendations, as approved by the Engineer. Sufficient time shall be allowed between coats to assure thorough drying of previously applied paint. All prime coats shall be applied by brush and the coating thoroughly worked into the surface.

Shop and field painting of metal surfaces shall conform to SSPC-PA 1, Shop, Field, and Maintenance Painting. Units to be bolted together in the field shall be cleaned and painted prior to assembly.

Where 2 successive coats of the same color paint are to be applied, the first coat shall be of a slightly different shade to differentiate it from the second coat. Undercoats shall be tinted to approximate final color.

Paint shall not be applied in extreme heat nor in dust- or smoke-laden air, nor in damp or humid weather. Work shall be free from runs, bridges,

shiners, laps, or other imperfections due to faulty workmanship. The Contractor shall assume all responsibility for preventing settling of dust or any other improper condition while paint is setting and to repair any damaged coats at no additional cost to the Owner.

Paint coverage per gallon shall not exceed the area recommended by the manufacturer; and the coverage shall be reduced when, in the opinion of the Engineer, a reduction is necessary to insure satisfactory protection to surfaces, uniform color and surface appearance. Where the paint manufacturer provides a dry film thickness (DFT) per coat, the thickness shall not be less than that recommended by the manufacturer or as specified herein.

Dry film thicknesses will be checked by the Owner with a magnetic thickness gauge, and edges and surfaces will be checked with an electric holiday detector. Paint films found to have holidays or to be less than the specified thickness shall be given such additional coats as are necessary to assure a continuous film of the specified thickness.

Material delivered to the job with a shop prime coat shall be touched-up as required to recoat all abraded areas prior to receiving any additional coating.

COMPATIBILITY OF NEW PAINTS WITH EXISTING COATINGS. The exact nature of the existing coatings is not known in all cases, and, while it is assumed that they have oxidized sufficiently to prevent lifting or peeling when over-coated with the paints specified, the compatibility shall be checked by application to a small area prior to starting the painting. If lifting or other problems occur, the Engineer shall be notified.

APPLICATION OF SEALER. Barrier sealer shall be applied by brush to all exterior horizontal surfaces. Remove all grease, oil, and soil from surfaces by washing with detergent or cleaner. Rinse with clear water and allow surface to thoroughly dry before applying the sealer. Apply sealer in one light coat and spread evenly across the surface. Follow manufacturer's instructions to insure a complete seal.

CLEANUP OF WORK AREA. All cloths and cotton waste that might constitute a fire hazard shall be placed in closed metal containers or destroyed at the end of each day. Upon completion of the work, all staging, scaffolding, and containers shall be removed from the site or destroyed in an approved manner. Paint spots, oil, or stains upon adjacent surfaces and floors shall be completely removed; and the entire job left clean and acceptable.

D. PAYMENT. Payment for the work in this section will be included as part of the lump sum bid.

IIA. CLEARWELL PUMPS AND DRIVING MOTORS

A. SCOPE. This section covers the work necessary for furnishing and installing high-service pumps Nos. 1 and 2 and the wash water pump, complete.

INFORMATION TO BE FURNISHED. At least 7 days prior to the bid opening, pump manufacturers quoting equipment for consideration in this project shall submit to the Engineer the information required by the data sheets at the end of this section. Data shall be submitted in duplicate. Equipment items will be selected by the Owner at the time of award of the Contract. Data sheets for the equipment selected will become a part of the Contract Documents as fully as if the same were completely set forth herein. The selection of the pumps at the time of award of the Contract shall not relieve the Contractor from responsibility for meeting the requirements of this Specification, nor shall it relieve the Contractor from responsibility of errors and/or omissions in the submitted information and data sheets. Any deviation or exception of the equipment from the requirements specified shall be indicated in writing at the time of submittal of the information.

An extra set of blank pump data sheets, perforated for removal, is bound in the front of the Documents for the bidders' easy reproduction.

DEFINITIONS.

TOTAL HEAD. Total head shall be the distance from the center line of the pump discharge flange to the water level in the suction well, plus the pressure in feet measured at the discharge flange.

EFFICIENCY. Efficiency shall be total overall efficiency for motor, pump, connecting shaft, and piping between water level and discharge flange covering the operating points given.

DIMENSIONAL DRAWINGS. Furnish dimensional drawings showing outline dimensions, column section lengths, overall sizes and weights. The drawings shall show dimensions of pump components, i.e., the motor, drive head, column section, and similar information. These dimensions shall be such as to permit the pumps to be installed in the locations shown without modification of the installation design, except that minor dimensional changes in the pump or pump support bases may be made, if necessary, to accommodate specific units.

Information submitted by pump manufacturers on the Pump Data Sheets and suitability for the installation will be used as a basis for selection of equipment.

MANUFACTURER'S REPRESENTATIVE. The pump manufacturer shall furnish the services of a qualified representative to supervise the unpacking, installation, and field testing of pump equipment. A qualified manufacturer's representative shall be one who has had at least 2 years' experience in the installation of the types of pumps specified on this job.

At completion of the pump installation, the manufacturer's representative shall issue certificates showing:

Condition of pump upon unpacking at jobsite.

That the handling of pump equipment was satisfactory to the manufacturer.

The installation is as specified and is acceptable to the manufacturer.

The warranty or guarantee is in full effect with no qualifications or reservations.

B. MATERIALS.

PUMP DESCRIPTION. The pumps shall be of the vertical turbine type conforming to AWWA E101, except as herein modified.

HIGH-SERVICE PUMP NO. 1

Capacity	1300 gpm
Total Head	350 feet at 1300 gpm; shutoff head to be 520 feet or less
Speed	1800 rpm maximum
Lubrication	Water-lubricated with accessories
Pump Shaft Material	Stainless steel
Pump Bearing Material	Bronze
Impellers	Bronze or meehanite
Bowls	Cast iron, enameled
Discharge Head	10-inch diameter
Column, Steel	10-inch minimum outside diameter, standard weight steel pipe
Suction Bell	To be provided without strainers
Total Length	To be arranged to provide for installation as shown

HIGH-SERVICE PUMP NO. 2

Capacity	2600 gpm
Total Head	410 feet at 2600 gpm; shutoff head to be 575 feet or less.

Speed	1800 rpm maximum
Lubrication	Water-lubricated with accessories
Pump Shaft Material	Stainless steel
Pump Bearing Material	Bronze
Impellers	Bronze or meehanite
Bowls	Cast iron, enameled
Discharge Head	12-inch diameter
Column, Steel	12-inch minimum outside diameter, standard weight steel pipe
Suction Bell	To be provided without strainers
Total Length	To be arranged to provide for installation as shown

WASH WATER PUMP

Capacity	5750 gpm
Total Head	42 feet at 5750 gpm
Speed	1200 rpm maximum
Lubrication	Water-lubricated with accessories
Pump Shaft Material	Stainless steel
Pump Bearing Material	Bronze
Impellers	Bronze or meehanite
Bowls	Cast iron, enameled
Discharge Head	12-inch diameter
Column, Steel	12-inch minimum outside diameter, standard weight steel pipe
Suction Bell	To be provided without strainers
Total Length	To be arranged to provide for installation as shown

PUMP CHARACTERISTICS.

WASH WATER PUMP. The curve for this pump should preferably be as steep as possible without exceeding a shutoff head of 75 feet. Efficiency

is not of primary importance, except insofar as it affects motor size. NPSH requirements shall be such as to allow pumping at full-rated capacity when clearwell water level falls as low as Elevation 76.50.

HIGH-SERVICE PUMPS. Efficiency is of first importance and it is desired that the pumps give the widest possible range of output, either singly or in combination, while maintaining high efficiencies. High-service pumps will at times be throttled by discharge valves supplied under Section LARGE AND SPECIAL VALVES. NPSH requirements shall be such as to allow pumping at full capacity when the clearwell elevation is as low as Elevation 76.50. The use of a combination of mixed-flow and vertical turbine type stages will be permitted for the high-service pumps if necessary to meet the NPSH requirements. Pump curves shall be continuously rising shutoff. No dip in the curve will be allowed.

DRIVING MOTORS. Driving motors shall be designed for starting as shown on the Plans and specified herein. Each pump with its driving motor and thrust bearing shall be an integrated unit approved by the pump manufacturer.

Type	Vertical a-c induction motor
Rating	460-volt, 3-phase, 60-cycle
Speed	To match the respective pump
Horsepower	The motor's nameplate horsepower shall not be exceeded at any head-capacity point from zero to maximum pump output.
Minimum horsepower shall be as follows:	
High-Service Pump No. 1 - 150 hp	
High-Service Pump No. 2 - 400 hp	
Wash Water Pump - 100 hp	
Enclosure	Dripproof
Insulation	Class B with moisture-resistant varnish
Temperature Rise	Maximum 60 degrees F. at full load
Service Factor	1.15
Duty Cycle	Continuous
Winding	400 hp shall be partwinding with J-box for 2 conduits. Other motors shall be standard.
Lubrication	Oil-lubricated
Shaft	Vertical hollow with nonreverse ratchet

Heater	Not required
Standard Specification	NEMA
Locked Rotor Current	Code G

THRUST BEARINGS. Thrust bearings shall be oil-bath lubricated or as recommended by the manufacturer and approved. The bearings shall be so designed that their rated life with the pumps operating at their guarantee points is not less than 8,750 hours. Rated life shall be determined in accordance with the standards of the Antifriction Bearing Manufacturer's Association.

C. WORKMANSHIP.

INSTALLATION. Install the pump in accordance with the pump manufacturer's directions and these Specifications. The pump installation shall be supervised by a manufacturer's representative and the installation approved by this representative prior to operating the pump.

Handle carefully and protect the pump and appurtenances to avoid damaging the equipment. If the pump and column are laid down, support them with blocks to prevent damage. Install pumps with the shaft plumb. Level by means of steel wedges (steel plates and steel shims). Wedge taper shall not be greater than 1/4 inch per foot. Use double wedges to provide a level bearing surface for the pump base. Secure each pair of wedges in their final positions with one tack weld on each side after leveling is complete. Accomplish wedging so that there is no change of level or springing on the foundation when the foundation bolts are tightened. Install the pumps so that connection may be made to the suction and discharge headers without any springing or otherwise forcing either the pump or the header. Carefully fit and coat all bolt threads with lubricant to facilitate future removal. After the pump has been set in position and wedged to the proper elevation, caulk the space between the bottom of the pump baseplate and the concrete foundation with a dry, tamped-in mixture of sand and cement. The mortar mixture shall consist of 1 part cement and 2 parts sand with only sufficient water to make a dry, crumbling mass. When the mixture is pressed tightly together into a ball with the hands, there should not be sufficient water in the mixture to stain the hands; and when such ball is broken, it should crumble. Tamp or rod this dry mixture solidly into the space between the machinery foundation and the concrete. A backing board or stop shall be provided at the back side of this space against which the dry mixture can be tamped. The arrangement of the column shall be straight and vertical when the installation is complete.

FIELD TEST. Prior to acceptance of the installed pump, demonstrate proper operation of the pump at the guarantee point, at which time data shall be taken on the total head, flow, and horsepower requirements of the pump. Furnish all instruments and labor as required for this procedure. The Owner will furnish electrical power for the test.

BALANCE OF VIBRATION. The rotating parts of each pump and its driving motor shall be statically and dynamically balanced before final assembly.

The complete unit, consisting of the motor and pump, connected and in normal operation, shall not develop amplitudes of vibration exceeding the recommended standards of the Hydraulics Institute.

D. PAYMENT. Payment for furnishing and installing the pumping units and appurtenances and for the service of the manufacturer's erection supervisor will be made at the prices quoted by the respective equipment manufacturer selected by the Owner. This payment shall constitute full compensation for furnishing and installing the pumps in satisfactory operating condition, complete, as specified.

(see next page)

(Perforated Pump Data Sheets are bound in front of the Fly Sheet for the Bidders' easy reproduction)

PUMP DATA SHEET NO. 1

HIGH-SERVICE PUMP NO. 1

Bidder's Name _____ Date _____

PUMP DATA

rpm
Manufacturer
Model Number
Number of Stages
Nominal Size of Bowls
Max. OD of Bowls
Overall Length Bowl Sec.
Pump Shaft Diameter
Pump Shaft Material
No. of Pump Bearings
Pump Bearing Material
Description of Pump Bearings
Pump Bowl Catalog Number
Pump Bowl Material
Pump Bowl Lining
Impeller Type (Open, Closed)
Impeller Number
Impeller Material
Type Lubrication
hp Demand at Guar. Point

COLUMN SHAFT DATA

Column Size
Type Column Couplings
Line Shaft Size
Line Shaft Insert Material
Line Shaft Coupling Material
No. Line Shaft Bearing Spacers
Line Shaft Bearing Materials
Line Shaft Bearing Description
Line Shaft Bearing Spider Material

DISCHARGE HEAD

Manufacturer
Model Number
Guide Bearing Material
Guide Bearing Lubrication
Guide Bearing Type
Weight

PUMP DATA SHEET NO. 1 (Cont'd.)
(High-Service Pump No. 1)

THRUST BEARING

Manufacturer
Manufacturer's Number
Maximum Total Thrust at Guarantee Point
Rating Life in Hours

MOTOR

Manufacturer
Model No. and Type
Nominal hp
Power Factor at Guar. Point
Weight
Overall Efficiency at Guar. Point
Heater Rating - Watts
Maximum Diameter

(Perforated Pump Data Sheets are bound in front of the Fly Sheet for the Bidders' easy reproduction)

PUMP DATA SHEET NO. 2

HIGH-SERVICE PUMP NO. 1

1300 GPM AT 350 FEET OF HEAD

Bidder's Name _____ Date _____

Discharge quantity at guar. point _____

Total head at guar. point in feet _____

Total overall efficiency at guar. point - percent _____

Power factor at guar. point _____

The following data are the actual performance characteristics of the pump proposed for installation as specified, but the quantity, head, horsepower, and efficiency at points other than the guarantee point proposed are not guaranteed.

Operating Characteristics - Pump No. 1

Quantity gpm	Total Head Feet	hp Demand by Pump	Overall Efficiency - % (Wire to Water)
0 (shutoff)			
300			
600			
900			
1100			
1300 (guarantee)			
1500			
1800			

PUMP DATA SHEET NO. 1

HIGH-SERVICE PUMP NO. 2

Bidder's Name _____ Date _____

PUMP DATA

rpm
Manufacturer
Model Number
Number of Stages
Nominal Size of Bowls
Max. OD of Bowls
Overall Length Bowl Sec.
Pump Shaft Diameter
Pump Shaft Material
No. of Pump Bearings
Pump Bearing Material
Description of Pump Bearings
Pump Bowl Catalog Number
Pump Bowl Material
Pump Bowl Lining
Impeller Type (Open, Closed)
Impeller Number
Impeller Material
Type Lubrication
hp Demand at Guar. Point

COLUMN SHAFT DATA

Column Size
Type Column Couplings
Line Shaft Size
Line Shaft Insert Material
Line Shaft Coupling Material
No. Line Shaft Bearing Spacers
Line Shaft Bearing Materials
Line Shaft Bearing Description
Line Shaft Bearing Spider Material

DISCHARGE HEAD

Manufacturer
Model Number
Guide Bearing Material
Guide Bearing Lubrication
Guide Bearing Type
Weight

PUMP DATA SHEET NO. 1 (Cont'd.)
(High-Service Pump No. 2)

THRUST BEARING

Manufacturer

Manufacturer's Number

Maximum Total Thrust at Guarantee Point

Rating Life in Hours

MOTOR

Manufacturer

Model No. and Type

Nominal hp

Power Factor at Guar. Point

Weight

Overall Efficiency at Guar. Point

Heater Rating - Watts

Maximum Diameter

(Perforated Pump Data Sheets are bound in front of the Fly Sheet for the Bidders' easy reproduction)

PUMP DATA SHEET NO. 2

HIGH-SERVICE PUMP NO. 2

2600 GPM AT 410 FEET OF HEAD

Bidder's Name _____ Date _____

Discharge quantity at guar. point _____

Total head at guar. point in feet _____

Total overall efficiency at guar. point - percent _____

Power factor at guar. point _____

The following data are the actual performance characteristics of the pump proposed for installation as specified, but the quantity, head, horsepower, and efficiency at points other than the guarantee point proposed are not guaranteed.

Operating Characteristics - Pump No. 2

Quantity gpm	Total Head Feet	hp Demand by Pump	Overall Efficiency - % (Wire to Water)
0 (shutoff)			
600			
1200			
1800			
2200			
2600 (guarantee)			
3000			
3600			

(Perforated Pump Data Sheets are bound in front of the Fly Sheet for the Bidders' easy reproduction)

PUMP DATA SHEET NO. 1

WASH. WATER PUMP

Bidder's Name _____ Date _____

PUMP DATA

rpm
Manufacturer
Model Number
Number of Stages
Nominal Size of Bowls
Max. OD of Bowls
Overall Length Bowl Sec.
Pump Shaft Diameter
Pump Shaft Material
No. of Pump Bearings
Pump Bearing Material
Description of Pump Bearings
Pump Bowl Catalog Number
Pump Bowl Material
Pump Bowl Lining
Impeller Type (Open, Closed)
Impeller Number
Impeller Material
Type Lubrication
hp Demand at Guar. Point

COLUMN SHAFT DATA

Column Size
Type Column Couplings
Line Shaft Size
Line Shaft Insert Material
Line Shaft Coupling Material
No. Line Shaft Bearing Spacers
Line Shaft Bearing Materials
Line Shaft Bearing Description
Line Shaft Bearing Spider Material

DISCHARGE HEAD

Manufacturer
Model Number
Guide Bearing Material
Guide Bearing Lubrication
Guide Bearing Type
Weight

PUMP DATA SHEET NO. 1 (Cont'd.)
(Wash Water Pump)

THRUST BEARING

Manufacturer
Manufacturer's Number
Maximum Total Thrust at Guarantee Point
Rating Life in Hours

MOTOR

Manufacturer
Model No. and Type
Nominal hp
Power Factor at Guar. Point
Weight
Overall Efficiency at Guar. Point
Heater Rating - Watts
Maximum Diameter

(Perforated Pump Data Sheets are bound in front of the Fly Sheet for the Bidders' easy reproduction)

PUMP DATA SHEET NO. 2

WASH WATER PUMP

5750 GPM AT 42 FEET OF HEAD

Bidder's Name _____ Date _____

Discharge quantity at guar. point _____

Total head at guar. point in feet _____

Total overall efficiency at guar. point - percent _____

Power factor at guar. point _____

The following data are the actual performance characteristics of the pump proposed for installation as specified, but the quantity, head, horsepower, and efficiency at points other than the guarantee point proposed are not guaranteed.

Operating Characteristics - Wash Water Pump

Quantity gpm	Total Head Feet	hp Demand by Pump	Overall Efficiency - % (Wire to Water)
0 (shutoff)			
1500			
3000			
4000			
5000			
5750 (guarantee)			
6000			
7000			

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IIB. FILTER UNDERDRAIN SYSTEM

A. SCOPE. This section covers the work necessary for complete filter underdrain system for two filters.

APPROVAL TO BID. The filters are designed to utilize clay underdrain tiles as manufactured by F. B. Leopold Company, Inc. All other manufacturers will require specific approval at least 10 days prior to bid opening. Submittal information shall include all required structural modifications necessary to incorporate underdrains to the filter design as shown.

B. MATERIALS.

GENERAL. The filter underdrains are to be the Leopold type made of a system of compound duplex filter bottom tiles as manufactured by the F. B. Leopold Company, Inc., Zelionople, Pennsylvania. Construct in accordance with the Plans.

FILTER TILES. Tiles shall be vitrified glazed fire clay. Each tile block shall be 10 inches high, 11 inches wide, with a maximum length of 30 inches. It shall consist of feeder laterals, each having cross-sectional areas not less than 30 square inches, distribution laterals directly above the feeder laterals, and connected by 5/8-inch orifices and 5/32-inch dispersion orifices on top of the distribution laterals. It shall be so arranged that each square foot of filter area shall be serviced with 2 distribution orifices and approximately 45 dispersion orifices. The blocks shall be manufactured in a first-class manner, having uniform and smooth surfaces with all orifices in accurate sizes. Blocks with warped surfaces or uneven orifices or blocks cracked, chipped, spalled, or otherwise in any way damaged, will be rejected by the Engineer.

GROUT. Grout for installation of the filter tiles shall be as specified under Section CONCRETE.

ANCHOR RODS. Anchor rods shall be as detailed, accurately bent of 1/2-inch diameter carbon steel.

ACCESS MANHOLES. Not required. Access will be provided through a blind flange on each 24-inch effluent line.

C. WORKMANSHIP. The Leopold type underdrain system shall be installed in strict accordance with the manufacturer's recommendations. Tiles shall be set level over the entire bottom in fresh grout. Gaskets shall be included by the manufacturer and installed at the end of each row of tiles. After all the tiles have been set and carefully aligned, all space between the rows and ends of the tiles and walls shall be filled with grout. The filter underdrain system shall be allowed to set for a minimum of 3 days before the filter media is placed. All orifices shall be carefully cleaned of grout and other debris, and the distribution channels in the block shall be cleaned. The entire installation shall be supervised by a manufacturer's representative.

Following the installation of the blocks and prior to the placing of filter media, a backwash test shall be performed on the completed system.

A wash rate of 20 gpm per square foot shall be applied to the system and any leak through the joints and deficits in the uniformity of distribution or structural stability shall be corrected.

D. PAYMENT. Payment for furnishing and installing the filter underdrain system, complete, will be the amount stated in the Contractor's Proposal for the particular type of underdrain system selected by the Owner. Payment shall include costs of structural changes to incorporate underdrain systems other than Leopold into the structure. Revised structural drawings for an alternate underdrain system, if selected by the Owner, will be furnished to the Contractor by the Engineer as a part of the Contract Documents, without the necessity of Change Order.

IIC. FILTER AGITATORS

A. SCOPE. This section covers the work necessary for the filter bed agitators, complete.

B. MATERIALS. Each of the 2 filter beds shall be equipped with four 7'-6" diameter filter agitators (or rotary surface washers). The filter bed agitators shall be self-propelling, revolving, S-type, Model 58, as manufactured by the Palmer Filter Equipment Company of Erie, Pennsylvania, or as approved. The units shall consist of a central bearing of all-bronze construction, a bronze tee having a nozzle affixed to emit a stream directly below and from the center of this tee, and arms extending laterally from the tee.

Arms shall be constructed of a straight section extending in opposite directions from the central tee, terminating in a curved or straight-end section at each end. Pipe sections shall be of red brass pipe, with bronze or brass nozzles located at double-angled positions on straight pipe in such a manner as to most effectively cover the area of the filter to be cleaned by each unit.

Curved or straight-end sections shall be equipped with bronze nozzles. End nozzles on the end section of the arm shall be sized by the manufacturer for most efficient operation. All nozzles shall be equipped with synthetic rubber caps slitted to act as check valves to exclude filter media from the washer arms (Stuart Flex-I-Jet, or equal).

C. WORKMANSHIP. The filter bed agitators shall be installed in strict accordance with the manufacturer's recommendations, at the locations and in the manner shown on the Plans. The agitators shall not be installed until the filter media has been placed, including skimming of fine material therefrom. Care shall be taken during installation to prevent foreign material from entering the units and plugging the nozzles.

The interior of the pipe arms shall be cleaned of any metal shavings or burrs before installation. They shall be installed in such a manner that they shall run in a truly horizontal plane, and the supporting piping shall be so supported that the units shall operate without vibration or wobble at their maximum rated capacity.

Care shall be taken not to drive the rotary surface washers at excessive speed during the testing period when the beds are not filled with water.

D. PAYMENT. Payment for the work in this section will be included as part of the lump sum bid.

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IID. FILTER MEDIA

A. SCOPE. This section covers the work necessary to provide and install filter media, complete, for two filters.

B. MATERIALS.

GRAVEL. Gravel shall consist of hard, rounded stones with an average specific gravity of not less than 2.5. Not more than one percent by weight of the material shall have a specific gravity of 2.25 or less. The gravel shall contain not more than 2 percent by weight of thin, flat, or elongated pieces (pieces in which the largest dimension exceeds 3 times the smallest dimension), as determined by hand picking, and shall be free from shale, mica, clay, sand, loam, and organic impurities of any kind. The porosity of the gravel in any layer shall be not less than 35 percent nor more than 45 percent.

The gravel shall be screened to proper size and placed in filters in layers as specified below. The gravel within each layer shall be uniformly graded. Gravel over 1/4 inch in diameter may be screened through wire screens with square openings or plates with round openings. Wire screens shall be used for sizes smaller than 1/4 inch. Not more than 8 percent of the weight of any layer shall be finer or coarser than the limit specified for that layer.

GRAVEL SIZE AND LAYER THICKNESS

<u>Gravel Layer</u>	<u>Layer Thickness-Inches</u>	<u>Size Limits-Inches</u>
Bottom	As required to cover the underdrain system	1 to 1-1/4
Second	3	5/8 to 1
Third	3	3/8 to 5/8
Fourth	3	3/16 to 3/8
Top Layer	3	No. 10 to 3/16

SPECIAL HIGH-DENSITY GRAVEL. The special high-density gravel (garnet) shall be similar and equal to that specially developed and supplied for water filters by the Neptune MicroFLOC Corporation, 1965 Airport Road, Corvallis, Oregon. The specific gravity of the material shall be not less than 4.2. The thickness of the special gravel layer shall be not less than 3 inches.

FINE MEDIA. Fine media shall be that specially developed and supplied for water filters by the Neptune MicroFLOC Corporation. The 4 beds shall contain a 30-inch total depth of fine media made up of 18 inches of anthracite coal, specific gravity 1.55; 9 inches of silica sand, specific gravity 2.6; and 3 inches of garnet sand, specific gravity 4.2. The relative size of the particles shall be such that hydraulic grading of the material during backwash will result in a filter bed graded progressively from coarse to fine in the direction of filtration (downward). The type and gradation of all fine media shall be approved by the Engineer prior to loading and shipment. Anthracite coal filter media shall be clean and free from long, thin, or scaly pieces, and shall have a hardness of 3.0 to 3.55 on the Moh scale and a specific gravity of not less than 1.55.

C. WORKMANSHIP.

GRAVEL. The filter tanks shall be thoroughly cleaned before any gravel is placed and shall be kept clean throughout the placing operation. Gravel made dirty in any way shall be removed and replaced with clean gravel.

The bottom layer shall be placed carefully by hand to avoid movement of the underdrain system and to assure free passage for water from the orifices.

Each gravel layer shall be completed before the next layer above is started. For materials less than 1/2 inch in diameter, the workmen shall not stand or walk directly upon the gravel, but shall walk upon boards which will sustain the weight of the workmen without displacing the gravel. Any gravel becoming mixed shall be removed and replaced in layers as herein specified.

The correct thickness of each layer shall be obtained as follows. Before the gravel is placed, the top of each layer shall be marked on the side of the filter. The top of each layer shall then be leveled against a water surface held at the appropriate mark. None of the particles shall be less than half submerged, and there shall be no places where additional gravel can be placed without the particles extending more than 1/2 their volume above the water surface.

SPECIAL HIGH-DENSITY GRAVEL. The special gravel shall be placed so as not to disturb the top layer of coarse gravel and shall be finished off level, smooth, and to the proper elevation. It shall be kept clean and free of dirt or other foreign material during placement.

FINE MEDIA. Media shall be transported and placed carefully to prevent contamination of any sort; and media made dirty before or after placement shall be replaced with clean media.

The fine media shall be placed in the bed as follows. The silica sand shall be placed first and leveled; then the garnet sand shall be placed and leveled. The bed shall then be backwashed 3 times to hydraulically invert the silica and garnet sands, and 1/2 inch of the surface fines shall be removed by scraping after each backwash. Finally the coal shall be placed and finished off smooth to the proper elevation. The bed shall again be backwashed twice and 1/2 inch of the surface fines removed by scraping after each backwash.

Final depth of the fine media shall be 30 inches.

STERILIZATION. After installation of the media is completed, it shall be sterilized in accordance with the requirements of Section STERILIZATION.

D. PAYMENT. Payment for the work in this section will be included as part of the lump sum bid.

11E. CHLORINE FEED EQUIPMENT

A. SCOPE. This section covers the work necessary for the chlorine feed equipment, complete.

At least 7 days prior to bid opening, manufacturers quoting equipment for consideration in this project shall submit to the Engineer complete details, catalog cuts, and supporting data for the equipment proposed.

B. MATERIALS.

CHLORINATORS. The 2 chlorinators shall be Wallace & Tiernan, Series V-800, 400-pound module, V-notch chlorinators, or as approved. The chlorinators shall be furnished with suitable rotameters and orifices so that one of them will have capacity of 7.5 to 150 pounds per day for pre-chlorination and the other 3.75 to 75 pounds per day for post-chlorination. Each of the 2 chlorinators is to be equipped for manual dosage adjustment and automatic pacing control by 0 - 10K ohm potentiometric signals from the plant influent flow recorder to a controller and a V-notched positioner located in each chlorinator. Three-way solenoid pilot valves shall be provided to control the diaphragm actuator of the injectors. Provide terminals to operate indicating lights on the plant control panel in the Control Room. The chlorine solution will be discharged against a maximum back pressure of 15 psi.

A 2-stream-in, 2-stream-out, nonproportioning chlorine solution manifold, which is the manufacturer's standard and similar to that shown on the Plans, shall be provided. Chlorine solution piping from the manifold to the application points shall be furnished and installed under Section PLUMBING AND MISCELLANEOUS PIPING SYSTEMS. Sufficient PVC chlorine solution pipe shall be provided to connect the feeders to the chlorine solution manifold.

Provide a 3/4-inch manifold solution distributor with 2 rotameters, similar to Wallace & Tiernan 140.046. Manifold shall be complete with valves, mounting plate, and 3/4-inch rotameters with maximum capacity of 7.70 gpm each.

Both chlorinators shall be equipped with chlorine gas orifice to allow future recording of chlorine flow. Provide sensing device and contact for remote alarm of low chlorine pressure.

Chlorine gas control equipment, including chlorine gas valves; chlorine gas pressure regulating valve with bypass; pressure gauge with diaphragm; flexible gas connections; chlorine gas strainers; and ammonia type unions shall be provided as shown on the Plans. The gas piping from the ton cylinder manifold to the feeders shall be as specified under Section PLUMBING AND MISCELLANEOUS PIPING SYSTEMS.

C. WORKMANSHIP. All equipment shall be installed in strict accordance with the manufacturer's recommendations and as shown on the Plans.

CHLORINATORS. All chlorination equipment shall be installed in accordance with the manufacturer's instructions, the details of the Plans, and these Special Specifications. The installation, when complete, shall be inspected and approved by a qualified representative of the equipment manufacturer.

Interconnecting control cable between the chlorinators and their controllers shall be supplied by the equipment manufacturer for installation under Section ELECTRICAL.

D. PAYMENT. Payment for furnishing and installing, in complete operating condition, 2 chlorinators and appurtenances as specified will be made in the amount stated in the Contractor's Proposal for the particular equipment selected by the Owner.

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IIF. LABORATORY EQUIPMENT

A. SCOPE. This section covers providing the laboratory equipment, complete.

B. MATERIALS.

ION EXCHANGE TYPE DEMINERALIZER. Ion exchange type demineralizer shall be capable of producing water with a total dissolved mineral content of less than 0.5 ppm and a flow capacity of 5 gph or greater, with an exchange capacity of 500 grains as CaCO_3 , and it shall be provided with a mounting bracket for attachment to laboratory wall. It shall be an Illicoway, Research Model, Ion Xchanger, manufactured by the Illinois Water Treatment Company, Rockford, Illinois, or as approved.

RESIDUAL CHLORINE AND pH COMPARATOR. This instrument shall be similar and equal to Wallace & Tiernan Type U-2374 for colorimetrically measuring residual chlorine using the orthotolidine method and pH values using appropriate reagent chemicals. The comparator shall be supplied complete with 4 sample tubes, 3 reagent bottles with graduated droppers, 3 permanent glass standard color discs, carrying case, and not less than 8 ounces of each of the 3 reagent solutions required. Discs and reagents to be furnished as follows:

<u>Test</u>	<u>Disc Color Standards</u>	<u>Reagent</u>
Residual Chlorine, ppm	0.1, 0.15, 0.2, 0.35, 0.5, 0.75, 1.0, 1.4, & 2.0	acid orthotolidine
pH Value	6.0 to 7.6 in increments of 0.2	Bromthymol blue
pH Value	6.8 to 8.4 in increments of 0.2	Phenol Red-D

COLORIMETRIC ANALYZER. This instrument shall be Hach Direct Reading Colorimeter DR-EL. It shall be complete and ready for use with long-life battery included. Analyzer shall be capable of analyzing for iron, alkalinity, chlorine, hardness, manganese, dissolved oxygen, pH, and turbidity.

GLASSWARE, REAGENTS, AND MISCELLANEOUS LABORATORY EQUIPMENT AND SUPPLIES.

<u>Equipment</u>	<u>Quantity</u>	<u>Scientific Supply Co. Catalog No. or Equal</u>
Beakers, pyrex 250 ml	3	13912
Beakers, pyrex 400 ml	3	13912
Bottles, 5 gal.	2	16141
Cylinders, graduated 100 ml	2	24707
Cylinders, graduated 250 ml	2	24707
Methyl orange indicator	50 gm	-
Phenolphthalein indicator	10 gm	-

C. WORKMANSHIP. All laboratory equipment shall be shipped, handled, and installed without damage of any kind. All equipment shall be placed in operation and adjusted in a manner satisfactory to the Engineer.

D. PAYMENT. Payment for the work in this section will be included as part of the lump sum bid.

Sp. Specs. IIF - 2

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11G. FILTER AID FEEDING EQUIPMENT

A. SCOPE. This section covers the work necessary for furnishing and installing the filter aid feeding equipment, complete.

B. MATERIALS.

GENERAL. This section includes, but is not limited to, furnishing and installing a mix and feed tank assembly and 2 solution feed pumps for the mixing and feeding of filter aid chemical.

MIX AND FEED TANK ASSEMBLY. The mix and feed tank assembly shall be similar to the Series VR-25 as manufactured by Neptune MicroFLOC Corporation, 1965 Airport Road, Corvallis, Oregon. The assembly shall consist of a mix tank of 250-gallon capacity and a feed tank of 250-gallon capacity, and suitable supporting structures. The tanks shall be fabricated of 1/4-inch steel plate and properly braced. All metal shall receive 2 coats of epoxy paint after surface preparation which is to be in strict accordance with the paint manufacturer's instructions.

The tanks and supporting structures shall be field assembled, and the dimensions of the tanks shall be adjusted so that the fabricated tank with various fitted pipe connections can pass through an existing door with clear width of 6 feet. Field assembling shall be limited to bolting only.

Field welding will not be permitted.

Accessories to the assembly shall include a stainless steel disperser with mounting bracket, a motor-driven portable mixer with mounting bracket, a mixer-timer panel suitable for wall mounting, and all piping appurtenances between the 2 tanks as shown on the Plans.

FILTER AID FEED PUMPS. The 2 filter aid solution feed pumps shall be chemical proportioning pumps of the positive displacement diaphragm type and shall be Milroyal diaphragm controlled volume pumps, or as approved. All components of the liquid ends shall be constructed of materials which are unaffected by constant immersion in polyelectrolyte solutions. The pumps shall be equipped with pressure relief valves as protection against accidental operation against a closed discharge valve. The pumps shall be capable of operating under minimum suction head of minus 5 feet and produce a minimum discharge head of 100 psi.

Each pump shall have a feed range of 4 to 40 gph when feeding polyelectrolyte solution at 0.5 percent concentration, and shall be equipped with a 1/2 hp, 460-volt, 3-phase, 60-cycle, totally-enclosed motor drive.

The pumps shall be furnished with local manual stroke adjustment which can be operated when the pumps are in operation, and shall be mRoy FR 161-72 or as approved.

Hot and cold water service to the equipment, solution discharge, and feeding piping and drain piping shall be provided as specified under Section PLUMBING AND MISCELLANEOUS PIPING SYSTEMS.

Electric power supply shall be as specified in Section ELECTRICAL.

C. WORKMANSHIP. All equipment shall be installed in strict accordance with the manufacturer's recommendations and as shown on the Plans.

GUARANTEE. The equipment shall be fully guaranteed against faulty materials and workmanship for a period of one year from the date of final payment.

D. PAYMENT. Payment for the work in this section will be included as part of the lump sum bid.

Sp. Specs. IIG - 2

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13A. STERILIZATION

A. SCOPE. This section covers the work necessary to sterilize all facilities designed to hold or transport filtered water, both newly constructed and modified under this project, including, but not limited to, the new clearwell, filters, filter media, the new high service pump discharge line and header, the new and existing plant effluent, and the wash water and filter effluent piping system, complete.

B. MATERIALS. The sterilization shall be accomplished by the use of chlorine solutions prepared from chlorine gas, sodium hypochlorite, or calcium hypochlorite.

C. WORKMANSHIP. The filter media, underdrains, filter effluent conduit and piping, all pipelines carrying treated water, and the clearwell reservoir shall be sterilized by contact with a 50 parts per million chlorine solution for a period of not less than 24 hours. For the clearwell reservoir and channels (only), an alternate method is described below.

The Owner will furnish water for the required washing and filling; the Contractor shall furnish all chemicals, labor, and other equipment such as pumps, hose, and fittings. All surfaces shall be washed and sterilized even though there is no visible evidence of necessity therefor. Sterilization shall be in accordance with the disinfection procedure described in AWWA C601, AWWA D102, and in accordance with the standards of the Oregon State Board of Health.

CLEARWELL RESERVOIRS AND CHANNELS. Prior to sterilization, the clearwell and filter effluent channel shall be scrubbed clean using fire hoses or other tools required for the removal of all foreign material. The scrub water shall be pumped or drained from the clearwells and channel before sterilization. The structures are to be filled completely with water containing not less than 50 parts per million of chlorine and allowed to stand full for 24 hours. The chlorine solution may then be drained or pumped to waste, and the structure is ready for use.

An acceptable alternate method of disinfecting the clearwell consists of scrubbing the walls and floor with a solution containing at least 200 parts per million of chlorine, rinsing the walls and floor with a stream of water, and wasting the rinse water. The clearwell should then be filled with water containing at least 2 parts per million of chlorine; and, if after 24 hours contact, one part per million of chlorine remains, the clearwells are ready for use.

PIPELINES. The procedure to be followed in sterilizing the pipelines shall be as follows, except as otherwise approved:

Flush thoroughly with water.

Release trapped air at high points.

Connect pump or chlorinator through a corporation cock at the inlet end of the line to be treated.

Prepare a chlorine solution of the desired concentration.

Start the flow into the line at the desired rate.

Adjust pump or chlorinator to inject the required dosage.

After the chlorine solution has reached all sections of the line, allow the chlorinated water to stand in the line under pressure for 24 hours.

Check the chlorine concentration at the end of 24 hours and flush lines until the heavily chlorinated water is removed.

D. PAYMENT. Payment for the work in this section will be included as part of the lump sum bid.

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13B. OPERATIONAL TEST

A. SCOPE. This section covers the work necessary for testing all plant components under operating conditions prior to placing them in service. The Owner will provide chemicals, power, and water for these tests.

B. MATERIALS. The Contractor shall provide all facilities necessary for the operational testing of all equipment furnished and installed, and for testing of the filters.

C. WORKMANSHIP. After completion of the work as shown on the Plans and as specified, all facilities shall be tested under operating conditions by passing water through them or otherwise testing them to the satisfaction of the Engineer. The time for the operational test shall be selected by the Engineer, and the test shall be for such period of time as is necessary to adjust all operating equipment and to assure that the filters operate in a satisfactory manner.

D. PAYMENT. Payment for the work in this section will be included as part of the lump sum bid.

Sp. Specs. 13B - 1

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14A. ELECTRIC HOIST AND CHLORINE SCALE

A. SCOPE. This section covers the work necessary for furnishing and installing one electric hoist and chlorine scale for the chlorine storage room, complete.

B. MATERIALS.

ELECTRIC HOIST. The hoist shall be 2-ton electric cable hoist with plain trolley and built-in overload cutoff device for straight track close head room service. The safety hook shall have a vertical travel of 14 feet. At its high position, the hook shall be not more than 18 inches below the bottom of the monorail flange which supports the trolley. The hoist shall be similar and equal to the Wright Speedway electric hoist, Model No. WHISR4P. The hoist lift speed shall be 20 feet per minute. Current shall be supplied to the hoist motors by means of flexible enclosed conductors; a tag line system suitable for a horizontal hoist travel of 25 feet shall be provided. It shall play out and take up the flexible conductors without twisting or tangling. The cords shall clear the chlorine storage area floor by 6-1/2 feet at the lowest point of sag where the bottom of monorail beam is 10'-3" above the floor.

Trolley wheels shall be equipped with ball or tapered roller bearings. The hoist shall be equipped with a single-speed, 460-volt, 3-phase, 60-cycle, a-c motor of not less than 3 hp capacity and a 460/120-volt transformer for control circuits.

The hoist shall be furnished complete with suitable controller, control station suspended from the hoist, terminal box, and all other accessories necessary for a satisfactory operating installation.

Drawings showing complete schematic control and connection diagrams shall be furnished for approval. Equipment shall conform to all applicable NEMA, AIEE, and NEC standards.

CHLORINE SCALE. Equipment shall consist of a fabricated steel frame to support 2 one-ton chlorine cylinders (gross weight of each cylinder is approximately 4,000 pounds), a load cell at the center of the scale frame, hydraulic hose, and a weight dial. The steel frame shall be fabricated from channels and other structural shapes, and shall have hinges, heavy-duty bushed bearing trunnions to allow easy cylinder rotation, and leveling screws or devices to level the scale on the sloped floor. Secure frame to floor with flush shells. The frame shall be galvanized or epoxy coated. The load cell shall be secured to the floor at the center of the scale frame, and shall support 1/2 the weight of each chlorine cylinder. Hinges on the frame shall support the other 1/2 of the cylinder weights. Submit shop drawings for approval for the scale frame.

The load cell, hydraulic hose, and weight dial shall be manufactured by Martin-Decker, or as approved. The load cell shall be stainless steel. Dial diameter shall be 6 inches and read 0 to 8,000 pounds with provision for tare adjustment. The scale dial shall be calibrated to read directly in pounds placed on the cylinder cradles.

C. WORKMANSHIP.

GENERAL. All equipment shall be installed in accordance with the manufacturer's recommendations, and placed in operation and adjusted to the satisfaction of the Engineer.

ELECTRIC HOIST. The trolley shall fit to a monorail built of 8-inch I-beam. The top surfaces of the beam flanges that support the trolley wheels shall be ground smooth to eliminate excessive rolling friction. Suitable stops shall be provided at each end of travel.

D. PAYMENT. Payment for the work in this section will be included as part of the lump sum bid.

Sp. Specs. 14A - 2

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15A. CAST AND DUCTILE IRON PIPE AND FITTINGS

A. SCOPE. This section covers the work necessary for furnishing and installing the cast and ductile iron pipe and fittings, complete.

B. MATERIALS.

GENERAL. All pipe and fittings shall be furnished with the type of ends required for the type of connections shown on the Plans. Where the pipe joint is not specified or indicated on the Plans, the Contractor may exercise his own option.

CAST IRON PIPE. Cast iron pipe shall conform to AWWA C106. Pipe shall be thickness Class 22 and shall be cement-mortar lined.

DUCTILE IRON PIPE. Shall conform to AWWA C151. Pipe shall be thickness Class 1 and shall be cement-mortar lined.

CAST IRON FITTINGS. Cast iron fittings shall conform to AWWA C110. Fittings shall be cement-mortar lined and shall have 150 psi pressure rating.

CEMENT-MORTAR LINING. Cement-mortar lining of pipe and fittings shall conform to AWWA C104.

FLANGED JOINTS. Shall conform to ASA B16.1, Class 125. Flanges shall be faced and drilled 125-pound ASA. Gaskets for flanged joints shall be cloth-inserted sheet rubber conforming to AWWA C207, Section 7, gaskets. The gaskets shall be 1/8-inch thick and shall be full-cut with holes to pass bolts. Gasket material shall be free from corrosive alkali or acid ingredients. All bolts and nuts for flanged joints shall be galvanized.

Fabricated flanged fittings using screwed-on flanges shall be shop fabricated. The wall thickness at the root of the threads shall not be less than the wall thickness of the adjacent pipe.

MECHANICAL JOINTS. Shall conform to AWWA C111.

IMPORTED GRANULAR MATERIAL FOR PIPE BASE AND PIPE ZONE. Use clean pea gravel or crushed rock with a maximum size of 3/4 inch, uniformly graded. Clean beach, pit-run, or reject crusher-run sand may be substituted for gravel in trenches with no groundwater in the pipe zone. Submit samples to the Engineer for approval, if requested.

CONCRETE. Concrete mix used for thrust blocking and floor supports shall not be leaner than 1 part cement, 2-1/2 parts sand, 5 parts coarse aggregate, and shall develop a minimum strength of 2,500 psi at 28 days in accordance with ASTM C 39.

C. WORKMANSHIP.

PREPARATION OF TRENCH.

IMPORTED GRANULAR BASE. Imported granular base is provided under Section EXCAVATION, FILL, BACKFILL, AND RIPRAP. Grade the top of the base ahead of pipe laying for the full width of the trench. Base shall provide a firm, unyielding support along entire pipe length.

BELL (JOINT) HOLES. At the location of each joint, dig bell (joint) holes of ample dimensions in the bottom of the trench and at the sides where necessary to permit the joint to be made properly and to permit easy visual inspection of the entire joint.

REMOVAL OF WATER. Provide and maintain ample means and devices at all times to remove and dispose of all water entering the trench excavation during the process of pipe laying.

LAYING.

PIPE PREPARATION AND HANDLING. Inspect all pipe and fittings prior to lowering into trench to assure no cracked, broken, or otherwise defective materials are being used. Clean ends of pipe thoroughly. Remove foreign matter and dirt from inside of pipe and keep clean during and after laying.

Use proper implements, tools, and facilities for the safe and proper protection of the work. Lower pipe into the trench in such a manner as to avoid any physical damage to the pipe. Remove all damaged pipe from the jobsite. Do not drop or dump pipe into trenches under any circumstances.

Cast iron pipe shall be cut where required and ends dressed all in strict accordance with the pipe manufacturer's recommendations.

LAYING AND JOINTING PIPE AND FITTINGS. After a section of pipe has been lowered into the prepared trench, clean the end of the pipe to be joined and the inside of the joint immediately before joining the pipe. Make assembly of the joint in accordance with the recommendations of the manufacturer. Provide all special tools and appliances required for the jointing assembly. Ends of the pipe shall be cleaned with a brush, washed, and thoroughly scrubbed where necessary to remove dirt or foreign material.

After the joint has been made, check pipe for alignment and grade. The trench bottom shall form a continuous and uniform bearing support for the pipe at every point between joints. Apply sufficient pressure in making the joint to assure that the joint is "home", as defined in the standard installation instructions provided by the pipe manufacturer. To assure proper pipe alignment and joint make-up, place sufficient pipe zone material to secure the pipe from movement before the next joint is installed.

Take the necessary precautions required to prevent excavated or other foreign material from entering the pipe during the laying operation. At all times, when laying operations are not in progress, at the close of the day's work, or whenever the workmen are absent from the job, close and block the open end of the last laid section of pipe to prevent entry of foreign material or creep of the gasketed joints.

Take all precautions necessary to prevent the "uplift" or floating of the line prior to the completion of the backfilling operation.

CUTTING PIPE.

GENERAL. Cut pipe for inserting valves, fittings, or closure pieces in a neat and workmanlike manner without damaging the pipe or lining and so as to leave a smooth end at right angles to the axis of the pipe.

CAST IRON PIPE. Cut pipe with milling-type cutter, rolling pipe cutter, or with sledge and cold cutter. Do not flame cut.

DUCTILE IRON PIPE. Cut pipe with milling-type cutter or saw. Do not flame cut.

DRESSING CUT ENDS. Dress cut end of mechanical joint pipe to remove sharp edges or projections which may damage the rubber gasket. Dress cut ends of push-on joint pipe by beveling, as recommended by the manufacturer.

ALIGNMENT. For pipelines intended to be straight, do not deviate from the straight line at any joint in excess of one inch.

UNSUITABLE CONDITIONS FOR LAYING PIPE. Do not lay pipe in water or when, in the opinion of the Engineer, trench conditions are unsuitable.

JOINTING MECHANICAL JOINT PIPE. Mechanical joint pipe varies slightly with different manufacturers. Install the particular pipe furnished in accordance with the manufacturer's recommendations as approved by the Engineer. In general, the procedure shall be as hereinafter specified. Clean the ends of the pipe of all dirt, mud, and foreign matter by washing with water and scrubbing with a wire brush, after which slip the gland and gasket on the plain end. If necessary, lubricate the pipe end with soapy water to facilitate sliding the gasket in place. Then guide the end of the pipe into the bell of the pipe previously laid. Locate the spigot centrally in the bell, place the gasket in position, and insert the bolts in the holes.

Torque ranges to be applied to bolts and wrench lengths which should produce the required torque when applied by the average man should be as follows:

<u>Diameter of Bolt - In.</u>	<u>Torque Range Ft. - Lbs.</u>	<u>Wrench Length - In.</u>
5/8	40 - 60	8
3/4	60 - 90	10
1	70 - 100	12
1-1/4	90 - 120	14

JOINTING FLANGED JOINTS. Join flanged joints in strict accordance with the manufacturer's recommendation, including torque to be applied to bolts. Tighten all bolts a little at a time until recommended torque is reached on all bolts.

WALL CASTINGS AND EMBEDMENT. Wall castings shall be used where pipes pass through concrete as shown on the Plans. Wall castings shall be installed in accordance with the details shown on the Plans and as specified in Section CONCRETE. All wall castings shall be set with care so that the alignment is correct.

ANCHORAGE.

THRUST BLOCKING. Provide reaction or thrust blocking as shown. The concrete mix shall not be leaner than 1 cement, 2-1/2 sand, 5 stone, and

shall have a compressive strength of not less than 2,000 pounds per square inch. Place blocking between the undisturbed ground and the fitting to be anchored. The quantity of concrete and the area of bearing on the pipe shall be as shown or as directed by the Engineer. Place the blocking so that the pipe and fitting joints will be accessible to repairs, unless otherwise shown.

DEFINITION OF PIPE ZONE. The pipe zone shall include the full width of the trench from the bottom of the pipe to a point 6 inches above the top of the pipe barrel.

IMPORTED GRANULAR BACKFILL AT PIPE ZONE. Imported granular pipe zone material shall be used for the full depth of the pipe zone. This material shall be placed, in a manner approved by the Engineer, simultaneously on both sides of pipe in lifts not to exceed 6 inches. Each lift shall be "walked in" and supplemented by slicing with a shovel to assure that all voids around the pipe have been completely filled.

HYDROSTATIC TESTS. Hydrostatic tests shall be as specified in Section WELDED STEEL PIPE AND FITTINGS.

D. PAYMENT. Payment for the work in this section will be included as part of the lump sum bid.

15B. WELDED STEEL PIPE AND FITTINGS

A. SCOPE. This section covers the work necessary for furnishing and installing the welded steel pipe and fittings, complete.

The term "welded steel pipe" shall be understood to include all special pieces and related parts necessary for the complete installation as shown. Special pieces shall include, but not be limited to, fittings, bends, outlets, branches, closure sections, and all other welded steel piping to complete the work.

B. MATERIALS.

VERIFICATION OF MATERIALS. When requested by the Engineer, submit samples of any or all materials specified herein for test and analysis or, at the option of the Engineer, submit a certified analysis of any or all materials, as directed.

WELDED STEEL PIPE. The welded steel pipe shall conform to AWWA C201 and corrosion protection, as specified, in accordance with AWWA C203.

SHOP DRAWINGS. Before starting fabrication, the Contractor shall submit to the Engineer shop drawings in quadruplicate which shall include a marking plan and details of a standard pipe section, special fittings, and bends. Dimensions, plate size, coating and lining, and other pertinent information shall be shown. These drawings shall be furnished in conformance with the requirements of the General Conditions. Examination of the drawings by the Engineer, returned appropriately stamped, shall not relieve the Contractor of responsibility for complying with all requirements of the Contract Documents.

MARKING PLANS. The marking plan to be furnished shall be based on the Plans and the requirements of the Specifications, and shall show the location of each pipe section and each special with each piece numbered or otherwise designated in sequence. All outlets and bends shall be attached on standard lengths of pipe or made up into special lengths so that, when installed, they will be located as indicated. The Contractor shall furnish the pipe, fabricated and designated, so that, when installed according to the marking plan, the location of all outlets and special fittings will correspond to the details of the construction Plans. Each pipe and fitting shall be marked on the outside to indicate the class of pipe and location number on the marking plan.

CERTIFICATION. Certifications properly executed by the manufacturer shall be furnished to the Engineer showing compliance with the required Specifications. Test data on tests performed shall be provided as requested by the Engineer.

INSPECTION. The Engineer and his representatives shall have access to all phases of the work, and the manufacturer shall provide proper facilities for access and inspection. Material, fabricated parts, and pipe which are discovered to be defective, or which do not conform to the requirements of this Specification will be subject to rejection at any time prior to final acceptance of the pipe.

PIPE. Pipe furnished shall be fabricated from steel plate of Grade B of ASTM A 283. Pipe and fittings for high-service pump discharge line and header, and pipe and fittings 20 inches and larger, shall be fabricated of 3-gauge or 1/4-inch steel plate. The wall thickness of all other welded steel pipe and fittings shall be 7-gauge or 3/16-inch, unless otherwise noted or shown on the Plans. The pipe shall be furnished to the outside diameters as specified on the Plans.

PIPE ENDS. All pipe ends shall be plain ends for use with mechanical couplings, in accordance with the applicable sections of AWWA C201 and C202.

MECHANICAL COUPLING JOINTS. The pipe ends and components for mechanically coupled field joints shall be free from defects and shall be prepared and furnished to permit the making of satisfactory joints. Couplings and accessories required for the making of the joint shall be furnished with the pipe. The pipe joint shall be assembled and installed in accordance with the manufacturer's instructions. The coupling shall be Dresser Style 38 with 7-inch middle ring or as approved.

FITTINGS. Fittings shall be fabricated in accordance with the details shown on the Plans and shall be fabricated of the same gauge material as that of the adjacent straight pipe section and in accordance with applicable parts of AWWA C201. Weldolets shall be provided for taps, where required. Where dimensions of fittings are not shown, they shall be as indicated in AWWA C208.

CORROSION PROTECTION. Clean and sandblast exterior and interior of pipe in conformance with Section 3.2 of AWWA C203 before primer is applied. The exterior and the interior of the pipe and fittings that are to be buried underground shall be protected with coal-tar primer and coal-tar enamel; welded steel pipe and fittings that are to be installed within the structure or encased in concrete shall receive the same treatment inside, but shall be primed on the outside as specified in Section PAINTING.

Protection of the exterior of the pipe and fittings to be buried underground shall be prepared and protected as specified in Section A1.5 of AWWA C203 and shall consist of primer, coal-tar enamel (3/32-inch with an allowable variation of $\pm 1/32$ -inch), fibrous glass mat, coal-tar enamel (1/32-inch min.), bonded asbestos felt, and water-resistant whitewash. The coating and wrapping shall extend 6 inches above ground line.

FLANGES. Flanges, where required, shall be steel ring flanges, conforming to AWWA C207. Flanges in high-service pump discharge and header shall be Class E. All other flanges shall be of Class B. All flanged shall be faced and drilled 125-pound ASA, except connection to high-service pump control valve which shall be faced and drilled 250-pound ASA.

FLANGE JOINTING MATERIALS. All nuts, bolts, and gaskets required for joining the flanged pipe, fittings, and appurtenances shall meet the requirements of AWWA C207. Gaskets shall be full-cut with holes to pass the bolts, of rubber or sheet asbestos composition, 1/8 inch thick.

SPECIALS AND BENDS. Materials used in the fabrication of the specials and bends shall be as specified for straight pipe.

JOINT HARNESS. The joint harness shall be used where thrust ties are indicated. The joint harness shall consist of steel tie-bolts extending across the pipe joint to lugs shop welded to the pipe barrel. The joint harness shall be of adequate strength to prevent movement of the joint with the number and size of tie rods as indicated and lugs designed as shown in AWWA Manual M11, Section 19.8. The harness design shall be submitted with the shop drawings for the pipe and fittings, all of which shall be examined by the Engineer before fabrication is started. The joint harness and accessories shall be furnished with a prime coating suitable for the finished painting; or where the joint is to be buried or coal-tar enameled, the harness shall receive a shop-applied coal-tar primer.

THRUST BLOCKING MATERIALS. The materials used for concrete for thrust blocking shall conform to the requirements specified in Section CONCRETE. The proportions and mix design shall be such that the concrete will develop a minimum strength of 2,500 psi at 28 days.

PIPE HANGERS. Overhead pipe shall be supported as shown on the Plans and as directed by the Engineer. Inserts shall be Grinnell Figure 282. Hangers shall be fabricated of 5/8-inch steel rod with threaded ends. The U-portion of the hanger shall be bent to a smooth semi-circle of the proper diameter for the respective pipe. Turnbuckles shall conform to the dimensions of the Cleveland City Forge Company standard for turnbuckles for use on 5/8-inch diameter rods. Turnbuckles shall be 6 inches long with American Standard Free Fit Class 2 thread. Turnbuckles shall be products of a reputable manufacturer regularly engaged in the commercial production of such material.

PIPE SUPPORTS. Supports for the welded steel pipe shall be as shown on the Plans or as specified herein. Unless otherwise shown on the Plans, pipe supports shall be adjustable saddle type similar to Grinnell Figure 264 with riser pipe and flange. Supports shall be located approximately as shown on the Plans.

C. WORKMANSHIP.

HANDLING MATERIAL. Provide and use proper implements, tools, and facilities satisfactory to the Engineer for the safe and convenient prosecution of the work. In general, slings shall be of heavy canvas or nylon of suitable strength for supporting the load. Do not use unprotected chains or cables. Lower all pipe, fittings, valves, and hydrants into the trench piece-by-piece by means of a derrick, ropes, or other suitable tools or equipment, so as to prevent damage to the pipeline materials and protective coatings and linings. Do not drop or dump pipeline materials into the trench.

INSPECTION BEFORE INSTALLATION. Inspect each pipe and fitting before the pipe and/or fitting is brought in place for installation. Inspect the coating and wrapping and patch all abraded areas as specified hereinafter, before the pipe or fitting is placed.

REPAIRING DAMAGED PIPE. Any unit of pipe that, in the opinion of the Engineer, is damaged beyond repair by the Contractor shall be removed from the site of the work and replaced with another unit. No payment will be made for damaged pipe or for repairs to such damaged pipe.

REPAIRING COATING AND WRAPPING. Brush the damaged area of the coating and wrapping with a stiff wire brush to remove all dirt, oil, and grease; strip off all loose wrapping, then give the damaged portion one coat of the same material as the original pipe coating or other approved compatible compound, applied at the recommended temperatures and thickness. Immediately thereafter apply the patch. The patch shall be of sufficient size to cover the entire abraded area, but smaller than the coated area. The patching shall be of the same material as the original wrapping. Depress the patch by hand to assure an adequate bond, and seal the edges of the patch by repainting with the coating material.

CUTTING PIPE. Field cutting of welded steel pipe will not be permitted.

MECHANICAL COUPLINGS. Before coupling, clean each pipe end of oil, scale, rust, and dirt for a distance of at least 8 inches back from the end to provide a seat for the coupling gaskets. The pipe coating need not be removed if it presents a smooth surface and is securely bonded to the pipe.

Install couplings in accordance with the manufacturer's instructions. Wipe the gaskets clean before they are installed. If necessary, lubricate with soapy water for installation on the pipe ends.

Tighten coupling bolts progressively, drawing up bolts on opposite sides a little at a time until all bolts have a uniform tightness. Tighten bolts with torque-limiting wrenches.

<u>Bolt Diameter</u>	<u>Recommended Torque</u>
5/8-inch	40 - 60
3/4-inch	60 - 90
1-inch	70 - 100
1-1/4-inch	90 - 120

FLANGED JOINTS. Install flanged joints in accordance with the best accepted practices. Tighten bolts and nuts progressively, a little at a time. Assure proper seating of the flange gasket.

JOINT HARNESS. Harness lugs shall be installed by the pipe fabricator as required for the metal harness hereinbefore specified before the pipe is lined or coated.

PIPE TAPS. Welded steel piping shall be equipped with all the necessary taps as required for air release, pressure testing, and sterilization. Taps shall be half couplings or weldolets welded to the pipe and plugged upon completion of the installation.

FIELD WELDING. Field welding of steel pipe joints where required shall be in strict accordance with AWWA C206.

HYDROSTATIC TESTS. Make pressure and leakage tests on all newly installed pipe. Tests shall be made on two or more valved sections when this

procedure is acceptable to the Engineer. Furnish all necessary equipment and material, make all taps, and furnish all closure pieces in the pipe as required. The Engineer will monitor and approve a satisfactory test.

Furnish the following equipment and materials for the tests:

- 2 Approved graduated containers.
- 2 Pressure gauges.
- 1 Hydraulic force pump as approved by the Engineer.
- Suitable hose and suction pipe as required.

Conduct the tests after the trench has been partially backfilled with the joints left exposed for inspection or when completely backfilled, as permitted by the Engineer. Where any section of pipe is provided with concrete thrust blocking, do not make the pressure test until at least 5 days have elapsed after the thrust blocking is installed. If high-early cement is used for the concrete thrust blocking, the time may be reduced to 2 days.

Conduct the pressure test in the following manner: After the pipe has been partially backfilled as hereinbefore specified, fill the pipe with water. The test pressure shall be 1-1/2 times the normal static pressure, but not less than 50 psi. The duration of each pressure test shall be one hour.

PROCEDURE. Slowly fill the section of pipe to be tested with water and allow to stand for 24 hours, applying the specified test pressure. Expel all air from the pipe. Apply the specified test pressure, calculated for the point of lowest elevation, or as specified by the Engineer, by means of a pump connected to the pipe. Then valve off the pump and hold the pressure in the line for the test period. At the end of the test period, operate the pump until the test pressure is again attained. The pump suction shall be in a barrel or similar device, or metered so that the amount of water required to restore the test pressure may be measured accurately.

LEAKAGE. Leakage shall be defined as the quantity of make-up water required to hold the specified test pressure for the duration of the test period. No pipe installation will be accepted if the leakage is greater than the number of gallons per hour as determined by the following formula:

$$L = \frac{NDP^{\frac{1}{2}}}{5,500}$$

In which

- L = allowable leakage in gallons per hour
- N = number of joints in the length of pipe tested
- D = nominal diameter of pipe in inches
- P = average test pressure during the leakage test, in pounds per square inch.

CORRECTION OF LEAKAGE. Should any test of pipe laid disclose leakage greater than that allowed by the above formula, locate and repair the defective joints or pipe until the leakage from subsequent testing is within the specified allowance, and there is no visible leakage.

STERILIZATION. Sterilization procedures shall be as specified in Section STERILIZATION.

D. PAYMENT. Payment for the work in this section will be included as part of the lump sum bid.

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15C. LARGE AND SPECIAL VALVES

A. SCOPE. This section covers the work necessary for furnishing and installing the large and special valves, complete.

B. MATERIALS.

GATE VALVES 4-INCH AND LARGER. Valves shall be iron body, bronze mounted, double disc, parallel seat, NRS valves with O-ring seals. The valve shall open when the stem is rotated counterclockwise. Unless otherwise shown, the valves shall have handwheel operators. Valve ends shall be as shown. Valves shall conform to AWWA C500. Each valve shall have the maker's initials, pressure rating, and year of manufacture cast in the body. Valves shall be Mueller, Rensselaer, Pacific States, or as approved.

SLIDE GATES. Slide gates shall have flat backs, bronze seat and facings, stainless steel stem and galvanized steel adjustable stem guides, and head angles. Gates shall be ARMCO Model 20-10C. Furnish galvanized steel anchor bolts and setting templates. Maximum seating and unseating pressures will be 20 feet and 10 feet, respectively. Slide gates shall conform to AWWA C501.

Slide gate lift shall be a cast iron handwheel with bronze lifting nut. Handwheel shall be ARMCO HB-18.

Extension stems shall be of the same material as the gate stem. Stem guides shall be spaced such that the slenderness ratio of the stem body does not exceed 200. Stem guides shall be Mueller A-26448.

Stand bracket shall be Mueller A-27020 or as approved.

SHEAR GATE. Iron body, bronze mounted, with spigot frame. Furnish 6-foot long galvanized lift handle with hook. Gate shall be Mueller A-2520.

FLAP GATE. Armco Model 20 or equivalent; Rodney Hunt, or as approved, 30 x 18 rectangular flap gate, spigot back with cast iron seating surfaces and galvanized assembly bolts. Furnish galvanized anchor bolts and setting templates.

VALVE BOXES. Valve boxes shall conform to specification for BURIED MANUAL OPERATORS, specified hereinafter.

MUD VALVES.

FILTER INFLUENT VALVES (MVI-1 and MVI-2). The 14-inch filter influent valves shall be cast iron body, bronze trim, resilient rubber O-ring seal, stainless steel valve stem, bronze extension stem with pneumatic cylinder operators and support brackets, as manufactured by Rodney Hunt Machine Company and distributed by Pacific Water Works Supply Company, Inc., Seattle, Washington, or as approved. Valve support brackets as approved shall be suitable for the valve and cylinder configuration shown.

Operator assembly shall include the cylinder, 4-way solenoid valve, limit switches with 2 contacts to indicate open and closed positions, and

speed control valves. The equipment shall comply in all respects with the requirements listed under BUTTERFLY VALVES. The cylinder shall be sized to operate the valve with a differential pressure of 10 psi and an air supply pressure of 40 psi. The solenoid valve shall be arranged to close the main valve on de-energization. Limit switches shall be S.P.S.T., N.O.

Provision for installation of the operator assembly components shall be constructed in the factory with field work limited to assembly and attachment of the components. Pneumatic and electrical connections will be made under other sections.

AIR RELEASE VALVE. Air release valves shall have cast iron or bronze bodies and copper or stainless steel floats. They shall be designed for operating service up to 300 psi. Air release valves shall be APCO No. 200-A, 1-inch size. American Valve and Primer Corporation, 341 W. Superior Street, Chicago, Illinois, or as approved.

COMBINATION AIR RELEASE VALVES. Combination air release valves shall have cast iron bodies and covers and stainless steel floats. Float guides, bushings, and lever pins shall be stainless steel or bronze. Valves shall be designed for operating service to 300 psi, and shall be APCO No. 143C, American Valve and Primer Corporation, Chicago, Illinois.

SURGE RELIEF VALVE. The 6-inch surge relief valve shall be a hydraulic pilot-operated type with rapid opening and adjustable closing speed. The valve shall be of the angle body design with 250-pound ASA flanged connections installed as shown. The valve shall be furnished with a 100 to 200 psi adjustable pilot set at 160 psi. The valve shall be Golden Anderson 66D, or as approved, with position indicator rod. The valve shall be equipped with a bypass in the pilot lines to permit the valve to be manually operated without readjusting the discharge pressure of the valve.

BUTTERFLY VALVES. Butterfly valves shall comply in all respects with AWWA C504, short body type. All valves shall be Class 150B, except for isolation valves in high-service pump discharges which shall be suitable for 250 psi working pressure, and valves in effluent line which shall be suitable for 200 psi working pressure. Manufacturers requesting approval shall furnish an affidavit stating this compliance and indicating the material options which are to be furnished. Short body valve installation shall be as shown. Operators, positioners, limit switches, speed control devices, and solenoid valves shall be factory-installed and piped.

ABOVEGROUND MANUAL OPERATORS. Operators shall comply with AWWA C504 with handwheels and valve position indicator. Operators shall be capable of developing torques listed in Table I of AWWA C504 for Class 150B, except for isolation valves in high-service pump discharges which shall be capable of operating with a 250 psi differential head. All valves not listed in the table of operating characteristics shall be furnished with manual operators.

BURIED MANUAL OPERATORS. Operators shall comply with AWWA C504 with 2-inch square operating nut. Operators shall be fully gasketed and grease-packed to withstand an external water pressure of 10 psi. Operators shall be capable of developing torques listed in Table I of AWWA C504 for Class 150B valves.

Each operator shall be fitted with a valve box assembly consisting of the top section, cover, and the extension section. The top section shall be cast iron with an overall length of 15 inches, or as approved. Inside diameter of the barrel shall be 6-1/4 inches. The cover shall be of cast iron and have the word WATER cast in its top. The extension stem shall be steel water well casing with an outside diameter of 6 inches and weighing 10.2 pounds per foot.

Provide a tee-handle wrench similar and equal to Mueller A-24610, length as required to extend 24 inches above ground level when operating the lowest valve furnished.

CYLINDER OPERATORS. Double-acting, trunnion-mounted, with bronze barrel, steel caps, and piston; 416 stainless steel rod; Buna-N or suitable elastomer seals, O-rings, and packing; and Teflon rod wipers. Rod wipers and seals shall be externally replaceable. Size cylinders to operate valves under conditions shown when supplied with 50 psig operating air. Connection between cylinders and positioner or solenoid valve shall be with flexible neoprene hose.

SOLENOID VALVES. Four-way type close main valve on de-energization, 120-volt, a-c, with manual operating plunger.

POSITIONERS. Characterized feed-back type with interchangeable linear square root and square cams. Install linear cam. Input signal will be 3 to 15 psi. Arrange positioner so that valve is closed at 3 psi. Enclosures shall be splash- and moisture-proof with gasketed covers.

SPEED CONTROL VALVES. Install an adjustable speed control valve on each cylinder port to restrict outflow and permit unrestricted inflow.

LIMIT SWITCHES. Install 2 adjustable limit switches on each valve, one to operate when valve is open and one to operate when valve is closed. Switches shall be single-acting, spring return, roller-lever, oiltight type with snap-acting contacts. Switch action shall be as shown.

AIR-OIL TANDEM CYLINDER. The backwash control valve shall be supplied with a tandem air-oil cylinder operator to provide smooth and uniform operation of the valve with 2 or more cylinders as required. The air and oil pistons shall be mounted on a common rod with the valve operating power supplied by the air piston. The oil circuit shall be completely closed with oil flowing to the top or bottom of the piston as a function of the air piston position. Opening and closing speed control shall be provided in the hydraulic circuit. Cylinder barrel shall be iron with a molybdenumdisulphite coating or bronze.

CYLINDER-OPERATED BUTTERFLY VALVES.

OPERATING CHARACTERISTICS AND ACCESSORIES:

Effluent Valves (BF1-1 and BF1-2)	10-inch size, positioner controlled; 0 to 10 psi operating differential range; 0 to 1750 gpm flow range.
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Waste Valves (BF2-1 and BF2-2)	24-inch size, solenoid valve controlled; 0 to 10 psi differential range; 0 to 5750 gpm flow range; DPST N.O. open limit switches; DPST N.O. closed limit switches.
Backwash Valves (BF3-1 and BF3-2)	18-inch size, solenoid valve controlled; 0 to 50 psi differential range; 0 to 5750 gpm flow range; DPST N.O. open limit switches; DPST N.O. closed limit switches.
Filter to Waste Valves (BF4-1 and BF4-2)	6-inch size, solenoid valve controlled; 0 to 10 psi differential range; 0 to 800 gpm flow range; DPDT closed limit switches. Provide adjustable mechanical stop to allow maximum opening of 50 degrees.
Backwash Control Valve (BF5)	12-inch size, tandem air-oil cylinder, positioner controlled; 0 to 50 psi differential range; 0 to 5750 gpm flow range.

SURFACE WASH VALVES. The surface wash valves shall be 115-volt, 60-cycle solenoid pilot operated globe valves, energized to open with self-cleaning strainer and manual auxiliary operator. The valve shall have an adjustable speed control for control of operating cycle with double lock nuts to secure stem in desired position. The valves shall be sized as shown on the Plans. The valves shall be Cla-Valves 132E or as approved.

HIGH-SERVICE PUMP CONTROL VALVES. Valves shall be cast iron with bronze piston and trim, globe pattern, hydraulically operated with self-contained differential type piston. Valves shall be rated for 300 psi working pressure, with 250-pound ASA flanges. Valves shall be Golden Anderson 1174DR cushioned type with stop-check piston, or as approved.

Valves shall be furnished with 2 pneumatically-operated, 2-way hydraulic pilot valves, speed control valves for control of normal opening and closing and emergency closing, a 3-way emergency solenoid valve to close valve on power failure, a limit switch mounted on the valve position indicator to control the pump, and a pneumatically-controlled valve positioner to operate the valve in response to a 3 to 15 psi control signal. Arrange positioner so that the valve is closed at 3 psi. In addition, all necessary stop and check valves and strainers required to complete the control package on the valve shall be furnished.

All controls, including the positioner, pilot valves, solenoid valve, and speed control valves and limit switch shall be factory installed and piped.

The throttling control system shall be arranged as described in Section PLANT CONTROL AND INSTRUMENTATION SYSTEM, under Paragraph CLEARWELL LEVEL CONTROL. A selector switch will select the valve to be controlled proportional to level. The solenoid valves necessary for operation from the switch shall be furnished under this section.

BOLTS, GASKETS, GLANDS, AND NUTS. Bolts, gaskets, glands, nuts, and miscellaneous accessories required to install all special valves are to be furnished. Bolts for flanged connections shall be galvanized steel with American Standard regular unfinished square or hex heads. Nuts shall be galvanized steel with American Standard regular hexagonal dimensions. Gaskets for flanged connections shall be 1/8-inch thick rubber. Gaskets shall extend from the inside diameter of the flange to at least the inside edge of the bolt holes, or they may extend beyond the bolt circle. Joining materials for mechanical joints shall conform to ASA A21.11.

C. WORKMANSHIP.

GENERAL. Before installation, carefully clean valves of all foreign material; adjust stuffing boxes; and inspect valves in open and closed positions. Install valves in accordance with the applicable portions of these Specifications. Unless otherwise indicated, install valves with the stem vertical. Mount horizontal valves in such a manner that adequate clearance is provided for operation. Installation practices shall conform to manufacturer's recommendations.

Prior to joining flanged valves the flange faces shall be thoroughly cleaned. After cleaning, insert the gasket and tighten the nuts progressively and uniformly. If flanges leak under pressure, loosen the nuts, reseat or replace the gasket, retighten the nuts, and retest the joint. Joints must be watertight at test pressures before acceptance.

Thoroughly clean threads of screwed joints by wire brushing, swabbing, or other approved methods. Apply approved joint compound to threads prior to making joint. Joints shall be watertight at test pressures before acceptance.

VALVE BOXES. Center the valve boxes and set plumb over the wrench nuts of the valves. Set valve boxes so that they do not transmit shock or stress to the valves. Set the valve box covers flush with the surface of the finished pavement as shown, or such other level as may be ordered by the Engineer. Cut extensions to the proper length so that the valve box does not ride on the extension when set at grade.

Place backfill around the valve boxes and thoroughly compact to a density equal to that of the undisturbed ground and in such a manner that will not damage or displace the valve box from proper alignment or grade. Misaligned valve boxes shall be excavated, plumbed, and backfilled at the Contractor's expense.

SLIDE AND FLAP GATES. For those gates not furnished with wall thimbles, cast anchor bolts in the concrete; furnish 2 nuts for each bolt; recess the wall as required to allow adjustment of the back nut to provide uniform bearing for the gate frame; dry pack the recess behind the gate frame with non-shrinking grout. Gates shall be watertight at specified heads.

BUTTERFLY VALVE CONTROLS. Adjustment of positioners, limit switches, and speed control valves will be under Section PLANT CONTROL AND INSTRUMENTATION SYSTEM.

INSTALLATION OF FLOW TUBES AND STRAIGHTENING VANES. Install flow tubes and straightening vanes furnished under Section PLANT CONTROL AND INSTRUMENTATION SYSTEM as shown and as recommended by the Control Supplier.

D. PAYMENT. Payment for the work in this section will be included as part of the lump sum bid.

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15D. PLUMBING AND MISCELLANEOUS PIPING SYSTEMS

A. SCOPE. This section covers the work necessary for the plumbing and miscellaneous piping systems, complete.

B. MATERIALS.

GENERAL. Submit catalog information for all equipment to be installed, regardless of whether or not it is the same manufacturer listed in the Specification.

Where specific manufacturers' equipment is listed, it is only to establish the type, quality, and configuration required. Other manufacturers will be considered in accordance with the procedure described in the Special Provisions.

PIPING SYSTEMS.

WATER. Standard weight, galvanized steel, ASTM A 120, with galvanized malleable screwed fittings, Federal Specification WW-P-521. Unions 2-1/2 inches and smaller, galvanized malleable screwed; unions 3 inches and larger shall be galvanized cast iron flanged.

Underfloor slabs, underground, or cast-in-concrete; Type K hard-drawn copper, ASTM B 88, with commercially pure wrought copper solder joint fittings. Make joints with silver solder brazing alloy. Connect to steel piping with Epco Model FX dielectric unions.

WASTE AND DRAINS. 1-1/2 inches and smaller shall be standard weight galvanized steel, ASTM A 120, with galvanized cast iron screwed drainage fittings, Federal Specification WW-P-491.

Two inches and larger shall be extra-heavy cast iron soil pipe, Federal Specification WW-P-401, Class XH, with fittings of same class. Joints shall be oakum-packed and caulked with lead.

Rain leaders 3 inches and smaller above floor slabs shall be standard weight galvanized steel, ASTM A 120, with galvanized cast iron screwed drainage fittings, Federal Specification WW-P-491.

VENTS. Three inches and smaller shall be standard weight galvanized steel, ASTM A 120, with galvanized 125 psi cast iron fittings, Federal Specification WW-P-501.

COMPRESSED AIR. Type K hard copper, ASTM B 88, with commercially pure wrought copper solder joint fittings. Make joints with 95-5 wire solder, ASTM B 32, Grade 95 TA, where exposed, and silver solder brazing alloy where concealed or underground. Do not use cored solder.

CHLORINE GAS. Schedule 80 black steel, ASTM A 120, with 2,000 psi, black, forged steel, screwed fittings. Make joints with litharge and glycerin. Unions shall be forged steel, black, 300 psi tongue-and-groove type.

CHLORINE SOLUTION AND VENT. Type I, Grade I, rigid PVC conforming to ASTM D 1784 and ASTM D 1785. Pipe shall be Schedule 40 when installed with solvent-weld fittings and Schedule 80 when screwed fittings are used. Fittings shall be Type I, Schedule 80, Uscolite (U.S. Rubber Company); Koroseal (B. F. Goodrich); or Kraloy/Chemtrol. Provision for expansion shall be as recommended by the pipe manufacturer.

P-TRAP PRIMING. Type K soft copper, ASTM B 88, with commercially pure wrought copper solder joint fittings. Make joints with 95-5 wire solder, ASTM B 32, Grade 95 TA. Do not use cored solder.

CHEMICAL FEED. Filter aid piping shall be Type I, Grade I, rigid PVC conforming to ASTM D 1784 and ASTM D 1785. Pipe shall be Schedule 40 when installed with solvent-weld fittings, and Schedule 80 when screwed fittings are used. Fittings shall be Type I, Schedule 80, Uscolite (U.S. Rubber Company); Koroseal (B. F. Goodrich); or Kraloy/Chemtrol. Provision for expansion shall be as recommended by the pipe manufacturer.

PIPE HANGERS. Adjustable swivel ring, solid- or split-ring type, Grinnell Figure 101 or Figure 104, or as approved. Pipe clamps shall be Grinnell Figure 126 or as approved. Attach to concrete inserts, flush shells, or steel angle clips. Galvanize or cadmium-plate all hangers, rods, and clamps. Align hangers on parallel pipes. Space supports as follows and at each change in direction:

Steel pipe	8 feet
Cast iron soil pipe	5 feet
Copper tubing	6 feet
PVC pipe	4 feet

Grade piping evenly between risers.

VALVES.

WATER VALVES. Three inches and smaller, 200-pound w.o.g., bronze body gate valve, nonrising stem, Crane No. 438, or as approved.

THROTTLING VALVES. Three inches and smaller, 150-pound w.o.g., iron body, plug type disc, globe and angle valves, Crane No. 314-1/2 P and No. 316-1/2 P, or as approved.

CHECK VALVES. Three inches and smaller, 125-pound w.o.g., bronze wye pattern, swing check, bronze disc, Crane No. 37, or as approved.

GAUGE COCKS. Bronze, Crane No. 744, or as approved.

COMPRESSED AIR CHECK VALVES. Three inches and smaller, 150-pound, with stainless steel discs, Pennsylvania Aircheck Valve, Pennsylvania Pump and Compressor Company of Easton, Pennsylvania, or as approved.

WATER BALL VALVES. Crane Accesso No. 2330-TF, or as approved.

TRAP PRIMERS. Trap primers shall be E & S automatic trap primers. Primer lines shall be Type K soft copper tubing. All traps without individual vents shall be primed.

CHLORINATOR WATER INLET PRESSURE REDUCING VALVE. Chlorinator water inlet pressure reducing valve shall be Mueller H-9300 No. 2 with 25 to 84 psi adjustable range.

PVC BALL VALVES. Ball valves in PVC piping shall be Type 1, Grade 1 PVC, ASTM D 1784, with threaded connections and Buna-N seals, as manufactured by Kraloy/Chemtrol, or as approved.

FIXTURES.

P-1. Laboratory Sink. Elkay Lustertone LR-2222, 3 holes, 18-gauge, 18-8 Type 302 stainless steel ledgeback sink with rim; LK-99 stainless steel basket strainer with 1-1/2-inch tailpiece, 1-1/2-inch rough cast brass adjustable P-trap with cleanout, Speedway supply and stops; Chicago Faucet No. 286 Quatern Combination Lavatory Fixture with GN-3 gooseneck spout and EI spout end.

HB-1. Hose Valve. Crane No. 58 or as approved, 3/4-inch size.

HB-2. Hose Valves. Crane No. 117, 1-1/2-inch angle hose valve with iron pipe thread, or as approved.

FD-1. Floor Drain. Zurn Z-500 or as approved, bottom outlet, size as shown, with P-trap galvanized body and grate.

FD-2. Floor Drain. Zurn Z-317-1 combination drip drain with 6-inch diameter funnel, galvanized body, grate, and funnel; size as shown with P-trap.

FLASHING SLEEVES. Flashing sleeves similar and equal to Zurn Z-195 shall be provided wherever piping passes through concrete roof structures.

INTERIOR FLOOR CLEANOUT. Zurn Z-1326 Supremo or as approved, cast iron floor level cleanout with nickel bronze access cover.

EXTERIOR CLEANOUT. Jay R. Smith Series 4240 cleanout.

RUBBER WATER HOSE. Provide two 50-foot lengths of 3/4-inch ID Gates Rubber Company, or as approved, Streamflex rubber hose. Provide each length with 3/4-inch brass male and female hose couplings to fit nozzles hereinafter specified.

HOSE NOZZLES. Provide two 3/4-inch No. 97 W. D. Allen, polished, 6-inch length, heavy cast brass nozzle with 1/4-inch discharge, or as approved. Nozzles shall have 3/4-inch hose thread inlet.

SUMP PUMP. The sump pump shall be Hydromatic Pump Company Model Sp-40, all bronze, oil-filled, with nonclogging impeller, 2-inch discharge, and a capacity of 100 gpm at 10-foot total head. Motor shall be 4/10 hp, 115-volt, 60-cycle. Provide 10 feet of waterproof cord and grounding type plug to fit receptable indicated.

AIR COMPRESSORS. The compressors shall be base-mounted, twin-cylinder, single-stage units, with capacity not less than 21 scfm at 100 psi. Each unit shall be complete with a 5 hp driving motor suitable for operation on 460-volt, 3-phase, 60-cycle, a-c supply. Motor starters will be provided under Section ELECTRICAL. The compressors shall incorporate a means whereby they are automatically unloaded at starting, and shall be provided with combination air intake filter-mufflers with renewable filter medium and discharge cushion chambers. The units shall be similar and equal, in all respects, to Quincy Compressor Company D240. Provide 6 spare intake filter cartridges. Maximum compressor speed shall be 1000 rpm.

AIR RECEIVER. One vertical, welded steel air receiver shall be provided and installed as shown. The receiver shall bear the ASME Code stamp and be suitable for a working pressure of 125 psi. The receiver capacity shall be 200 gallons. Safety valve, pressure gauge, and drain valve shall be provided.

AIR COOLER. One water-cooled air cooler, suitable for a maximum operating pressure of 150 psi, shall be provided and installed in the compressor discharge line as shown. The cooler shall have a rated capacity to cool not less than 25 cfm to within 15 degrees F. of the water temperature. The air cooler assembly shall include a moisture separator with automatically trapped drain to be mounted on the downstream end of the air cooler. The separator shall be suitable for a working pressure of 150 psi. The air cooler assembly shall be similar and equal, in all respects, to the Quincy Model 6244 with automatic moisture separator and trap. The cooler assembly shall be pipe mounted and supported from the wall by hangers. Water supply and drain shall be provided as shown.

OIL REMOVAL FILTER. One oil removal filter shall be provided and installed in the air piping where shown. The filter shall remove 99 percent of 0.5 micron lubricating oil particles from 25 scfm of air at 100 psi. The filter shall be Deltech Model 130, as manufactured by Deltech Engineering, Inc., New Castle, Delaware. Piping shall be so arranged that the filter element can be replaced without removing the filter from the line; one spare filter element shall be supplied. Filter shall be provided with an Armstrong No. 21 drain trap.

FLEXIBLE DISCHARGE CONNECTION. The flexible discharge connection on the compressor discharge shall be a U.S. FLEX BMH flexible connection.

AIR DRYER. A refrigerated type condenser unit shall be installed in the air system as shown. It shall be capable of cooling the air and reducing the dew point to 35 degrees F. at 100 psi pressure. The unit shall have an automatic drain to discharge oil and water to waste. The unit shall be similar and equal to Hankison Model E 20, suitable for 120-volt, single-phase, 60-cycle power supply.

PRESSURE SWITCHES.

COMPRESSOR CONTROL. Ashcroft 61S-4119A-12, 1/4-inch lower, 0/160, close on pressure fall, suitable for 120-volt operation. Set to start compressor at 80 psig and stop at 100 psig.

LOW AIR PRESSURE ALARM. Ashcroft 61S-4119A-12, 1/4-inch lower, 0/60 psi, close on pressure fall, suitable for 120-volt operation. Set to alarm at 60 psig.

C. WORKMANSHIP. Install all piping, fixtures, equipment, and accessories in strict accordance with the Plumbing Laws, Rules and Regulations of the State and of the City, whichever represents the higher standard. All work shall be approved by the State and City plumbing inspector.

Coordinate piping installation with piping provided under other items of the work to provide a neat and workmanlike installation, with piping run plumb and true with building lines. The Plans do not attempt to show complete details of all piping, and no extra payment will be allowed for obstruction of work by other trades or local obstructions to the work under this item which require offsets. Verify all measurements and dimensions at the site. Adjust all equipment and leave in a condition satisfactory to the Engineer.

Provide all piping which passes through walls, floors, or ceilings with standard weight pipe sleeves. Pipe sleeves installed in water-holding basins shall have a 1/4-inch steel seep ring, 4 inches larger in diameter than the OD of the sleeve. Continuously weld ring to sleeve. Make joint between pipe and sleeve watertight with poured and caulked lead. Dry pack sleeves in existing work in place, and provide a finished appearance. Pack holes left by removal of existing piping with grout and finish.

Trench excavation shall conform to Section EXCAVATION, FILL, BACKFILL, AND RIPRAP.

STEEL PIPE. Ream, clean, and remove burrs and mill scale from piping before making up. Make joints with compound approved for potable water. Provide unions to make possible removal of all equipment without cutting, and as directed by the Engineer.

WASTE, DRAIN, AND VENT PIPING. Pack joints with oakum, pour with lead, and caulk. Set waste and vent piping occurring above the floor slab true and plumb. Set risers as close to walls as possible where exposed. Where vent stacks pass through the roof slab, fit with the specified flashing sleeve for securing the roofing. Flashing and roof connection shall be watertight. Extend vents at least one foot above roof. Provide cleanouts where shown and where required by Code.

CHLORINE GAS PIPING. Steam clean all pipe and fittings for the chlorine gas handling system thoroughly to remove cutting oils, protective greases, and dirt. Clean first with hot water and steam, then dry steam, and, while pipe and fittings are hot, blow out with air. Plug ends of pipe while transporting to point of installation.

Blow out the completed piping system with nitrogen gas for a period of 10 minutes. Then valve the system to hold the nitrogen and subject to a pressure of 175 psig. Test all joints for leaks with a soap solution and correct any leaks. Following this, fill system with chlorine gas and test joints for leaks with a dauber dipped in strong ammonia water.

COPPER TUBING. Cut tubing square and remove burrs. Clean both inside of fittings and outside of tubings with steel wool and muriatic acid before sweating. Take care to prevent annealing of fittings and hard-drawn tubing when making connections. Mitering of joints for elbows and notching of straight runs of pipe for tees will not be permitted.

PLASTIC PIPE. All rigid PVC pipe shall be cut, made up, and installed in accordance with the pipe manufacturer's recommendations, as approved.

Only strap wrenches shall be used for tightening threaded plastic joints and care shall be taken not to overtighten these fittings. Pipe shall not be laid when the temperature is below zero degrees F., and precautions shall be taken as recommended by the manufacturer when the temperature is below 40 degrees F.

FIXTURES. Trap each fixture individually. Prime all trapped floor drains. Set all fixtures properly and install accurately, plumb, and horizontal. Provide adequate backing for fixture and accessory supports. Provide separate stop in each supply to each fixture. Fixtures damaged at any time prior to acceptance of the project by the Owner shall be replaced with an exact duplicate of the original fixture. Thoroughly and properly clean all fixtures and leave in first-class condition.

TESTS. All piping provided under this item shall be tested. Test piping to be buried before backfilling or pouring concrete. Where piping is laid below or within concrete, maintain test pressure during concrete pour. Duration of tests shall be 30 minutes or as approved. Where air tests are specified, each joint shall be covered with soap solution or leak detector fluid. Clean piping after completion of soap test. Tests shall be as follows:

Water - Test with water at 125 psi.

Compressed Air - Test with air at 125 psi.

Chemical Solution - Test with water at 50 psi.

PREPARATION OF OPERATING AND MAINTENANCE MANUALS. Provide catalog information for the preparation of operating and maintenance manuals as specified in Section GENERAL REQUIREMENTS.

D. PAYMENT. Payment for the work in this section will be included as part of the lump sum bid.

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15E. VENTILATING SYSTEM

A. SCOPE. This section covers the work necessary for the ventilating system, complete.

B. MATERIALS.

GENERAL. Submit catalog information for all equipment to be installed regardless of whether or not it is the same manufacturer listed in the Specification.

ROOF-MOUNTED CENTRIFUGAL EXHAUST FANS. Fans shall be suitable for curb mounting with multileaf gravity back draft damper within the curb. Provide a hinged base bird screen, fiber glass cap, and motor separator plate. V-belt drive shall be furnished with an adjustable drive pulley. Rubber-in-shear vibration isolators shall carry the entire rotating assembly. A safety disconnect switch shall be mounted on the fan unit. AMCA certified performance shall be as follows:

5000 cfm at 3/8-inch of water static pressure; 1200 fpm outlet velocity; 1 hp, 240-volt, 60-cycle, single-phase, 1750 rpm motor. Fan shall be Pace CRE-27 with Skycap and integral self-resetting overload protection.

WALL-MOUNTED CENTRIFUGAL EXHAUSTER. Penn Domex WAQ-10, or as approved, with bird guard and multileaf back draft damper. AMCA certified performance shall be as follows:

1050 cfm at 1/4-inch of water static pressure; 1/4 hp, 115-volt, single-phase, 1750 rpm direct connected motor, with integral self-resetting overload protection.

ADJUSTABLE LOUVERS. Carnes Model L-35, extruded aluminum construction, 4-inch frame, with 1/2-inch mesh hardware cloth bird screen in a folded screen frame. Motor operated louvers shall utilize Carnes Model DHO electric oil pump motor, 120-volt, 60-cycle, single-phase, or as approved.

DUCTWORK. Ductwork shall be fabricated from 24-gauge galvanized steel or 22-gauge aluminum sheets, at the Contractor's option. Joints shall be Type S, drive, or pocket slips. Square elbows shall be fitted with Elgen All-Tight double-blade turning vanes. Shop-fabricated devices will not be acceptable. Ductwork shall be supported with hanger straps not more than 6'-0" on center.

C. WORKMANSHIP. Install equipment as shown and parallel with building lines. Electrical wiring will be provided under Section ELECTRICAL.

DUCTWORK. All sheet metalwork shall be done by qualified, experienced mechanics as specified herein and in accordance with the requirements of the American Society of Heating, Refrigerating, and Air Conditioning Engineers. All horizontal surfaces shall be cross-braced, and additional bracing to prevent ballooning or breathing shall be installed if required by the Engineer.

D. PAYMENT. Payment for the work in this section will be included as part of the lump sum bid.

15F. PLANT INSTRUMENTATION AND CONTROL SYSTEM

A. SCOPE. This section covers the work necessary for furnishing and installing the Instrumentation and control system, complete.

DEFINITION OF TERMS.

CONTROL SUPPLIER. A single approved firm which shall assume complete responsibility for furnishing, installing, adjusting, and testing the complete instrumentation and control system.

CONTRACTOR. The General Contractor, as distinct from the Control Supplier.

APPROVED CONTROL SUPPLIERS. The following firms are approved for bidding on this project:

The Instrument Laboratory, Inc.
Honeywell, Inc.
Martig's, Inc.

All other firms will require specific approval at least 10 days prior to bid opening.

RESPONSIBILITY FOR COMPLETE SYSTEM. The Contractor shall provide for the supply, installation, adjustment, and start-up, all by the Control Supplier, of a complete, coordinated system which will perform the specified functions.

SUBMITTAL OF SHOP DRAWINGS. The successful Bidder shall, within 60 days after award of the Contract and before any material is fabricated or shipped to the site, furnish to the Engineer full details, shop drawings, catalog cuts, and such other descriptive matter as may be required to fully describe the equipment and to demonstrate its conformity to these Specification requirements. The decision of the Engineer, upon the acceptability of any submittal, shall be final. Catalog information shall be submitted for all equipment, regardless of whether or not it is the same manufacturer as listed in the Specification. Specifically, the Control Supplier shall submit the following material:

1. Catalog information and shop drawings on all controllers, recorders, indicators, differential pressure transmitters, purge rotameters, flow tubes, pressure regulating valves, and gauges.
2. Catalog information on all electrical devices furnished under this section.
3. Shop drawings and catalog material for all control cabinetry.
4. Wiring diagrams of prewired panels.

5. Pneumatic piping diagram.
6. Steady state air consumption of each instrument.

SYSTEM PERFORMANCE. This plant is designed for automatic, unattended operation. The instrumentation and control system shall, in general, perform the following functions:

1. Measure, indicate, record, and totalize the plant influent flow.
2. Measure, indicate, record, and totalize the plant effluent flow.
3. Measure, indicate, and record plant discharge pressure.
4. Measure, indicate, and control clearwell level.
5. Measure, indicate, and record flow rates in each of the 2 filters and control these rates at set points established manually at the control console or automatically from the Cascade control signal responding to the level in the settling basin.
6. Measure, indicate, and record the head loss across each filter.
7. Measure, indicate, and control settling basin level by resetting the filter flow rate set points so as to match filtering rate to plant influent flow rate. (see 5. above)
8. Measure and indicate filter level.
9. Measure, indicate, totalize, and control backwash flow.
10. Provide an annunciator panel for alarm functions.
11. Provide automatic backwash cycle.
12. Provide remote manual and automatic operation of the filter control valves.
13. Provide remote manual controls for starting the backwash pump from the control panel.
14. Provide for the remote manual and automatic selection, stopping, and starting of chemical feed pumps and chlorinators.
15. Provide for pacing of chemical feed equipment in proportion to plant influent flow.
16. Provide remote controls for manual and automatic stopping and starting the high-service pumps from the control panel.

WORK NOT INCLUDED UNDER THIS SECTION.

1. Furnishing and installing control valves.
2. Installation of flow tubes, flowmeters, and straightening vanes.
3. Electrical wiring, except as specifically described in this section for prewiring panels.
4. Furnishing and installing chlorination control equipment.
5. Furnishing and installing reservoir level and well pump control equipment in the control panel.

B. MATERIALS. Where specific manufacturers' equipment is listed, it is only to establish the type, quality, and configuration required. Alternate manufacturers will be considered in accordance with the procedure described in the Special Provisions.

INFLUENT FLOWMETER. Sparling CF-116-1 bolting type, saddle type meter, with Sparling straightening vanes to match, or as approved, 24-inch size, 0 to 5500 gpm (0 - 8 mgd) total range, 700 to 5500 gpm normal flow range.

TRANSMITTER. Sparling Type 249-BE, or as approved, dual outlet, to transmit an electrical signal to the flow recorder and to the filter aid feeder. The transmitter totalizer shall register in gallons. The transmitter shall provide a pulse signal of one pulse per 1,000 gallons to operate the reset timer for the filter aid pumps.

INDICATOR-TOTALIZER-RECORDER. Sparling Type 229, or as approved, panel mounted, 0 to 8 mgd scale range with 7-day chart drive. Indicator scale shall be in mgd and gpm, recorder in mgd, and totalizer in gallons.

Furnish 2 separate chlorinator control transmitters, installed within the recorder case, to provide a 0 - 10K ohm potentiometric signal directly proportional to flow over a 2-wire control circuit to each chlorinator furnished under Section CHLORINE FEED EQUIPMENT. One year's supply of charts and ink and 3 sets of operating instructions shall be furnished.

EFFLUENT FLOWMETER. Effluent flow measuring element shall be an annular primary flow element as manufactured by Ellison Instrument Division, Dieterich Standard Corporation, New Buffalo, Michigan. Element shall be Annubar Model 740, made of Type 316 s.s. pipe, rated to 200 psig, to be installed in an 18-inch OD, 3-gauge, welded steel pipe. Element shall be complete with permanent rust-proof metal identification tag on chain showing designed flow rates, differential pressure outputs at designed flow rates, and line size.

Element shall be furnished with 2 weld couplings, compression sleeve, and other appurtenances required for the complete installation. Accuracy shall be maintained to $\pm 1\frac{1}{2}$ percent at full flow of 5500 gpm. Minimum metered flow will be 600 gpm.

Extract square root and convert meter differential to 3 to 15 psi signal in direct linear proportion to flow.

INDICATOR-TOTALIZER-RECORDER: Fischer & Porter Model 1102, 12-inch circular chart recorder with indicator and integral 8-digit totalizer. Indicator and recorder shall have 0 to 8 mgd scale range with 7-day chart drive. Totalizer scale shall be in thousands of gallons. One year's supply of charts and ink shall be supplied.

PLANT DISCHARGE PRESSURE. Measure at plant discharge tap. Convert to 3 to 15 psi air signal proportional to pressure. Record on Fischer & Porter Model 1102, 12-inch, 7-day circular chart recorder. Scale shall be 0 to 250 psi. Provide pulsation damper in instrument.

CLEARWELL LEVEL CONTROL. Measure with bubble tube cutoff 6 inches below the clearwell floor in the pump sump. Transmit level signal to full size, panel mounted indicating controller located on the plant control panel. Provide internal adjustable damping. Scale range shall be 0 to 10 feet of water. Provide a MANUAL-AUTOMATIC transfer switch and a MANUAL-REGULATING valve within the instrument.

Control mode shall be proportional with an adjustable proportional band from 0 to 250 percent. Convert controller output signal to 3 to 15 psi and transmit to high service pump control valves through the AUTO selector switch. Valve shall be closed when signal is 3 psi.

The AUTO selector switch shall be 3-position, panel mounted, arranged so that the controller output signal is transmitted to the selected valve and a constant 15 psi signal transmitted to the other valve. One position to be reserved for a future pump. The solenoid valves for remote manual operation of these valves will be furnished under Section LARGE AND SPECIAL VALVES.

Provide a field adjustable microswitch operated off the indicator line to cutoff high service and backwash pumps at a clearwell level of 0.5 feet.

Mark indicator scale as approved to show level of switch set point.

Provide field-adjustable contacts for high level and low level alarm.

FILTER FLOW CONTROL AND HEAD LOSS. Measure flow through each filter with a flow tube installed in 10.374-inch ID pipe. Permanent head loss shall not exceed 2.0 inches of water at a flow rate of 2.0 mgd. Flow range is from 1.0 to 2.5 mgd. Flow tube shall be a plastic insert type, B-I-F Model DFT-PI, or as approved.

Extract square root and convert meter differential to 3 to 15 psi signal in direct linear proportion to flow. Transmit signal to miniature 2-pen recorder-controller located on filter control console and suitable for panel mounting as shown. Indicate filter flow rate and flow set point on vertical scale within instrument. Indicate controller output signal. Provide pneumatic switches to select LOCAL or REMOTE adjustment of set point and MANUAL-SEAL-AUTO operation of controller. Set point adjustment shall be by a 3 to 15 psi signal from either the contact basin level controller or the manual rate setter at the control station. Recording control station shall be similar and equal to Fischer & Porter Company Series 1212.

Controller shall be integral with the indicating control station or separately mounted within the console. Control mode shall be proportional plus reset with an adjustable proportional band from 0 to 500 percent and an adjustable reset rate from 0.1 to 10 repeats per minute. Controller output shall be 3 to 15 psi and shall be transmitted to the filter effluent valve positioner. Provide a block and bleed solenoid valve in the controller air supply to operate the effluent valve during the automatic backwash cycle.

Measure head loss across each filter by connection to head loss taps provided by the Contractor as shown. Convert to 3 to 15 psi air signal proportional to head loss. Transmit to recording controller.

Record flow and head loss on a 2-pen strip chart recorder graduated 0 to 2.5 mgd for flow and 0 to 15 feet for head loss. Provide internal damping valves for each signal line. Chart speed shall not exceed 1 inch per hour. Chart duration and ink supply shall be 1 month. Chassis shall be pullout type to allow viewing of at least 12 hours of chart without disturbing operation. Chart drive shall operate on 120 volts, a-c. Provide vertical indicating scales inscribed FLOW and HEAD LOSS. Provide a field adjustable microswitch operating off of the head loss pen to initiate backwash on high head loss. Recording control station shall be similar and equal to Fischer & Porter Company Series 1212 with a Model 53AC1010 Cascade subpanel.

SETTLING BASIN LEVEL CONTROL. Measure with bubble tube located as shown. Cutoff bubble tube at Elevation 92.0.

Transmit level signal to indicating control station located on filter control console. Indicator shall be approximately 3" wide x 6" high with vertical indicating scale. Set point adjustment knob and controller output gauge shall be located on the face of the instrument. Provide internal adjustable damping. Scale shall be plain white and graduated LOW at Elevation 98.5, NORMAL at 99.1, and HIGH at 99.5.

Control mode shall be proportional plus reset with an adjustable proportional band from 0 to 250 percent and an adjustable reset rate from 0.1 to 10 repeats per minute. Controller output signal shall be transmitted to each of the filter flow controllers. Provide a pressure regulating valve in the controller output signal line to limit this signal to a predetermined maximum. This valve shall be located within the console and shall have a repeatability of 0.5 percent of input span.

Provide a field adjustable normally open microswitch within the instrument to signal high basin level.

FILTER LEVEL INDICATION. Measure level in each filter with a bubble tube system as shown. Transmit level signal to indicators located on filter control console. Indicator shall be the same dimensions and similar in appearance to the settling basin indicating control station. Scale shall be plain white and graduated NORMAL at Elevation 97.25, TROUGH at Elevation 96.0, and LOW at Elevation 95.0. Cutoff bubble tube at Elevation 94.0.

Provide 3 field adjustable microswitches operated off the indicator linkage set to operate at NORMAL (N.O.), TROUGH (N.O.), and LOW (N.C.) elevations. Close effluent valve and actuate alarm at LOW elevation.

BACKWASH FLOW CONTROL. Measure with flow tube installed in 17.5-inch ID pipe. Permanent head loss shall not exceed 12 inches of water at a flow rate of 5750 gpm. Flow range is from 1450 to 5750 gpm. Flow tube shall be a plastic insert type, B-I-F Model DFT-PI, or as approved. Convert meter differential to 3 to 15 psi signal proportional to the square of the flow. Transmit signal to indicator-controller located on filter control console and suitable for panel mounting as shown. Indicator-controller shall be the same dimensions and case style as the filter flow rate recorder-controller. Indicate flow from 0 to 6000 gpm. Indicate controller output and provide for MANUAL-SEAL-AUTO operation of controller. Set point adjustment shall be manual from the control station.

Provide an 8-digit totalizer either integral with the indicator-controller or separately mounted to totalize backwash flow in gallons.

Controller shall be integral with the indicating control station or separately mounted within the console. Control mode shall be proportional plus reset with an adjustable proportional band from 0 to 500 percent and an adjustable reset rate from 0.1 to 10 repeats per minute. Controller output shall be 3 to 15 psi and shall be transmitted to the backwash control valve positioner. Provide a block and bleed solenoid valve in the controller air supply to operate the backwash control valve during the automatic backwash cycle.

ALARMS. The functions listed below shall be sensed as indicated and displayed on the annunciator panel. Unless otherwise indicated, the sensing device shall be provided by the Control Supplier.

<u>Alarm Function</u>	<u>Sensing Device</u>
Incomplete Backwash	N.O. contact in backwash programmer
Air Low Pressure	N.O. contact furnished under Section PLUMBING AND MISCELLANEOUS PIPING SYSTEMS
Chlorine Low Pressure	N.O. contact furnished under Section CHLORINE FEED EQUIPMENT
Settling Basin High Level	N.O. contact in basin level controller
Clearwell Low Level	N.O. contact in clearwell level controller
Clearwell High Level	N.O. contact in clearwell level controller
Reservoir High Level	N.O. contact furnished under Section ELECTRICAL

Electrical wiring between external sensing devices and the annunciator panel terminal block will be provided under Section ELECTRICAL, except wiring between instruments located on the panel.

ANNUNCIATOR PANEL. Alarm lights shall be approximately 3 inches square, backlighted, with inscription engraved on lens. Inscription shall be as described under ALARMS. Lights shall be red. Alarm sequence as follows:

NORMAL	Light off
OFF NORMAL	Flashing light and buzzer
ACKNOWLEDGE	Steady light and silence buzzer
RETURN TO NORMAL	Light off

Provide flasher, buzzer, ACKNOWLEDGE push button, and LAMP TEST push button. All components shall be suitable for panel mounting as shown. Unit shall operate on 120 volts, a-c.

CLOCK. The clock shall be a General Electric 2912 CHR, or as approved.

FILTER AID PUMP TIMER. Eagle Microflex, 60-second dial, semi-flush mounted on control panel. Timer shall accept pulse signal from influent flowmeter and provide automatic control of filter aid feeder pumps.

AUTOMATIC BACKWASH.

GENERAL DESCRIPTION. The automatic backwash can be initiated by excess head loss, or manually as determined by the position of the initiate selector switch. Once initiated, the backwash of a given filter will proceed as follows:

1. Close influent valve.
2. Close effluent valve when filter level reaches top of wash trough.
3. Open surface wash valve.
4. Open waste valve.
5. Open backwash valve.
6. Start backwash pump and open backwash control valve.
7. Close surface wash valve.
8. Close waste valve.
9. Close backwash control valve and shut off backwash pump.
10. Close backwash valve, open influent valve, and open filter-to-waste valve.

11. Close filter-to-waste valve.

12. Open effluent valve.

AUTOMATIC BACKWASH PROGRAMMERS. The automatic backwash programmers shall be capable of providing the backwash sequence as a function of end-point-feedback and/or preset time intervals. End-point-feedback will be provided. The backwash programmers shall operate on 120-volt, 60-cycle, a-c, and shall be chassis or sub-panel mounted in the filter control console. All external connections shall be brought to terminal boards. Switches and control devices shall be the following or as approved:

ROTARY SWITCH	Eagle Bulletin 910
INTERVAL TIMERS	Eagle Bulletin 110
CONTROL RELAYS	Shall conform to Section ELECTRICAL
LATCHING RELAY	Square D, Class 8508
TIME DELAY RELAY	Shall conform to Section ELECTRICAL

The backwash programmers shall be functionally equal to the schematic shown.

DIFFERENTIAL PRESSURE TRANSMITTERS. Force balance type with continuously adjustable range. Performance as follows:

Accuracy	+1 percent of scale span
Repeatability	-0.5 percent of scale span
Sensitivity	0.2 percent of scale span

Unit shall have a hydraulic filled damping chamber with external damping adjustment. Provide factory assembled 3-valve manifold. Where square root extraction is specified, it shall be accomplished in the transmitter. Mount below primary element.

PURGE METERS. Fiber glass body, stainless steel float, 3-inch scale length, 0.25 to 2.5 scfh range, similar and equal to Fischer & Porter Model 10A3135 with differential pressure regulator for pipeline or panel mounting as required.

STRAIGHTENING VANES. Furnish straightening vanes for installation upstream of all flow tubes. Vanes shall be tubular Type 406 stainless steel, with positive positioning screws. Length shall be as shown on the Plans.

NAMEPLATES. Panel and console nameplates shall be engraved, rigid, laminated plastic type with adhesive backs. Color shall be black with white letters, unless otherwise shown. Letter height shall be 3/16 inch, unless otherwise shown. Instruments designed with integral nameplates may be used if specifically approved.

Components within cabinets and branch lines from air headers shall be identified with Dymo-tape or as approved. Coat tape with clear lacquer to adhere to surface.

ELECTRICAL DEVICES. Selector switches, push buttons, indicating lights, and other electrical devices shall conform to Section ELECTRICAL.

AIR SUPPLY.

GENERAL. Compressed air at a pressure not less than 60 psig and not greater than 100 psig will be made available by the Contractor at the locations shown. The air at these points will be already cooled and filtered to a quality acceptable for use in the control system.

PIPING AND HEADERS. Type L hard copper, ASTM B 88. Make joints with compression fittings, except that header caps and joints in runs exceeding 30 feet in length shall be made with wrought copper solder joint fittings and 95-5 wire solder. Secure headers to wall with clamps or brackets. Provide a shutoff valve for each header branch connection and 2 spare branch connections on each header. Air supply piping shall be 1/4-inch nominal, unless otherwise shown.

HEADER VALVES. Hoke 300 Series needle valve.

PRESSURE REGULATORS AND RELIEF VALVES. Provide a pressure regulating valve similar and equal to Fischer Type 64 for each header. Capacity shall be 150 percent of maximum demand from header. Adjustment shall be by wrench with locknut. Provide a relief valve on each header to relieve at 50 percent overpressure.

LUBRICATOR. Gardner Denver Micro-Fog Lubricator, 3/8 inch, 65NL403 Type PQ, with 1/3-pint transparent bowl. Provide 1 gallon of recommended lubricant.

PRESSURE GAUGES. Pressure gauges shall be provided to show the air supply pressure to each header, the reduced air pressure, and wherever otherwise required on the instrument system for the satisfactory checking of operation. Pressure gauges shall not be less than 2 inches in diameter and shall have a range such that the normal maximum operating pressure lies between 50 and 80 percent of the scale range of each gauge.

ELECTRICAL WIRING. All electrical wiring, except for interior wiring between instruments in the control panel, will be installed in rigid conduit under Section ELECTRICAL. The Control Supplier shall be responsible to assure all necessary conduit is installed prior to pouring concrete slabs and structures.

PLANT CONTROL PANELS. Construct in sections as shown, except for "out-plant" control panel. Fabricate each section and console shelf from one piece of 10-gauge steel sheet. Flange all edges of each section 2 inches wide. Flanged corners shall not appear rounded. Provide 2 x 2 x 3/16 steel angle stiffeners as required to prevent deflection under instrument loading or operation. Assemble sections with bolts. No bolt heads shall show on panel exterior. Provide 2 x 2 x 3/16 steel angle support frame as shown to secure each section to floor and provide a rigid, free-standing installation. Support frame shall be designed to permit lifting of sections into place without racking or distortion. Attachment of the frame to the panel shall be as

approved with no bolt heads showing on the panel face. Panels shall be provided with hinged steel access doors for the rear of the entire panel.

Panel cutouts for instruments and devices shall be cut, punched, or drilled and smoothly finished with rounded edges. Reinforce around all cutouts with steel angles or flat bars. Panel for "out-plant" control will be fabricated by the "out-plant" control supplier under Section SUPERVISORY CONTROL SYSTEM. Complete specifications to assure the panel will match those constructed under this section shall be submitted to the Contractor by the control supplier.

Sand panel and remove all mill scale, rust, grease, and oil. Fill all imperfections and sand smooth. Paint panel face and back with 2 coats of gray lacquer primer and 2 finish coats of automotive lacquer, color as shown. Sand surface lightly between coats. Do not polish finish coat. Dry film thickness shall not be less than 3.5 mils. Inset strips shall be covered with Formica, color style as shown. Touch-up panels after installation.

PANEL AND CONSOLE PIPING AND WIRING.

GENERAL. The individual sections of the plant control panel shall be completely fabricated, piped, and wired in the manufacturer's factory. All piping and wiring shall be completed and tested prior to shipment.

PIPING. All pneumatic lines within panels shall be 3/8-inch OD polyethylene suitable for a minimum working pressure of 140 psi dimensional stability over a temperature range of -50 to 140 degrees F., and resistant to chemical attack by solvents. Fittings shall be compression type. Terminate all tubing at a bulkhead block at the top or the bottom of the panel. Group tubing runs with plastic wiring harness and support on racks attached to the panel supporting structure. Tubing shall be colored as follows:

20 psi air supply	-	Blue
50 psi air supply	-	Red
Signal	-	Green
Controller output	-	Neutral

ISOLATING VALVES AND CALIBRATION TEES. Install shutoff valves to isolate instruments from the air supply lines and the signal lines. Valves shall not be installed in control lines from the instruments. Shutoff valves shall be Hoke 300 Series needle valve. A plugged tee shall be provided on each signal line between the isolation valve and the instrument for calibration purposes.

PANEL AND CONSOLE POWER WIRING. All electrical wiring 115 volts or greater on the panels shall be in accordance with the standards of the NEC. Wires shall be Type TW or THW stranded, 600-volt insulation, and shall be in sizes not less than No. 14-gauge, suitable for the currents to be carried. All power wiring shall be enclosed in either sheet metal raceway or plastic wiring duct. Connections to the terminal strips shall be made using pressure type lugs. Locate all fuses on a common fuse block with circuit designations. Electric power supply to the instruments shall be via disconnect plugs that can be pulled out of receptacles provided at the back of the panel or below

the console as required. The disconnect plug connection shall be provided with cord grip clamps at each end of the cords. Terminate all connections to external equipment at numbered terminal blocks. Two 20-amp circuits will be extended to the panel area under Section ELECTRICAL.

SIGNAL WIRING. Signal wiring generally shall conform to the same standard as for power wiring, except that signal wiring may be grouped by the use of plastic wiring harness if desired; and metallic tubing, raceway, or ducts shall not be required. Signal wiring shall be separated a minimum of 6 inches from power wiring, including the connections to the terminal strips. No terminal strip or signal wiring shall be placed closer than 2 inches to a terminal strip carrying power wiring. Where necessary, suitable insulating shields shall be provided between the terminations of power and signal wiring to prevent accidental contacts. Terminate all connections to external equipment at numbered terminal blocks.

IDENTIFICATION OF TUBING AND WIRING. All tubing terminals shall be clearly identified by permanent type labels, which shall be printed or stamped metal tags, or as approved. All electrical wiring shall be identified at each end with imprinted Mylar adhesive back wire markers. Show terminal numbers on as-built wiring diagrams.

SPARE PARTS. Provide 3 fuses of each type installed in the system and 20 spare bulbs for the indicating lights. Each recorder shall be furnished with a year's supply of charts and ink.

PREPARATION OF OPERATING AND MAINTENANCE MANUALS. Thirty days prior to completion of the project, the Contractor and his suppliers shall provide the Engineer with 3 copies of all cuts, catalog information, manufacturer's specifications, manufacturer's replacement parts list, as-built wiring diagrams and equipment drawings, lubrication and maintenance instructions, operating instructions, and other complete technical data for all equipment installed under this section. This information shall be specifically for the equipment installed in the project and all extraneous sheets shall be removed from catalogs. Provide a nameplate directory giving nameplate data for all equipment. All material shall be assembled in indexed 3-ring binders.

Upon receipt of the above information from the Contractor, the Engineer will check to see that the information is complete and correct, and the Contractor shall provide any additional information required by the Engineer for the preparation of the Operating and Maintenance Manuals.

C. WORKMANSHIP.

EQUIPMENT FURNISHED BY CONTROL SUPPLIER AND INSTALLED BY CONTRACTOR. Control Supplier shall supervise the installation to the extent required to assure that the equipment will perform as required.

CONTROL VALVES. Verify correctness of installation. Calibrate all positioners and verify correct control action. Adjust limit switch settings. Adjust opening and closing speeds and travel stops.

PIPEWORK. Control piping shall be installed by competent workmen experienced in this type of work and employed by the Control Supplier. If the Control Supplier desires to perform this phase of the installation by subcontract, then the firm employed to do this work shall be one which specializes in such work. Handle piping carefully with proper tools to avoid flattening or kinking. Group pipe runs and secure parallel to building lines. Conceal pipes in metal ducts when crossing open spaces or where otherwise exposed to risk of mechanical damage. Blow out tubing with clean, dry, compressed air immediately before making final connections.

ADJUSTMENT OF SYSTEM. The completed system of instruments and controls shall be regulated and adjusted by the Control Supplier in such manner as to insure its proper performance before any of the plant functions are transferred to this system. Upon start-up of the filter plant, the instrument and control system shall be adjusted so as to perform as hereinbefore specified. The Engineer will assist in start-up and final adjustment of the system.

TESTS. The entire pneumatic system, except for prepiped panels, shall be tested for leakage upon completion. Leakage tests upon the panels and the system shall be conducted in accordance with the recommended practice of the Instrument Society of America Publication RP 7.1, as revised August 1965. The leakage rates shall not exceed the maximum permitted by this publication, and all apparent leakage of whatever magnitude shall be corrected. Soap solution or leak detection fluid shall be completely cleaned off when the tests are concluded.

D. PAYMENT. Payment for the work in this section will be included as part of the lump sum bid.

15G. CONCRETE CYLINDER PIPE

A. SCOPE. This section covers the work necessary for furnishing and installing concrete cylinder pipe, complete.

The term "concrete cylinder pipe" shall be understood to include all special pieces and related parts necessary for the complete installation as shown. Special pieces shall include, but not be limited to, fittings, bends, outlets, branches, closure sections, and all other concrete cylinder piping required to complete the work.

Rigid joints, where shown, shall be flanged or field-welded standard joints, as required.

B. MATERIALS.

CONCRETE CYLINDER PIPE. Concrete cylinder pipe shall conform to AWWA C303-70, Reinforced Concrete Water Pipe - Steel Cylinder Type, Pretensioned.

SHOP DRAWINGS. Before starting fabrication, furnish the Engineer with shop drawings in quadruplicate. Shop drawings shall consist of a marking plan, based on the construction plans, showing the location of each pipe section and each special piece. Each pipe section and special piece shall be designated in sequence on the marking plan. Shop drawings shall show details of a standard pipe section and details of all special pieces, including dimensions, plate thicknesses, coating and lining thicknesses, laying lengths, outlet lengths, and other pertinent information. Pipe shall be furnished and installed in accordance with the approved marking plan.

CERTIFICATION. Certifications properly executed by the manufacturer shall be furnished to the Engineer showing compliance to the required Specifications. Test data on tests performed shall be provided as requested by the Engineer.

CLASSIFICATION. Concrete cylinder pipe shall have an internal diameter of 16 inches and shall be designed for a maximum water working pressure of 150 psi.

LONGITUDINAL STRESS. Where pipe and/or fittings are subjected to longitudinal stresses induced by thrust ties or thrust blocks, the longitudinal steel area (cylinder thickness) shall be increased, if necessary, to prevent the cylinder stress from exceeding the minimum yield point with a differential pressure equal to 2-1/4 times the design pressure at the restrained location.

CEMENT. The total alkali content, when determined as the mixed sulphates of sodium and potassium and calculated to sodium oxide, shall not exceed 0.6 of 1 percent.

GASKETS FOR STANDARD JOINTS. Gaskets shall be of natural rubber.

JOINT LUBRICANT. Furnish joint lubricant with the pipe. Furnish the amount and type recommended by the pipe manufacturer. The lubricant shall

be a water-soluble, nontoxic, vegetable soap compound conforming to United States Pharmacopeia No. P 39.

JOINT SWAB. Furnish sufficient swabs of the proper size and shape for use by the installation contractor to remove excess mortar from the joints inside pipes with diameters less than 24 inches. These swabs shall be of rubber and capable of being inflated to the proper size for their intended use. The swabs shall be equipped with rings, straps, or similar devices which will permit a rope or cable to be attached to pull the swab through the pipe without deforming the swab to the point where the inside joint is not wiped clean.

INSPECTION. The Engineer and his representatives shall have access to all phases of the work and the manufacturer shall provide proper facilities for access and inspection. Material, fabricated parts, and pipe which are discovered to be defective, or which do not conform to the requirements of this Special Specification will be subject to rejection at any time prior to final acceptance of the pipe.

STEEL PIPE FOR CLOSURE SECTIONS. Steel pipe for closure sections shall conform to AWWA C201, except that the pipe shall be mortar-lined to the same thickness as the cylinder pipe. Alternate closure section designs may be submitted for approval.

BONDING MATERIALS. Bond bars shall be 5/16-inch diameter mild steel rod.

WELDING MATERIALS. Welding materials shall conform to AWWA C206.

NUTS, BOLTS, AND GASKETS. Nuts and bolts shall be of the sizes and quantities recommended in AWWA C207. Gaskets for flanged joints shall be cloth-inserted sheet rubber gaskets conforming to AWWA C207 and ASA B16.21, 1/8 inch thick. The gasket shall be full-cut, with holes to pass bolts. Gasket material shall be free from corrosive alkali or acid ingredients.

CONCRETE FOR THRUST BLOCKING. Plant-mix concrete, conforming to ASTM C 94, Alternate 2, developing a 28-day compressive strength of at least 2,500 psi.

C. WORKMANSHIP.

GENERAL. Stationing shown on the Plans is approximate only. Contractor should field verify actual measurements. Fitting connections and closures shall be made with approved closure pieces or shop-fabricated lengths of pipe certified in the field by the Contractor.

HANDLING MATERIAL. Pipe shall not be stored under conditions which would cause injurious drying out of the mortar coatings. When necessary, stored pipe shall be protected by means of shelter and application of water. Deliver the pipe to the site of the work. No pipe shall be hauled to the site of the work until it has been fully cured as specified.

Lifting of pipe shall be done using at least two slings placed at the quarter points of the pipe sections. The slings shall bear uniformly against the pipe. When not being handled, the pipe shall be supported on timber cradles or on properly prepared ground, graded to eliminate all rock points and to provide uniform support along the full length. When being transported, the pipe shall be supported at all times in a manner which will not permit distortion or damage to the lining or coating. Any unit of pipe that, in the opinion of the Engineer, is damaged beyond repair by the Contractor shall be removed from the site of the work and replaced with another unit. No payment will be made for damaged pipe or for repairs to such damaged pipe.

PREPARATION OF TRENCH.

IMPORTED GRANULAR BASE. Provide imported granular base under all pipe where, in the opinion of the Engineer, material satisfactory for fine grading and bedding the pipe is not available at the trench. Imported base will be used principally where groundwater conditions make the use of a lesser base impractical. Place granular base for pipe in the trench to a minimum depth of 4 inches for pipe 16 inches in diameter. Trenches to be provided with a granular base for pipe will be designated by the Engineer during construction. Grade the top of the base to the bottom of the pipe ahead of pipe laying for the full width of the trench. Base shall provide a firm unyielding support along entire pipe length.

BELL (JOINT) HOLES. At the location of each joint, dig bell (joint) holes in the bottom of the trench and at the sides where necessary to permit the joint to be made as specified and to permit visual inspection of the entire joint.

LAYING.

LAYING PLAN. Furnish laying plan prior to delivery of material. Lay the pipe and fittings in accordance with the marking plan, except as modified by the Engineer.

PLACING OF PIPE IN THE TRENCH. Prevent foreign material from entering the pipe while it is being placed in the trench. Remove all foreign material from the pipe or joint ring before the next pipe is placed. If the pipe-laying crew cannot put the pipe into the trench and in place without getting earth into the pipe, the Engineer may require that snugly fitted, tightly-woven, canvas bags be placed over each end before lowering the pipe. The bags shall be left in place until the connection is to be made to the adjacent pipe. During laying operations, keep debris, tools, clothing, or other materials out of the pipe.

Place the backfill carefully and simultaneously on both sides of the pipe to avoid displacement of the pipe and damage to the joints and mortar coating. Follow pipe-laying operations closely with outside grouting operations and backfilling of the trenches with sufficient material to prevent the pipe from floating. Schedule work so that at no time will pipe remain in the trench more than one day before being covered with backfill, unless otherwise approved by the Engineer.

UNSUITABLE CONDITIONS FOR LAYING PIPE. Do not lay pipe in water, or when, in the opinion of the Engineer, trench conditions are unsuitable.

JOINTING.

INSTALLATION. Point the bell end of the pipe in the direction of laying. As the next section of pipe is being readied for laying, clean the bell of the previously laid pipe of all foreign material, and "butter" the inside face of the bell with a mortar composed of 1 part portland cement to not more than 3 parts fine aggregate. At the same time, lubricate the rubber gasket and install in the spigot groove. The gasket tension shall be uniform around the groove before placing the pipe in the trench. Lower the pipe section to be laid into the trench until it is approximately in line with the previously laid pipe section and the spigot is centered in the bell. Then force the pipe home and secure to proper alignment and grade with approved backfill material, well tamped. Use wood wedges as required to hold the joint open a distance sufficient to check the placement of the gasket. The rubber gasket shall be checked with a feeler gauge to assure proper seating. After the pipe is in place, pull the joint swab, furnished by the pipe manufacturer, past the joint to remove any excess mortar that may be squeezed into the interior of the pipe.

ALIGNMENT. Pipelines intended to be straight shall be so laid, and in no case shall a deviation from a straight line exceed one inch.

STANDARD JOINT PROTECTION. After the pipe section has been laid, clean the exposed metal at the exterior space at the joint and fill the annular space with a portland cement grout, composed of one part cement to one part fine aggregate with sufficient water to form a mixture the consistency of thick cream. Wrap the joint with a strip of medium, coarse, woven fabric and band around the pipe at each side of the joint. The fabric shall be of such a weave as to allow the escape of air and excess water but prevent escape of mortar. Pour the joint full of grout through a space in the woven fabric slightly to one side of the top. Rod the grout with a beaded wire or chain as it is poured into the joint. Immediately after completing the exterior joint, place damp earth over and around the joint to prevent rapid drying. Styrofoam "diapers" with integral banding may be used subject to prior approval by the Engineer of the design and method of use.

CLOSING PIPE ENDS. At times when pipe laying is not in progress, close the open end of pipe with a watertight plug, or by other means approved by the Engineer, to preclude rapid drying of the interior joint mortar and to prevent trench water from entering the pipe. If water is in the trench, keep the seal in place until the trench is pumped free of water.

WELDED JOINTS. Make field-welded joints in accordance with AWWA C206, or as shown, or both. Joint protection on field-welded joints shall be as specified for the standard joint.

INSTALLATION OF BOND BARS. Two bond-bar jumper rods shall be welded at each joint in conformance with the details of the Plans.

ELECTRIC CONTINUITY TEST. At the completion of the pipeline installation, The Engineer will make tests to insure that the pipeline and test lead stations have electrical continuity throughout the length of the pipeline. If the pipe does not pass the tests, the Contractor shall uncover the joints and correct the deficiency.

ANCHORAGE.

LOCATION OF THRUST BLOCKING. All pipeline tees, plugs, caps, bends, and other locations where unbalanced forces exist shall be anchored by thrust blocking as shown or specified.

THRUST BLOCKING. Place thrust blocking between undisturbed ground and the fitting to be anchored. The quantity of concrete and the area of bearing on the pipe shall be as shown or directed. Place the blocking so that the pipe and fitting joints will be accessible for repairs, unless otherwise directed.

TIME INTERVAL BEFORE FILLING PIPE. Do not fill pipe with water within 12 hours of the time the last joint has been completed and the interior mortar placed. Do not subject the pipe to internal hydrostatic pressure until all joints have aged at least 36 hours.

HYDROSTATIC TESTS. Make pressure and leakage tests on all newly laid pipe and valved section of it. Tests shall be made on two or more valved sections not to exceed 1,000 feet when this procedure is acceptable to the Engineer. Furnish all necessary equipment and material, make all taps, and furnish all closure pieces in the pipe as required. The Engineer will monitor and approve a satisfactory test.

Furnish the following equipment and materials for the tests:

- 2 Approved graduated containers
- 2 Pressure gauges
- 1 Hydraulic force pump as approved by the Engineer
- Suitable hose and suction pipe as required.

Conduct the tests after the trench has been partially backfilled with the joints left exposed for inspection or when completely backfilled, as permitted by the Engineer. Where any section of pipe is provided with concrete thrust blocking, do not make the pressure test until at least 5 days have elapsed after the thrust blocking is installed. If high-early cement is used for the concrete thrust blocking, the time may be reduced to 2 days.

Conduct the pressure test in the following manner: After the pipe has been partially backfilled as hereinbefore specified, fill the pipe with water. The test pressure shall be 150 psi.

DURATION. The duration of each pressure test shall be 30 minutes.

EXPELLING AIR. Before applying the specified test pressure, expel all air from the pipe.

PROCEDURE. Slowly fill the section of pipe to be tested with water and allow to stand for 48 hours under slight pressure to allow the cement-mortar lining to absorb water. Then slowly apply the specified test pressure, calculated for the point of lowest elevation, by means of a pump connected to the pipe.

Then valve off the pump and hold the pressure in the line for the test period. At the end of the test period, operate the pump until the test pressure is again attained. The pump suction shall be in a barrel or similar device, or metered so that the amount of water required to restore the test pressure may be measured accurately.

LEAKAGE. Leakage shall be defined as the quantity of makeup water required to hold the specified test pressure for the duration of the test period. No pipe installation will be accepted if the leakage is greater than the number of gallons per hour as determined by the formula following:

$$L = \frac{NDP^{\frac{1}{2}}}{5,500}$$

In which

L = allowable leakage in gallons per hour
N = number of joints in the length of pipe tested
D = nominal diameter of pipe in inches
P = average test pressure during the leakage test, in pounds per square inch.

CORRECTION OF LEAKAGE. Should any test of pipe laid disclose leakage greater than that allowed by use of the above formula, locate and repair the defective joints or pipe until the leakage from subsequent testing is within the specified allowance and there is no visible leakage.

FLUSHING. Before sterilizing, flush all foreign matter from the pipeline. Provide hoses, temporary pipes, ditches, etc. as required to dispose of flushing water without damage to adjacent properties. Flushing velocities shall be at least 2.5 fps. For large diameter pipe where it is impractical or impossible to flush the pipe at 2.5 fps velocity, clean the pipeline in place from the inside by brushing and sweeping, then flush the line at a lower velocity.

STERILIZATION. Sterilization shall be covered under Section STERILIZATION.

D. PAYMENT. Payment for the work in this section will be included as part of the lump sum bid.

15H. CORRUGATED METAL PIPE

A. SCOPE. This section covers the work necessary for furnishing and installing the corrugated metal pipe, complete.

B. MATERIALS.

PIPE. Corrugated metal pipe shall be 16-gauge conforming to Federal Specification WW-P-405 and AASHTO M 36. Pipe shall have helical corrugations with butt welding seams, without lap joints or lock seams, to assure watertightness. Pipe shall be galvanized Armco welded Hel-Cor, or as approved.

COUPLINGS. Couplings shall be manufacturer's standard, galvanized, with gaskets to provide watertight connections.

C. WORKMANSHIP.

HANDLING MATERIAL. Proper implements, tools, and facilities satisfactory to the Engineer shall be provided and used by the Contractor for the safe and convenient prosecution of the work. Care shall be exercised in handling and installation to avoid damage to pipe or couplings.

INSTALLATION. Pipe shall be installed on slope as shown. Trench excavation and backfill shall conform to Section EXCAVATION, FILL, BACKFILL, AND RIPRAP. All joints shall be made watertight, as hereinbefore specified. Care shall be exercised in placing backfill and riprap to avoid crushing or damaging the pipe. Construct and install concrete anchors as shown.

D. PAYMENT. Payment for the work in this section will be included as part of the lump sum bid.

16A. ELECTRICAL

A. SCOPE. This section covers the work necessary for the complete power, lighting, and control systems. The following electrical devices are to be furnished and installed under other sections and wired under this section:

- Air Compressor Pressure Control Switch
- Chlorination Equipment
- Filter Control Center
- Flow Measurement Equipment
- Hoisting Equipment
- Motors
- Ventilating Equipment

This section includes the following electrical schedules:

- Electrical Panel Schedule
- Electrical Device Schedule
- Raceway Schedule
- Circuit Schedule
- Lighting Fixture Schedule
- Electric Heater Schedule
- Nameplate Schedule

B. MATERIALS.

GENERAL. Unless otherwise instructed by the Engineer, provide all new materials, first quality, approved by UL wherever standards have been established by that agency. Materials shall comply with the NEC and applicable State and local electric codes. It is the intent of these Documents that all items of material required for a complete installation shall be furnished and installed. Where 2 or more units of the same class of equipment are required, they shall be products of a single manufacturer; however, the component parts of the equipment need not be the products of the same manufacturer.

STANDARD PRODUCTS. Unless otherwise indicated, the materials to be furnished shall be the standard products of manufacturers regularly engaged in the production of such equipment and shall be the manufacturer's latest standard design that conforms to the Specification requirements.

MATERIAL AND EQUIPMENT SCHEDULES. As soon as practicable and within 30 days after the date of notice to proceed and before commencement of installation or fabrication of any materials or equipment, submit to the Engineer for approval, in quadruplicate (minimum), complete descriptive information for all materials as follows in accordance with the provisions of the applicable Article of the General Conditions:

- Motor control center outline and elementary drawings
and equipment schedule
- Unit heaters
- Thermostats
- Lighting fixtures
- Flexible conduit
- Receptacles
- Light switches

INSTRUCTION BOOKS. Compile 4 copies of a composite instruction book including operation, installation, maintenance, renewal parts information, and complete as-built drawings for all electrical equipment. This information shall be placed in a hard-backed binder in a well organized manner. These books shall be delivered to the Owner at the completion of the project.

TYPE. The materials used shall be as follows:

CONDUIT.

CONDUIT, RIGID STEEL, ZINC-COATED. Rigid steel conduit, including couplings, elbows, and nipples shall be galvanized by hot-dipping, electroplating, sherardizing, or metallizing process, and shall meet the requirements of ASA C80.1, UL, and the NEC.

CONDUIT, FLEXIBLE. All flexible conduit shall be moisture-proof flexible steel, polyvinyl chloride jacketed type, UL approved, with continuous copper ground path in the flexible steel tube, and shall be American Brass Sealite Flexible Conduit, or as approved.

CONDUIT FITTINGS. Conduit fittings shall be of the type indicated or required for the anticipated purpose, and shall meet applicable requirements of ASA C80.4, UL, NEC, and NEMA FB 1. Fittings used with aluminum conduit shall be made of aluminum or copper-free aluminum alloy in all areas where moisture may be present.

CONDUCTORS.

CONDUCTORS, 600 VOLTS AND LESS. Conductors No. 6 or smaller shall be copper with the type of insulation specified. Conductors No. 6 or larger may, at the Contractor's option, be aluminum with the type insulation specified. Conductors, including insulation, cabling, jacket, filler, shielding, covering, and testing, shall meet all applicable requirements of IPCEA S-19-81 and S-61-402, the NEC, and UL. Conductor sizes shall be not less than those shown.

Conductor sizes indicated are based on copper conductors. Aluminum conductors of equivalent current-carrying capacity in conduit sizes required by the NEC may be used, if approved connectors are used where aluminum is joined to copper.

Conductors No. 8 AWG or larger shall be stranded. Conductors No. 6 AWG or larger shall have insulation of a heat- and moisture-resistant Grade THW. Conductors smaller than No. 6 AWG shall have thermoplastic insulation Type TW, and shall be factory color coded with separate color for each phase and neutral used consistently throughout the system.

CONTROL CABLE. Where specified and where control circuits require 4 or more conductors between units of equipment installed 6 feet or more apart, use multiconductor, color coded, industrial control cable, with the number of conductors indicated. Cable shall be in accordance with IPCEA S-61-402, and shall be color coded in accordance with Method No. 1 of that standard. At his option, the Contractor may supply cable with a greater

number of conductors or larger sized conductors than those indicated, provided conduit sizes used are those required by the NEC. Multiconductor control cable shall be Alcoa CT-3, Anaconda AP06932, Okonite P-30, or as approved.

EQUIPMENT GROUNDING CONDUCTORS. Conductors for equipment grounding shall be stranded copper. Conductor sizes No. 12 AWG through No. 2 AWG shall have green Type TW insulation with a minimum thickness of 2/64 inch. Conductor sizes No. 1 AWG or larger shall be bare copper.

OUTLETS. Each outlet in the wiring or raceway system shall be provided with an outlet box to suit the conditions encountered. Outlet boxes installed where they are exposed to the weather, in normally wet locations, including flush or surface mountings on exterior surface of exterior walls exposed to the weather or exposed on interior walls, or in Class I, II, and III hazardous locations, shall be of the gasketed cast steel or alloy type having threaded hubs, similar and equal to Crouse-Hinds Type FS or FD. Concealed boxes and exposed boxes in other areas shall be of the cadmium-plated or zinc-coated sheet metal type. Boxes shall be not less than 1-1/2 inches deep, unless shallower boxes are required by structural conditions and are specifically approved by the Engineer. Ceiling and bracket outlet boxes shall not be less than 4-inch octagonal, except that smaller boxes may be used where required by the particular fixture to be installed. Switch and receptacle boxes shall be approximately 4" x 2", unless a larger box is required.

DEVICE PLATES. Provide one-piece device plates of satin-finish 302 stainless steel. Screws shall be of metal with countersunk heads and color to match the finish of the plate. Where shown, plates shall be engraved with the letters, numbers, or characters as designated. Such letters, numbers, or characters shall be 1/8-inch high with filler of red color. Reference: Sierra stock-marked Wall Plates, Sierra Electric Corporation, 15100 S. Figueroa, Gardena, California.

RECEPTACLES.

SINGLE AND DUPLEX CONVENIENCE RECEPTACLES. Each receptacle shall be specification grade and rated 10 amperes at 250 volts and 15 amperes at 125 volts. Each receptacle shall have a grounding pole. Contact arrangement shall be such that contact is made on 2 sides of an inserted blade. Bases shall be of ivory phenolic composition with side-mounted terminals. Receptacles shall be capable of receiving 2-wire parallel-bladed caps or 3-pole caps. All receptacles shall be UL listed. Receptacles shall be Sierra or Hubbell.

WEATHERPROOF RECEPTACLES. Each shall consist of a duplex receptacle as specified mounted in a cast metal box with gasketed, weather-proof, cast metal cover plate, and cap over each receptacle opening. The cap shall be provided with a spring-hinged flap with rubber gaskets and stainless steel springs.

WALL SWITCHES. Wall switches shall be of the specification grades, totally enclosed, tumbler type. Enclosures shall be of phenolic composition

with color to match the plates specified. Single-pole switches shall be rated 20 amperes at 120/277 volts. All switches shall be a-c type, suitable for the control of tungsten filament lamp loads, and approved by UL. Switches shall be Sierra or Hubbell.

LAMPS AND LIGHTING FIXTURES. Lamps and lighting fixtures of the types and sizes as indicated shall be furnished and installed complete. Lamps manufactured by General Electric, Sylvania, or Westinghouse, of the proper type, wattage, and voltage rating shall be furnished and installed in each fixture. Illustrations and references on the Plans are indicative of the general type of fixture desired. Fixtures of similar designs and equivalent light distribution and brightness characteristics and having equal finish and quality will be acceptable if approved by the Engineer prior to bid opening.

Fluorescent units shall be rapid-start type with standard cool white color characteristics, unless otherwise specified. Ballasts shall be high power factor and ETL certified to meet CBM standards. Ballasts shall be individually fused or have individual, nonresettable, thermal protectors.

LIGHTING AND POWER PANELBOARDS. Panelboards shall be circuit breaker type as indicated, and shall meet the standards established by UL, NEMA PB 1, and the NEC. Panels used as service entrance equipment shall have UL approval for that use.

CIRCUIT BREAKERS, INDIVIDUAL. In the enclosures indicated, mount individual circuit breakers of the indicating type providing ON, TRIPPED, and OFF positions of the operating handle. Include provisions for padlocking circuit breakers in the ON or OFF position. Interlock enclosures to prevent opening the cover with the circuit breaker in the ON position. Circuit breakers shall be quick-make, quick-break, with thermal-magnetic action. An overload of one pole of all multiple-pole circuit breakers shall automatically cause all poles to open. Circuit breakers shall meet the requirements of UL and NEMA AB 1, and shall have a minimum interrupting rating of 25,000 amperes, RMS asymmetrical at 480 volts. Where they are used as service entrance equipment, circuit breakers shall have UL approval for that use.

FUSED SWITCHES, INDIVIDUAL. Individually mounted fused switches in the enclosure indicated shall meet the requirements of UL and NEMA KS 1, and shall have a minimum interrupting rating of 100,000 amperes RMS asymmetrical. Fused switches shall be of the heavy-duty (HD) type, unless otherwise indicated. Switches shall have a quick-make, quick-break operating mechanism independent of the handle operation, and shall have external markings clearly indicating ON and OFF positions. Provision shall be made for padlocking all switches in the ON or OFF position. Provide interlocks to prevent opening the switch cover while the switch is in the ON position. Provide fuses of current ratings indicated, and as specified herein. Where current-limiting fuses are specified, provide rejection clips or other means to prevent the insertion of noncurrent-limiting fuses.

FUSES. Provide a complete set of Bussmann fuses for all equipment. Where current-limiting fuses are specified, supply a set of 6 spare fuses

of each current rating installed. Fuses shall meet the requirements of NEMA FU 1. Provide Class J, current-limiting fuses 1-600 amperes, 200,000 amperes interrupting rating. Where 0.1 to 600 amperes fused motor circuits are indicated, provide current-limiting dual element fuses with 100,000 amperes interrupting rating.

SERVICE ENTRANCE. Provide a meter base and other materials, as required by the electric utility which will provide service to the facility, for installation of metering equipment and attachment of service conductors.

MOTOR CONTROL, GENERAL. Provide each motor with a suitable controller and devices that will perform the functions as specified for the respective motors. Controllers shall meet NEMA IC 1, ASA C19.1, the NEC, and UL. Motor horsepower ratings and enclosures shown are what is expected. This information is for guidance only and does not limit the equipment size. When motors furnished differ from the expected ratings, make the necessary adjustments to wiring, conduit, disconnect devices, motor starters, branch circuit protection, and other affected material or equipment to accommodate the motors actually installed, at no additional cost to the Owner.

Provide each motor with thermal overload protection in all ungrounded phases. This protection shall consist of thermal overload relays sensitive to motor current and mounted within the motor controller as indicated. All overload protection devices shall be of the inverse-time-limit type.

Controller-mounted overload relays shall be manual-reset type with externally operated reset button. Select and install overload relay heaters after the actual nameplate full-load current rating of the motor has been determined.

Provide each motor with the disconnecting means indicated, and as required by the NEC. Disconnecting means, separately enclosed or included in combination starters, shall meet the requirements for individual circuit breakers or fused switches and fuses specified herein.

Enclosures, modifications, and types of controllers shall be as indicated. Provide suitable laminated plastic nameplates for each starter.

FULL VOLTAGE MAGNETIC STARTERS. Provide starters meeting NEMA IC 1, Class A, with the rating and enclosure shown.

REDUCED VOLTAGE STARTERS, NEMA CLASS A. Provide starters meeting NEMA IC 1, Class A, with the rating shown. Starters shall be of the two-step magnetic part-winding type, having an adjustable time interval between application of starting and running conditions to the motors.

CONTROL POWER TRANSFORMERS. Supply individual control power transformers where indicated. The transformers shall have sufficient capacity to serve the connected load and limit voltage regulation to 10 percent during contact or pickup. Fuse one side of the secondary winding and ground the other side.

UTILITY EQUIPMENT ENCLOSURE. Enclosure shall be 90 inches high, 36 inches wide, and 20 inches deep and shall be of the same construction, gauge, finish, and manufacture as the Motor Control Center A described below. Provision will be made for mounting of utility company terminal block in a lower 36-inch high section and mounting utility company current transformers in the upper section. The terminal block will be provided by the utility company and installed under this Specification section. The two sections shall be separated by an isolating barrier with holes to accommodate the conductors indicated. Each section shall have a piano-hinged door with provision for locking.

The utility enclosure shall contain an ammeter and voltmeter as shown. The voltmeter shall be Switchboard class, 250-degree indicating scale (0-600 volts) and selector switch, connected to provide 3-phase voltage indication. The ammeter shall be a switchboard class, 250-degree scale, transformer rated indicating ammeter (0-600 amps) with 3-current transformers and selector switch connected to provide current indications in each phase. The meters shall be Westinghouse Type KA-241. The selector switches shall be Westinghouse Type W-2. The current transformers shall be Westinghouse Type EC-1.

MOTOR CONTROL CENTERS. Motor control centers and components shall meet the requirements of the latest revised NEMA Standards. The following requirements shall be met, unless otherwise indicated:

Rating

Voltage	As indicated.
Supply circuit, short circuit rating	25,000 amps RMS asymmetrical.
NEMA Class	Class I, Type B.

Enclosure

Type	Type I gasketed.
Vertical section dimensions	90" high, 20" wide, 20" deep.
Finish	Manufacturer's standard gray over a primer and rust inhibitor.
Construction	Sheet steel reinforced with channel or angle irons. Sections constructed so they may be butted flush, end-to-end against a similar section without bolts, nuts, or cover plates causing interference.
Section mounting	Removable formed steel channel sills and removable lifting angles.

Horizontal wiring
compartments

Full width, top and bottom accessible
from front.

Vertical wiring com-
partments

Full height, accessible from front.

Terminal board com-
partment

Bottom.

Unit compartments

Individual compartments separated by
steel barriers for each starter, feeder,
or other unit capable of being wired
from front without unit removal.

Compartment doors

Separate hinged doors for each starter,
feeder, or other unit.

Door interlocking

Starter and feeder doors mechanically
interlocked so doors cannot be opened
with unit energized. Provide defeater
mechanism to allow intentional access
at any time. Provisions for padlocking
external disconnect handles in the ON
or OFF position.

Bus

Horizontal power bus

3-phase copper bus entire width of
control center rated 1,600 amps.
Constructed to allow future extension
to additional sections. Pressure type
solderless lugs for each incoming line
cable.

Vertical power bus

3-phase copper bus full height of
section rated 300 amps minimum.

Bus barriers

Power bus shall be isolated from front
access by means of bus barriers.

Neutral bus

None, unless indicated.

Ground bus

Same size as single-phase of
horizontal power bus.

Bus bracing

25,000 amps.

Motor Starter Units

Construction

Drawout combination type with stab
connections, except where size and

	weight of equipment make this impracticable. Readily interchangeable with starters of similar size. Positive grounding means which ground unit before stabs engage power bus.
Starters	NEMA standard rating, except none smaller than NEMA Size 1. Meet requirements specified under MOTOR CONTROL, GENERAL.
Disconnecting device	As indicated.
Circuit breakers	Molded case with manufacturer's recommended trip setting for maximum motor protection. Thermal-magnetic trip or magnetic trip only if approved by Engineer. Tripping indicated by operating handle position.
Fused switches	Current-limiting fuses as specified herein with rejection clips. Manufacturer's recommended fuse rating for maximum motor protection, with interference plates which prevent fuse removal with switch in ON position. Switch interrupting rating of 12 times rated current.
Control devices	As indicated and specified herein.
Ground fault relays	In the starters indicated on the Plans, provide ground fault relays suitable for use on a 480-volt, 3-phase, 3-wire, solidly grounded wye, 60-cycle system. Ground fault protection for the motor feeder shall consist of ground sensors encircling all phase conductors and connected to solid-state ground relays which initiate tripping of the circuit breakers. Ground protection shall be adjustable from 5 to 50 primary amperes and shall have time-current characteristics to provide 0.1 second operation. The shunt trip and relay shall operate from a 120-volt a-c control source. The unit shall be internally mounted in the motor control center.
Control wiring	Minimum wire size 14 AWG copper.

Feeder Units

Construction	Same as under motor starter unit.
Circuit breakers	Molded case with thermo-magnetic trip. 25,000 amps RMS asymmetrical minimum interrupting rating. Tripping indicated by operating handle position.
Fused switches	Same as under motor starter unit, except fuse rating indicated.
Nameplates	Engraved laminated plastic nameplates on each unit. Blank nameplates on spaces for future units.

Diagrams

Elementary wiring and outline diagrams submitted in quadruplicate (minimum) to Engineer for approval before fabrication begun.

Tests

NEMA Standard.

Approved Manufacturers

General Electric, Square D, Allen Bradley, Westinghouse, I.T.E., Cutler-Hammer.

SWITCHBOARD. The switchboard shall be the product of the motor control center manufacturer. Switchboard finish shall match the motor control center. The switchboard shall be a completely enclosed metal structure of the required number of formed and welded vertical panel sections incorporating circuit breakers, incoming line sections, and other associated equipment as indicated on the Plans.

The switchboard section shall be 20 inches deep and 90 inches high with the width as required. The switchboard section shall be aligned so that the back of the switchboard may be installed flush against a wall. All components mounted in the switchboard shall be completely accessible and removable from the front.

Vertical section front covers shall be sectionalized and screw-attached. Front covers shall be fabricated from 12-gauge sheet steel. The top enclosing cover shall be fabricated from 12-gauge sheet steel and screw-attached to permit removal.

Circuit breakers installed in the switchboard shall comply with the requirements for individual circuit breakers specified herein.

Ground fault relays shall be installed in the switchboard as shown on the Plans. The ground fault protection shall be suitable for use on a 480-volt, 3-phase, 3-wire solidly grounded wye, 60-cycle system. Ground fault protection equipment for the main circuit breaker shall consist of ground sensors encircling all phase conductors and connected to solid-state ground

relays which initiate tripping of the circuit breakers. Ground protection shall be adjustable from 200 to 2,000 primary amperes and shall have time-current characteristics to provide 0.3 second operation at approximately 10 times setting. The shunt trip and relay shall operate from a 120-volt, a-c control source. Units shall be installed internally in the switchboard.

The switchboard section shall have a UL label for service entrance.

PUSH BUTTONS, INDICATING LIGHTS, AND SELECTOR SWITCHES. Push buttons, indicating lights, selector switches, and stations for nonhazardous indoor dry locations shall be of the heavy-duty, oiltight type, similar and equal to Westinghouse Type OT, General Electric Type CR 2940, Cutler-Hammer Type 10250, or Square D Class 9001, and shall be mounted in starter covers or oiltight NEMA 1 general purpose enclosures, as indicated. For nonhazardous outdoor or normally wet locations, these devices shall be of the heavy-duty type mounted in NEMA 4 watertight enclosures, and shall be Westinghouse Type HDW, G.E. Type CR 2940, or Square D Class 9001. These devices shall meet the requirements of NEMA IC 1, and shall have individual, extra-large nameplates indicating their specific function. Push-button stations shall have laminated plastic nameplates indicating the drive they control.

All push buttons and selector switches mounted near the motors which they control shall have provisions for locking in the STOP or OFF position.

All selector switches shall have standard operating levers.

All indicating lights for 110-volt control circuits shall be transformer type.

ELAPSED TIME METERS. Elapsed time meters shall be synchronous motor driven, 0 - 99,999.9 hours range, without reset knob, 2-1/2-inch size in conduit mounting case. Time meters shall be Westinghouse Type BH-351, General Electric Type 236, or as approved.

TRANSFORMERS, DRY TYPE. Provide self-cooled dry type transformers of the ratings indicated built in accordance with the latest Standards of IEEE, UL, ASA, and NEMA. Provide NEMA Standard taps and Class F, 115-degree C. rise insulation.

Transformer sound level shall be tested in accordance with NEMA and ASA Standards. Transformer shall have sound level not exceeding 36 decibels for 10-25 kva.

Provide transformers with built-in mounting lugs. Mount transformers in motor control centers. Each transformer shall be equipped with integral vibration isolators rated for the weight of the transformer and designed to provide 99 percent isolation efficiency at the fundamental frequency of the sound emitted by the transformer.

The terminal compartment shall be located in the bottom of the transformer. Transformers shall be manufactured by Westinghouse, General Electric, Tierney, or Sorgel.

CONTACTOR. Contactor shall be magnetically held and shall be furnished in a general purpose, NEMA 1 surface-mounted enclosure. Contactor shall be NEMA Size 1 (minimum) and shall have the contact arrangement as shown. Control voltage shall be 120 volts, a-c.

MAGNETIC CONTROL RELAYS. Magnetic control relays shall be of the machine tool, NEMA Class A1B, 600-volt, 10 amp, continuous, convertible contact type, meeting the requirements of NEMA IC 1. Enclosures, if required, shall be as indicated.

PNEUMATIC TIME DELAY RELAYS. Pneumatic time delay relays shall be adjustable from 0.2 to 180 seconds with micrometer type dial. Contacts shall be rated 10 amps minimum continuous. Relays shall be invertible, allowing field conversion from time delay after energization to time delay after de-energization and vice versa. Relays shall be Square D Class 9050, Type B, Cutler-Hammer, General Electric, or as approved.

C. WORKMANSHIP.

GENERAL. The installations shall conform to the latest applicable rules of the NEC, and applicable State and local codes. Workmanship shall be of the highest grade. Install products in strict accordance with the manufacturer's recommendations, unless otherwise specified or directed by the Engineer. Replace or repair defective equipment or equipment damaged in the course of installation or test in a manner approved by the Engineer. If any departures from the Plans are deemed necessary, submit details of such departures and the reasons therefor as soon as practicable, and within 30 days after the award of the Contract, to the Engineer for approval. No such departures shall be made without the prior written approval of the Engineer.

Examine all Plans and coordinate work so as to avoid conflicts, errors, delays, and unnecessary interference with the continuous operation of the plant during construction. Wiring shown is diagrammatic only and is meant to show circuiting and switching details. Locations of lighting fixtures, equipment, and electrical outlets shown are approximately correct; however, check the locations of all outlets shown with the Plans and verify the locations by taking measurements on the job. In the event of any conflicts, consult the Engineer; his decision shall govern.

Obtain all permits and pay all fees required by any governmental agency having jurisdiction over his work.

Electrical loads shall be balanced at panelboards. After final service connections are made, check and correct, if necessary, the rotation of all motors.

WIRING METHODS.

GENERAL. Generally and unless otherwise specified or indicated, wiring shall consist of insulated conductors installed in rigid zinc-coated steel conduit.

CONDUIT SYSTEMS. Conduit system installations shall meet or exceed the requirements of the NEC. Minimum size of conduit shall be 1/2 inch, except conduit not smaller than 3/4 inch shall be used where run in or under concrete floor slabs. Raceways shall be concealed or exposed as indicated. Raceways shall be supported at intervals required by the NEC, and shall have exposed runs installed parallel or perpendicular to walls, structural members, or intersections of vertical planes and ceilings. Avoid field-made bends and offsets where possible, but where necessary, make with an approved hickey or conduit bending machine. Heating of conduit to facilitate bending will not be acceptable. Changes in direction of runs shall be made with symmetrical bends or cast metal fittings. Do not install crushed or deformed raceways. Avoid trapped raceways where possible. Take care to prevent the lodgment of plaster, dirt, or trash in raceways, boxes, fittings, and equipment during the course of construction. Raceways shall be entirely free of obstructions or shall be replaced. All conduit shall be reamed, burrs removed, and cleaned for proper introduction of wires and cables. Immediately after installation, plug or cap all conduit ends with watertight and dust-tight conduit seals until the time for pulling wires.

All empty conduit for future devices shall be provided with a coupling and plugged flush with the finished floor.

Install insulating type bushings or manufacturer's standard insulated metallic bushings on the ends of all rigid conduits, except where conduits terminate in threaded hubs on cast boxes or cabinets, in which case insert manufacturer's standard insulating sleeves. Where insulating bushings are used, and where bushings cannot be brought into firm contact with the box, fasten rigid conduits to all sheet metal boxes and cabinets with 2 locknuts where required by NEC; otherwise, a single locknut and insulated, metallic bushings are acceptable. Provide suitable expansion fittings for raceways crossing expansion joints in concrete slabs, or provide other suitable means to compensate for the building expansion and contraction. Wooden plugs inserted in concrete or masonry are not acceptable as a base for raceway fastenings, nor shall raceways or pipe straps be welded to steel structures. Support multiple raceways adjacent to each other by ceiling trapeze. Support individual raceways by wall brackets, strap hangers, or ceiling trapeze, fastened by wood screws on wood and expansion shields on concrete or brick. Threaded studs driven in by a powder charge and provided with lock washers and nuts are acceptable in lieu of expansion shields.

Conduits shall emerge from the concrete at right angles and shall have none of the curved portion of the bend exposed. The curved portion of the bends under floor slab where conduits emerge from the floor shall be concrete encased. Provide structural support for the conduit during pouring of concrete to insure that the conduit remains in position; also, seal the ends of all conduits by pipe caps or plugs in couplings. Conduit shall be of greatest practicable single length between joints, and all joints shall be made up with approved jointing compound. Do not use nails to fasten boxes or conduits; do not use wire in lieu of straps or hangers; and do not notch structural members for the passage of raceways.

Install and equip conduit boxes and fittings installed outdoors or in other wet locations so as to prevent water from entering the conduit.

Rigid steel conduit installed underground shall have a minimum cover of 2 feet and the excavation and backfill shall conform to the requirements of Section EXCAVATION, FILL, AND BACKFILL. Coat conduit installed underground throughout its length with Kopper's Bitumastic No. 505, or wrap with Scotchrap No. 51 plastic tape with 1/2-inch overlap in strict accordance with the manufacturer's recommendations. Conduit may be wrapped or coated before final assembly, provided that all wrench marks, exposed threads, or other holidays are wrapped or coated to provide a continuous holiday-free uniform coating after final assembly. Do not use union type fittings underground, except with approval of the Engineer.

Separate parallel runs of 2 or more conduits in a single trench with Kindorf Type C-105, or as approved, and install spacers and channel at not more than 20-foot intervals. Support conduits installed in fill areas suitably to prevent accidental bending until backfilling is complete.

Do not backfill underground conduit until it has been inspected by the Engineer or his representative.

Final connection to motors, wall or ceiling-mounted fans and unit heaters, and to other equipment where flexible connection is desired or required to minimize vibration, shall be made with 18-inch minimum lengths of liquid-tight, neoprene-jacketed, flexible steel conduit where the required conduit size is 3 inches or less. Where required conduit size is greater than 3 inches, rigid steel conduit shall be continued to the terminal box.

CONDUCTORS.

CONDUCTORS, 600 VOLTS AND BELOW. All wire shall be continuous from outlet to outlet. Splices, where required, may be made in outlet and pull boxes only. Use wire connectors of insulating material or solderless pressure connectors properly taped for all splices. Soldered mechanical joints insulated with tape will not be acceptable. Vinyl plastic tape of suitable quality is acceptable in lieu of rubber and friction tapes. Conductor sizes shall not be less than those shown. Conductors shall not be smaller than No. 12 AWG for lighting or power circuits, or No. 14 AWG for control circuits, unless otherwise indicated.

Arrange wiring in cabinets, panels, and motor control centers neatly cut to proper length, and remove surplus wire. Apply Stak-on or similar terminals to control wiring for connection to terminals, and bridle and secure in an approved manner. List all circuits emanating from power, distribution, and lighting panelboards by function on the directory card. Identify all circuits entering motor control centers or other control cabinets by directory card listing terminal block number and function or by means of tags securely fastened to the conductors.

CONTROL CABLE. Keep splices to an absolute minimum. Locate splices, when necessary, only in readily accessible cabinets or junction boxes using terminal strips. Splices of a control cable with a large number of conductors, into one or smaller control cables, will not be acceptable.

OUTLETS. Provide each outlet in the wiring or raceway systems with an outlet box to suit the conditions encountered. Each box shall have sufficient volume to accommodate the number of conductors entering the box in accordance with the requirements of the NEC. Provide flush or recessed fixtures with separate junction boxes when required by the fixture terminal temperature requirements. Set boxes installed in concealed locations flush with the finished surfaces and provide with proper type extension rings or plaster covers where required. Install boxes in a rigid and satisfactory manner and fasten directly with wood screws on wood and bolts and expansion shields on concrete or brick. Threaded studs driven in by a powder charge and provided with lock washers and nuts are acceptable in lieu of expansion shields. Where boxes are concealed in walls, if not embedded in concrete, the hole shall be no larger than required to receive the box. Locations of outlets indicated are approximate; study the building plans in relation to the spaces and equipment surrounding each outlet, so that the lighting fixtures are symmetrically located according to the room layout. When necessary, with the approval of the Engineer, relocate outlets to avoid interference with the mechanical equipment or structural features.

JUNCTION BOXES. Provide junction boxes as shown on the Plans of not less than the minimum size required by the NEC. Furnish boxes with screw-fastened covers. All boxes shall be accessible and shall be in the locations as shown on the Plans.

PULL BOXES. Construct pull boxes, where specified or required, of code-gauge galvanized sheet metal of not less than the minimum size required by the NEC. Furnish boxes with screw-fastened covers. Where several feeders pass through a common pull box, tag the feeders to indicate clearly their electrical characteristics, circuit number, and panel designation. All boxes shall be readily accessible and shall not be installed in finished areas unless approved by the Engineer. Provide pull boxes not less than 150 feet apart in long runs.

RECEPTACLES AND WALL SWITCHES. Equipment shall be located at the following height above the floor, unless otherwise indicated:

Weatherproof convenience receptacles	24" above grade
Convenience receptacles (indoor)	12" above floor,
	6" above counter tops
Wall switches	48" above floor

DEVICE PLATES. Install plates with all 4 edges in continuous contact with the finished wall surfaces without the use of mats or similar devices. Plaster fillings will not be permitted. Install plates vertically and with an alignment tolerance of 1/16 inch. Do not use sectional type device plates.

LIGHTING FIXTURES. Install lighting fixtures at the height and in the manner indicated. Provide accessories, such as straps, mounting plates, nipples, or brackets, for proper installation. Provide suspended incandescent fixtures with swivel hangers to insure a plumb installation. Single-unit fluorescent fixtures shall have twin stem hangers. Suspended multiple-unit or continuous-row fluorescent units shall have a tubing or stem for

wiring at one point and tubing or rod suspension mprovided for each unit length of chassis. Rods shall be of not less than 1/4-inch diameter and shall have a finish to match the fixture.

Deliver lamps to the project in their original cartons and install in the fixtures just prior to the completion of the project. After construction of the total project is completed, wash fixtures and clean lamps.

MOTOR CONTROL. Install equipment in strict accordance with approved drawings and manufacturer's recommendations. Secure motor control centers and other free standing motor control rigidly to floors or mounting pads with anchor bolts, Phillips Drill Company concrete anchors, or other approved means. Grout mounting channels provided with motor control centers into the floor or mounting pads, unless the control center is firmly anchored with the specified concrete anchors, in which case the channels may be removed.

TRANSFORMERS, DRY TYPE. Mount transformers approximately where indicated. Transformers rated 3 kva or less may be mounted directly on heavy reinforced concrete walls, unless otherwise indicated. Transformers larger than 3 kva without built-in vibration dampeners and all transformers mounted on structural frame, wall, ceiling, column, or other surface having a light mass (i.e., where the weight of the mounting surface corresponding to the projected area of the transformer is less than the weight of the transformer) shall have flexible mounting. Load flexible mounts properly and provide complete isolation with no direct metal contact with mounting surface. Connect electric circuits to transformers by means of moistureproof flexible conduit to help prevent vibrations from being transmitted to other equipment. Avoid mounting of transformer in areas which tend to amplify noises, such as stairways, hall areas, and corners near ceiling. Avoid, where possible, nearby reflecting objects or enclosures which might resonate or echo.

Ground neutrals of all transformers. Connect voltage taps on all transformers to give as close as possible rated output voltage under normal plant load conditions.

UNIT HEATERS. Attach unit heaters securely and permanently to the wall in accordance with the manufacturer's recommendations, and make final wiring connections with a short length of moistureproof flexible conduit. The installed unit heater shall be free from objectionable noise or vibration when in operation. Control shall be by thermostat as indicated.

THERMOSTATS. Mount thermostats approximately where indicated and in accordance with the manufacturer's recommendations. Mount thermostats located on exterior walls on a base of thermal-insulating material.

GROUNDING. Except where specifically indicated otherwise, ground all exposed noncurrent-carrying metallic parts of electrical equipment, raceway systems, and the neutral of all wiring systems in strict accordance with the NEC and other applicable laws and regulations. Where ground rods are indicated or used, they shall be of galvanized steel, not less than 3/4-inch diameter, 8 feet long, and driven full length into the earth. Special requirements shall be as shown and as specified herein.

GROUNDING CIRCUITS ABOVE 150 VOLTS TO GROUND. Ground all enclosing cases and mounting frames of all switches, control panels, motors, junction boxes, and other electrical or electrically operated equipment with a separate grounding conductor from the source of supply. Run the grounding conductor inside the conduit enclosing the power conductors supplying the equipment.

Supply all metallic conduits with ground wedges and connect at each end to the grounding conductor.

Make the ground conductor connections to motors 10 hp and above or circuits 20 amperes and above by solderless terminal and a 5/16-inch minimum bolt tapped to the motor frame or equipment housing. Ground connections to smaller motors or equipment may be made by fastening the terminal to a connection box. Connect junction boxes to the equipment grounding system with grounding clips mounted directly on the box or with 3/8-inch machine screws.

GROUNDING CONNECTIONS. Make all buried grounding connections by brazing or Cadweld type joint. Make all other grounding connections by brazing, Cadweld, or with approved pressure terminals.

REPAIR OF EXISTING WORK. Lay out the work carefully in advance. Do not cut or notch any structural member without specific approval of the Engineer. Where cutting, channeling, chasing, or drilling of floors, walls, partitions, ceilings, paving, or other surfaces is necessary for the proper installation, support, or anchorage of the conduit, raceways, or other electrical work, this work shall be carefully done, and any damage to buildings, piping, or equipment shall be neatly restored to original condition by skilled mechanics of the trades involved, at no additional cost to the Owner.

SALVAGED MATERIAL. Unless otherwise indicated, all material shall become the property of the Owner and shall be stored as directed.

REMOVAL AND RELOCATION OF EQUIPMENT. Where existing equipment of any kind is removed or relocated, all exposed materials no longer used, such as studs, straps, conduits, and wire, shall be removed. Where such equipment is removed from walls or other surfaces, the surface shall be repaired to conform to the finish of the surrounding surface in a neat and workmanlike manner.

SERVICE CONTINUITY. Maintain continuity of service to all functioning portions of the building during hours the building is normally in use. Temporary outages will be permitted during cutover work at such times and places as can be prearranged with the Owner. Keep such outages to a minimum length of time and make no outages without prior approval. Include all costs for temporary wiring and overtime work required in the Contract price. Remove all temporary wiring at the completion of the work.

TESTS. After completion of all wiring, insulating resistance testing of power circuits consisting of Size No. 1/0 wire or larger shall be performed with a 500-volt megger. The test on each circuit shall be performed for one minute in the presence of the Engineer or his representative, and a written

test report of the results shall be submitted to the Engineer. Equipment which may be damaged during this test should be disconnected. The tests shall be performed with all other equipment connected to the circuit.

After the electrical system installation is completed and at such time as the Engineer may direct, conduct an operating test for approval. Demonstrate the equipment operating in accordance with the requirements of these Special Specifications. The test shall be performed in the presence of the Engineer or his authorized representative. Furnish all instruments and personnel required for the tests; the Owner will furnish the necessary electric power.

GUARANTEE. All equipment to be furnished under this item shall be guaranteed for a period of one year from the date of acceptance thereof against defective materials, design, and workmanship in accordance with the provisions of the applicable Article of the General Conditions.

D. PAYMENT. Payment for the work in this section will be included as part of the lump sum bid.

(See following pages for tables)

ELECTRICAL DEVICE SCHEDULE

<u>NO.</u>	<u>TYPE</u>	<u>LOCATION</u>	<u>DESCRIPTION/FUNCTION</u>	<u>REMARKS</u>
1	Limit Switch	Pipe Gallery	BF1-1	Wiring Only by Elect.
2	Limit Switch	Pipe Gallery	BF3-1	Wiring Only by Elect.
3	Limit Switch	Pipe Gallery	BF4-1	Wiring Only by Elect.
4	Limit Switch	Pipe Gallery	SWV-1	Wiring Only by Elect.
5	Limit Switch	Pipe Gallery	BF2-1	Wiring Only by Elect.
6	Limit Switch	Filter	MVI-1	Wiring Only by Elect.
7	Limit Switch	Pipe Gallery	BF1-2	Wiring Only by Elect.
8	Limit Switch	Pipe Gallery	BF3-2	Wiring Only by Elect.
9	Limit Switch	Pipe Gallery	BF4-2	Wiring Only by Elect.
10	Limit Switch	Pipe Gallery	SMV-2	Wiring Only by Elect.
11	Limit Switch	Pipe Gallery	BF2-2	Wiring Only by Elect.
12	Limit Switch	Filter	MVI-2	Wiring Only by Elect.
13	Control Contact	Plant Control Panel	Reservoir Level Indicator-Recorder	Wiring Only by Elect.
14	Control Contact	Plant Control Panel	Clearwell Level Indicator	Wiring Only by Elect.
15	H-O-A Switch	Plant Control Panel	Controls Motors Specified	Wiring Only by Elect.
16	Indicating Lights	Plant Control Panel	Indicating Motor ON-OFF	Wiring Only by Elect.
17	Pressure Switch	Plant Control Panel	On Effluent Pressure Recorder	Wiring Only by Elect.
18	Limit Switch	Pump Room	Control Valve	Wiring Only by Elect.
19	Solenoid Valve	Pump Room	Control Valve	Wiring Only by Elect.
20	Limit Switch	Pump Room	On Backwash Valve	Wiring Only by Elect.
21	Solenoid Valve	Pump Room	On Backwash Valve	Wiring Only by Elect.
22	Relay Contacts	Plant Control Panel	CR-4 Contacts in Filter B/W Circuit	Wiring Only by Elect.
23	Programmer Contacts	Plant Control Panel	RLS-18 Contacts on Filter B/W Programmer	Wiring Only by Elect.
24	Pressure Switch	Air Compressor Room	Controls Compressor Motors	Wiring Only by Elect.
25	Solenoid Valve	Pump Room	Surge Relief Valve	Wiring Only by Elect.
26	Pressure Switch	Chlorine Room	Chlorine Low Pressure Alarm	Wiring Only by Elect.
27	Chlorinators	Chlorine Room	Contacts for Indicating Lights and Control	Wiring Only by Elect.
28	Pacing Contact	Influent Flowmeter	Pacing Contact from Influent Flowmeter	Wiring Only by Elect.
29	Lighting Contactor	Pump Room	Controls EF-2 and Louver Motors	By Elect.
30	Programmer	Plant Control Panel	Backwash Programmer	By Other Spec. Section.
31	Flowmeter	Parking Lot	Plant Influent Flowmeter	Wiring Only by Elect.
32	Timer	Plant Control Panel	Filter Aid Feed Pump Timer	Wiring Only by Elect.
33	Pressure Switch	Compressor Room	Low Air Pressure Alarm	Wiring Only by Elect.
34	Air Dryer	Compressor Room		Wiring Only by Elect.

ELECTRICAL PANEL SCHEDULE

SCHED. 1 OF 1PROJECT Newberg W.T.P. ExpansionNAMEPLATE: "PANEL LA 120/240 VOLTS 1 PH. 3 W."LOCATION Pump Room FEEDER Top/BottomMAINS: RATING 100 A.MOUNTING In MCC-A

CIRCUIT DESCRIPTION	BREAKER AMP/POLE	CKT NO.	CKT NO.	BREAKER AMP/POLE	CIRCUIT DESCRIPTION
Lighting, Chlorine Rm.	20/1	1	2	20/2	Heater, Toilet Rm, First Floor
Lighting, Pump Room	20/1	3	4	--	
Lighting, Pipe Gallery	20/1	5	6	20/1	Receptacles, Chlorine Room
Lighting, Pipe Gallery	20/1	7	8	20/1	Receptacles, Pump Room
Lighting, Control Room	20/1	9	10	20/1	Receptacles, Pipe Gallery
Lighting, Control Room	20/1	11	12	20/1	Receptacles, Control Room
Lighting, Parking Lot	20/1	13	14	20/1	Receptacles, Control Room
Lighting, 1st Floor Hall	20/1	15	16	20/1	Receptacles, Exterior
Lighting, Filter Beds	20/1	17	18	20/1	Receptacles, Hallway
Exterior Bldg. Lights	20/1	19	20	20/1	Plant Control Panel
Air Compressor and Air Dryer Control	20/1	21	22	20/1	Plant Control Panel
Surge Relief Valve	20/1	23	24	20/1	Chlorinators
Filter Aid Control Cab.	20/1	25	26	20/1	Exhaust Fan No. 1 (1/4 hp)

ELECTRICAL PANEL SCHEDULE (Cont'd)

CIRCUIT DESCRIPTION	BREAKER AMP/POLE	CKT NO.	CKT NO.	BREAKER AMP/POLE	CIRCUIT DESCRIPTION
Exhaust Fan No. 2 (1 hp)	20/2	27	28	20/1	Sump Pump
	--	29	30	20/1	Spare
Heater, 1st Floor Hall	20/2	31	32	20/1	Spare
	--	33	34	Space	
	Space	35	36	Space	

RACEWAY SCHEDULE

<u>NO.</u>	<u>SIZE (IN)</u>	<u>TYPE/REMARKS</u>
1	3/4	Rigid Steel
2	3/4	Rigid Steel
3	1	Rigid Steel
4	3/4	Rigid Steel
5	3/4	Rigid Steel
6	1	Rigid Steel
7	3/4	Rigid Steel
8	3/4	Rigid Steel
9	3/4	Rigid Steel
10	3/4	Rigid Steel
11	3/4	Rigid Steel
12	3/4	Rigid Steel
13	3/4	Rigid Steel
14	3/4	Rigid Steel
15	3/4	Rigid Steel
16	1	Rigid Steel
17	3/4	Rigid Steel
18	3/4	Rigid Steel
19	1	Rigid Steel
20	2	Rigid Steel
21	2-1/2	Rigid Steel
22	3	Rigid Steel
23	3	Rigid Steel
24	3	To MCC-A
25	3	To MCC-A
26	3	To MCC-A
27	3	To MCC-A
28	3	To MCC-A
29	3	To MCC-A
30	1	Rigid Steel
31	1	Rigid Steel
32	1	Rigid Steel
33	1	Rigid Steel

RACEWAY SCHEDULE (Cont'd.)

<u>NO.</u>	<u>SIZE (IN)</u>	<u>TYPE/REMARKS</u>
34	1	Rigid Steel
35	1	Rigid Steel
36	1	Rigid Steel
37	1	Rigid Steel
38	1	Rigid Steel
39	1	Rigid Steel
40	1	Rigid Steel
41	1	Rigid Steel
42	4	Rigid Steel
43	4	Rigid Steel
44	4	Rigid Steel
45	4	Rigid Steel
46	4	Rigid Steel
47	1	Rigid Steel
48	1	Rigid Steel
49	1	Rigid Steel
50	1	To MCC-A
51	1	To MCC-A
52	1	To MCC-A
53	3	Rigid Steel
54	3/4	Rigid Steel
55	3/4	Rigid Steel
56	1	To Existing Panel (Lc)
57	1	Rigid Steel
58	2-1/2	To P.C.P.
59	2-1/2	To P.C.P.
60	3/4	Rigid Steel
61	3/4	Rigid Steel
62	3/4	Rigid Steel
63	1	To Meter Base
64	1	Rigid Steel
65	3/4	Rigid Steel
66	1-1/4	Rigid Steel
67	3-1/2	Rigid Steel
68	3-1/2	Rigid Steel
69	3/4	Rigid Steel

CIRCUIT SCHEDULE

CKT NO.	CONDUCTORS		FROM	TO	VIA RACEWAY
	NO.	SIZE			
1	3	#12			
	1	#12 (GND)	UH-1	A-3	1, 3
2	3	#12			
	1	#12 (GND)	UH-2	A-3	2, 3
3	3	#12			
	1	#12 (GND)	UH-4	A-4	4, 6
4	3	#12			
	1	#12 (GND)	UH-5	A-4	5, 6
5	3	#12			
	1	#12 (GND)	UH-6	A-4	7
6	3	#10			
	1	#12 (GND)	UH-7	A-5	8
7	3	#10			
	1	#12 (GND)	UH-8	A-5	9
8	3	#10			
	1	#12 (GND)	UH-9	A-6	10
9	3	#10			
	1	#12 (GND)	UH-10	A-6	11
10	3	#10			
	1	#12 (GND)	UH-16	A-9	12
11	3	#10			
	1	#12 (GND)	UH-15	A-9	13

CIRCUIT SCHEDULE (Cont'd.)

CKT NO.	CONDUCTORS		FROM	TO	VIA RACEWAY
	NO.	SIZE			
12	3	#12	UH-13	A-8	14, 16
	1	#12 (GND)			
13	3	#12	UH-14	A-8	15, 16
	1	#12 (GND)			
14	3	#10	UH-12	A-7	17, 19
	1	#12 (GND)			
15	3	#10	UH-11	A-7	18, 19
	1	#12 (GND)			
16	3	#2/0	Backwash Pump	A-13	20
	1	#6			
17	3	4/0	H.S. Pump No. 1	A-12	21
	1	#2 (GND)			
18	3	350 MCM	H.S. Pump No. 2	A-11	22
	1	#1/0 (GND)			
19	3	350 MCM	H.S. Pump No. 2	A-11	23
	1	#1/0 (GND)			
20	3	#12	Air Comp. No. 1	A-14	61
	1	#12 (GND)			
21	3	#12	Air Comp. No. 2	A-15	62
	1	#12 (GND)			
22	4	#12	Devices 20 & 21	A-13	47
23	1	10C/#14CC	Device No. 1	P.C.P.	30

CIRCUIT SCHEDULE (Cont'd.)

<u>CKT NO.</u>	<u>CONDUCTORS</u>		<u>FROM</u>	<u>TO</u>	<u>VIA RACEWAY</u>
	<u>NO.</u>	<u>SIZE</u>			
24	1	10C/#14CC	Device No. 2	P.C.P.	31
25	1	10C/#14CC	Device No. 3	P.C.P.	32
26	1	10C/#14CC	Device No. 4	P.C.P.	33
27	1	10C/#14CC	Device No. 5	P.C.P.	34
28	1	10C/#14CC	Device No. 6	P.C.P.	35
29	1	10C/#14CC	Device No. 7	P.C.P.	36
30	1	10C/#14CC	Device No. 8	P.C.P.	37
31	1	10C/#14CC	Device No. 9	P.C.P.	38
32	1	10C/#14CC	Device No. 10	P.C.P.	39
33	1	10C/#14CC	Device No. 11	P.C.P.	40
34	1	10C/#14CC	Device No. 12	P.C.P.	41
35	4	#12	Devices 18 and 19	A-12	48
36	4	#12	Devices 18 and 19	A-11	49
37	2	30C/#14CC	P.C.P.	MCC-A	53
38	3	#12	Filter Aid Pump No. 1	A-12	54
	1	#12 (GND)			
39	3	#12	Filter Aid Pump No. 2	A-22	55
	1	#12 (GND)			

CIRCUIT SCHEDULE (Cont'd.)

CKT NO.	CONDUCTORS		FROM	TO	VIA RACEWAY
	NO.	SIZE			
40	6	#10	Exist Gutter	Old Ltg. Panel	56 (Run the required number of circuits to carry the load of the circuits removed.)
41	2	#12	Device No. 26	P.C.P.	57
42	4	#12	Device No. 27	P.C.P.	57
43	3	#12	Monorail	A-18	60
	1	#12 (GND)			
44	2	#12	Chlorinator No. 1	P.C.P.	64
45	2	#12	Chlorinator No. 2	P.C.P.	64
46	4	#14	Device No. 31	P.C.P.	65
47	1	#106 Pull Wire	Property Line	P.C.P.	66
48	3	#8	Transf "B"	Panel "LB"	69

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LIGHTING FIXTURE SCHEDULE

<u>NO.</u>	<u>TYPE</u>	<u>VOLTS</u>	<u>MANUFACTURER</u>	<u>CATALOG NO.</u>	<u>LAMP(S)</u>	<u>MOUNTING-REMARKS</u>
1	Inc	120	Appleton	G-5321Y-V 3/4	300 W	Pendant
2	Fluor	120	Sunbeam	POX 390	2-F40WW	Surface
3	Fluor	120	Holophane	7400-4	4-F40WW	Surface
4	Fluor	120	Holophane	6100-4	1-F40WW	Surface
5	Fluor	120	Holophane	7100-4	2-F40TRRSWW	Surface
6	Incan	120	Appleton	VA2050ST	200W	Pendant (Conduit)
7	Merc-Vap	120	Holophane	589-120	250W H-37	Wall
8	Incan	120	Holophane	480	300W	Wall
9	Incan	120	Shalda	433Y & 203	150W/PAR38FL	Side of Slab
10	Fluor	120	Holophane	6100-4	1-F40WW	On Stem Hangers
11	Incan	120	Stonco	WB 502-EL & Cord	1-300W- PAR-56	See sheet for required mounting and wiring

ELECTRIC HEATER SCHEDULE UH/CUH

<u>HEATER THERM.</u>	<u>LOCATION</u>	<u>KW</u>	<u>VOLTS</u>	<u>PHASE</u>	<u>MANUFACTURER</u>	<u>CATALOG NO.</u>	<u>REMARKS</u>
UH-1	1st Floor North	5	480	3	Electromode	9421-ZAR	Wall Mount Up 8'-0"
UH-2	1st Floor North	7.5	480	3	Electromode	9423-ZAR	Wall Mount Up 8'-0"
UH-3	Toilet	2	240	1	Electromode	4990-M	Surface Mount On Wall Using Box No. 8754
UH-4	Exist. Pump Rm.	5	480	3	Electromode	9421-ZAR	Wall Mount Up 8'-0"
UH-5	Exist. Pump Rm.	5	480	3	Electromode	9421-ZAR	Wall Mount Up 8'-0"
UH-6	CL ₂ Room	3	480	3	Electromode	9420-ZAR	Wall Mount Up 8'-0"
UH-7	New Pump Room	7.5	480	3	Electromode	9423-ZAR	Wall Mount Up 8'-0"
UH-8	New Pump Room	7.5	480	3	Electromode	9423-ZAR	Wall Mount Up 8'-0"
UH-9	Pipe Gallery	7.5	480	3	Electromode	9423-ZAR	Wall Mount Up 8'-0"
UH-10	Pipe Gallery	7.5	480	3	Electromode	9423-ZAR	Wall Mount Up 8'-0"
UH-11	2nd Floor	7.5	480	3	Electromode	9423-ZAR	Wall Mount Up 8'-0"
UH-12	2nd Floor	7.5	480	3	Electromode	9423-ZAR	Wall Mount Up 8'-0"
UH-13	2nd Floor	7.5	480	3	Electromode	9423-ZAR	Wall Mount Up 8'-0"
UH-14	2nd Floor	5	480	3	Electromode	9421-ZAR	Wall Mount Up 8'-0"
UH-15	Control Room	7.5	480	3	Electromode	9423-ZR	Wall Mount Up 8'-0"
T-1	Control Room				Penn	826	Wall Mount. Use T-1 for UH-15 and UH-16

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ELECTRIC HEATER SCHEDULE (Cont'd.)

<u>HEATER THERM.</u>	<u>LOCATION</u>	<u>KW</u>	<u>VOLTS</u>	<u>PHASE</u>	<u>MANUFACTURER</u>	<u>CATALOG NO.</u>	<u>REMARKS</u>
UH-16	Control Room	7.5	480	3	Electromode	9423-ZR	Wall Mount Up 8'-0"
UH-17	Hallway	2	240	1	Electromode	4990-M	Wall Mount - Flush
T-2	Pump Room	-	-	-	Penn	826X-2000	Wall - Control EF-2

NAMEPLATE SCHEDULE

<u>NO.</u>	<u>LOCATION</u>	<u>LETTERING</u>	<u>REMARKS</u>
1	A-1	Main Breaker	Nameplates 1 thru 21 shall be furnished and installed by the supplier of MCC-A
2	A-3	Heaters, First Floor North	
3	A-4	Heaters, CL ₂ Room and Existing Pump Room ²	
4	A-5	Heaters, New Pump Room	
5	A-6	Heaters, Pipe Gallery	
6	A-7	Heaters, Second Floor	
7	A-8	Heaters, Second Floor	
8	A-10	High Service Pump No. 3	
9	A-11	High Service Pump No. 2	
10	A-14	Air Compressor No. 1	
11	A-15	Air Compressor No. 2	
12	A-12	High Service Pump No. 1	
13	A-9	Heaters, Control Room	
14	A-18	Monorail Hoist	
15	A-16	Panel "LA" Disconnect	
16	A-17	Panel "LB" Disconnect	
17	A-13	Backwash Pump	
18	A-20	Panel "LA" Disconnect	
19	A-19	Transformer	
20	A-21	Filter Aid Feed Pump No. 1	
21	A-22	Filter Aid Feed Pump No. 2	
22	Clearwell Switch	Caution - Clearwell Viewing Light Must Be Submerged Before Turning This Switch On	Red With White Letters

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16B. SUPERVISORY CONTROL SYSTEM

A. SCOPE. This section includes the work necessary for a complete supervisory control system to perform the following functions:

Transmit reservoir water level signal from reservoir and record level at the water treatment plant and the City maintenance shops.

Provide remote ON-OFF control of three existing well pumps and one new well pump from the water treatment plant.

Provide motor running light for all four well pump motors at the water treatment plant.

Provide alarm functions as indicated at the water treatment plant and City maintenance shops.

The complete, unified supervisory control system shall be the product of a single manufacturer responsible for the supply, adjustment, installation, and start-up of a complete system which will perform the functions shown.

The following firms are approved for this project: Sparling Meter Company, Fischer & Porter Company, Minneapolis-Honeywell, Martig's Incorporated, and Instrument Laboratory, Inc.

All other firms will require specific approval at least 10 days prior to bid opening. Requests for approval shall include the following information in order to receive consideration:

System accuracy and response.

List of existing installations of similar type.

Service capability and availability of parts.

APPROVAL DRAWINGS. The successful Bidder shall within 30 days after award of the Contract and before any material is fabricated or shipped to the site, furnish to the Engineer full details, shop drawings, catalog cuts, and such other descriptive matter as may be required to fully describe the equipment and to demonstrate its conformity to these Specification requirements. The decision of the Engineer upon the acceptability of any submittal shall be final.

B. MATERIALS.

GENERAL. Unless otherwise instructed by the Engineer, the Contractor shall use all new materials, of first quality, approved by the Underwriters' Laboratories, Inc., wherever standards have been established by that agency. It is intended that the complete system of telemetering and control shall be the products of a single manufacturer. The term "product of a single manufacturer" is not necessarily restricted to mean components normally furnished by that manufacturer as part of systems furnished by him. Unless otherwise indicated in writing by the Engineer, the materials to be furnished shall be the standard products of manufacturers regularly engaged in the production of

equipment of similar type and purpose and shall be the manufacturer's latest standard design which meets the requirements of this Specification.

RESERVOIR LEVEL.

SYSTEM PERFORMANCE. A complete telemetry system shall be provided to sense and transmit a reservoir level signal at the reservoir location, and to receive, indicate, and record level at the plant control panel of the water treatment plant. Alarm and control functions shall also be provided as shown. The system accuracy shall be determined by calculating the square root of the sum of the squares of the accuracies of all components of the measuring system. The overall system performance shall conform to the following:

Calibration accuracy	+ 1.0% of full scale
Repeatability accuracy	$\pm$ 0.5% of full scale
Speed of response	100.0% of full scale in 15 seconds
Sensitivity	0.5% of full scale

The telemetering level signal shall be pulse frequency or pulse duration suitable for transmission by an audio tone signaling system over telephone lines leased by the Owner.

LEVEL SENSOR-TRANSMITTER. A level sensor indicator and transmitter shall be furnished to sense reservoir level and to transmit a signal for remote display. The level sensor shall be direct-pressure type with either bourdon tube or bellows sensing element and linear output signal. A meter with 4-inch minimum scale length shall be provided to give local indication of level. The level sensor-transmitter shall be Sparling Model 710 or as approved.

RECEIVER-INDICATOR-RECORDER. Level recorders shall be supplied in a rectangular case and semi-flush mounted on the water treatment plant control panel and the City maintenance shops. The recorders shall have the following performance characteristics:

Indicator	Separate, 10 inches long (nominal).
Recorder	12 inches, circular, direct-reading, 7-day rotation, single pen.
Scale	0-40 feet.
Calibrated	$\pm$ 0.5% of full scale.
Repeatability	$\pm$ 0.25% of full scale.
Sensitivity	$\pm$ 0.2% of full scale.

Alarm contacts for high and low level conditions shall be provided. The contacts shall be individually adjustable, rated 3 amperes at 115 volts, and shall be capable of being set with an accuracy of $\pm$ 0.5 percent of full scale.

The instrument shall operate at 120 volts, 60 cycles, and shall not have accuracy affected by a ± 10 percent change in supply voltage.

Upon loss of local power or loss of telemetry signal, the instrument shall be designed to drive upscale to a maximum reading.

Provide contacts for pump control purposes on the recorder at the water treatment plant. The level control contacts shall be adjustable over the entire range of the transmitter and have a setting accuracy of ± 0.5 percent of full scale. A single isolated contact for each pump shall be provided having an adjustable differential from one percent (minimum) to 100 percent (maximum) and a rating of 5 amperes at 120 volts. The instrument shall operate at 120 volts, 60 cycles, and shall not have accuracy affected by a ± 10 percent change in supply voltage.

ALARMS. Audible and flashing visual alarms shall be provided on the plant control panel at the water treatment plant for the following system conditions:

High reservoir water level.
Telemetry signal failure.

The alarm system shall be an annunciator with hermetically sealed remote mounted relays. The annunciator shall be designed to signal new alarms with previous alarms still indicated. The system shall be designed to allow common testing of all lamps and shall have a single audible alarm silence push button. The annunciator shall sound an audible alarm and cause a light to flash when an alarm condition exists. The audible alarm will be silenced and the light shall glow steady when the alarm is acknowledged. The light will continue to glow until the alarm condition is corrected. Oiltight bull's-eye type lamp indication, audible alarm, flasher, test, and silence push buttons shall be supplied.

REMOTE PUMP CONTROL. The remote control of the well pumps shall be by an audio-tone system as shown on the Plans.

tone SIGNALING SYSTEM. An audio-tone frequency shift system shall be supplied to provide multiple control channels over a single pair of telephone lines between the locations shown. The system shall be capable of providing at least 25 interference-free channels over voice-grade circuit handling frequencies from 400 to 3,000 cycles per second.

All tone transmitters and receivers shall be transistorized plug-in type and completely interchangeable with each other. One spare FS transmitter and receiver and power supply plug-in unit shall be furnished.

Each frequency shall be determined by a separate, sealed, plug-in package, designed to be impervious to external physical conditions and particularly to eliminate frequency drift. The tone unit shall be capable of pulsing speeds of at least 20 pulses per second.

The audio-tone equipment shall be Quindar, Hersey-Sparling, Hammerlund, Bristol, or RFL.

Interposing relays for control and alarm functions shall be supplied with the tone equipment to provide external keying and control initiation at 115 volts.

All 110-volt a-c relays, except pump interpose relays, shall be plug-in type with dust covers and shall be interchangeable with one another. One spare relay of each type shall be furnished with the system.

SPARE PARTS TEST EQUIPMENT. A one-year's supply of charts and ink shall be supplied for each instrument. A test meter specifically designed to test and trouble-shoot the telemetering transmitting and recording equipment shall be supplied.

WATER TREATMENT PLANT CONTROL PANEL. The electric clock and panel specifications shall be supplied under Section INSTRUMENTATION AND CONTROL. The panel shall be constructed under this section. The supervisory control equipment, selector switches, nameplates, and indicating lights shall be provided under this section for installation at the factory.

The tone equipment, power supplies, and accessory relay equipment shall be mounted on an inner equipment rack accessible from the rear.

All wiring shall be color coded, numbered at each end, and neatly bundled and tied. Minimum wire size shall be No. 12 AWG for power and No. 16 AWG for signaling circuits. All wiring for external connections shall be brought to a master terminal block near the bottom of the enclosure.

REMOTE CABINETY. Equipment at the well pump stations shall be enclosed in a NEMA 1 enclosure with strip heaters adequate to eliminate condensation. Utilize existing thermostat circuits for 120-volt power at the old well site and provide new thermostat (Chromolox WR80) at new well site. The enclosures shall include electric power circuit breaker, telephone surge protection, tone signaling devices, relays, and other auxiliary equipment. The units shall be complete, requiring only one 120-volt power connection, telephone line, or control circuit connection for operation.

Equipment at the reservoir shall be enclosed in a NEMA 4 enclosure with strip heater and thermostat adequate to eliminate condensation. The enclosure shall include a light of adequate size to read the indicator scale, electric power circuit breaker, a 120-volt power receptacle, tone signaling devices, relays, and other auxiliary equipment. The unit shall be complete, requiring only one 120-volt power connection, telephone line, or pressure connection for operation.

C. WORKMANSHIP.

GENERAL. The completed system of telemetering equipment and controls shall be regulated and adjusted by the supervisory control supplier in such manner as to assure its proper performance. Upon start-up of the plant, the supervisory control system shall be adjusted to perform as hereinbefore specified.

The installations shall conform to the latest applicable rules of the NEC, and applicable State and local codes. Install products in strict accordance with the manufacturer's recommendations, unless otherwise specified or directed by the Engineer. Replace or repair defective equipment or equipment damaged in the course of installation or test in a manner approved by the Engineer.

INSTRUCTION AND OPERATING MANUALS. Four sets of operating and maintenance manuals, installation features, maintenance and repair instructions, and detailed parts drawings of all equipment shall be furnished in a hard bound ring binder. The cover sheet shall list the local sales and service representative.

ELECTRICAL WIRING. Electrical wiring shall conform to the requirements of Section ELECTRICAL.

TESTS. The completed panel and cabinet assemblies shall be tested for proper operation at the supervisory control system supplier's works. Retest of the panel-mounted systems after erection shall not be required, unless there is evidence of mishandling in transit or erection. All electrical wiring shall be tested for continuity, shorts, or grounds, and all incorrect conditions shall be corrected. The test shall be performed before the wire runs are connected to the instruments.

GUARANTEE. All equipment, materials, and workmanship furnished in fulfillment of the requirements of these Special Specifications shall be guaranteed for a period of one year from the date of final acceptance of the system by the Owner, in accordance with the provisions of the General Conditions. Within the guarantee period, any defect arising from the use of defective materials or unsatisfactory workmanship in construction or installation shall be made good without cost to the Owner. The Contractor shall assume responsibility to the Owner for the implementation of this guarantee upon receipt of notification that a defect falling within the scope hereof has been discovered.

FIELD SERVICE. The Contractor shall provide three field trips by the supervisory control system supplier during the first year of service to inspect the equipment, make any necessary adjustments, and instruct operating personnel to assure proper performance of the system. This service shall be furnished without additional cost to the Owner.

D. PAYMENT. Payment for the supervisory control system installed, complete, in operating condition will be on the basis of the lump sum bid as stated in the Contractor's Proposal.

Rev: Jan.'69 Re-run: Jul.'70 .

STANDARD SPECIFICATIONS
FOR
REINFORCED CONCRETE

(Index follows Page 24)

STANDARD SPECIFICATIONS
FOR
REINFORCED CONCRETE

Reference herein is made to Standards, Tests, Methods, and Specifications of research and technical organizations, as follows:

AWS	American Welding Society
ASTM	American Society for Testing and Materials
CRSI	Concrete Reinforcing Steel Institute
CRD	Corps of Engineers

<u>Item</u>		<u>Standard Specification, Test, or Method Designation</u>	
		<u>ASTM</u>	<u>OTHER</u>
B-1	Cement	C 150	
B-3	Concrete Aggregates	C 33 C 87	
B-6	Steel Reinforcement	A 82 A 185 A 615	
B-8	Air-Entraining Admixture	C 260	CRD-C 13
B-10	Asphalt & Asphalt Primer and Asphalt Joint Sealer	D 449 D 41 D 1190	
B-11	Rubber-Asphalt Joint Seal	D 1190	
B-12	Premolded Joint Filler	D 994 D 1751 D 1752	
B-14	Copper Water Stop	B 152	
B-17	Plastic Water Stop		CRD-C 572
C-8	Tests of Concrete	C 31 C 39	

All references to the above Specifications, Standards, or Methods shall, in each instance, be understood to refer to the latest adopted revision, including all amendments.

B. MATERIALS

B-1. Cement. Cement used shall conform to ASTM C 150, except that the total alkali content, when determined as the mixed sulphates of sodium and potassium and calculated to sodium oxide, shall not be greater than 0.6 of 1 percent. Unless otherwise specified in the Special Specifications or authorized by the Engineer, Type 1 cement shall be furnished.

B-2. Water. Water for concrete shall be clean and free from oil, acid, alkali, organic matter, or other deleterious substances. Water furnished by the Owner will be considered as meeting the above requirements.

B-3. Concrete Aggregates. Concrete aggregates shall conform to ASTM C 33, or to the applicable specifications of the State Highway Department for Bridge Construction of the state in which the work is to be performed. Fine aggregate, when tested in accordance with ASTM C 87, shall develop a compressive strength at 7 and 28 days of not less than 85 percent of that developed by the standard mortar specified in ASTM C 87 as the basis of comparison. The size of coarse aggregate shall be that specified in the Special Specifications.

B-4. Admixture for Nonshrinking Grout. The nonshrinking admixture shall be a metallic material which will reduce and control shrinkage and shall be Embecco, as manufactured by Master Builders Company, Cleveland, Ohio, or an approved equal. Unpolished aluminum powder may be used as an admixture to control shrinkage subject to approval of the Engineer.

B-5. Dry-Pack Grout.

a. Nonshrinking Type. Dry-pack grout for water-holding basins and as otherwise specified to be nonshrinking shall consist of 1 part portland cement, 1 part of fine sand, and 1 part Embecco, or other approved admixture. Proportions shall be established by weight. Where a nonstaining, nonshrinking grout is required, unpolished aluminum powder shall be used and the proportions shall be in accordance with the manufacturer's recommendations as approved. Only sufficient water shall be added to the mixture to produce a dry, crumbling mass. When the mixture is pressed tightly together into a ball with the hands, there should not be sufficient water in the mixture to stain the hands, and when such a ball is broken, it should crumble.

b. Ordinary Type. Dry-pack grout for use in other than water-holding basins, unless otherwise specified, shall consist of 1 part portland cement to 2 parts of sand. Proportions shall be established by volumetric measurements. Only sufficient water shall be added to make a dry, crumbling mass. When the mixture is pressed tightly together into a ball with the hands, there should not be sufficient water in the mixture to stain the hands; and, when such ball is broken, it should crumble.

B-6. Steel Reinforcement. Reinforcement shall be plain or deformed steel bars or cold-drawn steel wire, or fabricated forms of these materials as required by the Plans or the Specifications, or both. Bar reinforcing

shall conform to ASTM A 615, Grade 40, unless otherwise specified. Cold-drawn steel wire and welded wire fabric shall conform to ASTM A 82 and A 185, respectively.

B-7. Forms. Plywood or steel forms shall be used on all exposed wall surfaces and shall extend to a minimum of 6 inches below finished grade on exterior surfaces or the normal waterline on the inside of uncovered basins, unless otherwise specified. Lumber used in forms for surfaces where plywood is not required shall be dressed to a uniform thickness and shall be free from loose knots or other defects. Upon approval by the Engineer, steel or plywood panel forms may be used to form walls of curved shape.

B-8. Concrete Admixtures. The air-entraining admixture furnished shall be approved by the Engineer and shall conform to ASTM C 260, or U.S. Army Corps of Engineers Specification CRD-C 13.

Admixture furnished for use as a water-reducing and cement-dispersing or plasticizing agent shall be Pozzolith (Normal), as manufactured by the Master Builders Company, Cleveland, Ohio, or approved equal. Pozzolith Retarder and high-early admixtures may be used in lieu of Pozzolith (Normal) to suit job conditions subject to approval of the Engineer. Water-reducing admixture shall be provided for concrete mixes when specified in the Special Specifications. Use of substitute admixtures will not be approved without verification, satisfactory to the Engineer, of the chemical properties of the admixture and its effects on the concrete mix as substantiated by laboratory reports and certified experience records.

B-9. Bonding Agent. Bonding agent for bonding new concrete to existing concrete shall be Sta-Crete, as manufactured by Sta-Crete, Inc., San Francisco, California; or Epoxy Bond MPC, Code 2090-Special, as manufactured by Edoco Technical Producers, Inc., Long Beach, California; or an approved equal.

B-10. Asphalt. Where indicated on the Plans, surfaces of concrete at joints shall be painted with asphalt meeting ASTM D 449 requirements. Asphalt primer for use with sealing asphalt shall meet the requirements of ASTM D 41. Hot-poured asphalt filler shall conform to ASTM D 1190, with the added requirement that the specific gravity shall be more than 1.

B-11. Poured Rubber-Asphalt Joint Sealing Material. Poured rubber-asphalt joint sealing material shall conform to ASTM D 1190.

B-12. Premolded Joint Filler. Premolded joint filler shall be a bituminous type conforming to ASTM D 994 or D 1751. Bituminous cellular types conforming to ASTM D 1751 or D 1752, Type III, may be used in dry interior locations. Where sponge rubber type is shown on the Plans, it shall be cement color conforming to ASTM D 1752, Type I.

B-13. Steel Water Stop for Construction Joints. Steel water stop in construction joints shall be 16-gauge, hot-dip galvanized sheet metal. Width shall be 6 inches, unless otherwise noted on the Plans.

B-14. Copper Water Stop. Copper water stops shall be formed of 18-ounce, cold-rolled sheet copper of suitable temper, meeting the requirements of ASTM B 152. Water stops shall be formed as shown on the Plans.

B-15. Rubber Water Stop. Rubber water stop shall be molded or extruded and shall be fabricated from a high-grade, tread type compound. Water stop shall be Gates Type B or Type C, or an approved equal as shown on the Plans. Intersection pieces shall be furnished to provide a continuous seal.

B-16. Labyrinth Water Stop. Labyrinth type water stop shall be of size shown on the Plans and shall be Harza Labyrinth type water stop as supplied by Water Seals, Inc., Chicago, Illinois, or approved equal.

B-17. Plastic Water Stop. Plastic water stop shall be extruded from an elastomeric plastic compound, the basic resin of which shall be polyvinyl chloride (PVC). The compound shall contain any additional resins, plasticizers, stabilizers, or other materials needed to insure that, when the material is compounded, it will meet performance requirements herein. The material shall not, however, contain an excessive amount of inert filler added for the purpose of increasing the unit weight of the compound. Specific gravity shall be approximately 1.37 and the Shore Durometer Type A hardness, approximately 80. No reclaimed PVC shall be used in the compound.

Plastic water stop shall be resistant to alkalies, acids, salt water, fungi, petroleum products, sewage, and organic compounds. Water stop shall be produced by an extrusion process such that, as supplied for use, it will be dense, homogeneous, and free from holes and other imperfections.

The water stop, or the material from which the water stop is fabricated, shall meet the following performance requirements when tested by the methods outlined in the Corps of Engineers Specification CRD-C 572.

a. Samples taken from the finished water stop shall meet the following requirements:

<u>Number of Specimens Tested</u>	<u>Requirements</u>
At least 5	Tensile strength not less than..... 1400 psi
	Ultimate elongation, not less than..... 280%

b. Samples taken from the sheet material from which the water stop is made shall meet the following requirements:

<u>Number of Specimens Tested</u>	<u>Requirements</u>
At least 5	Tensile strength, not less than..... 1750 psi
	Ultimate elongation, not less than..... 350%
At least 3	Low temperature brittleness, no sign of failure, such as cracking or chipping at..... -35°F.

Number of Specimens Tested

Requirements

At least 3

Stiffness in flexure, 1/4-inch span,
not less than..... 400 psi

Effect of Alkalies

Change in weight after 7 days,
between..... -0.10 and
+0.25%

Change in Shore Durometer reading after
7 days, not more than..... +5

Change in weight after 28 days,
between..... -0.30 and
+0.40%

Change in thickness after 28 days,
not more than..... +1.0%

c. Samples taken across job-made splices should meet the following requirements:

Number of Specimens Tested

Requirements

As directed

Tensile strength, not less than..... 1120 psi

Water stop shall be of the shape and dimensions shown on the Plans or specified in the Special Specifications. The cross section of the water stop shall be uniform along its length and shall be symmetrical transversely so that the thickness at any given distance from either edge of the water stop will be uniform. Water stop shall have a constant thickness from the edge of the bulb to the outside edge. All water stops shall have a number of parallel ribs or protrusions on each side of the center of the strip. Corrugated type or tapered water stops are not acceptable.

Dimensional Requirements

Ordinary Conditions:

Thickness, minimum..... 3/16 inch
Width, minimum..... 6 inches
Weight, minimum, pounds per 100 linear feet..... 75 pounds

6-inch water stop for expansion joints:

Type..... Center bulb
Weight, minimum, pounds per 100 linear feet..... 135 pounds
Thickness, minimum..... 3/8 inch

Dimensional Requirements (Cont'd.)

9-inch water stop for expansion joints:

Type.....	Center bulb
Weight, minimum, pounds per 100 linear feet.....	205 pounds
Thickness, minimum.....	3/8 inch

B-18. Floor Hardener (Surface-Applied). Floor hardener shall be a colorless, aqueous solution of zinc and/or magnesium fluosilicate, or of sodium silicate. Each gallon of the fluosilicate solution shall contain not less than 2 pounds of crystals. The sodium silicate solution shall be 32 percent by volume of 42-degree Baume sodium silicate. An approved proprietary hardener such as Saniseal, as manufactured by the Master Builders Company, may be used provided the solution is delivered ready for use in the manufacturer's original containers.

C. WORKMANSHIP

C-1. Proportioning.

a. Submission of Samples of Materials. Immediately upon receipt of notification to begin work and upon request of the Engineer, the Contractor shall submit to the Engineer samples of the aggregate which he proposes to use in the construction, together with samples of the cement and air-entraining or cement-dispersion admixtures which he plans to use.

b. Proportions. Proportions indicated in Table I of the Special Specifications will provide the basis for estimating the type of mixture and the materials and methods necessary for placing the concrete, and are based on the use of aggregates available locally in the vicinity of the work. The actual proportions to be used will be based on tests made on samples of the aggregate, cement, and admixture submitted by the Contractor. The Engineer will make the necessary test and design the mixture. The Owner will bear the expense of the tests necessary to design the concrete mixture for 1 set of aggregate samples. Should the Contractor desire tests run or mixtures designed for additional samples of aggregate, such tests shall be made by the Engineer but shall be at the expense of the Contractor. Acceptance by the Engineer of a given aggregate on the basis of preliminary tests shall not prevent the Engineer from later rejecting aggregate from the same source if subsequent tests indicate that the aggregate no longer meets the requirements for grading and quality given herein.

The cement factor specified is that required for concrete of the desired strength using local aggregates. The Contract is to be based on this cement factor and the other proportions specified. If the subsequent mix design indicates a change from the specified cement content is necessary, the Engineer may order such change, and the Contract price shall be increased or diminished accordingly, in proportion to the increase or reduction of cement and the current market price of cement in the locality, unless otherwise provided for in the Proposal. This price adjustment shall be made on the basis of cost to the Contractor of cement only, without allowance for

overhead, profit, anticipated profits, or other indirect costs. If the Contractor chooses to use other than local aggregate, and greater or less cement than that specified for local aggregate is required to obtain the desired strength, or if he elects to increase the cement factor to correct for shortages of fines in the aggregate, or for any other reason, no adjustment of the Contract price will be made. Strength determinations will be made as specified under C-8.

c. Cement Factor. The cement factor given in the Special Specifications indicates the number of 94-pound sacks of cement per cubic yard of concrete when the concrete is in a freshly mixed condition. The volume of the freshly mixed concrete shall be assumed to be the absolute volume of the cement, plus the volume of the mixing water, plus the displaced volumes of the saturated, surface-dry aggregates. The quantity of mixing water to be used in this calculation shall not include water absorbed by the aggregates.

d. Variations in Proportions. In order to obtain proper workability and a smooth, dense, homogeneous, plastic mixture, free from segregation, the percentage of fine aggregate may be varied during the progress of the work with the approval of the Engineer.

e. Water Content and Slump Range. The maximum quantity of water per 94 pounds of cement specified in the Special Specifications shall be based on saturated, surface-dry aggregates. The slump range indicated in the Special Specifications is intended as a guide to the Contractor for the determination of placing and compacting procedures and equipment. Within the range specified, the slump shall be as directed by the Engineer. If the concrete has a greater slump than the maximum indicated, the proportion of water shall be reduced to meet the slump requirements. If the concrete has a smaller slump than the minimum indicated, changes in the mixture shall be made as specified hereinbefore in C-1.d. or water may be added with the approval of the Engineer.

C-2. Measurement of Materials.

a. Weight Measurement. Materials shall be measured by weighing. The apparatus provided for weighing the aggregates and cement shall be suitably designed and constructed for this purpose. The equipment for weighing materials shall provide convenient and positive means for determining the quantities in the batch of concrete. Bins with adequate separate compartments for fine aggregates and for each required size of coarse aggregate shall be provided in the batching plant. Each compartment shall be designed to discharge efficiently and freely into the weighing hopper. Means of control shall be provided so that as the quantity desired in the weighing hopper is approached, the material may be added slowly and shut off with precision. A port or other opening for removing an overload and sampling materials from the weighing hopper shall be provided. Weighing hoppers shall be constructed so as to eliminate accumulations of tare material and discharge fully. Fine aggregate, coarse aggregate, and cement shall be weighed separately. Cement in standard packages (sack) need not be weighed.

Mixing water shall be measured by volume or by weight. Weighing of materials for a batch shall be within the following limits of accuracy: Water, 1 percent; cement, 1 percent; and aggregate, 2 percent. All measuring devices shall be subject to approval of the Engineer. The batching plant shall be of adequate capacity and acceptable to the Engineer. The Engineer reserves the right to disapprove of facilities which in his opinion are inadequate and/or do not conform to the Specification requirements.

b. Volumetric Measurement. Where volumetric measurements are authorized by the Engineer, the weight proportions shall be converted to equivalent volumetric proportions. In such case, suitable allowance shall be made for variations in the moisture condition of the aggregates, including the bulking effect in the fine aggregate.

c. Measurement of Air-Entraining Admixture. The air-entraining admixture shall be introduced with the water. Accurate means of measuring the amount of air-entraining admixture shall be provided, and the mix shall be controlled to maintain an entrained air content of not less than 3 percent nor more than 6 percent, unless otherwise specified in the Special Specifications.

d. Measurement of Water-Reducing Admixture. Accurate means of measuring the amount of Pozzolath admixture shall be provided. The quantity used per batch and the method of introducing and mixing shall be in accordance with the manufacturer's recommendations.

C-3. Mixing.

a. Equipment. The mixing equipment shall be capable of combining the aggregates, cement, and water within the specified time into a thoroughly mixed and uniform mass and of discharging the mixture without segregation.

b. Machine Mixing (at Site or at Central Mixing Plant). Unless otherwise authorized by the Engineer, the mixing of concrete shall be done in a batch mixer of approved type. The equipment at the mixing plant shall be so constructed that all materials entering the drum can be accurately proportioned and be under control. The entire batch shall be discharged before recharging. The volume of the mixed material per batch shall not exceed the manufacturer's rated capacity of the mixer. Except as qualified in C-3.c. to C-3.e., mixing of each batch shall continue for the periods indicated below during which time the drum shall rotate at a peripheral speed of about 200 feet per minute. The mixing periods shall be measured from the time when all of the solid materials are in the mixer drum, provided that all of the mixing water shall be introduced before 1/4 of the mixing time has elapsed.

Mixing time shall be as follows:

(1) For mixers of a capacity of 1 cubic yard or less, 1-1/2 minutes; and,

(2) For mixers of capacities larger than 1 cubic yard, the time of mixing shall be increased 15 seconds for each additional 1/2 cubic yard capacity or fraction thereof.

c. Truck Mixing. Truck mixers shall be watertight and, unless otherwise authorized by the Engineer, shall be of the revolving-drum type. All solid materials for the concrete shall be accurately measured as specified in C-2 and charged into the drum at the proportioning plant. The mixing water may be added directly to the batch, but all truck mixers shall be equipped with a tank for carrying mixing water. When water is to be added subsequent to dry charging at the plant, only the prescribed amount of water shall be placed in the tank unless the tank is equipped with a device by which the quantity of water added can be readily verified. The maximum size of batch in truck mixers shall be in accordance with the specified rating. Truck mixing shall be continued for not less than 50 revolutions after all ingredients, including the water, are in the drum. The speed shall not be less than 4 rpm nor more than a speed resulting in a peripheral velocity of the drum of 225 feet per minute. Not more than 150 revolutions of mixing shall be at a speed in excess of 6 rpm. Mixing shall begin within 30 minutes after the cement has been added either to the water or aggregate.

d. Partial Mixing at Central Plant. When a truck mixer or an agitator provided with adequate mixing blades is used for transportation, the mixing time at the stationary machine mixer may be reduced to 30 seconds and the mixing completed in a truck mixer or agitator. The mixing time in the truck mixer or agitator, equipped with mixing blades, shall be as specified for truck mixing in C-3.c.

e. Time of Hauling Ready-Mixed Concrete. Concrete transported in a truck mixer, agitator, or other transportation device shall be discharged at the job within 1-1/2 hours after the cement has been added to the water or the aggregates, except for high-early-strength concrete mixes which shall be 45 minutes.

f. Retempering. The retempering of concrete or mortar in which the cement has partially hydrated will not be permitted.

g. Air-Entraining Admixture. The air-entraining admixture shall be added to the mixer at the time of mixing in such a manner as to insure uniform distribution of the admixture throughout the batch. An air meter shall be provided for measuring the air content of concrete at the jobsite, unless otherwise approved. Air-entraining admixture shall not be used unless suitable means for determining air content in the freshly mixed concrete are available. At the option of the Engineer, entrained air may be eliminated in interior slabs on ground and at other locations where appearance may be of greater importance than additional durability or impermeability.

C-4. Forms.

a. General. Forms shall conform to the shape, lines, grades, and dimensions of the concrete as called for on the Plans, unless otherwise approved by the Engineer. Lumber once used in forms shall have nails withdrawn and surfaces to be in contact with concrete cleaned before being used again. Reuse of forms and form lumber will be permitted only when the condition of forms or form lumber is approved by the Engineer. It is the intent of this Specification to maintain "new form" appearance for all work.

Suitable moldings or fillets shall be placed in the tops of the forms and in the crotch of the forms to bevel all concrete edges. Moldings shall also be placed on all discontinuous edges. Bevels shall be approximately 3/4 inch in depth. All bevels and fillets, except as otherwise shown on the Plans, shall be the same size. Where the tops of walls are given a trowel finish, an edging tool may be used instead of fillets.

b. Design. Forms shall be sufficiently tight to prevent leakage of mortar. They shall be properly braced or tied together so as to maintain the desired position and shape until removed. Bolts and rods shall preferably be used for internal ties. Ties for water-holding structures and on walls exposed to weather or earth shall have conical or spherical type inserts and shall be so constructed that when the forms are removed no metal shall be within 5/8 inch of any surface. Plastic or rubber inserts shall be used with flat bar ties for panel forms and shall be a minimum of 1 inch in depth and of sufficient dimensions to permit proper grouting of the tie hole. Snap ties for water-holding basins shall be constructed with a water stop. The Engineer may direct the use of one type of insert or head where appearance is important. Flat washer type heads may be used on concealed walls which are to receive a finish coat of stucco, plaster, or wallboard. Openings shall be provided such that concrete is dropped no farther than 6 feet in walls 8 inches or less in width, and not more than 12 feet in walls wider than 8 inches. Temporary openings shall be provided at the base of wall forms and at other points where necessary to facilitate cleaning and inspection immediately before depositing concrete.

Forms shall be constructed and maintained to insure satisfactory fit of all components of the structures but in no case shall the following tolerance limits of the finished work be exceeded:

Tolerances for Reinforced Concrete Structures

Variation from the plumb:

In the lines and surfaces of columns, piers, walls, and in arrises;
In 10 feet..... 1/4 inch
In any story or 20 feet maximum..... 3/8 inch

For exposed corner columns control-joint grooves, and other conspicuous lines;
In any bay or 20 feet maximum..... 1/4 inch

Variation from the level or from the grades indicated on the Plans:

In floors, *ceilings, beam soffits, and in arrises;
In 10 feet..... 1/4 inch
In any bay or 20 feet maximum..... 3/8 inch

For exposed lintels, sills, parapets, horizontal grooves, and other conspicuous lines;
In any bay or 20 feet maximum..... 1/4 inch
In 40 feet or more..... 1/2 inch

*Applies to concrete only, not to reinforcing bars or dowels.

Variation of the linear building lines from established position in Plan and related position of columns, walls, and partitions:

In any bay or 20 feet maximum..... 1/2 inch
In 40 feet or more..... 1 inch

Variation in the sizes and locations of sleeves, floor openings, and wall openings..... 1/4 inch

Variation in cross-sectional dimensions of columns and beams and in the thickness of slabs and walls:

Minus..... 1/4 inch
Plus..... 1/2 inch

Footings:

Variation in dimensions in Plan;

Minus..... 1/2 inch
Plus..... 2 inches

Misplacement or eccentricity;

2 percent of the footing width in the direction of
misplacement but not more than..... 2 inches

Reduction in thickness;

Minus..... 5% of specified thickness

Variation in steps:

In a flight of stairs;

Rise..... 1/8 inch
Tread..... 1/4 inch

In consecutive steps;

Rise..... 1/16 inch
Tread..... 1/8 inch

Tolerances for Pavements

Pavements and roadways:

Departure from established alignment..... $\pm 1/2$ inch
Departure from established longitudinal grade on any line.. $\pm 1/4$ inch

c. Oiling. The inside of forms shall be coated with nonstaining mineral oil or other approved material. Where oil is used, it shall be applied before the reinforcement is placed.

d. Removal of Forms. The removal of forms shall not be started until the concrete has attained the necessary strength to support its own weight and any construction live loads as well as strength to prevent cracking

or chipping when the forms are removed. The Contractor shall be responsible for all damage resulting from premature removal of forms. Forms and shoring for aboveground slabs or beams shall remain in place a minimum of 14 days or until the concrete has reached a compressive strength equal to $\frac{2}{3}$ the specified 28-day compressive strength as determined by test cylinders as specified in C-8. Earth backfill shall not be placed against walls below grade until the concrete has obtained a compressive strength equal to $\frac{2}{3}$ the specified 28-day compressive strength, except as otherwise directed by the Engineer.

C-5. Construction and Expansion Joints. (See also page 18)

a. Premolded Joints. Premolded joint filler shall be placed in the forms in the proper position before concrete is poured, and nails at about 1 foot on centers shall be driven through the filler so as to extend into the concrete when it is poured and hold the filler in position. Premolded joint filler shall be installed in all walks to provide expansion and contraction joints at not more than 40-foot intervals and at all changes in direction or intersections.

b. Water Stops. The water stop shall be correctly positioned in the forms so that the center of the water stop is centered on the joint. In cases where preformed expansion joint material is used in conjunction with the water stop, allowance shall be made for equal water stop embedment on each side in the concrete. Water stop shall be held in place in the forms by use of a split form or other approved method that will positively hold the water stop in correct position. The water stop may be held in place in the forms by driving nails at about 12-inch intervals adjacent to, but not through the water stop. Nails may be driven into the form and then bent over the water stop strip to hold it in position. During any concrete pour around the water stop, the half which is being embedded in the concrete shall be rigidly supported in an approved manner so that the final position of the water stop will be in a straight line. Concrete being placed around the water stops shall be well vibrated in order to obtain impervious concrete in the vicinity of all joints. In horizontal joints extreme care shall be taken during the placing of concrete to insure that the area below the water stop is completely filled with concrete. The method of installation of the water stop and the method to hold the water stop in proper position during and after the pouring of concrete shall be approved of by the Engineer before the concrete pour is begun.

(1) Water Stops in Construction Joints. All construction joints in concrete, liquid, or gas-holding basins shall be provided with steel water stops, unless otherwise noted (See B-13). Vertical water stops shall be rigidly held in place in the forms, and concrete shall be thoroughly worked around the metal. Horizontal water stops shall be placed immediately after the pour is completed and before concrete has begun to set. Each side shall be puddled to level the concrete and then the water stop properly embedded. After the concrete has set to the point where the surface can be cut with a broom or a stream of water, the surface shall be cut off to a rough finish with all laitance removed and the concrete left clean. Metal strips for water stops shall be provided in the maximum length practicable; and, where strips are spliced, they shall be lapped at least 12 inches.

(2) Labyrinth Water Stops. Labyrinth type water stops shall be installed in accordance with the manufacturer's directions. Splices and intersections shall be joined by heat to make a continuous, strong, water-tight seal.

(3) Expansion Joints with Copper Water Stop. Copper expansion joints shall be accurately bent to shape and placed in position as shown on the Plans. Adjacent strips shall be lapped and soldered to make watertight joints. All joints shall be protected from damage at all times. Special joint pieces as shown on the Plans shall be used at intersections. The first piece fabricated of each type shall be carefully checked in its relation to adjoining pieces to insure that there is no error in either the Plans or the builder's pattern. Any errors found shall be corrected before additional pieces are fabricated. All joints, both shop and field, shall be lapped not less than 1/2 inch and continuously soldered or brazed on each edge of the lap.

(4) Expansion Joints with Rubber Water Stop. The rubber water stop shall be installed in accordance with the details shown on the Plans and the instructions of the manufacturer. Corner and intersection pieces shall be provided as required and shall be field spliced to insure a continuous, watertight seal at the joints. Field splices shall be made with cement gum and a field vulcanizer capable of supplying sufficient heat to vulcanize the joint, or may be made by means of a chemical bond. The method of splicing used shall be similar to that specified by the Bureau of Reclamation and shall be in strict accordance with the manufacturer's recommendations as approved. The completed splice shall develop a strength of at least 50 percent of the strength of the continuous factory-molded or extruded shape.

(5) Expansion Joints with Plastic Water Stop. The plastic water stop shall be installed in accordance with the details shown on the Plans and the instructions of the manufacturer. Corner and intersection pieces shall be made up by field splicing. Ends to be spliced shall be carefully cut with a sharp knife so that the 2 pieces will match as exactly as possible. Splices shall be made with a thermostatically controlled heating plate or iron. The maximum temperature shall not cause burning or charring of the plastic and in no case shall it exceed 460 degrees F. When using a plate, both ends shall be pressed together vertically on the heated metal plate until the plastic melts around the edges. When the ends are melted, the water stop shall be pulled up straight and 2 heated ends placed on a flat surface so that they meet in a straight line. The plate or iron shall be kept clean and the finished joint free from impurities. The ends shall be pressed together and held firmly for about 1 minute to allow the plastic to fuse while it cools. At least 10 minutes shall be allowed before the new splice shall be pulled or strained in any way. The finished splices shall provide a cross section that is dense and free of porosity with tensile strength of not less than 80 percent of the unspliced materials.

c. Poured Asphalt Filler. Poured asphalt filler shall not be placed until all other concrete has been poured. Before placing filler, all joints in copper water stops shall be checked and resoldered where necessary. Joints shall be thoroughly cleaned, dry, and primed before pouring asphalt filler. The primer shall be compatible with the filler. The filler material

shall be heated in a double-walled boiler and placed in the joint by means of a nozzle. Placement shall begin at the bottom of the joint and proceed upward in a manner that will preclude the possibility of trapping air in the joint.

d. Poured Rubber-Asphalt Filler. Poured rubber-asphalt filler shall be placed in accordance with the manufacturer's instructions. Joints shall be thoroughly cleaned of all dust, powder, and foreign materials and shall be primed before pouring the rubber-asphalt filler. The primer used shall be compatible with the filler material. The filler material shall be heated in a double-walled boiler and placed in the joint by means of a nozzle. Placement shall begin at the bottom of the joint and proceed upwards in a manner that will preclude the possibility of trapping air in the joint.

C-6. Steel Reinforcement.

a. Storage. Steel reinforcement not placed in the work shall be stored under cover to prevent rusting and shall be placed on blocking such that no steel touches any ground surface.

b. Fabrication. The Contractor shall submit detailed placing drawings and complete, legible bending lists in triplicate showing location, shape, dimensions, and number of bars required for the Engineer's approval before the reinforcement is fabricated. The details shall follow the Manual of Standard Practice for Detailing Reinforced Concrete Structures of the American Concrete Institute, except as otherwise specified. The Contractor is not required to use the exact arrangement of reinforcement shown, provided the same area and perimeter of reinforcement are provided at all sections and any changes in the Plans are approved by the Engineer. Reinforcement shall be formed to the dimensions shown on the Plans and the approved bending detail sheets. Bends for bars other than hooks, stirrups, and ties shall be made around a pin having a diameter not less than 6 times the minimum thickness of the bar. All bars shall be bent cold. Forming and cutting tolerances shall be in accordance with CRSI Recommended Practice for Placing Reinforcing Bars.

c. Cleaning. Metal reinforcement, before being positioned, shall be cleaned of loose mill scale, rust, oil, earth, and from any coatings. After positioning, the reinforcement shall be free of any coatings which will destroy or reduce the bond, including oil, dirt, ice, or old concrete. Where there is a delay in depositing concrete, reinforcement shall be re-inspected and cleaned when necessary.

d. Straightening and Rebending. Metal reinforcement shall not be straightened or rebent in a manner that will injure the material. Bars with kinks or bends not shown on the Plans shall not be used. Heating of the reinforcement will be permitted only when the entire operation is approved by the Engineer.

e. Placing Reinforcement.

(1) Positioning. Metal reinforcements shall be positioned and secured against displacement by using annealed iron wire ties or clips

at intersections, or by welding, and shall be supported by concrete or metal supports, spacers, or metal hangers. Reinforcement shall be placed as shown on the Plans and in accordance with CRSI Recommended Practice for Placing Reinforcing Bars. Where welding is required, the method shall be subject to the approval of the Engineer. Where concrete block supports are used, such blocks shall be of concrete of the same strength and density as required for the structural concrete. Galvanized metal chairs shall be used to support reinforcement in exposed concrete slab ceilings.

(2) Reinforcing Steel Tolerances. Placement of reinforcing steel shall conform to the following tolerances:

<u>Location</u>	<u>Tolerances</u>
Height of top and bottom bars above forms.....	+1/4 inch
Lengthwise location and spacing in slabs and walls.....	+2 inches
Number of bars.....	0
Lateral spacing of bars in joists or beams.....	-0 + 1/4 inch
Stirrup spacing.....	+1 inch in any one stirrup and +1 inch in end stirrups.

(3) Spacing. The minimum clear distance between parallel bars, except in columns, shall be equal to the nominal diameter of the bars, but in no case shall the clear spacing between the bars be less than 1 inch nor less than 1-1/3 times the maximum size of the coarse aggregate. Where reinforcement in beams or girders is placed in 2 or more layers, the clear distance between layers shall be not less than 1 inch, and the bars in the upper layers shall be placed directly above those in the bottom layer.

(4) Protection. At surfaces of footings, walls, and other principal structural members where the concrete is deposited directly against the ground or gravel backfill, the metal reinforcement shall have a minimum covering of 3 inches of concrete. At other surfaces of concrete exposed to the ground or to the weather, metal reinforcement shall be protected by not less than 2 inches of concrete for bars 5/8 inch or more in diameter and 1-1/2 inches of concrete otherwise. In other cases, protection shall be not less than 3/4 inch for slabs and walls and not less than 1-1/2 inches for beams, girders, and columns, but in no case less than the diameter of the bar, except as otherwise shown on the Plans or approved by the Engineer.

(5) Splicing. When it is necessary to splice reinforcement at points other than shown on the Plans, the character of the splice shall be determined by the Engineer. In all splices, the bars shall be placed in contact and wired, and the lap shall be at least 24 times the diameter of the bar and a minimum of 12 inches, unless otherwise shown on the Plans. Splices in adjacent bars shall be staggered.

(6) Tying Reinforcing Bars. Tying of reinforcing bars shall be in conformance with CRSI Recommended Practice for Placing Reinforcing Bars (current edition). Additional tie wires shall be provided where necessary for a satisfactory installation.

(7) Reinforcement Around Openings. Where necessary to cut bars for pipe or openings and where not shown otherwise, an equivalent area of steel shall be placed around the pipe or opening and extended on each side sufficiently to develop bond in each bar as approved by the Engineer.

(8) Placing Wire Mesh. Wire mesh reinforcement used in slabs shall be placed at the depth shown on the Plans. The fabric shall extend to within 2 inches of the edges of the slab, and splices shall be lapped at least 1-1/2 courses of the fabric and a minimum of 6 inches. The fabric shall be pulled into position as the concrete is placed by means of hooks, and concrete worked under the steel to insure that it is placed at the proper distance above the bottom of the slab. Laps and splices of the fabric shall be tied together with annealed wire at least every 24 inches.

C-7. Placing Concrete.

a. General. Before beginning placement of concrete, hardened concrete and foreign materials shall be removed from the inner surface of the mixing and conveying equipment. Before depositing concrete, debris shall be removed from the space to be occupied by the concrete. Forms, if constructed of lumber, shall be thoroughly wetted. Reinforcement shall be secured in position and approved by the Engineer before concrete is placed.

b. Removal of Water. Except when the tremie method is specified, water shall be removed from the space to be occupied by the concrete before it is deposited, unless otherwise approved by the Engineer. Any flow of water into an excavation shall be diverted through proper side drains to a sump or be removed by other approved methods.

c. Handling. Concrete shall be handled from the mixer, or in the case of ready-mixed concrete, from the transporting vehicle to the place of final deposit as rapidly as practicable by methods which prevent the separation or loss of the ingredients. Under no circumstances shall concrete that has partially hardened be deposited in the work. When placing concrete by pumping, the discharge line shall be steel pipe. The use of aluminum pipe or aluminum chutes will not be permitted. Concrete shall be deposited in the forms as nearly as practicable in its final position to avoid rehandling. It shall be so deposited as to maintain, until the completion of the unit, a plastic surface approximately horizontal. Vertical lifts or layers greater than 1-1/2 feet in depth shall not be allowed in pouring wall sections. Total vertical lifts made in a single pour shall not exceed 10 feet in height, unless otherwise shown on the Plans or approved by the Engineer. Forms for walls or thin sections of considerable height shall be provided with openings or other devices that will permit the concrete to be placed in a manner preventing segregation and accumulations of hardened concrete on the forms or metal reinforcement above the level of the concrete. Concrete shall be dropped no farther than a distance which will prevent segregation of ingredients, but in no case more than 6 feet in walls 8 inches or less in width, or more than 12 feet in wider walls unless chutes or trunks are used. The buggy, the bucket, or the lower end of the chute from which the concrete is discharged shall be so positioned that the concrete is released within 2 feet horizontally of its final position. When deposited in the forms, concrete shall have the required quality, regardless of the type of transporting vehicle.

d. Chuting. When concrete is conveyed by chutes, the equipment shall be of such size and design as to insure a continuous flow in the chute. The slope shall not be less than 1 vertical to 2 horizontal and shall be such as to prevent the segregation of the ingredients. The discharge end of the chutes shall be provided with a baffle plate to prevent segregation. When the operation is intermittent, the chute shall discharge into a hopper. The chute shall be cleaned before and after each run, and the debris and any water used shall be discharged outside the forms.

e. Compacting. Concrete, during and immediately after depositing, shall be worked into place and compacted by mechanical vibration. The concrete shall be worked around the reinforcement and into the corners of the forms. Accumulations of water on the surface of the concrete due to water gain, segregation, or other causes during placement and compacting shall be prevented as far as possible by adjustments in the mixture. Provision shall be made for the removal of such water as may accumulate so that under no circumstances will concrete be placed in such accumulations. The number and type of vibrators shall be subject to the approval of the Engineer. Internal vibrators shall be used and they shall have a minimum frequency of 7000 vpm when the vibrator is immersed in the concrete. Vibration shall not be applied through the reinforcement, either directly or indirectly. Vibration shall not be applied to layers of concrete which have hardened to the extent the concrete is no longer plastic. Vibration shall be continued at each point of application until a decrease in volume is no longer apparent and all trapped air has been removed, but shall not be continued to the extent that localized areas of grout are formed. Vibration shall be applied at evenly spaced points not farther apart than the radius over which vibration is visibly effective such that the entire volume of concrete receives vibration. Vibration shall not be used to make concrete flow in the forms over distances so great as to cause segregation and in no case more than 2 feet.

f. Depositing Continuously. Concrete shall be deposited continuously or in layers of such thickness that no concrete will be deposited on concrete which has hardened sufficiently to cause the formation of seams and planes of weakness within the section. If a section cannot be placed continuously, construction joints may be located at points as provided for in the Plans or approved by the Engineer.

g. Bonding.

(1) To New Concrete. Before depositing new concrete on or against concrete which has hardened, the forms shall be retightened. The surface of the hardened concrete shall be roughened by green cutting, chipping, or sandblasting, as required by the Engineer so that sound concrete is exposed. It shall be thoroughly cleaned of foreign matter and laitance and saturated with water. In case oil has been spilled on the surface to be bonded, this oil must be removed by chipping out the oil-saturated concrete. To insure an excess of mortar at the juncture of the hardened and the newly deposited concrete, the cleaned and saturated surfaces, including inclined surfaces, shall first be covered with a coating of mortar against which the new concrete shall be placed before the grout has attained its initial set. On horizontal construction joints, at least 2 inches of grout shall be provided. The proportions of sand and cement in the grout shall be the same as those for the

sand and cement in the concrete mixture, and only sufficient water to provide a consistency similar to that of thick cream shall be used.

(2) To Old Concrete. Where new concrete is to be placed against old concrete, a bonding agent shall be used to coat the surfaces of the old concrete, unless otherwise specified in the Special Specifications. The bonding agent shall be one of those specified in B-9 and the method of preparation and application shall conform to the manufacturer's printed instructions and recommendations. Mortar grout shall then be provided as hereinbefore specified in C-7-g.(1).

h. Depositing in Cold Weather. 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. The temperature of concrete materials and all reinforcement, forms, fillers, and ground with which the concrete is to come in contact shall be above 32 degrees F.

Whenever the temperature of the surrounding air is below 40 degrees F., all concrete, when placed in the forms, shall have a temperature of between 50 degrees and 70 degrees F. and shall be maintained at a temperature of not less than 50 degrees F. for at least 6 days for normal concrete or 4 days for high-early-strength concrete, or for as much more time as is necessary to insure proper rate of curing of the concrete. After artificial heating is discontinued, the housing, covering, or other protection used in connection with curing shall be dismantled in such a way that the fall in temperature in all parts of the concrete will be gradual throughout the first 24 hours and shall not exceed 40 degrees F. in 24 hours.

Heaters for the protection of concrete in cold weather shall be vented so that carbon dioxide does not combine with concrete slab surface to make a dust-producing condition.

No dependence shall be placed on salt or other chemicals for the prevention of freezing. Calcium chloride in amounts not exceeding 2 percent by weight of cement may be used, with approval of the Engineer, except as hereinafter specified, to accelerate setting and reduce the period of protection required to a minimum of 3 days, but under no circumstances is the calcium chloride to be considered an "antifreeze."

The use of calcium chloride, Pozzolith high-early, or other additives which may be corrosive will not be permitted in any concrete that is to be prestressed or which will be placed in contact with prestressed wire or strand. Likewise, no such additives are permitted in concrete which embeds or is in contact with aluminum.

i. Construction Joints. (See also page 12)

(1) Location. Joints not indicated on the Plans shall be so made and located as to least impair the strength of the structure and shall be approved by the Engineer prior to construction.

(2) Time Between Pours. At least 2 hours must elapse after depositing concrete in the columns or walls before depositing in beams,

girders, or slabs supported thereon. Beams, girders, brackets, column capitals, and haunches shall be considered as part of the floor system and shall be placed monolithically therewith.

(3) In Floors. Construction joints in floors shall be located near the middle of the spans of slabs, beams, or girders, unless a beam intersects a girder at this point, in which case the joints in the girders shall be offset a distance equal to twice the width of the beam. In this last case, provision shall be made for shear by use of inclined reinforcement.

C-8. Tests of Concrete. During the progress of construction, the Engineer will make or have tests made to determine whether the concrete as being produced complies with the standard specified. The Contractor shall cooperate in the making of such tests to the extent of allowing free access to the work for the selection of samples and storage of specimens, assistance in casting cylinders, and in affording protection to the specimens against injury or loss through his operations. Specimens shall be made and cured in accordance with ASTM C 31 and tested in accordance with ASTM C 39.

When a ratio between 7-day and 28-day strengths has been established by these tests or by preliminary tests, the 7-day strength may be taken as a satisfactory indication of the 28-day strength. Field strength shall be assumed as equal to 85 percent of the strength of laboratory-cured cylinders. The required compressive strength of concrete proportioned in accordance with Table I of the Special Specifications is the field strength.

C-9. Finish.

a. General. Concrete which requires finishing shall not be poured until the materials, tools, and labor necessary for finishing the wet concrete are on the job and approved by the Engineer. All horizontal surfaces shall be steel troweled, unless otherwise specified.

b. Patching. Defects in all concrete surfaces shall be cut out and patched as specified herein. After removal of the forms, all imperfections, rock pockets, holes from form ties, and other defects shall be chipped out to solid concrete. The surface of the cavity to be patched shall be thoroughly wet before the patching mixture is applied. This mixture shall be proportioned as set forth in B-5, herein, or it shall be of the proportions of the original pour where uniform color is desired. The mixture shall be tamped solidly into the cavity to be patched and shall then be cured. (See C-10)

Where the pull-out type ties are used, the holes shall be filled as recommended by the manufacturer of the ties.

c. Unexposed Wall Finish. Immediately after removal of the forms, all rock pockets, form tie holes, and other irregularities shall be patched as specified in C-9.b. and cured as specified in C-10. No further finishing will be required.

d. Ordinary Wall Finish. Ordinary wall finish requires the use of new plywood forms or linings which will produce a uniform surface. The number of joints should be kept to a minimum. Immediately after removal

of the forms, all defects shall be patched and patches cured as specified in C-10. After pointings have set sufficiently, all form marks and pointing shall be ground or filled to give a smooth surface even with the flat wall surface.

e. Rubbed Wall Finish.

(1) Class I. The rubbing shall be done immediately after the patching of rock pockets and form tie holes have set sufficiently. In all cases, except where it is structurally impossible to remove the forms within 5 days, the rubbing shall be done preferably the day following the pour, and in no case more than 5 days after the pour has been completed. Forms shall be removed at such a rate that all finishing can be completed on the same day that the forms are removed. After the pointings have set sufficiently to permit working on the surface, the entire surface shall be thoroughly saturated with water for a period of 3 hours and rubbed until a uniform surface is obtained, either by hand with a carborundum stone of medium-coarse grade, or an abrasive of equal quality, or a mechanically-operated carborundum stone. If a mechanically-operated carborundum stone is to be used, its type shall be approved by the Engineer before the concrete has been poured. A small amount of mortar shall be used on the face of the stone. The mortar shall be a mixture of cement and fine sand in proportions used in the concrete being finished. The paste formed by rubbing, as described above, may be finished by carefully striking with a clean brush, or it may be spread uniformly over the surface and allowed to take a reset, after which it may be finished by floating with a canvas, carpet face, or cork float, or rubbed down with dry burlap. Brushing shall be done in the long direction of the surface being finished.

(2) Class II. Rubbed wall finish, Class II, shall conform to the requirements for Class I, above, except that the paste obtained from the described rubbing shall be allowed to set at least 24 hours. After thoroughly saturating with water, the surface shall then be painted with a mixture of 85 percent cement and 15 percent lime with sufficient water to give a creamy consistency. This mixture shall be rubbed into the surface with a coarse carborundum stone and brushed with a damp brush. Brushing shall be done in the long direction of the surface being finished.

f. Concrete Floor and Roof Slab Finishes. Concrete slabs shall be finished with the type of finish specified in the Special Specifications. Each type shall be as specified hereinafter. The use of "jitterbugs" or other special tools designed for the purpose of forcing the coarse aggregate away from the surface will not be permitted on any slab finish. The dusting of surfaces with dry materials will not be permitted. Slabs and floors shall be thoroughly compacted by vibration or tamping. In preparation for finishing, floor slabs shall be struck off true to the required grade of the finished floors as shown on the Plans. Floors shall be level with a tolerance of 1/8 inch in 10 feet, except where drains occur, in which case the floors shall be pitched to the drains at 1/4 inch per foot or as indicated on the Plans or directed. All discontinuous edges shall be rounded off with a steel edging tool. Steel edging tool radius shall be 1/8 inch for all slabs subject to wheeled traffic.

(1) Monolithic Finish. Except where otherwise specified, floors and slabs shall be finished by screeding and floating with straight-edges to bring the surfaces to the required finish elevation shown on the Plans. While the concrete is still green but sufficiently hardened to bear a man's weight without deep imprint, it shall be wood floated to a true, even plane with no coarse aggregate visible. Sufficient pressure shall be used on the wood floats to bring moisture to the surface. After surface moisture has disappeared, the concrete shall be hand troweled to produce a smooth, impervious surface, free from trowel marks. An additional troweling shall be given the surface for the purpose of burnishing. The final troweling shall produce a ringing sound from the trowel. Dry cement or additional water shall not be used in troweling, nor will excessive troweling be permitted.

(2) Rough Slab Finish. Slabs to receive fill and mortar-setting beds shall be finished by screeding with straightedges to bring the surface to the required finish plane. All laitance shall be removed and the surface left clean.

(3) Wood-Float Finish. Exterior slabs and ramps and roof slabs, unless otherwise specified in the Special Specifications, shall be finished by screeding with straightedges to bring the surface to the required line as shown on the Plans. While the concrete is still green but hardened sufficiently to bear the cement finisher's weight, the surface shall be wood floated to a true and uniform plane with no coarse aggregate visible.

(4) Broomed Finish. Where broomed finish is specified, the concrete shall be finished as specified for monolithic floor finish above, except the final troweling shall be omitted and the surface shall be finished by drawing a fine-hair broom lightly across the surface. All brooming shall be in the same direction and parallel to expansion joints, or, in the case of inclined slabs, perpendicular to the slope.

(5) Power Machine Finish. In lieu of hand finishing, the Contractor may use an approved power machine for finishing concrete floors in slabs in accordance with the directions of the machine manufacturer as approved by the Engineer.

g. Sidewalk Finish. After the concrete has been deposited in place, it shall be compacted and the surface shall be struck off by means of a strike board and floated with a wooden or cork float. Joints shall be provided as specified in C-5.a. An edging tool shall be used on all edges and at all expansion joints. The surface shall not vary more than 1/8 inch under a 10-foot straightedge. The surface shall have a granular or matted texture which will not be slick when wet, or it shall be broomed at right angles to the direction of traffic. Walks shall slope 1/4 inch per foot away from structures, unless otherwise shown on the Plans.

Sidewalk surfaces shall be laid out in blocks with an approved grooving tool as shown on the Plans or as directed by the Engineer.

h. Screeded Finish on Clarifier Slabs. The concrete topping for the floor of clarifier tanks shall not be placed until the equipment for the tanks has been completely installed and in working order. All laitance

shall be removed from the surface of the concrete with a wire brush and the surface shall then be thoroughly cleaned and washed. The concrete base shall be kept constantly wet for a period of 24 hours and then hand-swept with grout as specified under C-7.g.(1) before placing the concrete topping. After placing the concrete topping, it shall be swept by the collector mechanism until the surface conforms accurately to the profiles of the blades on the raking arm and, if necessary, shall be troweled with a steel trowel to a smooth, even surface. The topping shall be kept wet using a hose with fine spray, and as soon as the concrete topping is sufficiently hard, the tank shall be filled with water to a sufficient height to cover the entire floor for a period of 7 days. This topping coat shall consist of 1 part standard portland cement, and 2 parts of sand as specified in B-3.

C-10. Curing of Concrete.

a. Curing. Curing of concrete shall be accomplished by keeping the surface continuously wet for 7 days where normal portland cement is used, or 3 days when high-early-strength cement is used. Subject to approval by the Engineer, one of the following methods shall be followed:

WALLS

(1) Concrete forms shall be left in place and kept sufficiently damp at all times to prevent opening of the joints and drying of the concrete; or

(2) An approved curing compound shall be applied immediately after removal of forms, except where finishing is required. In this case, forms will be kept damp as required above until removed. Where rubbed finish is required, curing compound shall be applied immediately upon completion of finishing, and the unfinished, exposed surfaces shall be kept wet by sprinkling until finishing begins. When ordinary wall finish is required, curing compound shall be applied immediately after removal of the forms and the compound chipped off or otherwise removed where patching or pointing is required. Compound shall not be applied to surfaces which are to later be bonded to new concrete; or

(3) Exposed surfaces shall be continuously sprinkled.

SLABS

(1) Protect surface by ponding; or

(2) Cover with burlap or cotton mats kept continuously wet; or

(3) Cover with 1-inch layer of wet sand, earth, or sawdust, and keep continuously wet; or

(4) Continuously sprinkle the exposed surface.

b. Protection in Cold Weather. Concrete shall be protected in cold weather as specified in C-7.h.

C-11. Hardener Application. Floors to receive hardener shall be cured, cleaned, and perfectly dry with all work above them completed. Zinc and/or magnesium fluosilicate shall be applied evenly, using 3 coats, allowing 24 hours between coats; the first coat shall be 1/3 strength, second coat 1/2 strength, and third coat 2/3 strength; each coat shall be applied so as to remain wet on the concrete surface for 15 minutes. Sodium silicate shall be applied evenly, using 3 coats, allowing 24 hours between coats; the material shall be applied full strength at the rate of 1/3 gallon per 100 square feet. Approved proprietary hardeners shall be applied in conformance with the manufacturer's instructions. After the final coat is completed and dry, surplus hardener shall be removed from the surface by scrubbing and mopping with water.

C-12. Blockouts for Pipe and Conduit. Where pipe or conduit passes into or through concrete walls, floors, or roof slabs, the Contractor may, to facilitate proper alignment, leave holes through the concrete and pour the concrete opening after the pipe or conduit is in place. The size of such openings shall be 2 inches larger than the outside diameter of the bell, flange, or coupling, and shall conform to the special details for pipe openings shown on the Plans. When the piping or conduit is entirely placed and securely anchored, the concrete openings through the walls will be poured in accordance with the requirements for bonding new concrete to old as set forth in C-7.g. Concrete used to pour these openings shall consist of 1 part cement, 1 part fine aggregate, 1 part nonshrinking aggregate, and 1-1/2 parts coarse aggregate of maximum size of 1/2 inch when the concrete is part of a liquid-holding basin. Otherwise, the nonshrinking aggregate shall be replaced by fine aggregate. Concrete poured in these openings shall be thoroughly vibrated or rodded to insure a watertight joint between the new and old concrete, and the new concrete and the pipe or conduit. The form for the closure shall be constructed with a pouring funnel. A plug of concrete shall be left in the pouring funnel. After the concrete has taken its initial set, the plug shall be removed and the exposed, broken face ground smooth. Pouring of blockout holes shall be done from the pressure side wherever possible. Such joints shall be cured by keeping them constantly wet for not less than 7 days.

Where approved by the Engineer, blockout holes may be dry packed using a grout proportioned and mixed as specified in B-5.a. This mixture shall be tamped or rodded solidly into the space from the pressure side. A backing board or stop shall be provided at the back side of this space against which the dry mixture can be tamped.

C-13. Grouting Machinery Foundations. Where machinery is to be secured by anchor bolts set in concrete and supported on foundations which are to be grouted in place, the original concrete pour shall be blocked out or finished off a sufficient distance below the bottom of the machinery foundation to provide for the thickness of grout shown on the Plans. After the machinery has been set in position and wedged to the proper elevation by steel wedges, the space between the bottom of the machinery foundation and the original pour of concrete shall be caulked with a dry-pack grout proportioned and mixed as specified in B-5.a. This dry mixture shall be tamped or rodded solidly into the space between the machinery foundation and the original concrete. A backing board or stop shall be provided at the back side of this space against which the dry mixture can be tamped.

C-14. Leakage Tests. After the final pour of concrete on basins which are to be subjected to leakage tests has been cured for 14 days, and before backfill or brick facing or other work which will cover the exposed faces of the walls of the basins has been completed, the basins specified in the Special Specifications to be subjected to leakage tests shall be filled with water to the normal liquid level line. Unless otherwise specified in the Special Specifications, water for this test shall be provided by the Contractor. After the basin has been kept full for 48 hours, it will be assumed for the purposes of the test that the absorption of moisture by the concrete in the basin is complete. All valves and gates to the structure shall then be closed and the change in water surface measured for a 24-hour period. During the test period, all exposed portions of the structure shall be examined and any leaks or damp spots shall be marked and such leaks or damp spots shall be later patched or corrected in any case. If the drop in water surface in the 24-hour period exceeds 1/10 of 1 percent of the normal volume of liquid contained in the basin, the leakage shall be considered excessive. If the leakage is excessive, the water surface shall be dropped by stages and the leakage measured at each stage until the area in which the leakage occurs has been isolated. The basin shall then be drained, all leaks previously marked shall be patched, and the necessary repairs made in the area where leakage is indicated. The basin shall then be refilled and again tested for leakage. This process shall be continued until the drop in water surface in a 24-hour period with the basin full is less than 1/10 of 1 percent of the volume of liquid held in the basin. If the cause of excessive leakage is found to be faulty workmanship or materials, the cost of repairs and subsequent tests shall be borne by the Contractor. If the leakage is found to be due to causes not under the Contractor's control, the cost of repairs and subsequent tests after the first shall be paid for by the Owner as extra work.

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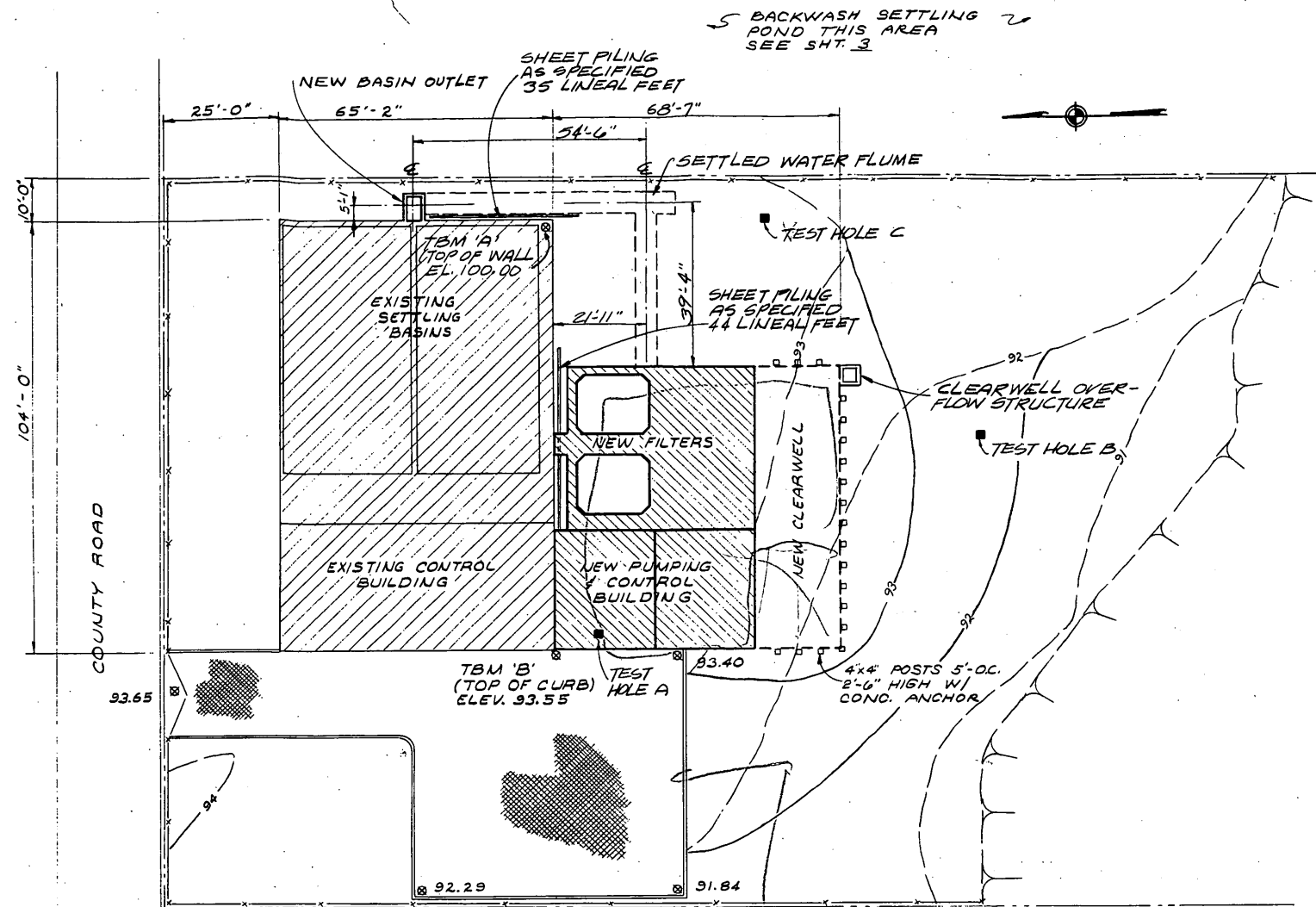
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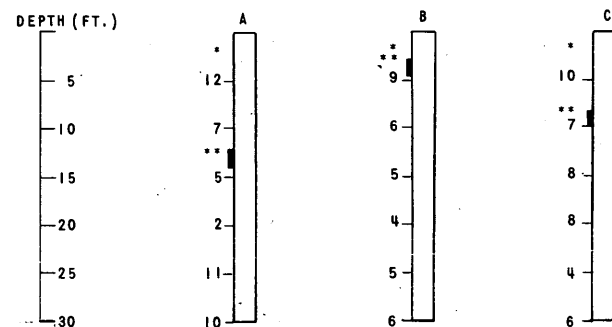
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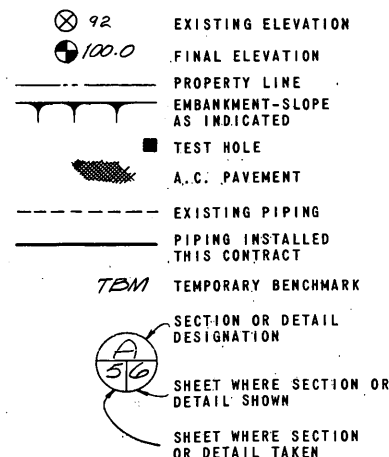


SITE PLAN
1" = 20'

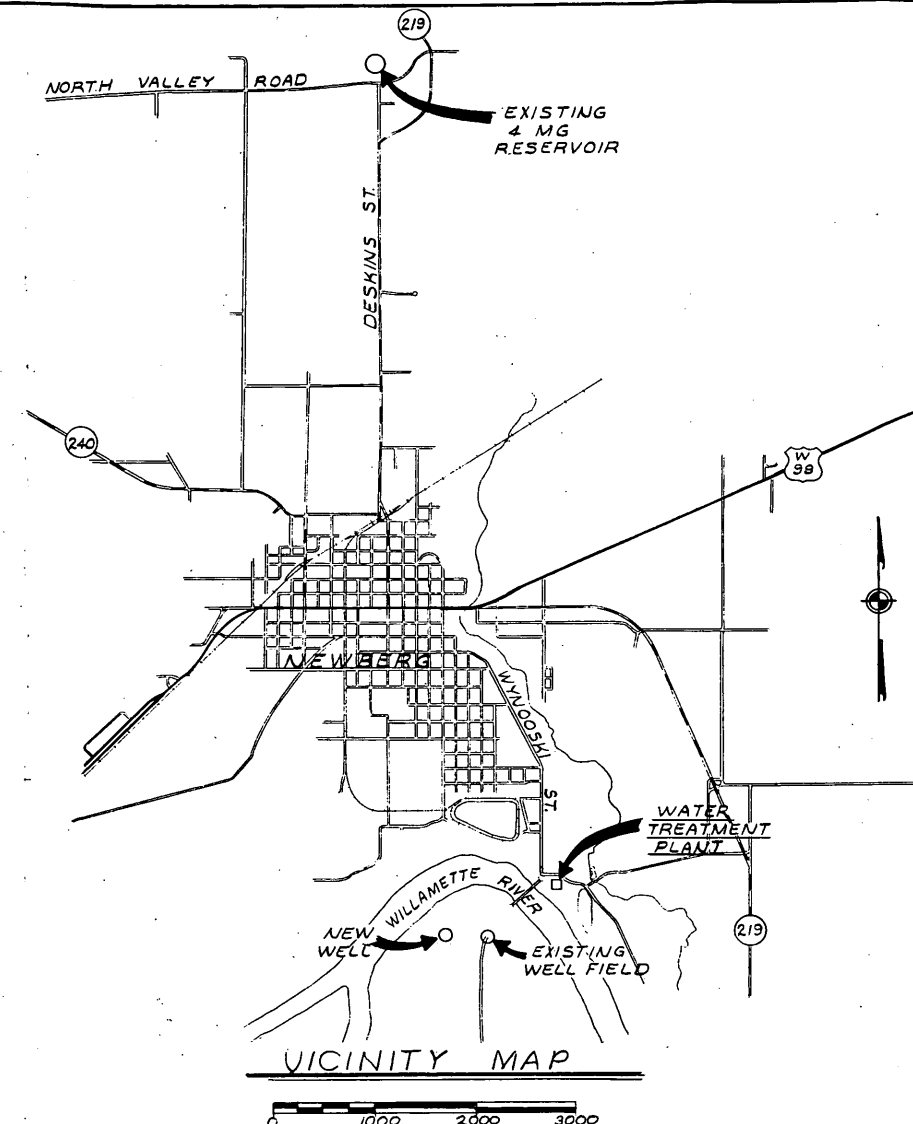
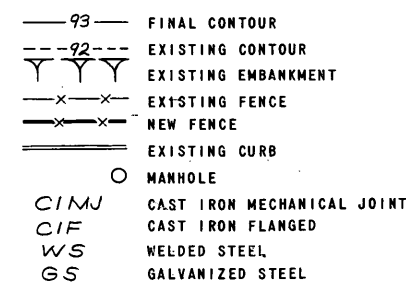
TEST HOLE LOGS



- NOTES:
- 1) ALL SOIL SANDY SILT
 - 2) NO GROUNDWATER TABLE ENCOUNTERED
 - 3) *NUMBERS INDICATE STANDARD PENETRATION TEST, DRIVING RESISTANCE, BLOWS PER FOOT
 - 4) ** UNDISTURBED SAMPLE 3-INCH SHELBY TUBE



LEGEND



INDEX TO DRAWINGS

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1	VICINITY MAP & SITE PLAN	23	FILTER BUILDING-STRUCTURAL SECTIONS & DETAILS
2	OUTSIDE PIPING PLAN & DETAILS	24	FILTER BUILDING-MECHANICAL PLAN
3	BACKWASH SETTLING POND	25	FILTERS-GENERAL ARRANGEMENT
4	BACKWASH SETTLING POND DETAILS	26	FILTERS-STRUCTURAL PLANS
5	CLEARWELL OVERFLOW LINE & DETAILS	27	FILTERS-STRUCTURAL SECTIONS AND DETAILS
6	MODIFICATIONS TO SETTLING BASINS-PLAN & SECTIONS	28	FILTERS-STRUCTURAL SECTIONS AND DETAILS
7	MODIFICATIONS TO SETTLING BASINS-SECTIONS & DETAILS	29	FILTERS-STRUCTURAL SECTIONS AND DETAILS
8	MODIFICATIONS TO SETTLING BASINS-DETAILS	30	FILTERS-STRUCTURAL PLAN AND DETAILS
9	FILTER BUILDING-ARCHITECTURAL ELEVATIONS	31	FILTER PIPE GALLERY-MECHANICAL PLAN & SECTIONS
10	FILTER BUILDING-ARCHITECTURAL FIRST FLOOR PLAN	32	FILTER BUILDING-CHEMICAL FEED DETAILS
11	FILTER BUILDING-ARCHITECTURAL SECOND FLOOR PLAN	33	FILTER BUILDING-FIRST FLOOR PLUMBING PLAN
12	FILTER BUILDING-ARCHITECTURAL SECTIONS AND DETAILS	34	FILTER BUILDING-SECOND FLOOR PLUMBING PLAN
13	FILTER BUILDING-STRUCTURAL CLEARWELL PLAN & DETAILS	35	PLANT CONTROL SCHEMATIC
14	FILTER BUILDING-STRUCTURAL FIRST FLOOR PLAN & DETAILS	36	PLANT CONTROL PANELS
15	FILTER BUILDING-STRUCTURAL SECOND FLOOR PLAN & DETAILS	37	BACKWASH PROGRAMMER SCHEMATIC
16	FILTER BUILDING-STRUCTURAL SECTION AND DETAILS	38	ELECTRICAL-LEGENDS
17	FILTER BUILDING-STRUCTURAL SECTIONS AND DETAILS	39	ELECTRICAL-SITE PLAN & ONE-LINE DIAGRAM
18	FILTER BUILDING-STRUCTURAL SECTIONS AND DETAILS	40	ELECTRICAL-FIRST FLOOR
19	FILTER BUILDING-STRUCTURAL DETAILS	41	ELECTRICAL-SECOND FLOOR AND DETAILS
20	FILTER BUILDING-STRUCTURAL DETAILS	42	ELECTRICAL-CONTROL DIAGRAMS
21	FILTER BUILDING-STRUCTURAL BEAM DETAILS	43	ELECTRICAL-OUTPLANT SUPERVISORY CONTROL
22	FILTER BUILDING-STRUCTURAL BEAM DETAILS		

THIS PRINT IS REDUCED TO ONE-HALF OF THE ORIGINAL SCALE
IF THE SCALE READS:
1" = 1'-0" USE 1/2" = 1'-0" OR 1" = 10' USE 1" = 20'



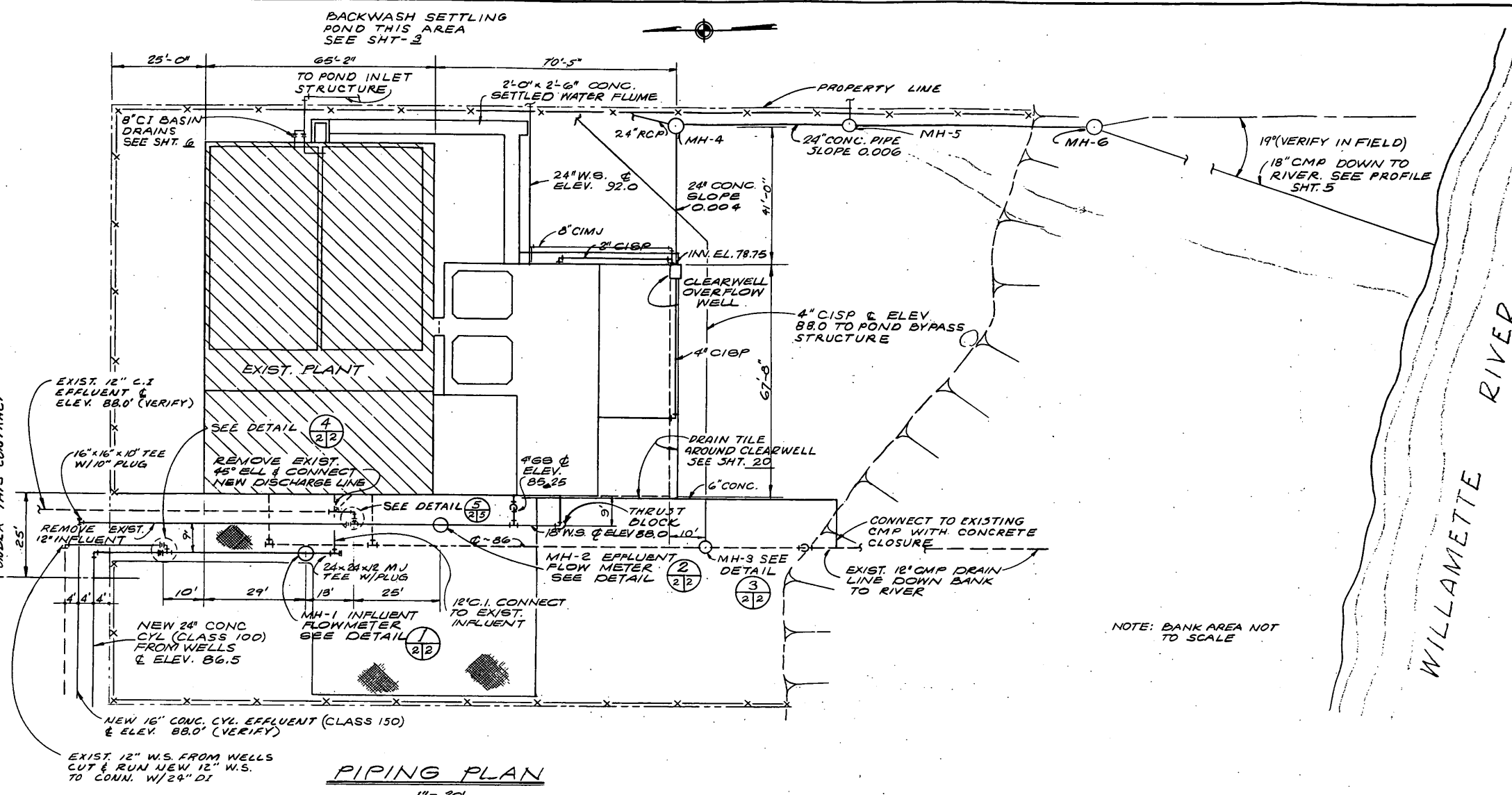
CORNELL, HOWLAND, HAYES & MERRYFIELD
ENGINEERS, PLANNERS, ECONOMISTS

CITY OF NEWBERG, OREGON
WATER TREATMENT PLANT EXPANSION

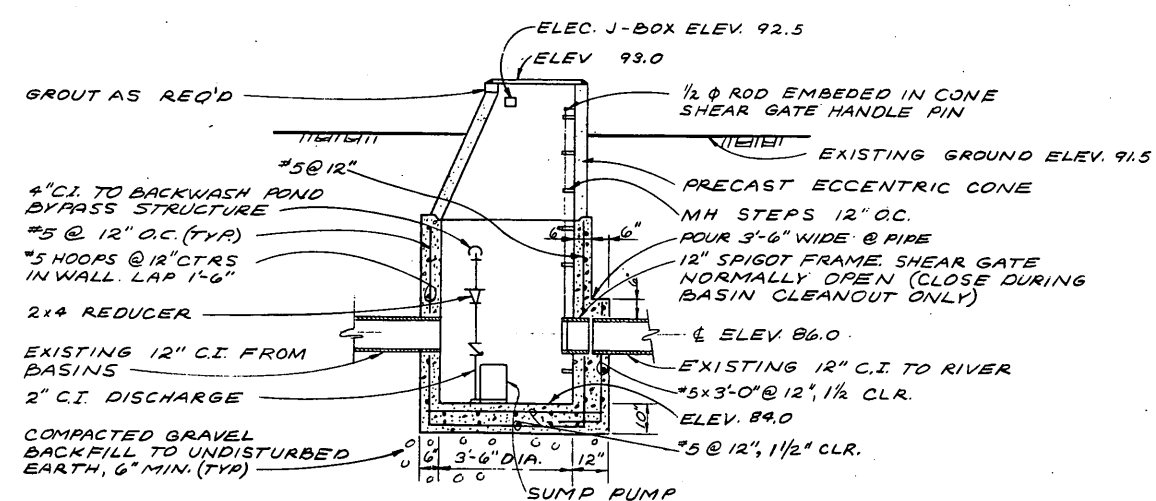
VICINITY MAP & SITE PLAN

DESIGNED BY	RSR	SHEET	1
CHECKED BY	AFW	OF	43
DATE	CYS		
SCALE	AS SHOWN		
DWG NO.	C5508-1		

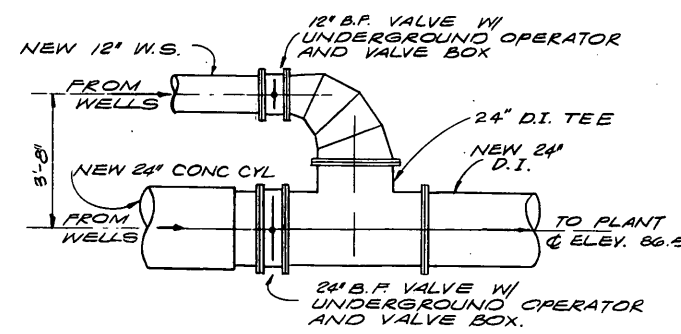
PIPING INSTALLED UNDER LIMITS OF THIS CONTRACT.
MAKE CONNECTIONS UNDER THIS CONTRACT
SEPARATE CONTRACTS



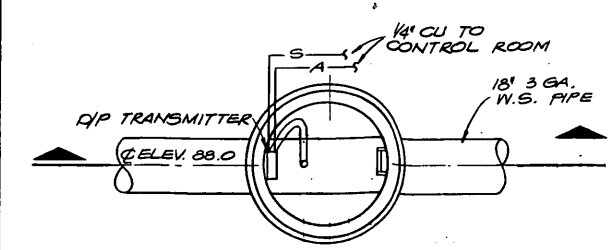
PIPING PLAN
1" = 20'



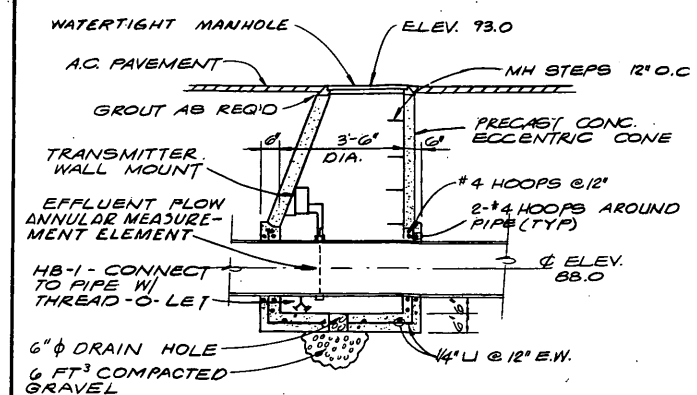
MH-3 DETAIL (3/22)



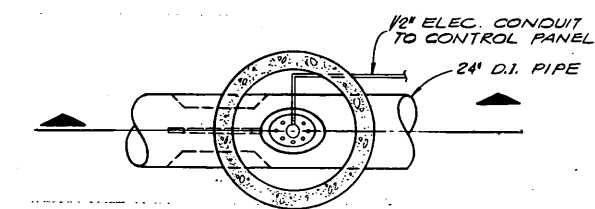
DETAIL (4/22)
3/8" = 1' 0"



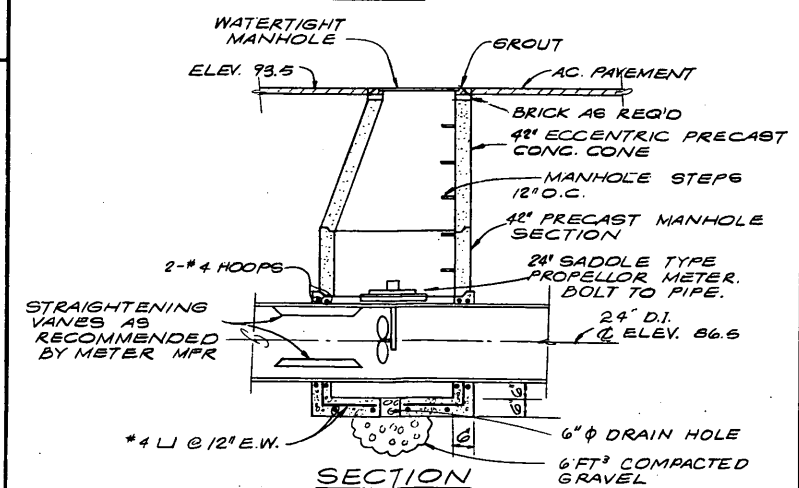
PLAN



MANHOLE MH-2 DETAIL (2/22)
3/8" = 1' 0"



PLAN



MANHOLE MH-1 DETAIL (1/22)
3/8" = 1' 0"

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OF THE ORIGINAL SCALE
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REGISTERED PROFESSIONAL
ENGINEER
STATE OF OREGON
JULY 1970
CORNELL, HOWLAND, HAYES & MERRYFIELD

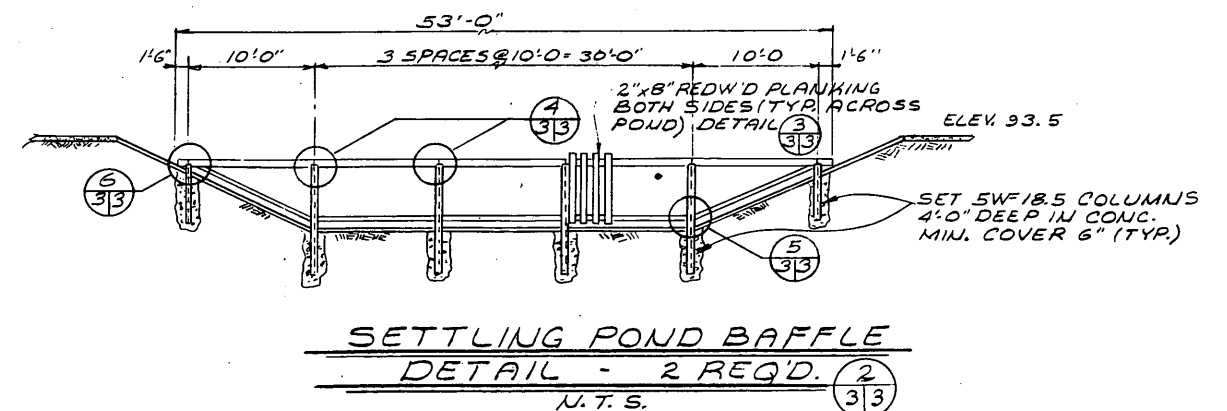
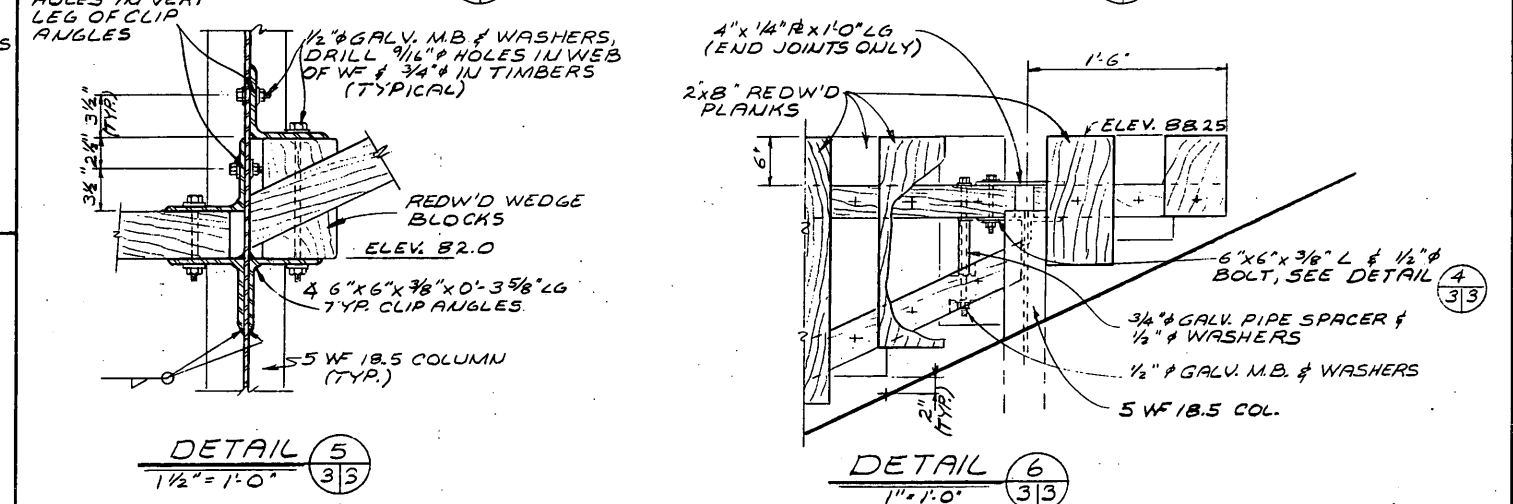
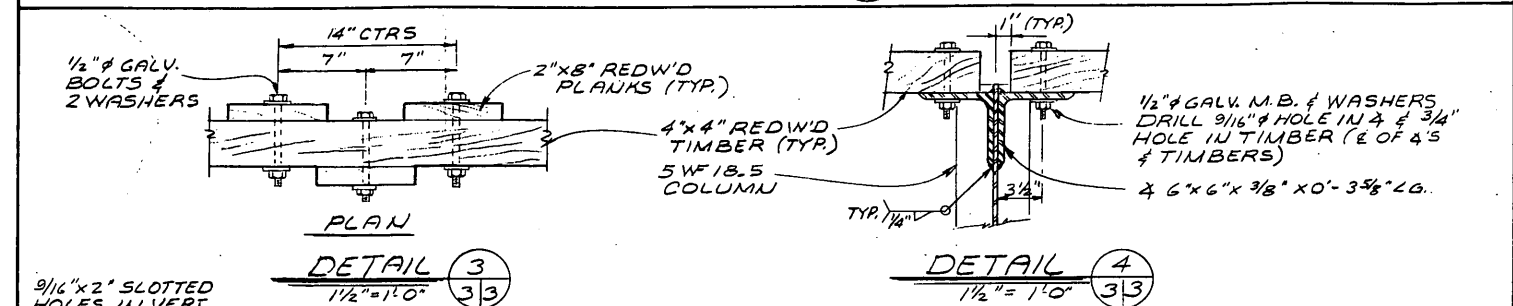
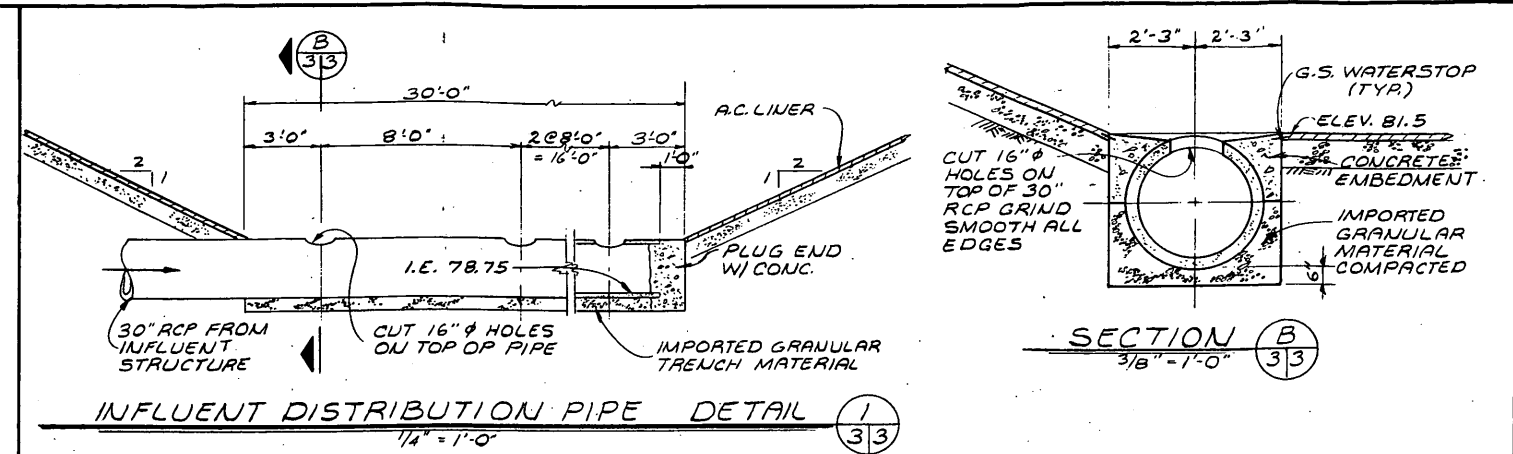
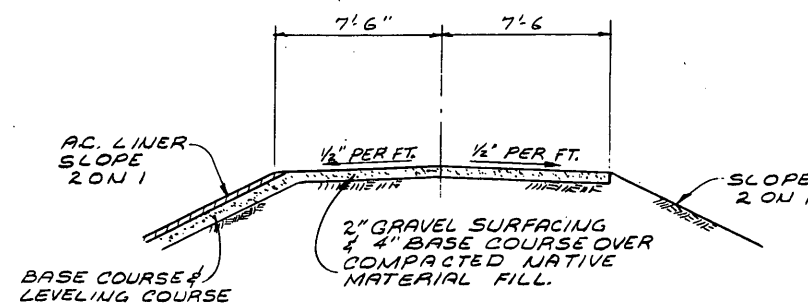
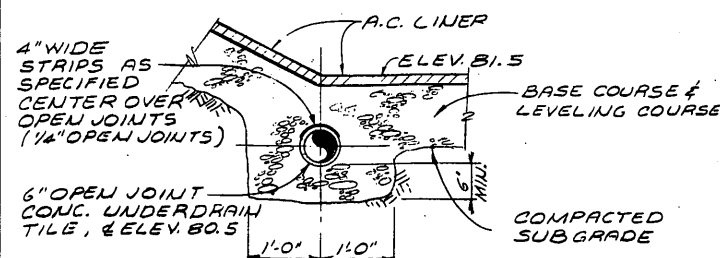
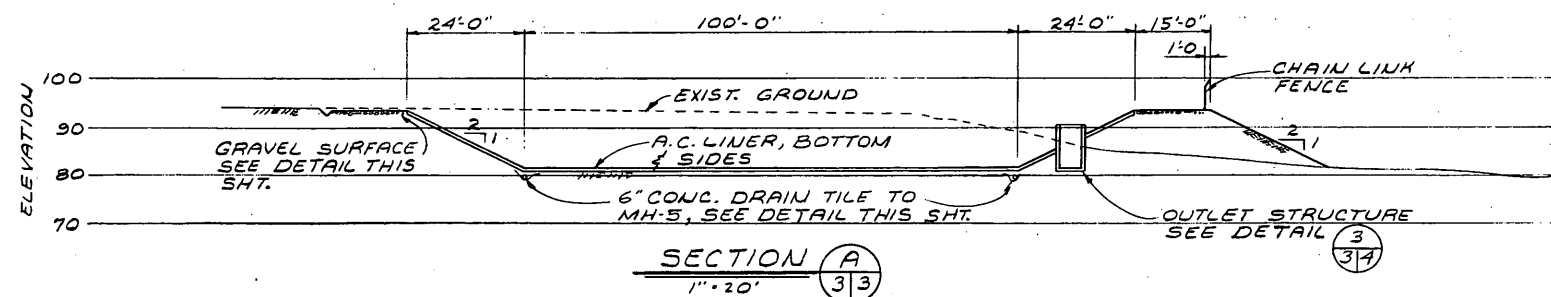
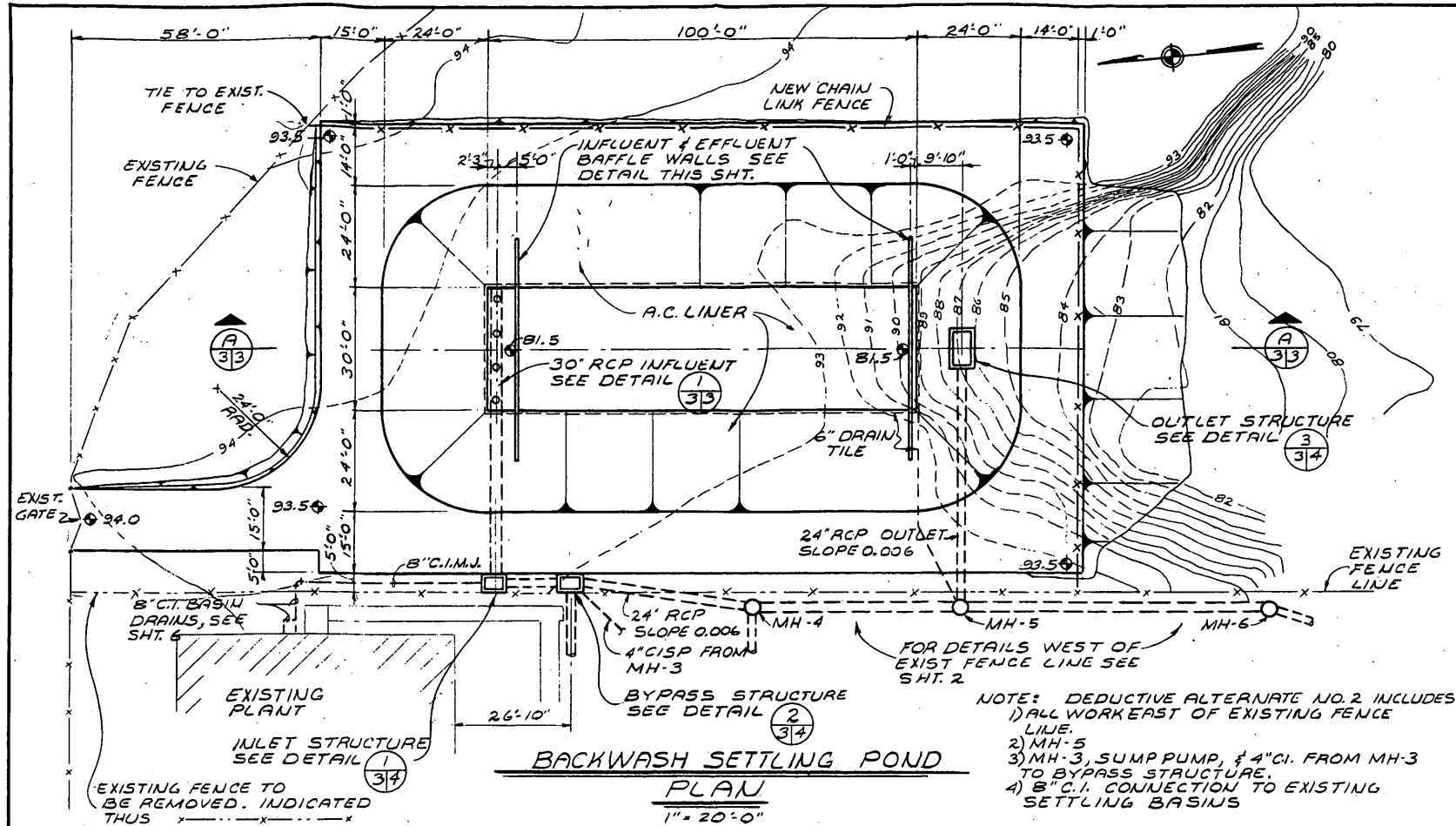


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OUTSIDE PIPING PLAN & DETAILS

DES	RSR	SHEET	2
BY	OK	OF	43
CH	CYS	DATE	JULY 1970
SCALE	AS SHOWN		
PROJECT	C 5508-1		



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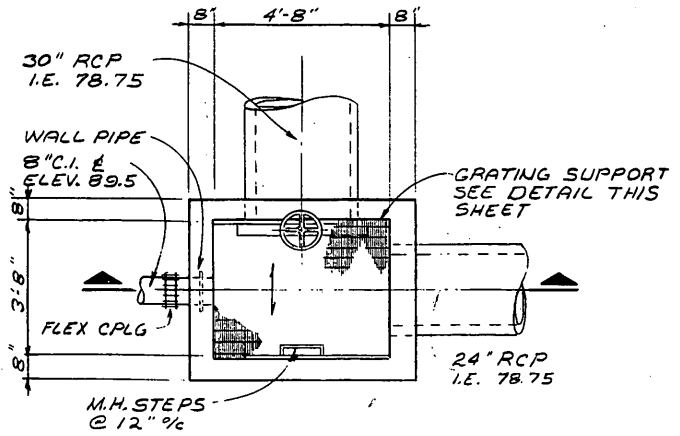


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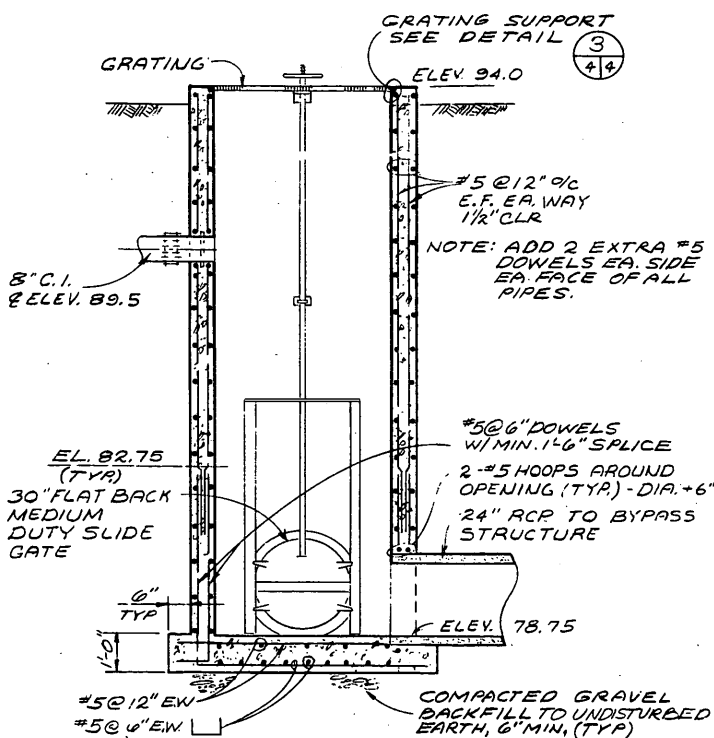
CITY OF NEWBERG, OREGON
WATER TREATMENT PLANT EXPANSION

BACKWASH SETTLING POND

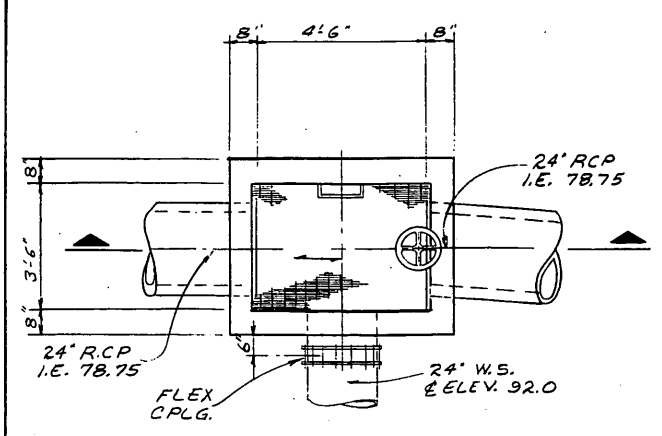
DESIGNED BY
RSR
CHECKED BY
AFW
DATE
JULY 1970
SCALE
AS SHOWN
DWG
C5508-1



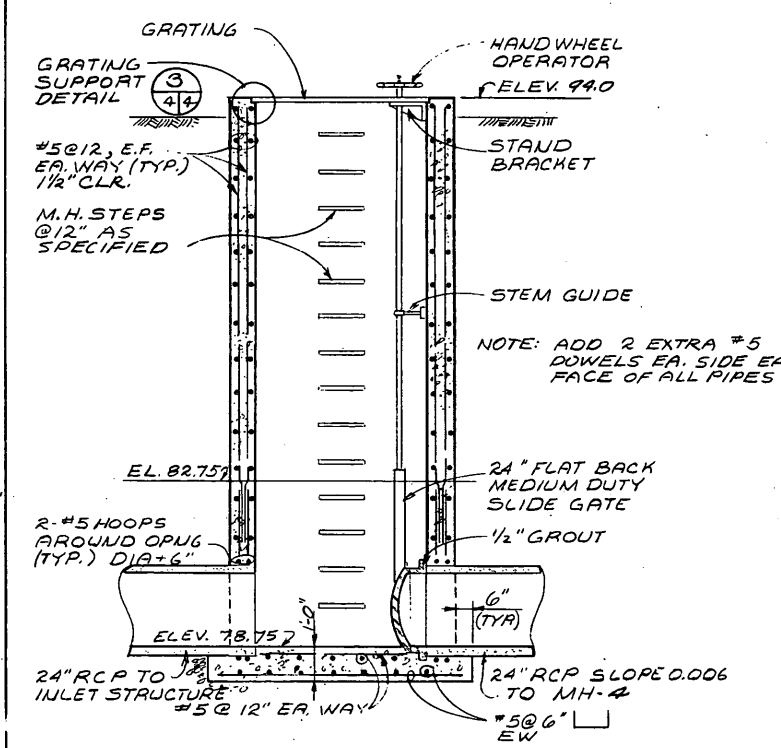
PLAN



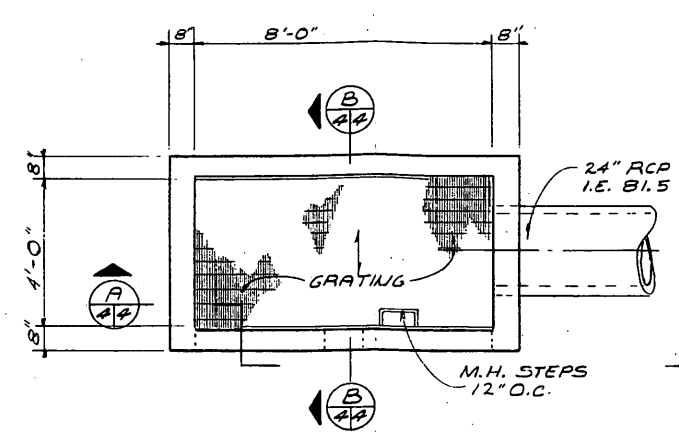
SECTION
INLET STRUCTURE DETAIL (1/3/4) = 1'-0"



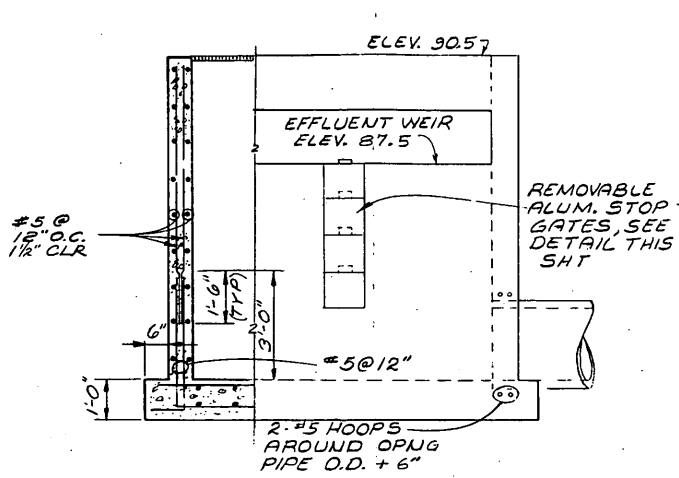
PLAN



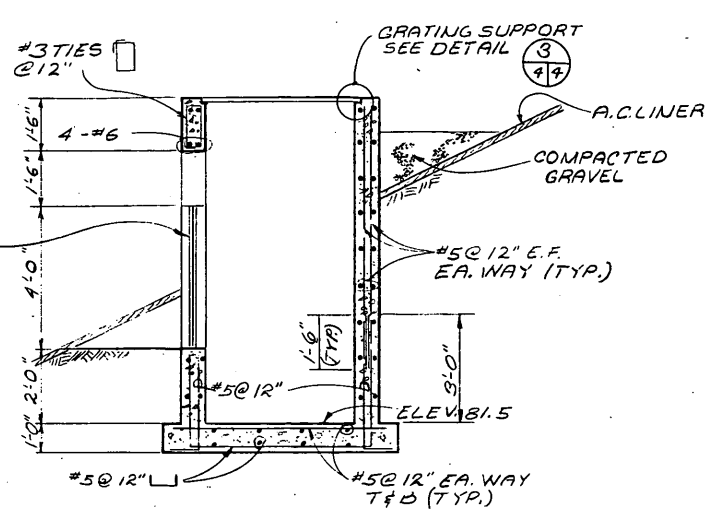
SECTION
BYPASS STRUCTURE DETAIL (2/3/4) = 1'-0"



PLAN



SECTION (A/A)



SECTION (B/B)

OUTLET STRUCTURE DETAIL (3/3/4) = 1'-0"

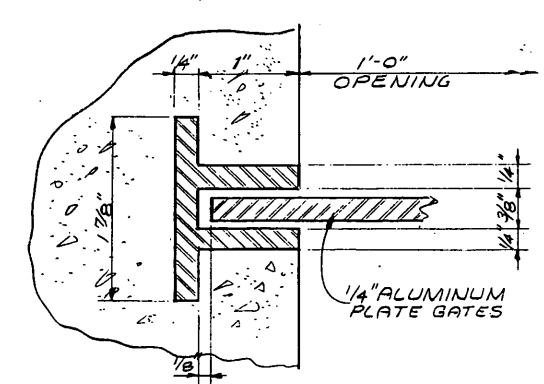
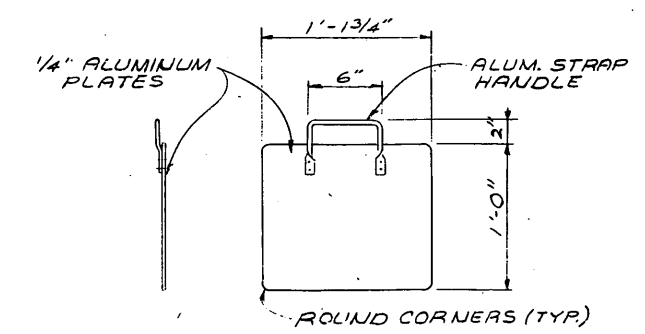
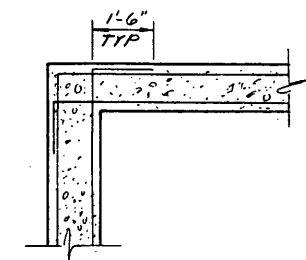


PLATE GUIDE FRAME
FULL SIZE

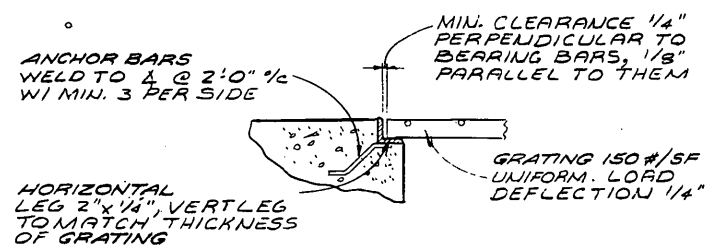


TYPICAL STOP PLATES - 4 REQ'D.
1 1/2" = 1'-0"

ALUMINUM STOP GATE DETAILS



TYPICAL HORIZONTAL
REINF. AT CORNER
1/2" = 1'-0"



TYPICAL GRATING
SUPPORT DETAIL (3/4/4)
U.T.S.

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OF THE ORIGINAL SCALE
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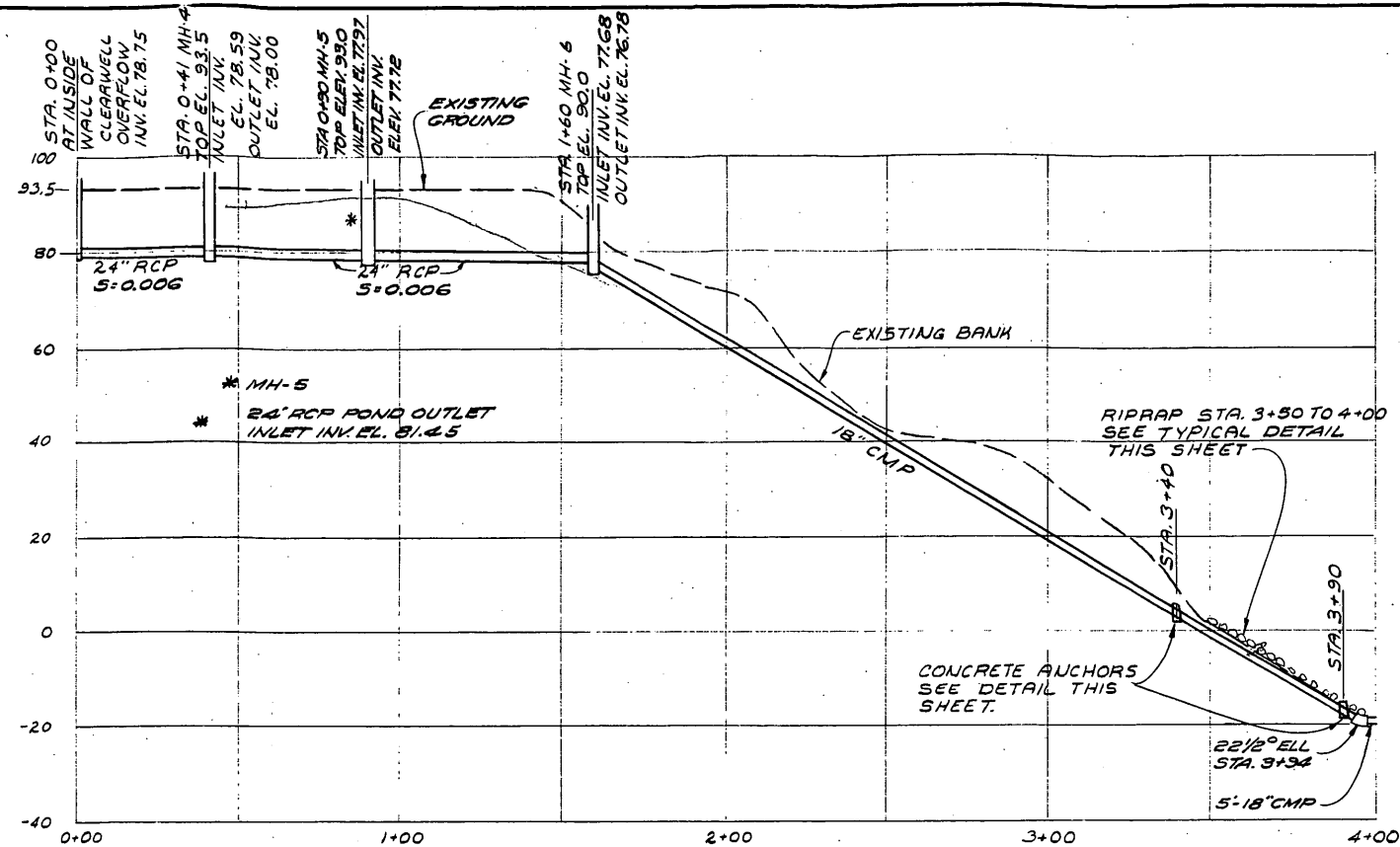
Richard J. Field
ENGINEERS
PLANNERS
ECONOMISTS



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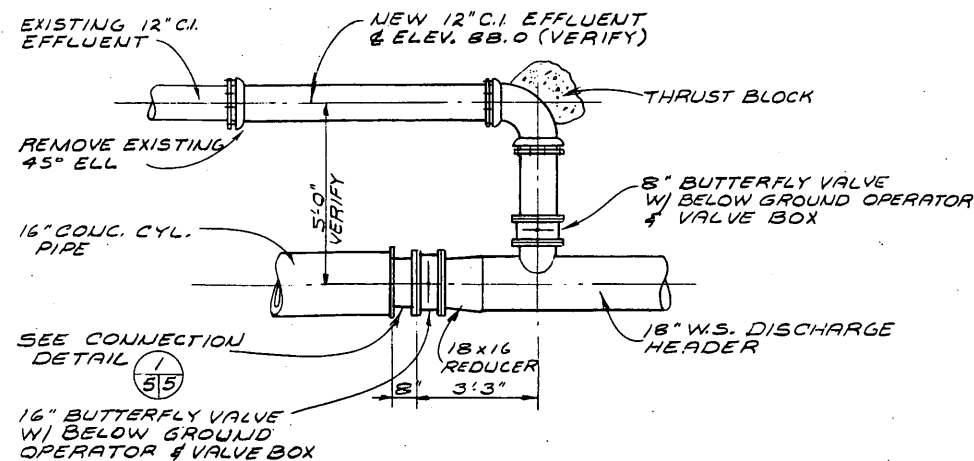
CITY OF NEWBERG, OREGON
WATER TREATMENT PLANT EXPANSION
BACKWASH SETTLING POND DETAILS

DES	ASR	SHEET	4
BY	AFW	OF	43
CHK	CYS	DATE	JULY 1970
IN	CS508.1	SCALE	AS SHOWN
DWG	C	5508-1	



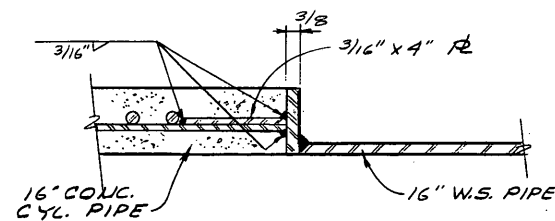
PROFILE CLEARWELL OVERFLOW LINE

SCALE HORIZ 1" = 30'
VERT 1" = 20'



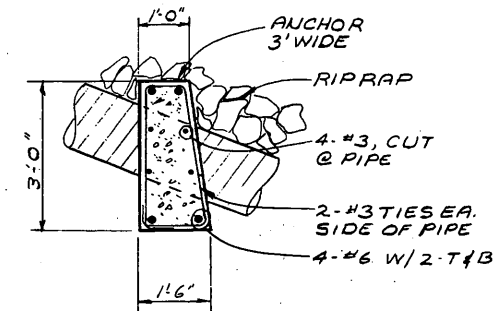
EFFLUENT PIPING DETAIL

3/8" = 1'-0"



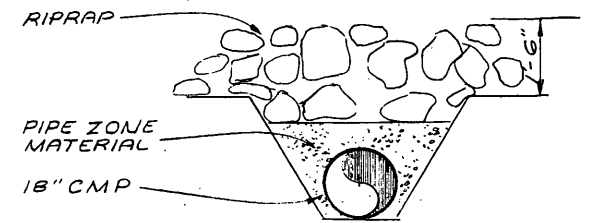
CONNECTION DETAIL

N.T.S.



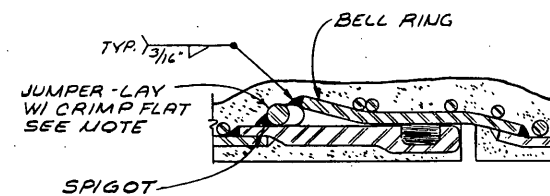
ANCHOR DETAIL

1/2" = 1'-0"

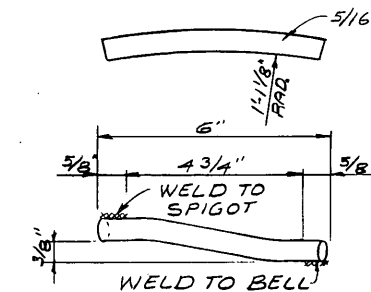


TYPICAL RIPRAP DETAIL

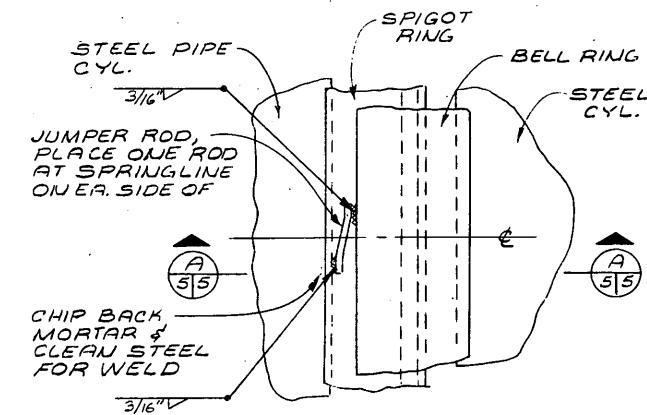
N.T.S.



SECTION A-55



JUMPER ROD DETAIL



JOINT BONDING DETAIL

CONCRETE CYLINDER PIPE
N.T.S.

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OF THE ORIGINAL SCALE
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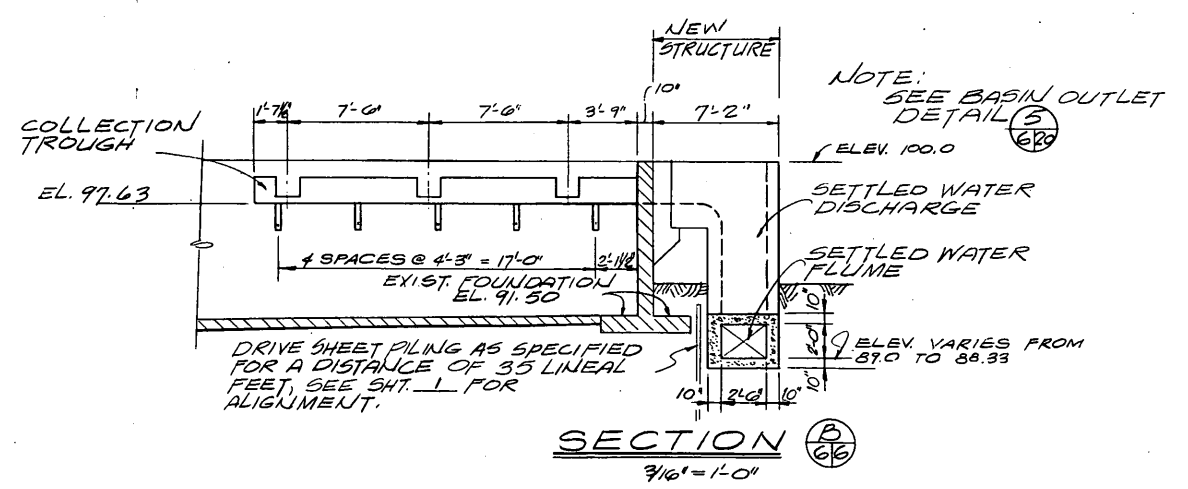
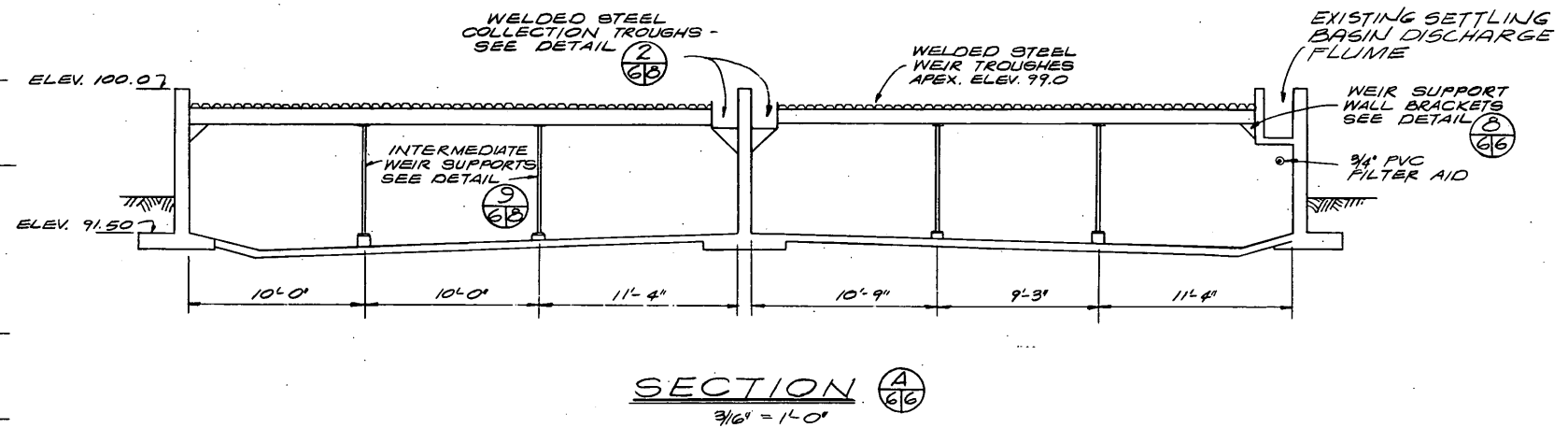
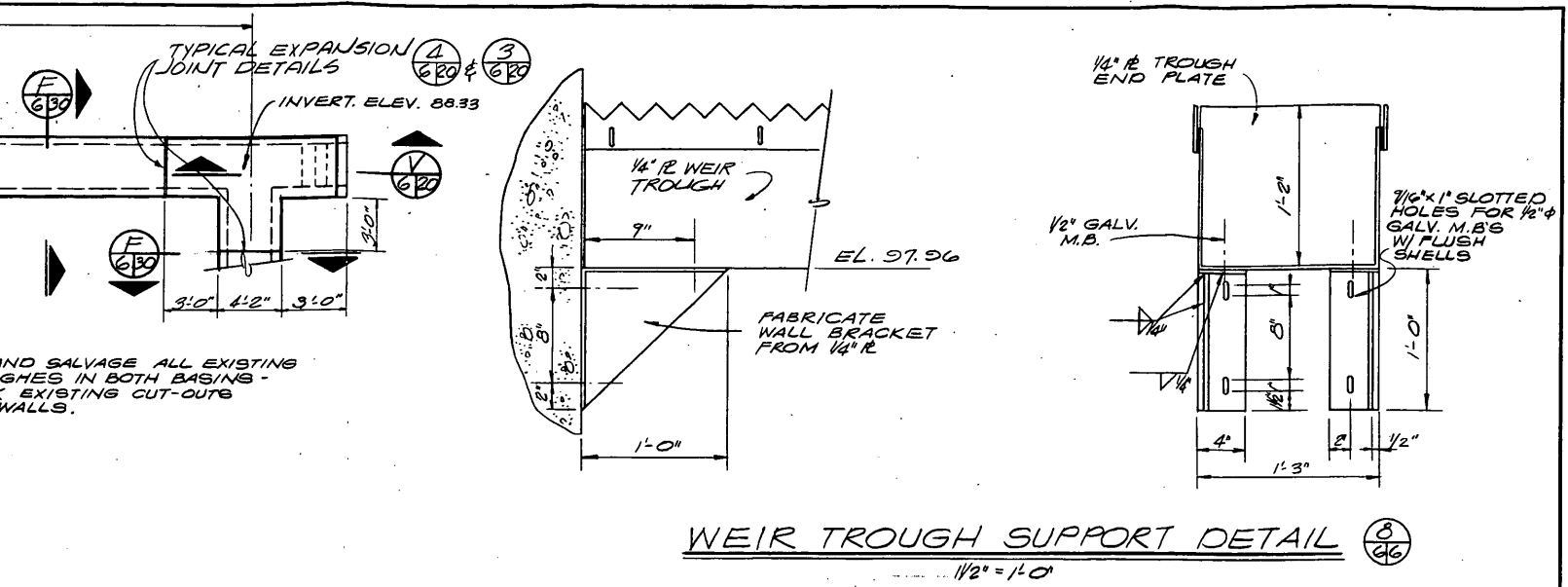
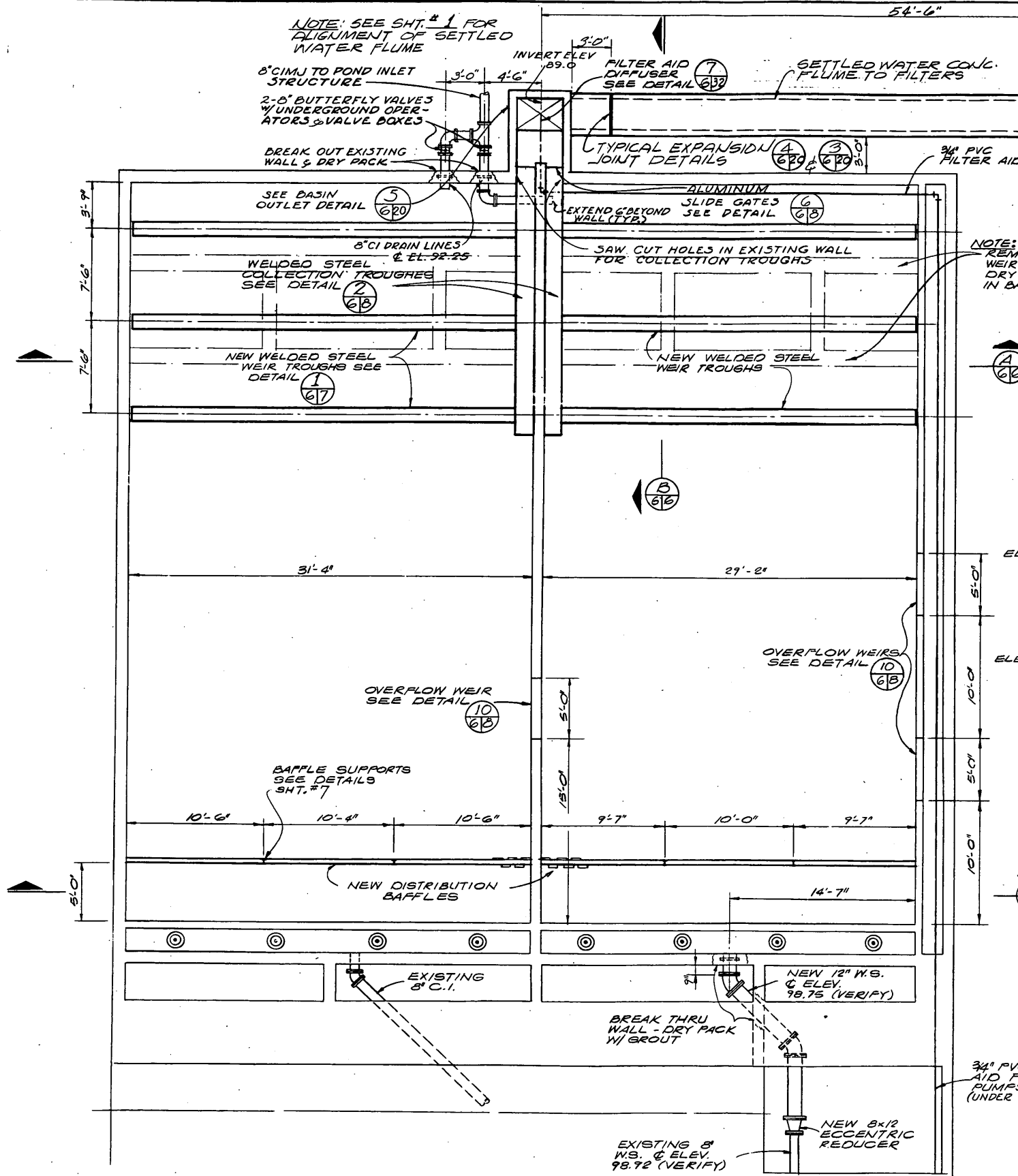


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WATER TREATMENT PLANT EXPANSION

CLEARWELL OVERFLOW LINE & DETAILS

DES RSR
BY APW
CYS
DATE JULY 1970
SCALE AS SHOWN
DWG C5508-1

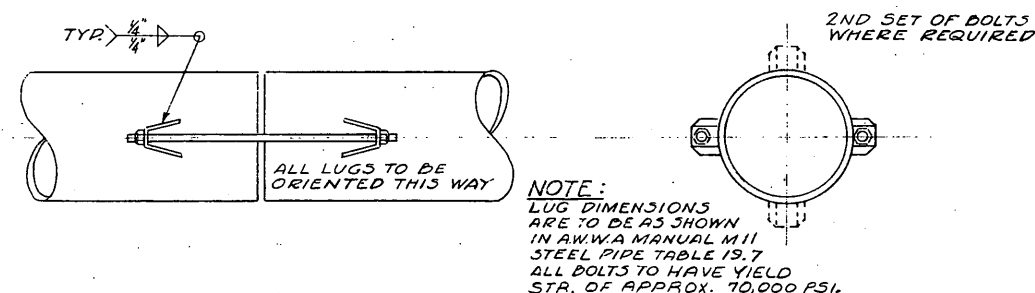
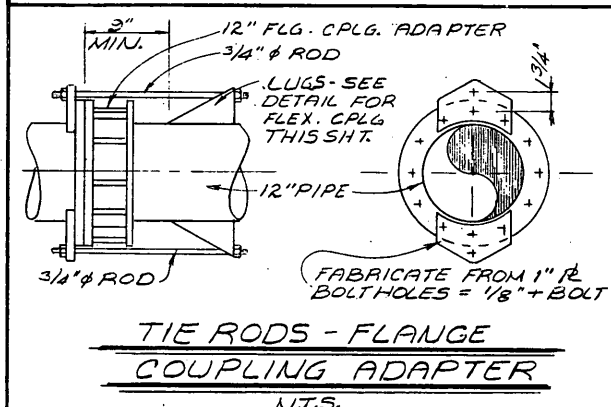
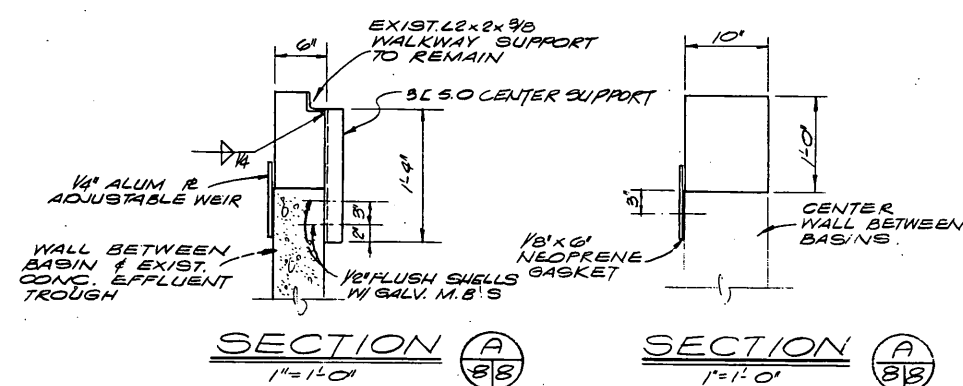
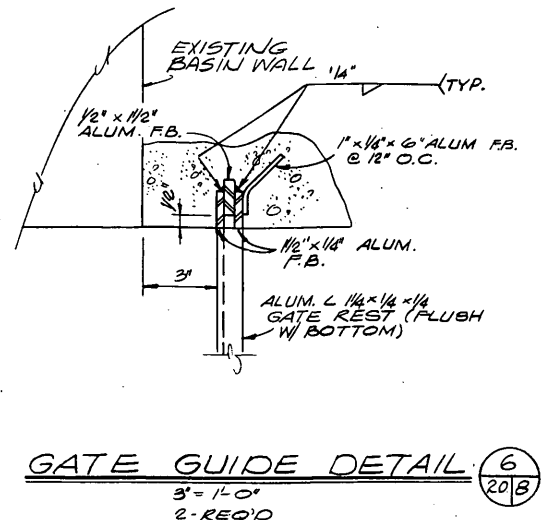
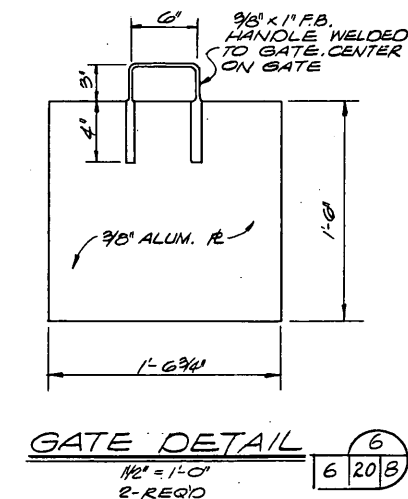
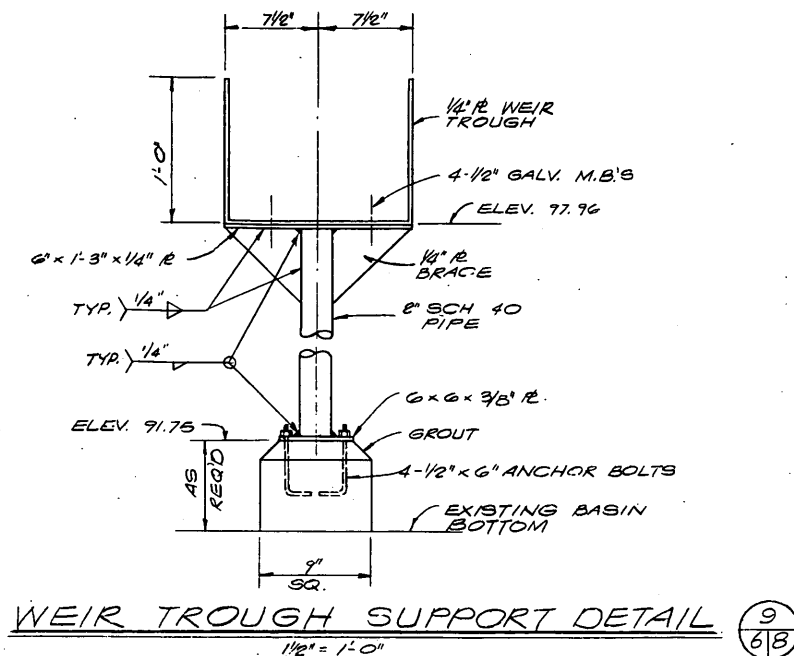
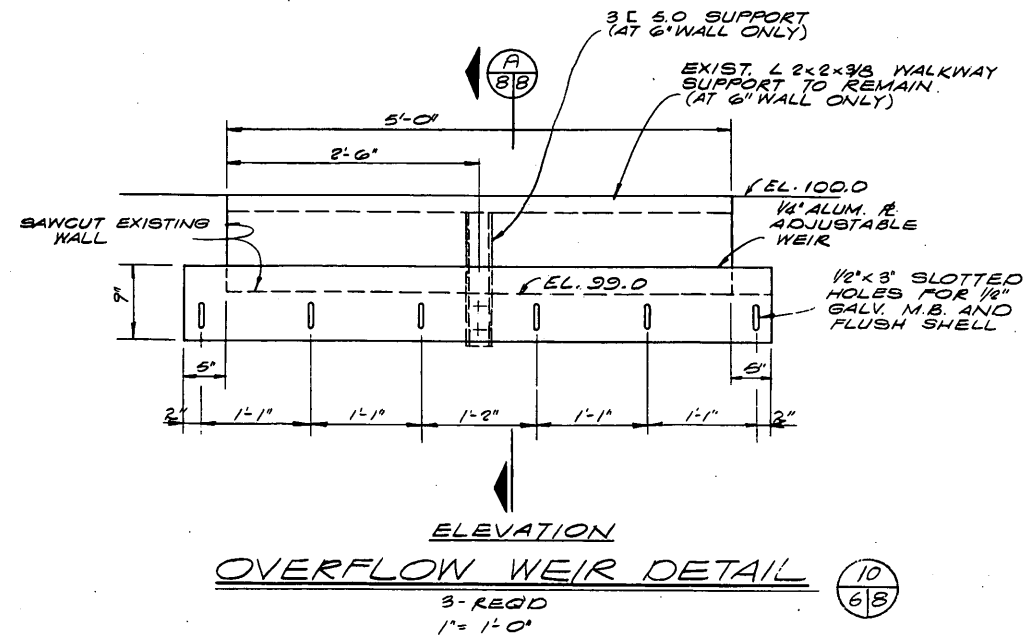


MODIFICATIONS TO EXISTING SEDIMENTATION BASINS

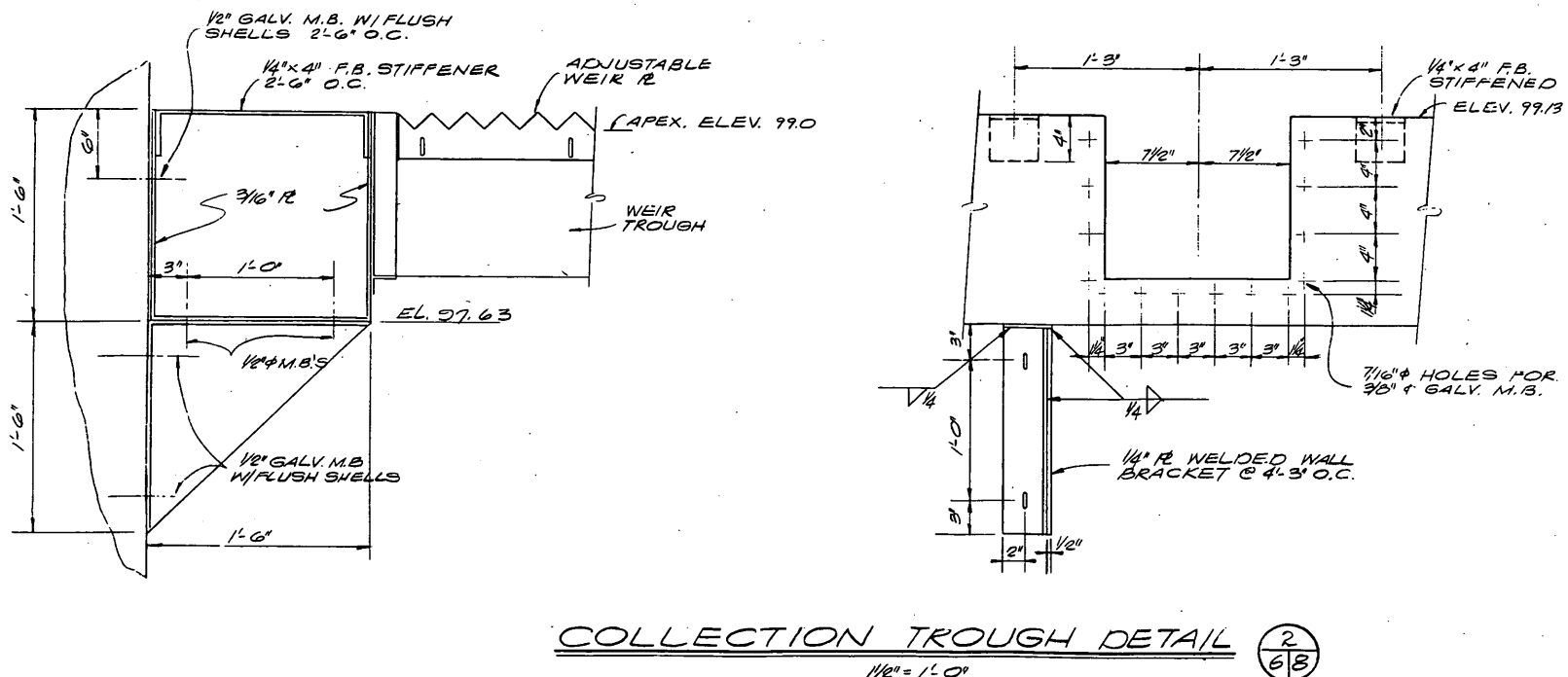
3/16" = 1'-0"

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 CORNELL, HOWLAND, HAYES & MERRYFIELD ENGINEERS, PLANNERS, ECONOMISTS	CITY OF NEWBERG, OREGON WATER TREATMENT PLANT EXPANSION		DESIGNED BY RSR CHECKED BY DK DATE JULY 1970 SCALE AS SHOWN DWG C 5508-1
	MODIFICATIONS TO SETTLING BASINS- PLAN & SECTIONS		SHEET 6 OF 43
			DATE JULY 1970 SCALE AS SHOWN
			DWG C 5508-1



NOTE:
LUG DIMENSIONS ARE TO BE AS SHOWN IN AWWA MANUAL M11 STEEL PIPE TABLE 19.7 ALL BOLTS TO HAVE YIELD STR. OF APPROX. 70,000 PSI.



TYPICAL FLEXIBLE COUPLING THRUST CONNECTION DETAIL
N.T.S.

PIPE DIAMETER (IN.)	BACKWASH & GALLERY PIPING (35 PSI OR LESS)	HIGH SERVICE PIPING (DISCHARGE SIDE OF HIGH SERVICE PUMPS)
8	2 BOLTS @ 5/8" DIA.	2 BOLTS @ 3/4" DIA.
10	2 BOLTS @ 5/8" DIA.	2 BOLTS @ 3/4" DIA.
12	2 BOLTS @ 5/8" DIA.	2 BOLTS @ 3/4" DIA.
14	2 BOLTS @ 5/8" DIA.	4 BOLTS @ 3/4" DIA.
16	2 BOLTS @ 5/8" DIA.	4 BOLTS @ 3/4" DIA.
18	2 BOLTS @ 3/4" DIA.	4 BOLTS @ 7/8" DIA.
24	2 BOLTS @ 3/4" DIA.	4 BOLTS @ 7/8" DIA.

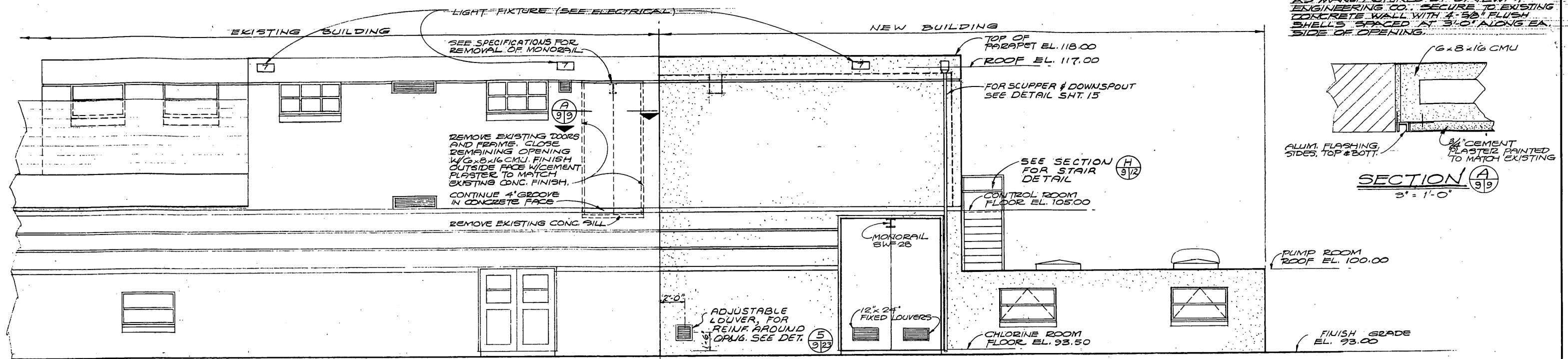
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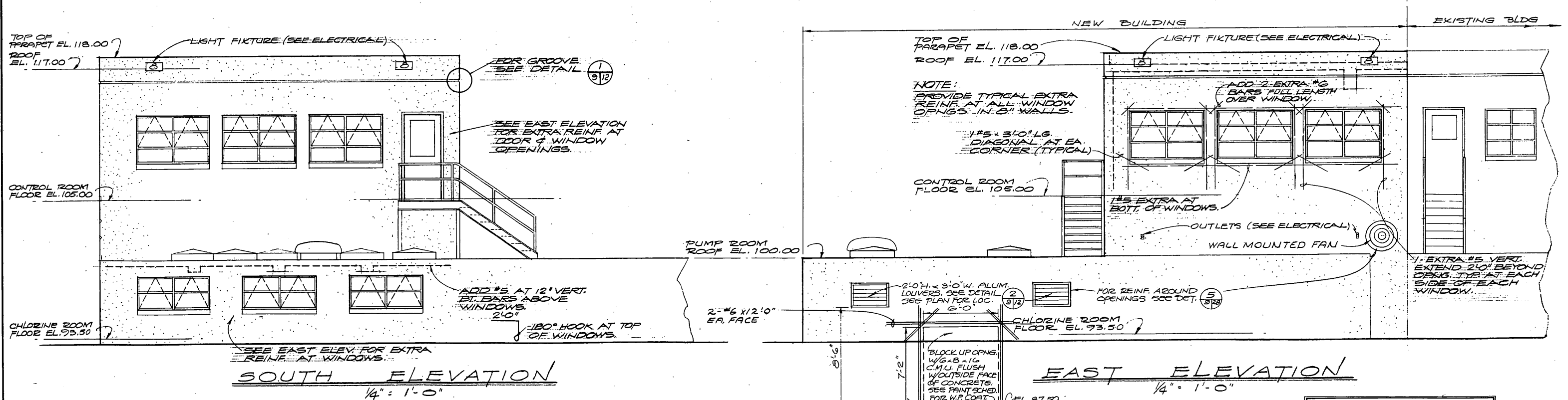
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CITY OF NEWBERG, OREGON
WATER TREATMENT PLANT EXPANSION
MODIFICATIONS TO SETTLING BASINS-
DETAILS

DESIGNED BY: **RSR**
CHECKED BY: **DK**
DATE: **JULY 1970**
SCALE: **AS SHOWN**
DWG NO: **C5508-1**



WEST ELEVATION
1/4" = 1'-0"



SOUTH ELEVATION
1/4" = 1'-0"

EAST ELEVATION
1/4" = 1'-0"

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OF THE ORIGINAL SCALE
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NOTE:
SEE SECTION A-9/9
FOR ANCHORS
EACH SIDE OF
OPENING.

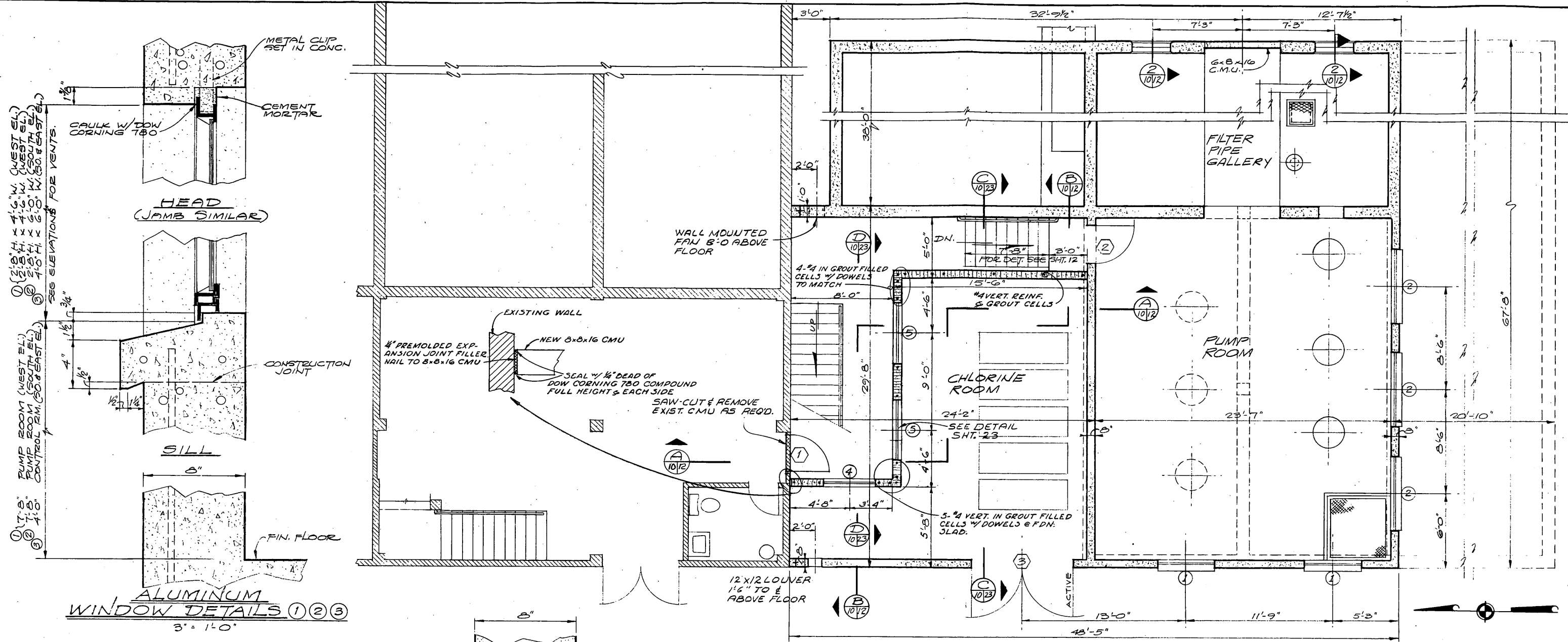


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WATER TREATMENT PLANT EXPANSION

FILTER BUILDING
ARCHITECTURAL ELEVATIONS

SHEET 9
OF 43
DATE JULY 1970
DRAWN BY AS SHOWN
CHECKED BY
CDS:08.1
DWG NO. 5508-1



NOTE:
1) DOORS IN CMU SIMILAR.
2) PROVIDE ALUM. THRESHOLD, REESE #V350A, WEATHER STRIP STOPS; REESE #DS69 AB FOR DOOR 5.

3/4" L.M.B. & FLUSH SHELLS, 1" EA. JAMB. & 2" HEAD.
PRESSED STEEL BUCK & FRAME
1 3/4" OR 1 3/8" H.M. DOOR.

LEGEND

	EXISTING
	EXISTING TO BE REMOVED
	NEW CONCRETE
	NEW BLOCK

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DOOR SCHEDULE

NO.	SIZE	MATERIAL	GLASS	HARDWARE	REMARKS
1.	3'-0" X 7'-0" X 1 3/8"	H.M.	D.S.	SET NO. 1	
2.	3'-0" X 7'-0" X 1 3/8"	H.M.	D.S.	SET NO. 1	
3.	2'-4" X 11'-0" X 1 3/4"	H.M.	D.S.	SET NO. 2	R.H. ASTRAGAL ON ACTIVE DOOR
4.	3'-0" X 7'-0" X 1 3/8"	H.M.	D.S.	SET NO. 1	
5.	3'-0" X 7'-0" X 1 3/4"	H.M.	D.S.	SET NO. 3	

DOOR HARDWARE SCHEDULE

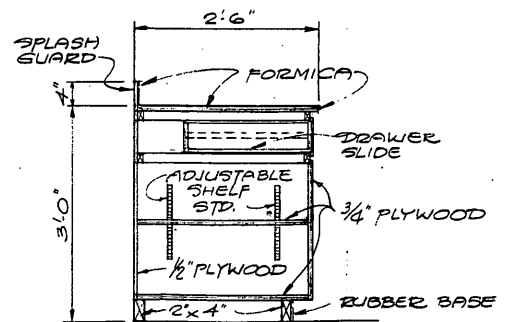
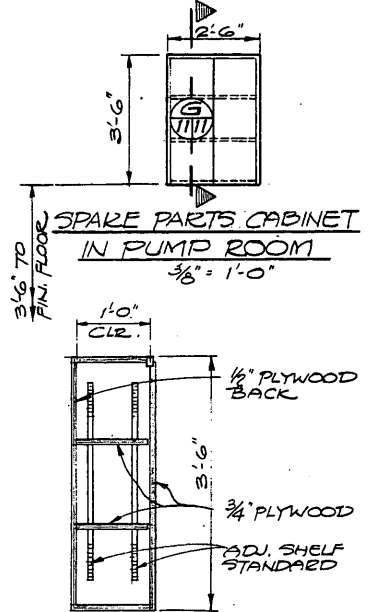
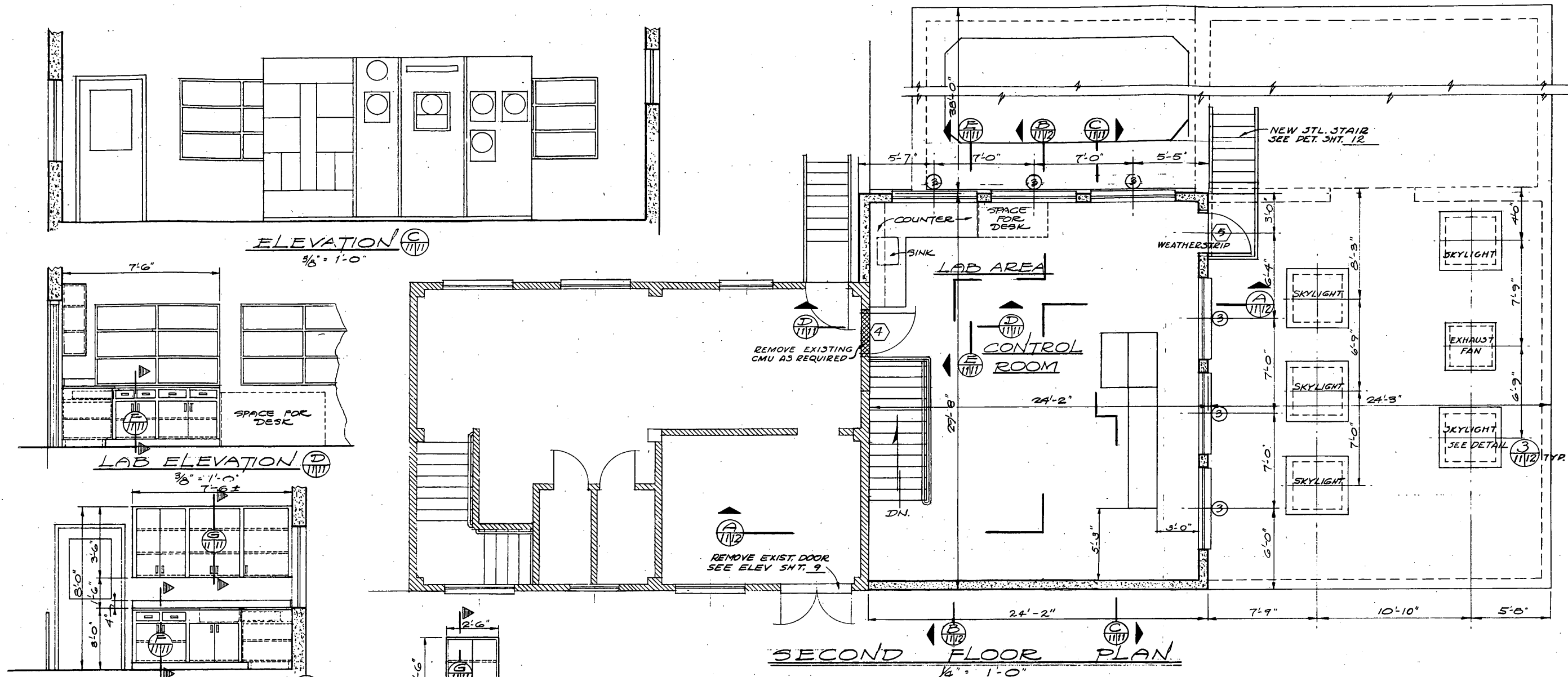
SET NO. 1			
1 1/2 PAIR HINGES	FENESTRA	2389A PRIME	
1 LOCKSET	FENESTRA	9471 US10	
1 STOP	FENESTRA	9459 US10	
1 CLOSER WITH HOLD OPEN FEATURE	FENESTRA	1462 EP	
SET NO. 2			
4 PAIR HINGES	McKINNEY	TB279B PRIME	
1 LOCKSET	FENESTRA	9470 US10	
1 HEAD & FOOT BOLT	FENESTRA	1893 US10	
1 STOP	FENESTRA	9461 US10	
SET NO. 3			
1 1/2 PAIR HINGES	FENESTRA	643A PRIME	
1 LOCKSET	FENESTRA	9470 US10	
1 STOP	FENESTRA	9494 US10	

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CITY OF NEWBERG, OREGON
WATER TREATMENT PLANT EXPANSION

FILTER BUILDING
ARCHITECTURAL FIRST FLOOR PLAN

DWG. SHEET
C5508-1 10
DATE
JULY 1970
SCALE
AS SHOWN



CABINET HARDWARE

HINGES	STANLEY - 1545 US10
PULLS	STANLEY - 4477 US10
CATCHES	STANLEY - 38
DRAWER SLIDES	KNAPE AND VOGT - 1300
ADJUSTABLE SHELF STANDARDS	KNAPE AND VOGT - 255
SHELF SUPPORTS	KNAPE AND VOGT - 256

INTERIOR NEW WORK AND PATCHING

PLASTER AND CONCRETE

1ST COAT DUTCH BOY LUSTRELAC PRIMER-SEALER 30P12
2ND COAT DUTCH BOY NALTHETIC EGGSHELL ENAMEL 35P10
3RD COAT DUTCH BOY NALTHETIC EGGSHELL ENAMEL 35P10

WOOD

1ST COAT DUTCH BOY LUSTRELAC ENAMEL UNDERCOAT 30P15
2ND COAT DUTCH BOY NALTHETIC EGGSHELL ENAMEL 35P10
3RD COAT DUTCH BOY NALTHETIC EGGSHELL ENAMEL 35P10

METAL (SHOP PRIMED)

TOUCH UP WITH DUTCH BOY ANTI-RUST PRIMER 059
1ST COAT DUTCH BOY LUSTRELAC ENAMEL UNDERCOAT 30P15
2ND COAT DUTCH BOY NALTHETIC EGGSHELL ENAMEL 35P10

CABINET WORK AND COUNTER

1ST COAT DUTCH BOY LUSTRELAC ENAMEL UNDERCOAT 30P15
2ND COAT DUTCH BOY NALTHETIC EGGSHELL ENAMEL 35P10
3RD COAT DUTCH BOY NALTHETIC EGGSHELL ENAMEL 35P10

PAINT APPLICATION SCHEDULE

EXTERIOR NEW AND EXISTING WORK

CONCRETE

1ST COAT DUTCH BOY NALPREP 019
2ND COAT DUTCH BOY EXTERIOR ACRYLIC FINISH 32W90
3RD COAT DUTCH BOY EXTERIOR ACRYLIC FINISH 32W90

C.M.U.

1ST COAT DUTCH BOY BLOCK COATER 30W01
2ND COAT DUTCH BOY NALPREP 019
3RD COAT DUTCH BOY EXTERIOR ACRYLIC FINISH 32W90

METAL (SHOP PRIMED)

TOUCH UP WITH DUTCH BOY ANTI-RUST PRIMER 059
1ST COAT DUTCH BOY EXTERIOR UNDERCOAT 30P06
2ND COAT DUTCH BOY MARINA HOUSE AND TRIM 31P10

INTERIOR EXISTING

PLASTER, CONCRETE AND WOOD

1ST COAT DUTCH BOY NALTHETIC EGGSHELL ENAMEL 35P10
2ND COAT DUTCH BOY NALTHETIC EGGSHELL ENAMEL 35P10

METAL

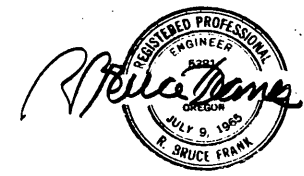
SAME AS NEW WORK

NOTE:

THE USE OF PROPRIETARY NAMES IN THE SCHEDULES IS NOT INTENDED TO INDICATE PREFERENCE FOR THE SPECIFIC MANUFACTURER'S PROJECT, BUT RATHER TO ESTABLISH THE QUALITY AND COLOR DESIRED. OTHER MANUFACTURER'S PRODUCTS MAY BE USED UPON APPROVAL BY THE ENGINEER.

NEW EXTERIOR PAINT FINISH TO MATCH EXISTING PAINT IN BOTH TEXTURE AND COLOR.

THIS PRINT IS REDUCED TO ONE-HALF OF THE ORIGINAL SCALE
IF THE SCALE READS:
1" = 1'-0" USE 1/2" = 1'-0" OR 1" = 10' USE 1" = 20'

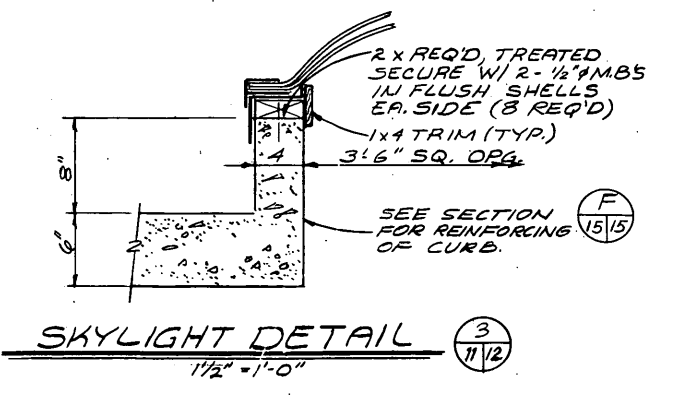
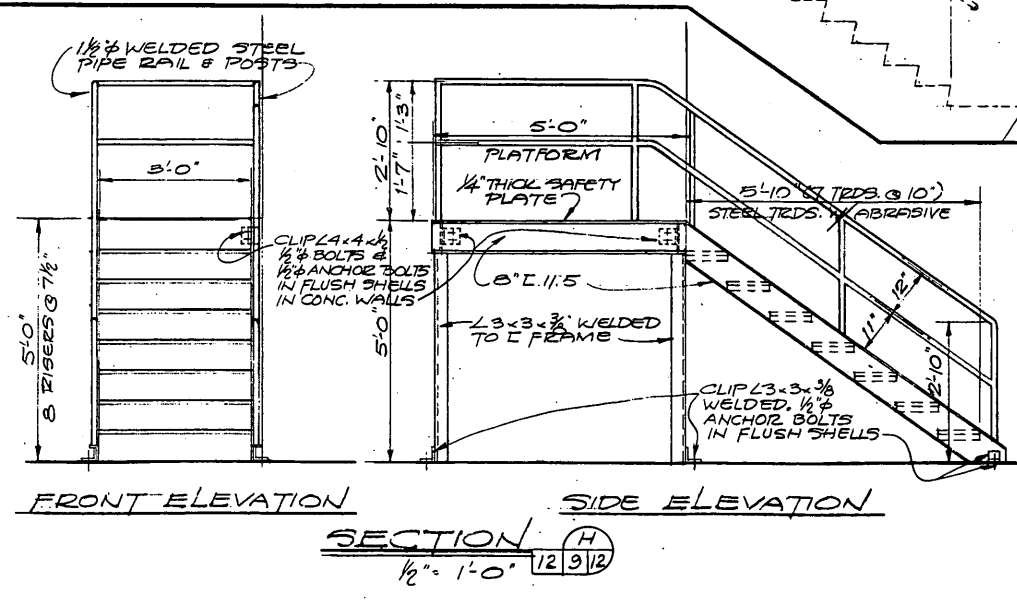
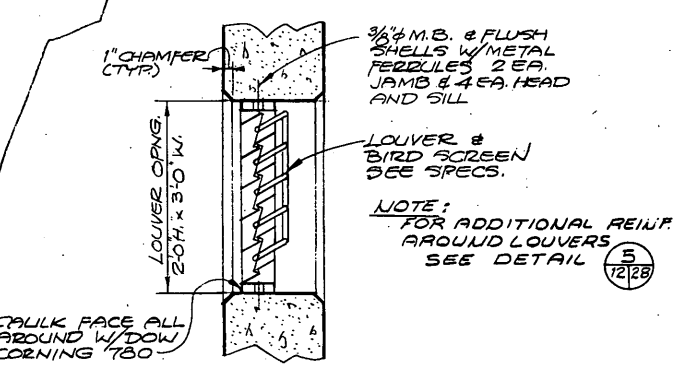
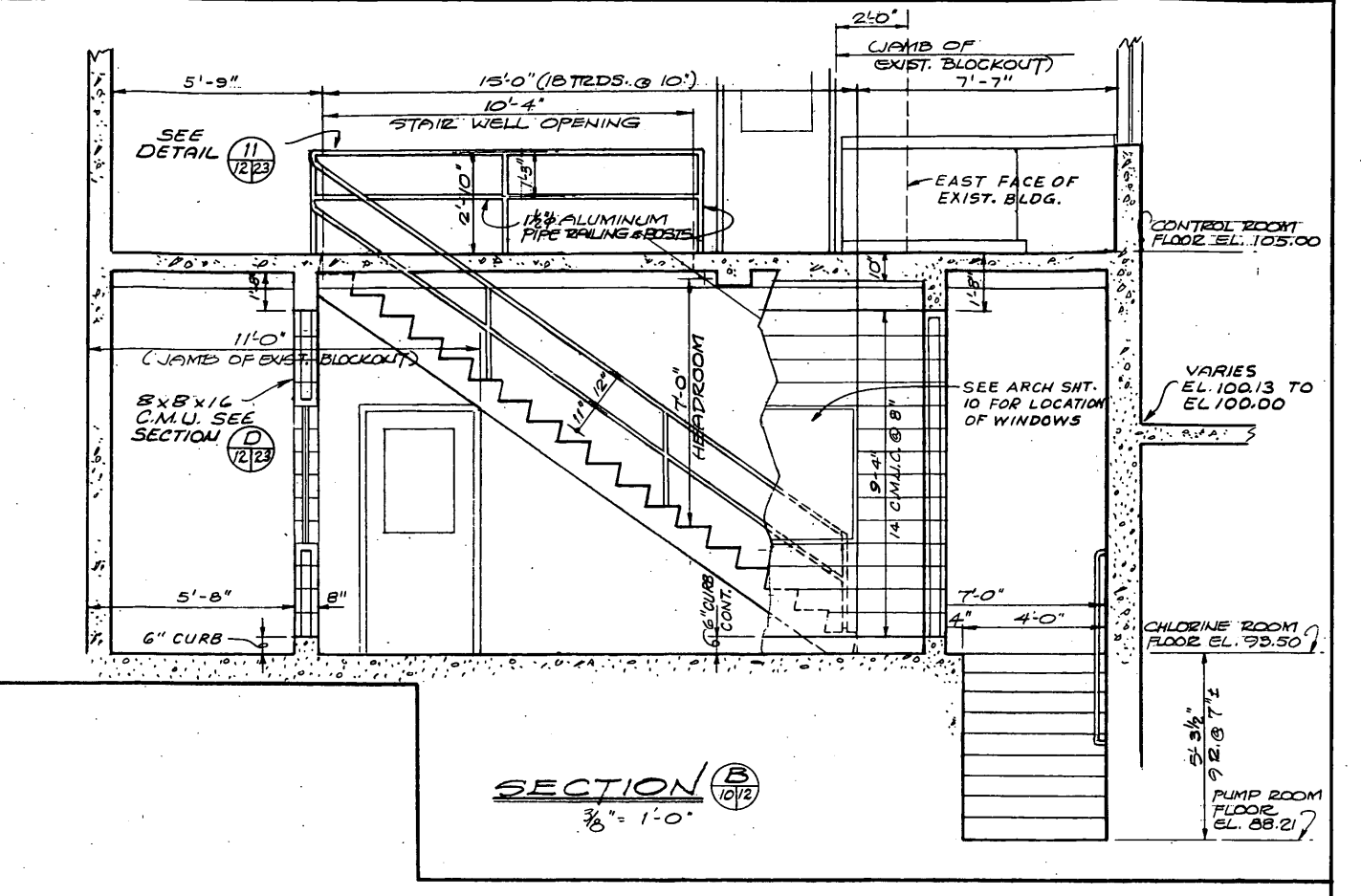
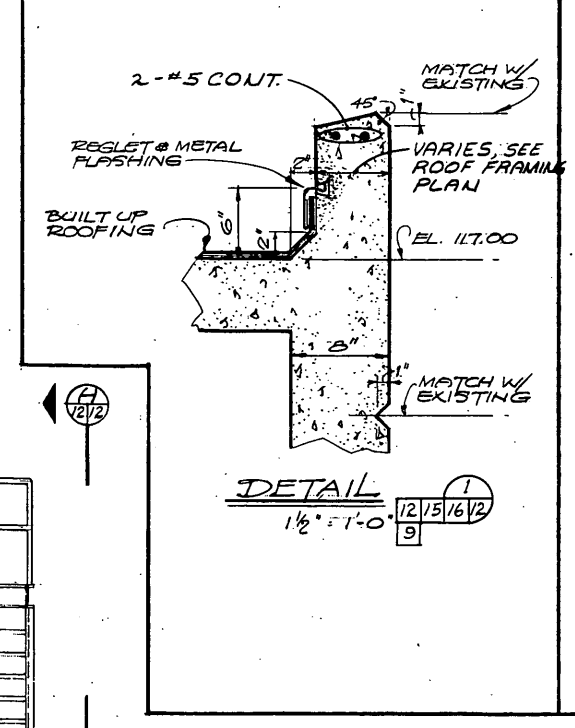
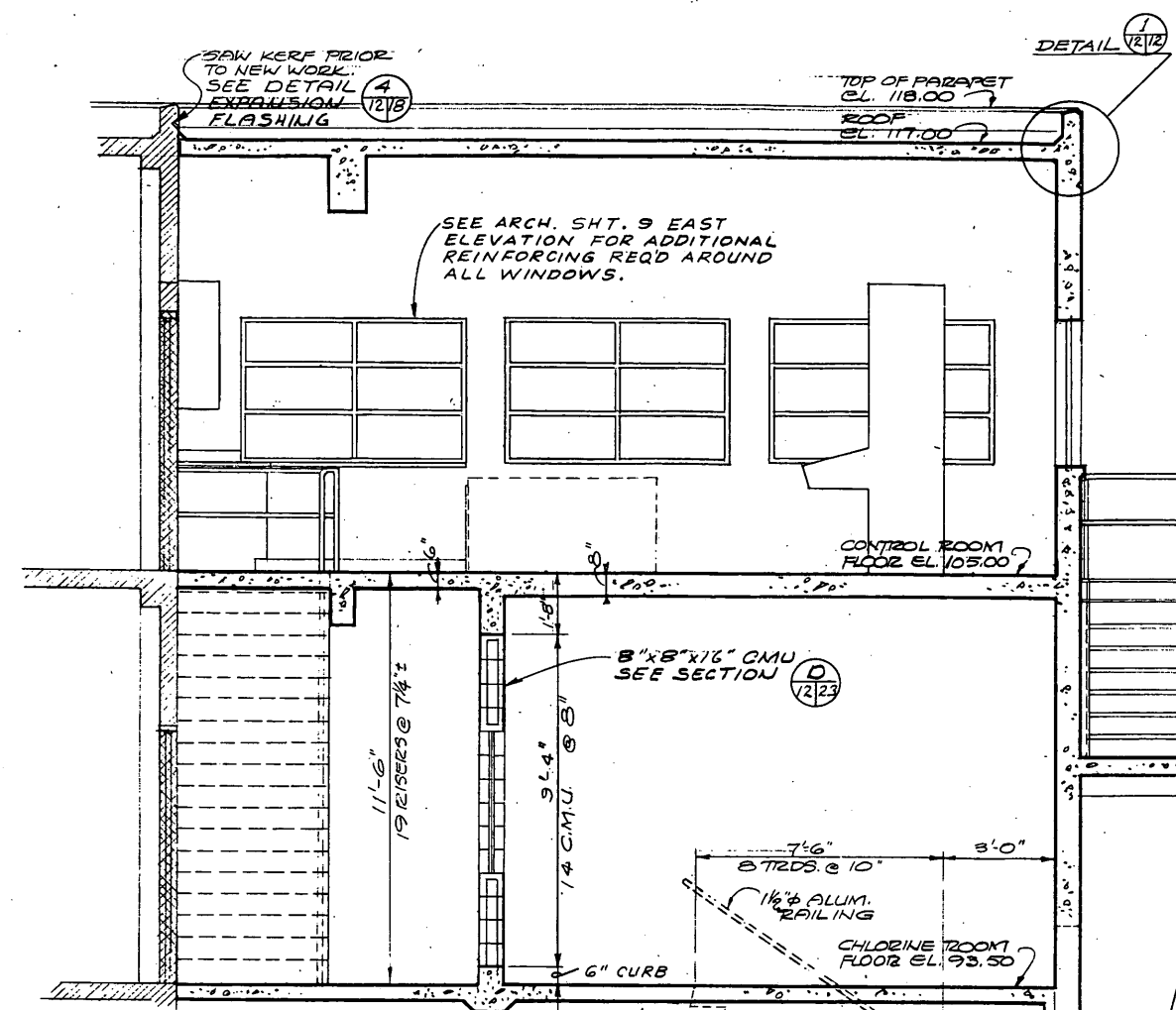


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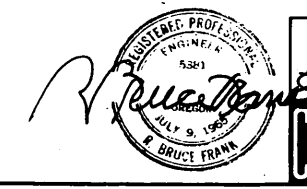
CITY OF NEWBERG, OREGON
WATER TREATMENT PLANT EXPANSION

FILTER BUILDING
ARCHITECTURAL SECOND FLOOR PLAN

DESIGNED BY	DATE	SHEET
RSR	JULY 1970	11
OF 43		
BY	DATE	
RBF	JULY 1970	
BY	DATE	
CS508.1	AS SHOWN	
DWG		
C 5508-1		

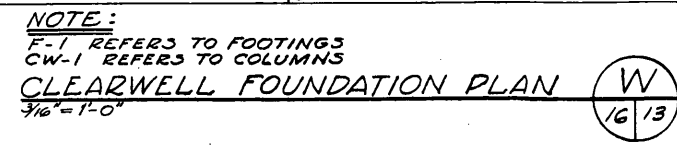


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IF THE SCALE READS:
1" = 1'-0" USE 1/2" = 1'-0" OR 1" = 10' USE 1" = 20'

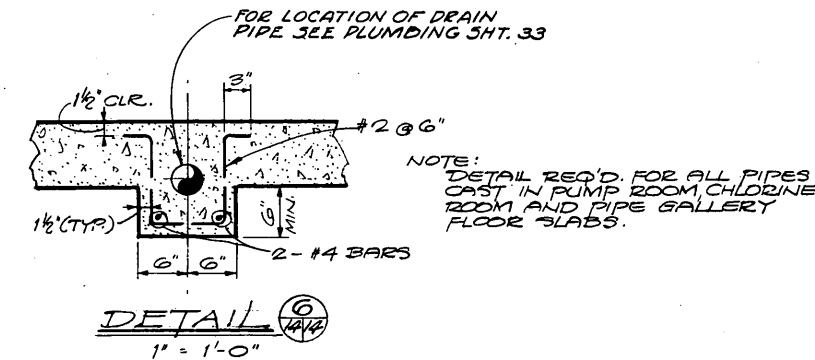
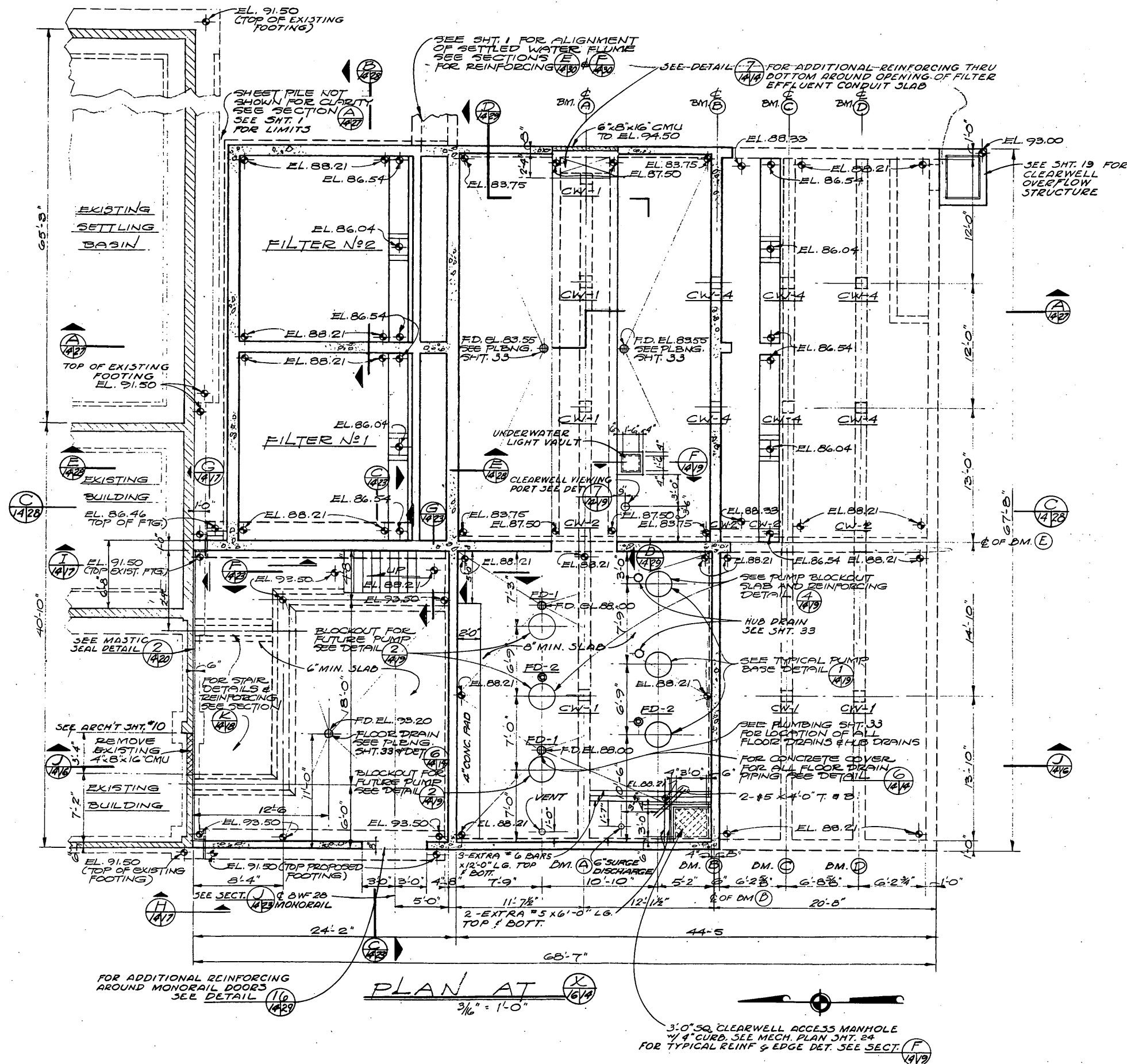


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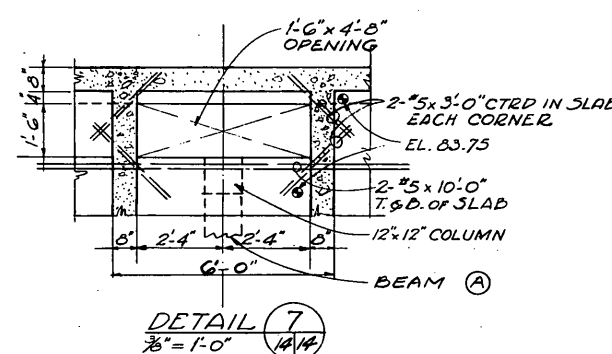
CITY OF NEWBERG, OREGON WATER TREATMENT PLANT EXPANSION		DES. RBF	SHEET 12
FILTER BUILDING		DATE OF 43	
ARCHITECTURAL SECTIONS AND DETAILS		DATE JULY 1970	
		SCALE AS SHOWN	
		DRW. C5608-1	



DES R.D.F.	SHEET 13
OR C.C.M.	OF 43
OR GFD	DATE JULY 1970
BY C5508.1	SCALE AS SHOWN
DWG C 5508-1	



- GENERAL NOTES**
1. WATERSTOP NOT SHOWN FOR CLARITY AT FUTURE FILTERS OVER CLEARWELL. SEE FILTER ROOF PLAN, SHT. 26 FOR LOCATION OF WATERSTOP AS REQUIRED FOR FUTURE FILTERS.
 2. PROVIDE STANDARD CAST IRON RINGS AT 1'-0" CTRS. IN 1'-0" WALL AT CLEARWELL ACCESS MANHOLE. SEE SPECIFICATIONS.
 3. SEE FILTER PLAN AND FILTER ROOF PLAN SHT. 26 FOR DIMENSIONS PERTAINING TO FILTERS AND PIPE GALLERY.
 4. SEE SHTS 21 & 22 FOR ELEVATIONS & SECTIONS OF BEAMS (A)(B)(C)(D) AND (E).
 5. SEE ARCHITECTURAL SHT. 12 FOR DETAILS OF 8"x8"x16" CMU BLOCK WALLS IN CHLORINE ROOM.
 6. BEND ALL TOP SLAB BARS 1'-6" INTO WALLS OR BEAMS.
 7. SEE SECTION (J) FOR FLOOR SLAB REINFORCING.



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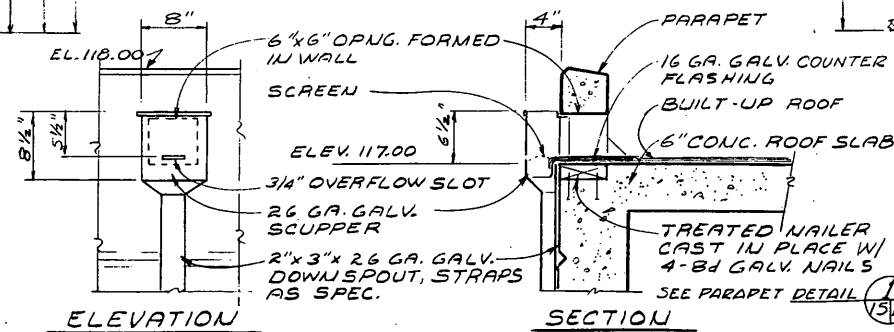
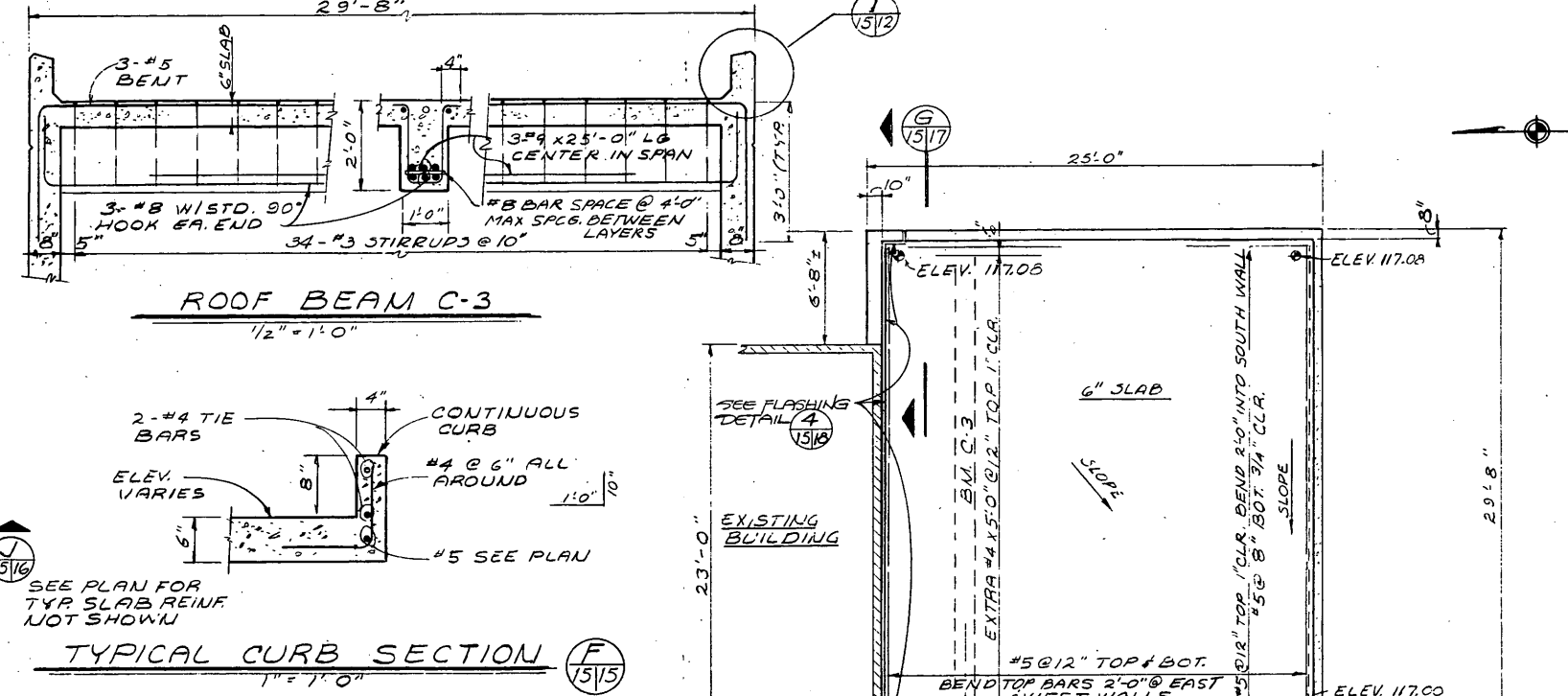
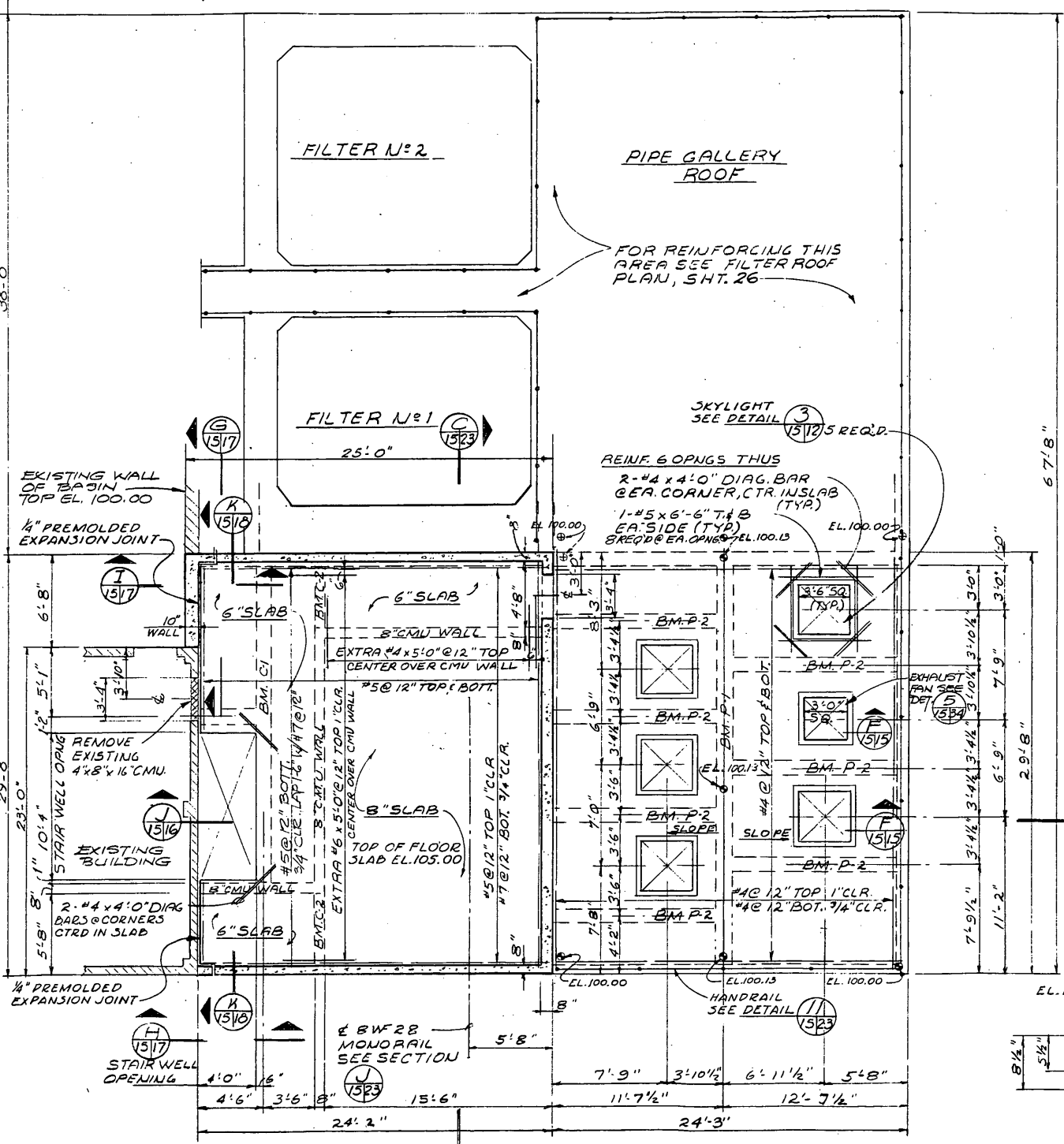
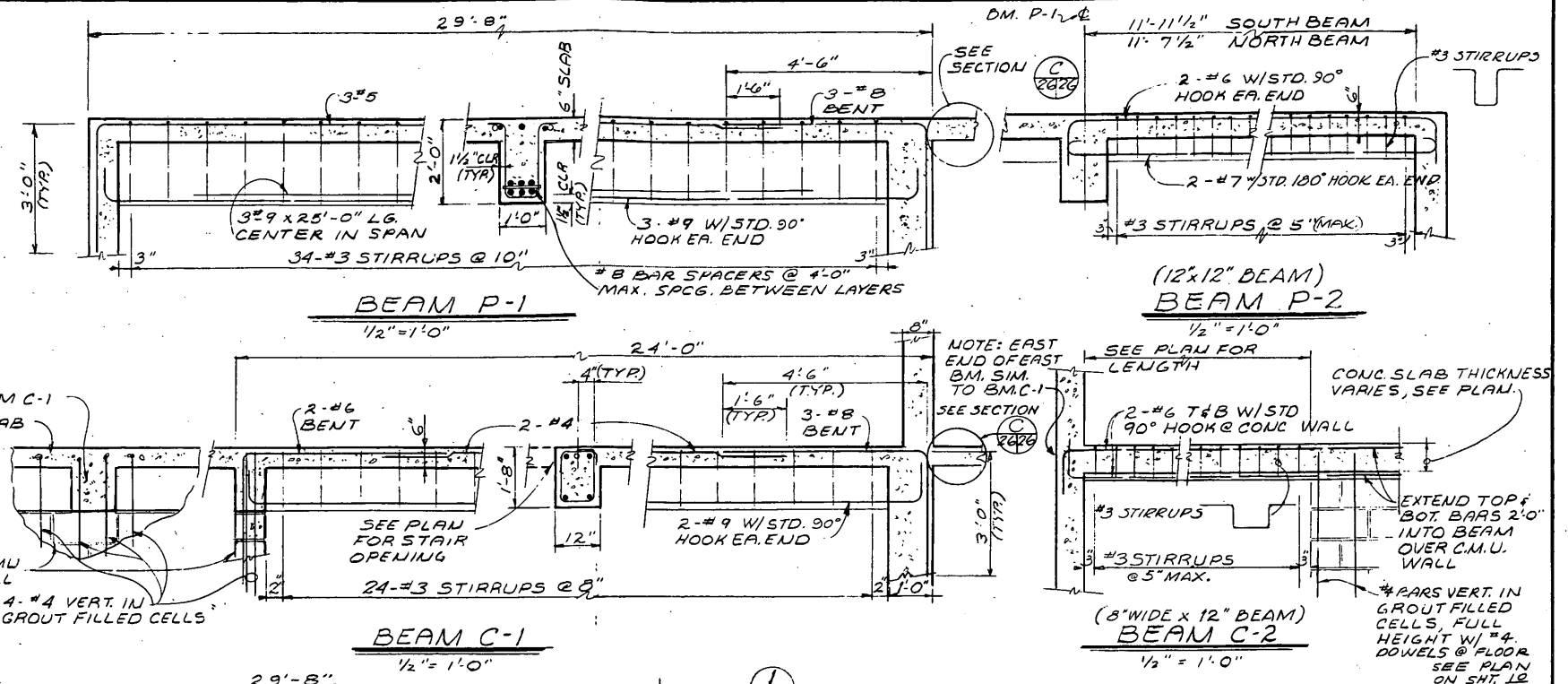
CITY OF NEWBERG, OREGON
WATER TREATMENT PLANT EXPANSION

FILTER BUILDING
STRUCTURAL FIRST FLOOR PLAN AND DETAILS

DES. R.D.F.
CHK. E.K.W.
DATE JULY 1970
BY G.F.D.
C5508.1
DWG. C 5508-1

GENERAL NOTES:

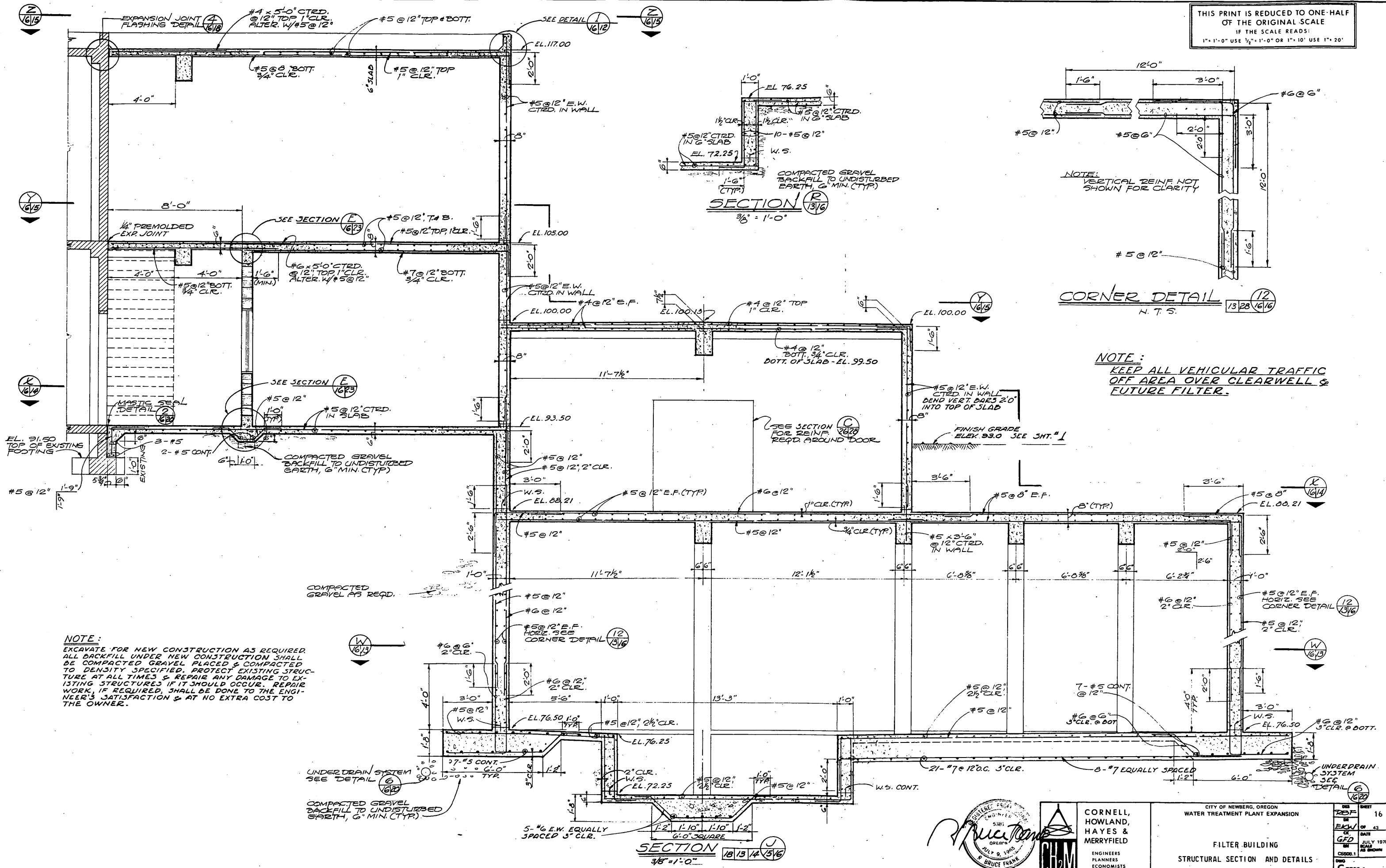
1. PLACE ALL TOP BEAM BARS BELOW DECK STEEL
2. USE 1 1/2" MINIMUM CLEARANCE FOR ALL #3 STIRRUPS
3. BEAM DEPTH INCLUDES SLAB
4. BEND ALL TOP SLAB BARS 1'-6" INTO WALLS OR BEAM.



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IF THE SCALE READS:
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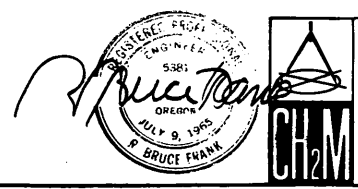
R. R. R. R.

THIS PRINT IS REDUCED TO ONE-HALF
OF THE ORIGINAL SCALE
IF THE SCALE READS:
1" = 1'-0" USE 1/2" = 1'-0" OR 1" = 10' USE 1" = 20'



NOTE:
EXCAVATE FOR NEW CONSTRUCTION AS REQUIRED.
ALL BACKFILL UNDER NEW CONSTRUCTION SHALL
BE COMPACTED GRAVEL PLACED & COMPACTED
TO DENSITY SPECIFIED. PROTECT EXISTING STRUC-
TURE AT ALL TIMES & REPAIR ANY DAMAGE TO EX-
ISTING STRUCTURES IF IT SHOULD OCCUR. REPAIR
WORK, IF REQUIRED, SHALL BE DONE TO THE ENGI-
NEER'S SATISFACTION & AT NO EXTRA COST TO
THE OWNER.

NOTE:
KEEP ALL VEHICULAR TRAFFIC
OFF AREA OVER CLEARWELL &
FUTURE FILTER.

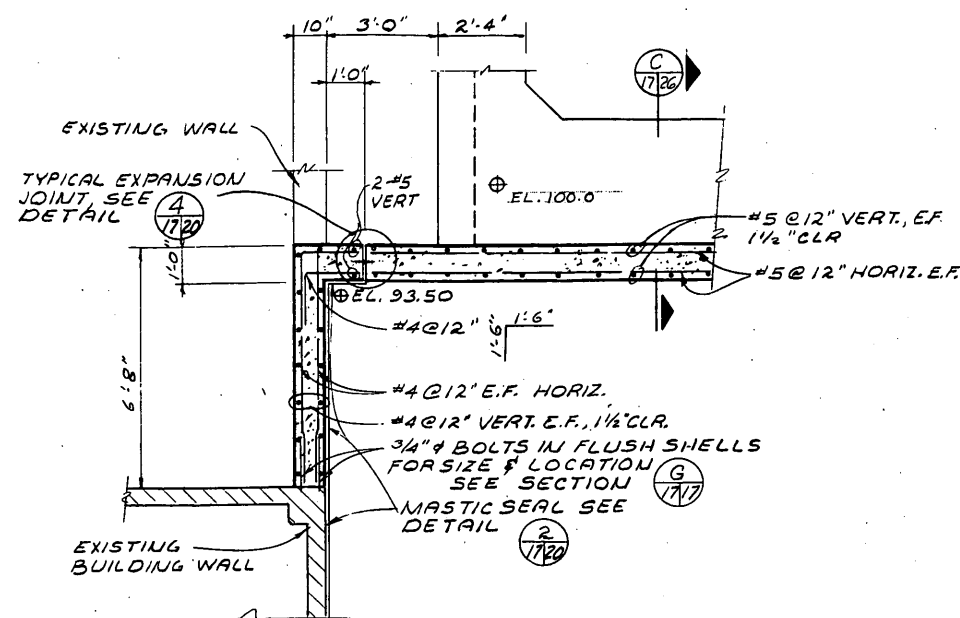


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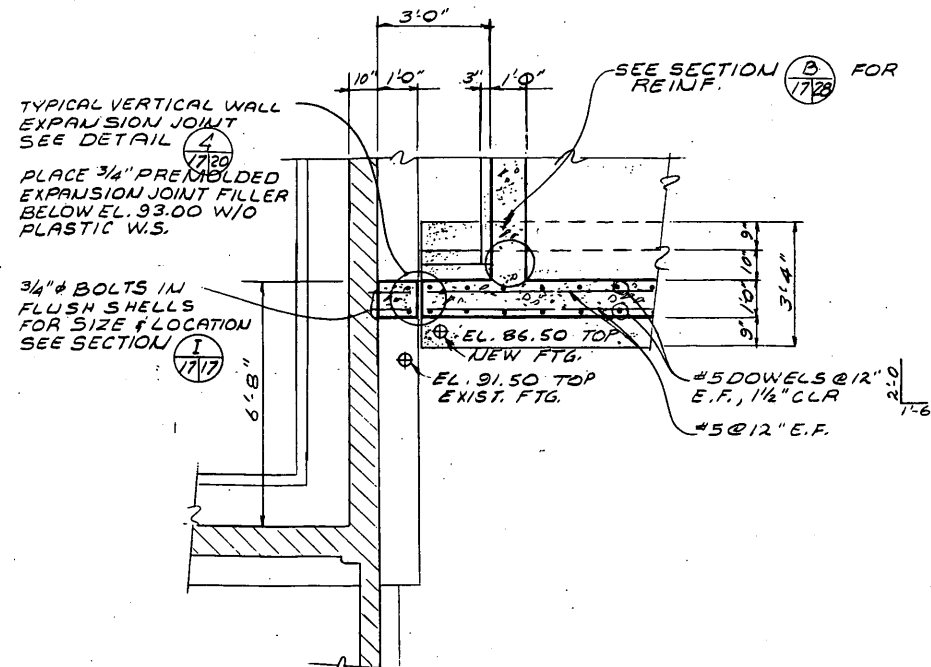
CITY OF NEWBERG, OREGON
WATER TREATMENT PLANT EXPANSION

FILTER BUILDING
STRUCTURAL SECTION AND DETAILS

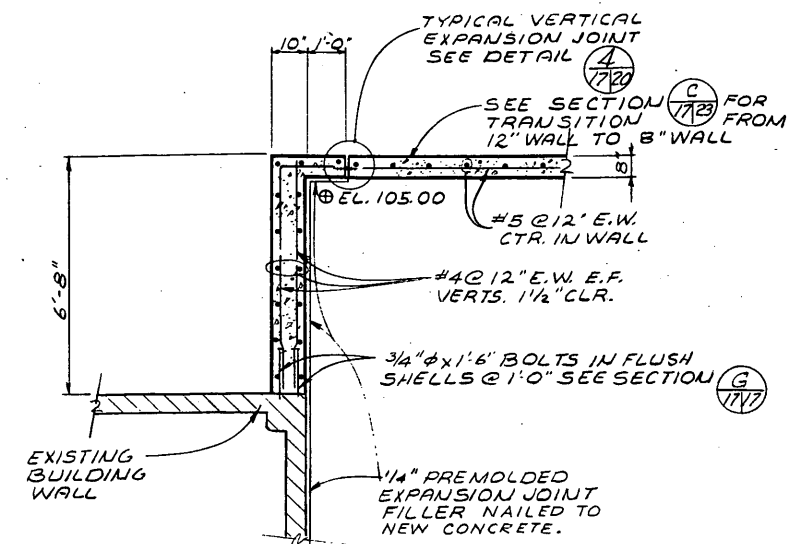
DESIGNED BY	16
CHECKED BY	OF 43
DATE	JULY 1970
SCALE	AS SHOWN
DWG NO.	C 5508-1



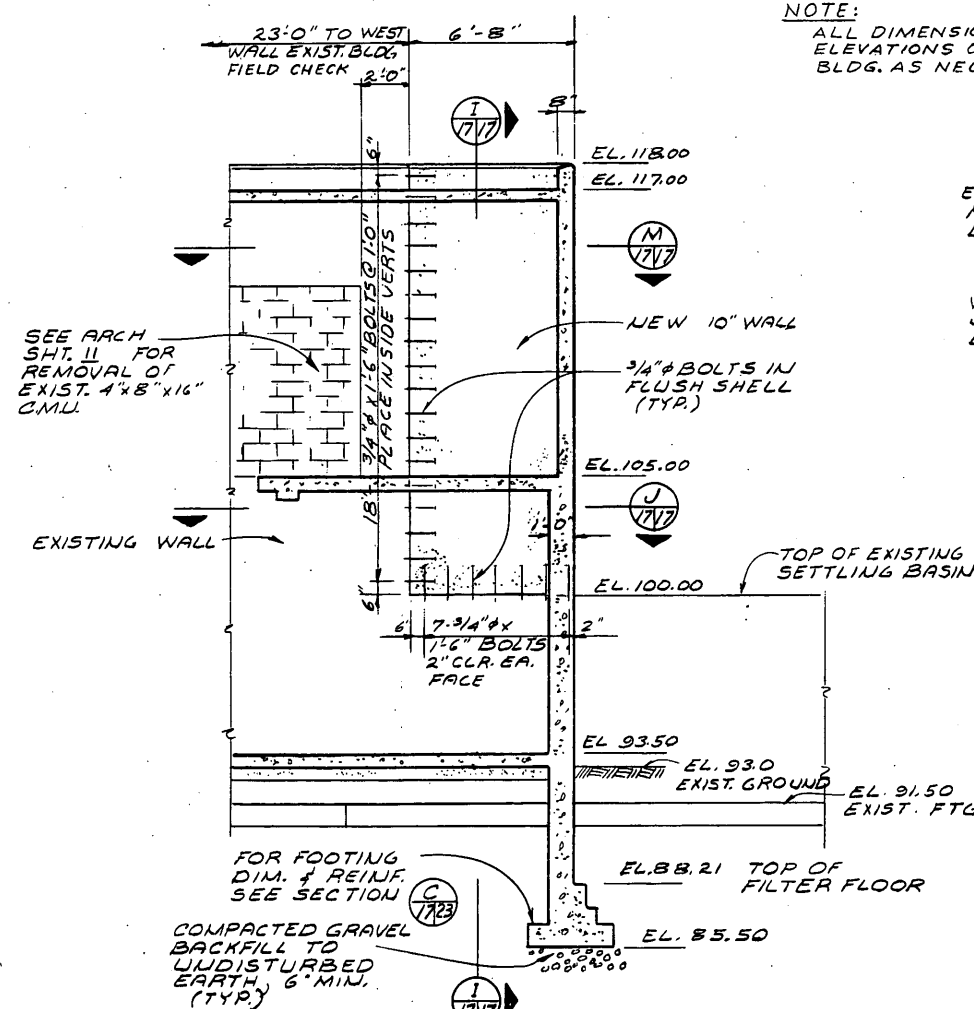
SECTION J
3/8" = 1'-0" (17/17)



SECTION K
3/8" = 1'-0" (17/17)

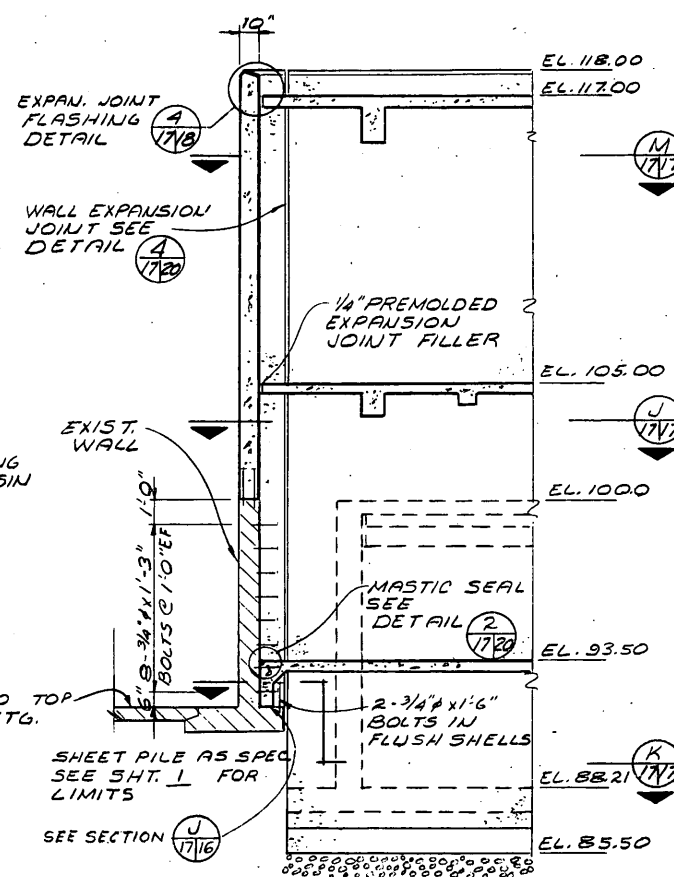


SECTION M
3/8" = 1'-0" (17/17)

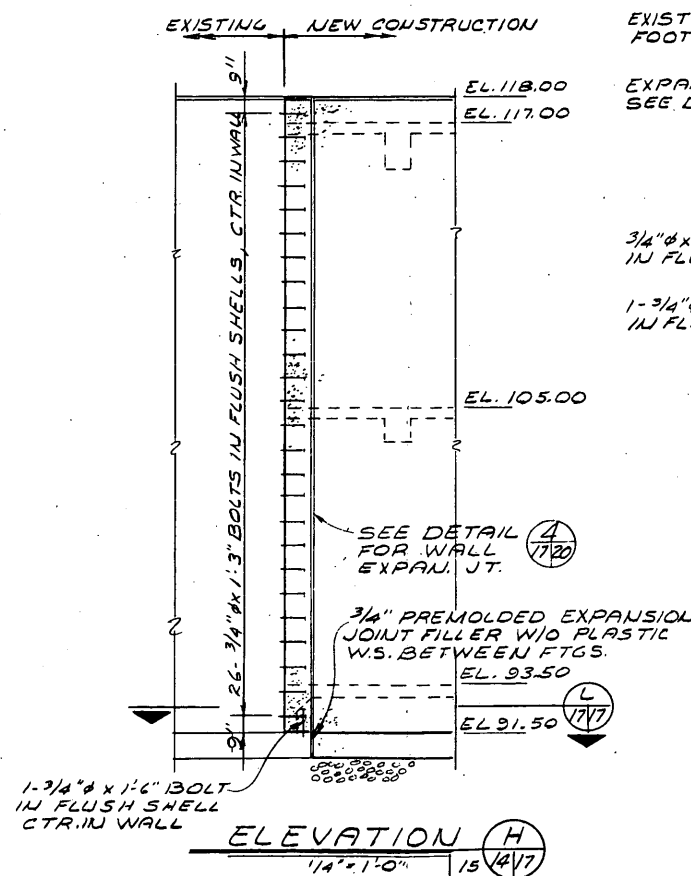


SECTION G
1/4" = 1'-0" (17/15)

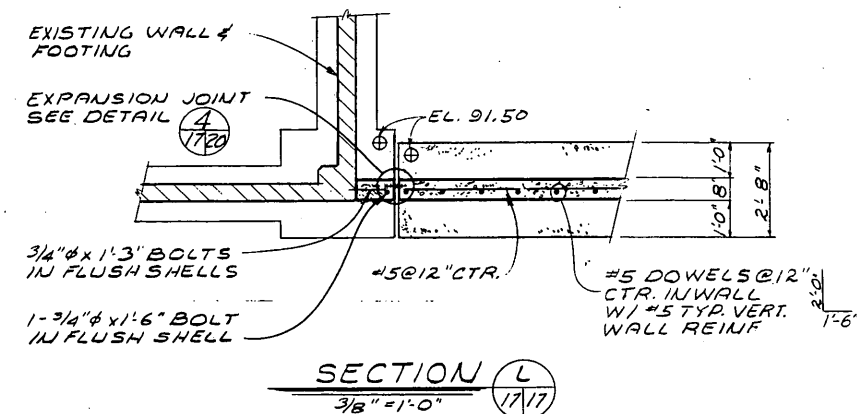
NOTE:
ALL DIMENSIONS &
ELEVATIONS OF EXISTING
BLDG. AS NECESSARY.



SECTION I
1/4" = 1'-0" (17/17)



ELEVATION H
1/4" = 1'-0" (15/17)



SECTION L
3/8" = 1'-0" (17/17)

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OF THE ORIGINAL SCALE
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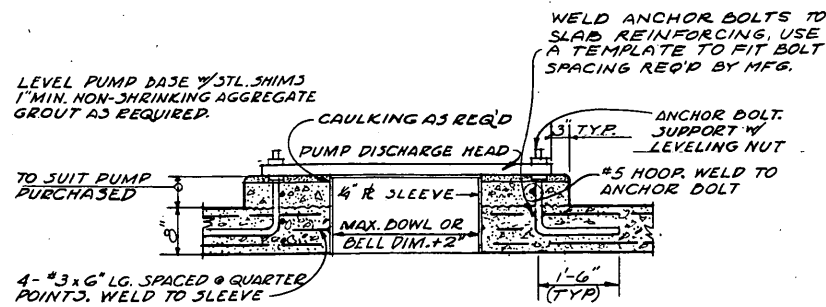


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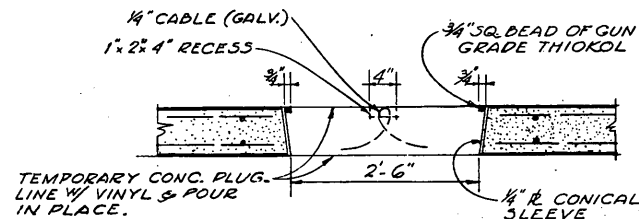
CITY OF NEWBERG, OREGON
WATER TREATMENT PLANT EXPANSION

FILTER BUILDING
STRUCTURAL SECTIONS AND DETAILS

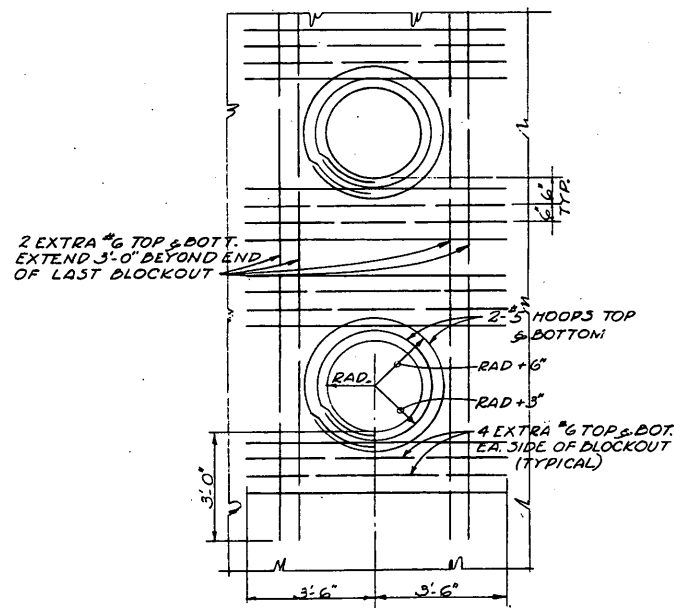
DESIGNED BY	RBF	SHEET	17
CHECKED BY	APW	OF	43
DATE	JULY 1970		
SCALE	AS SHOWN		
DWG NO.	C5508.1		
	C 5508-1		



TYPICAL PUMP BASE DETAIL 1
3/4" = 1'-0"

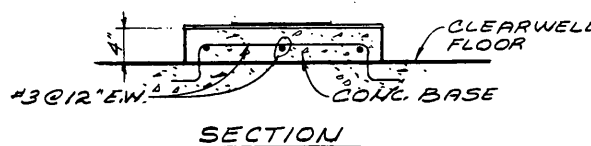
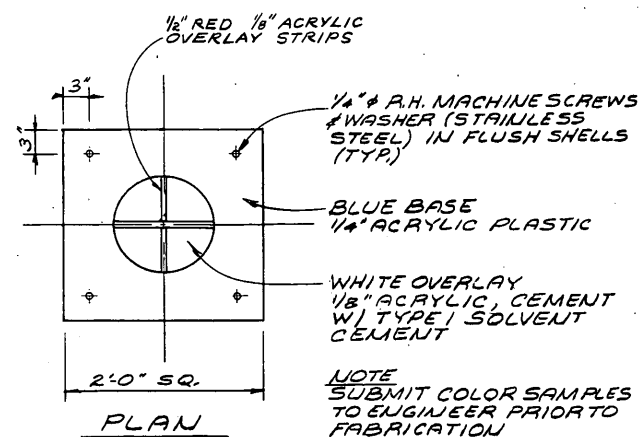
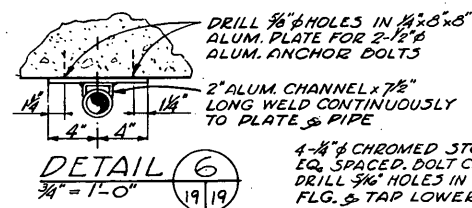
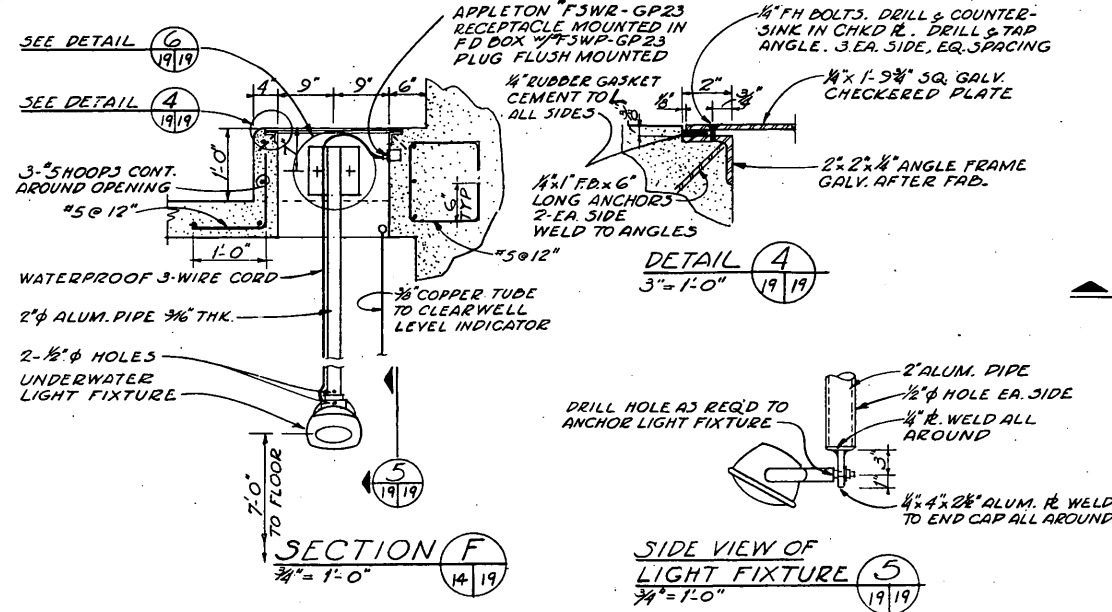


BLOCK-OUT FOR FUTURE PUMP TYPICAL DETAIL 2
3/4" = 1'-0"

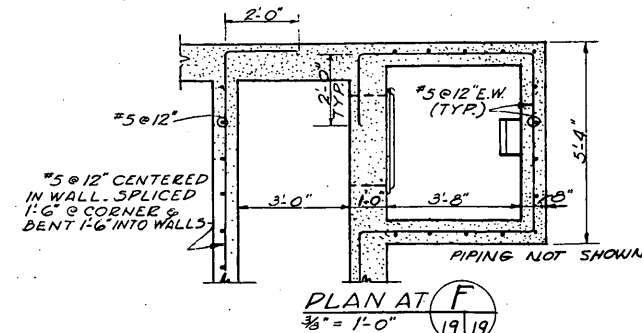
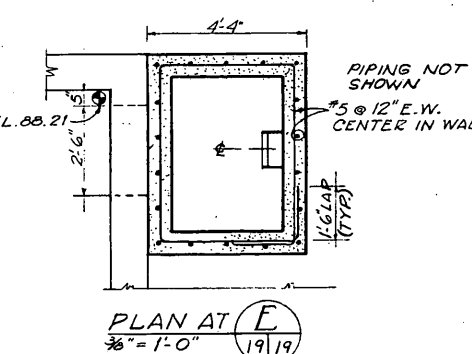
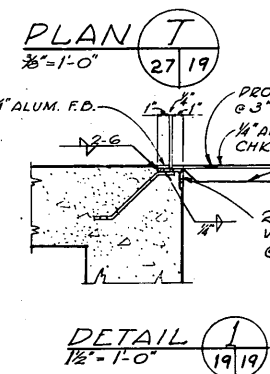
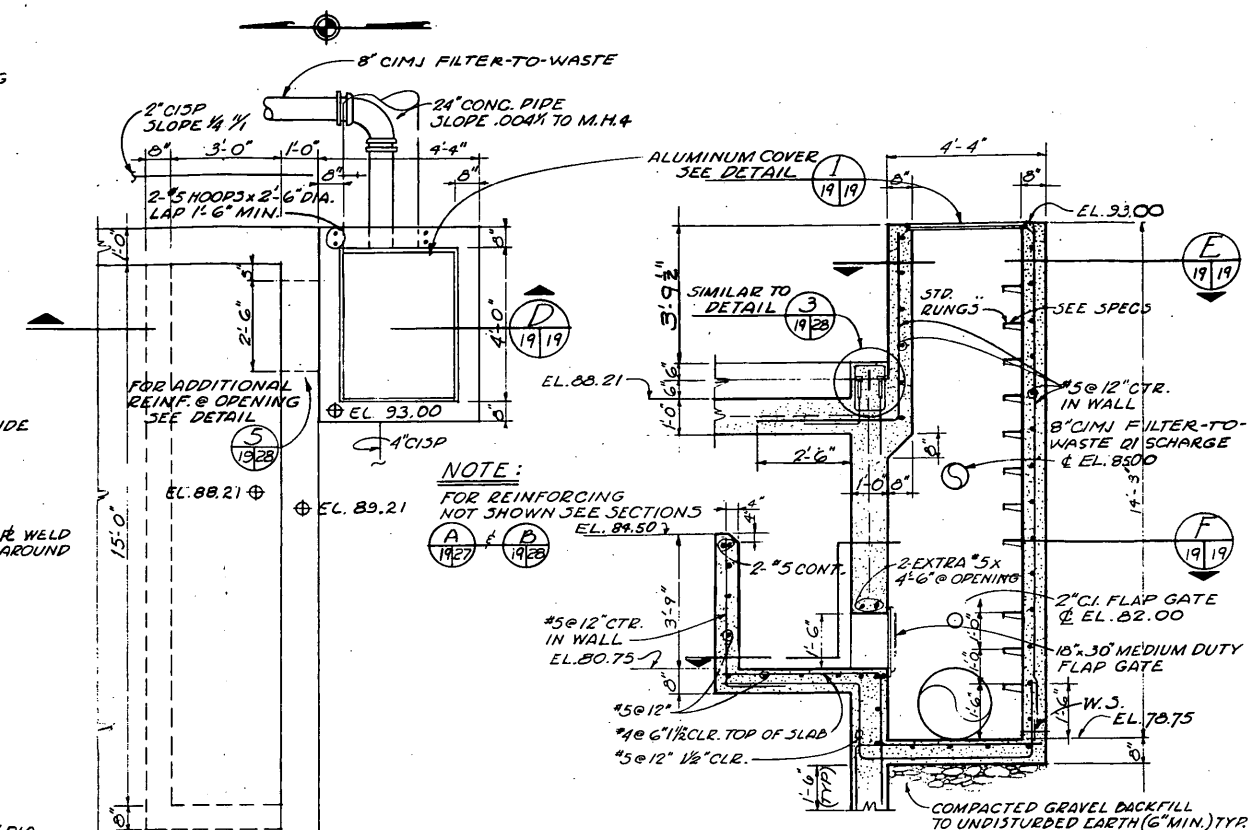
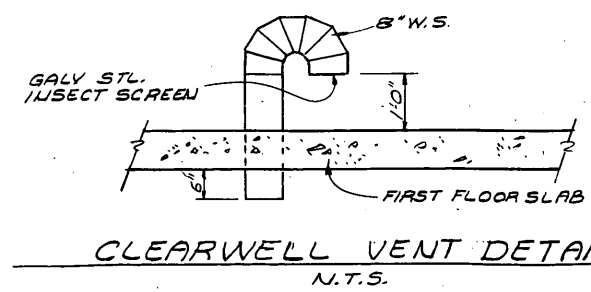


PUMP BLOCKOUT SLAB REINF. DETAIL 4
3/8" = 1'-0"

(TYP. @ NEW F FUTURE PUMPS)



CLEARWELL VIEWING PLATE DETAIL 11
1" = 1'-0"



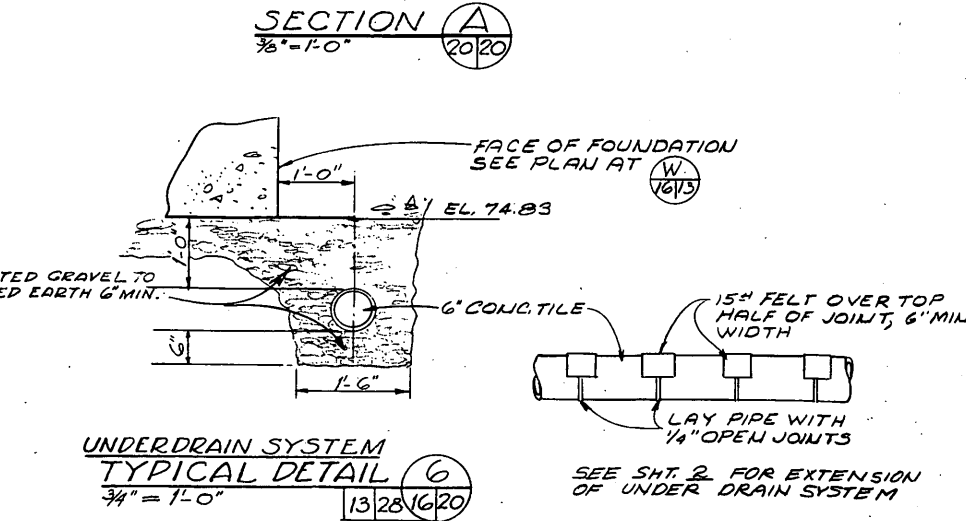
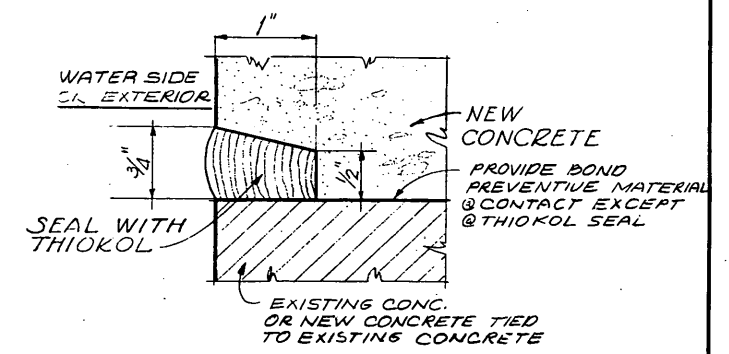
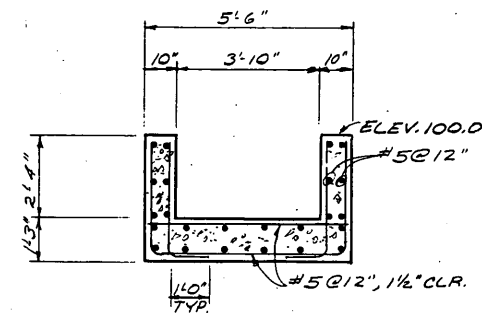
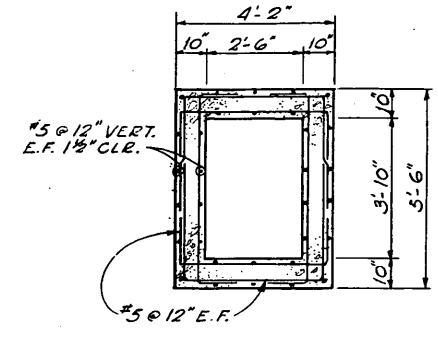
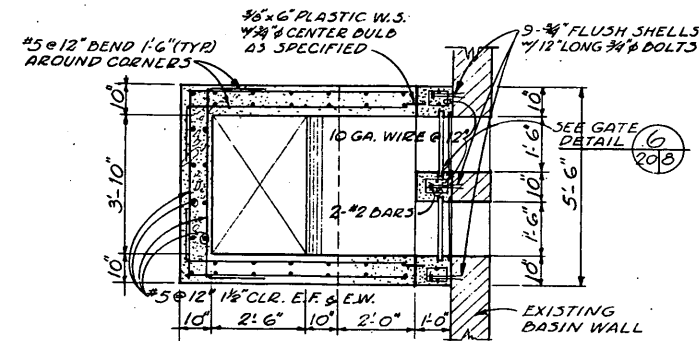
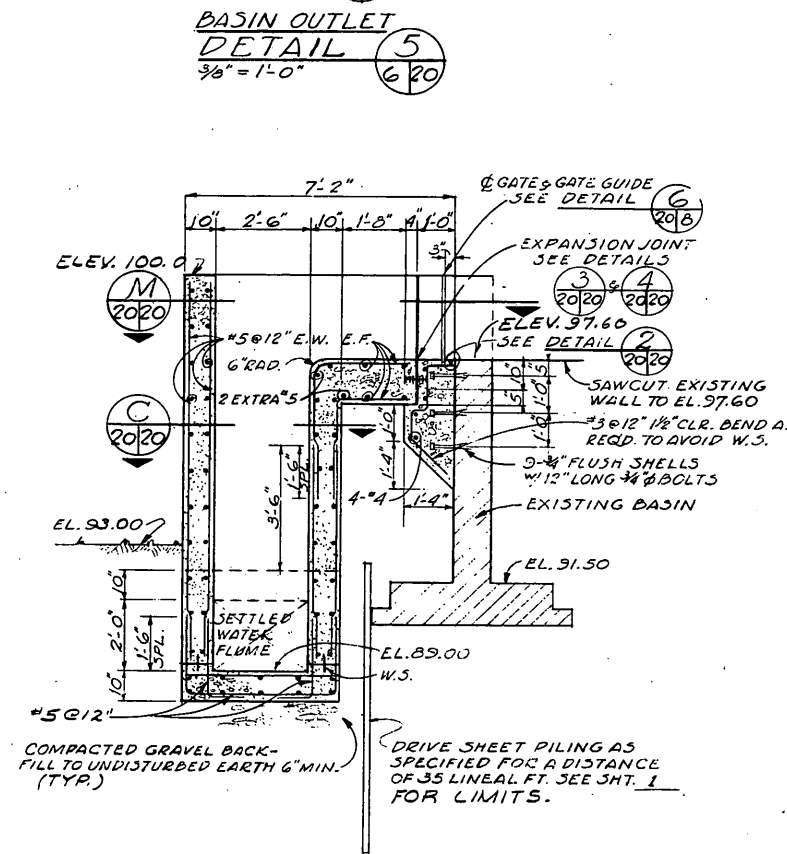
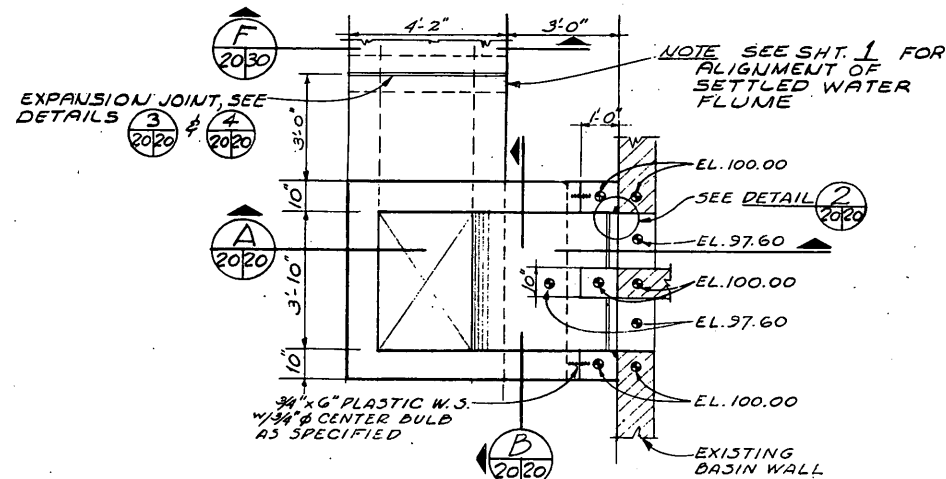
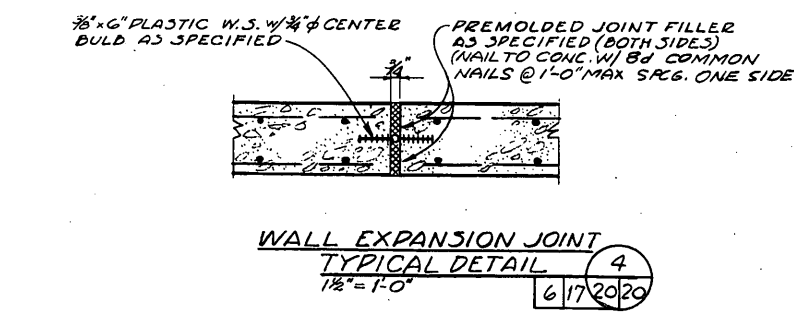
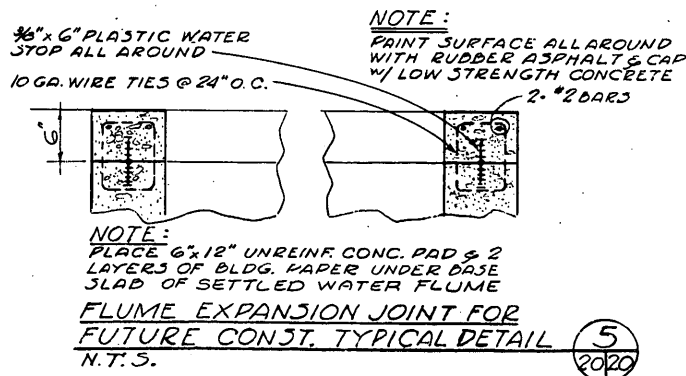
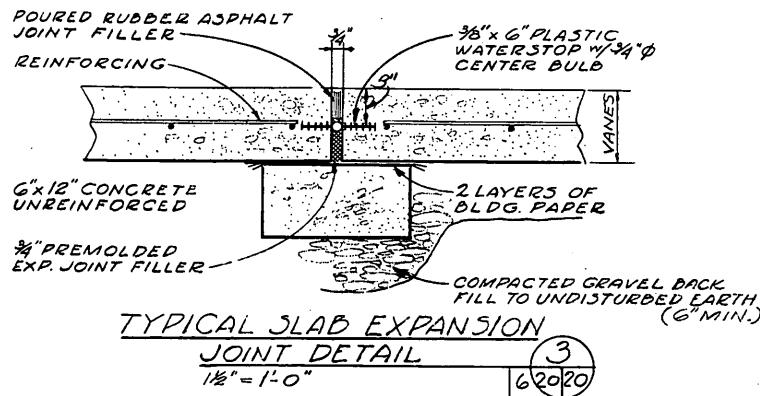
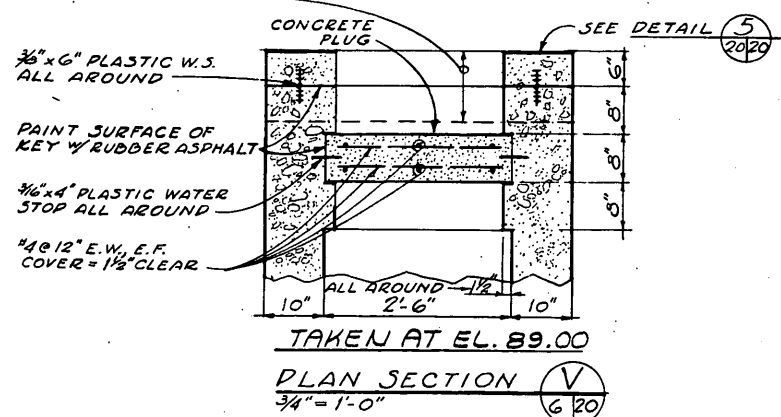
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CITY OF NEWBERG, OREGON
WATER TREATMENT PLANT EXPANSION
FILTER BUILDING
STRUCTURAL DETAILS
DES. SHEET 19
RBF
CCM
GFD
JULY 1970
C6508-1

12" WIDE x 6" HIGH UNREIN. CONCRETE PAD UNDER BASE SLAB WITH 2 LAYERS OF BUILDING PAPER



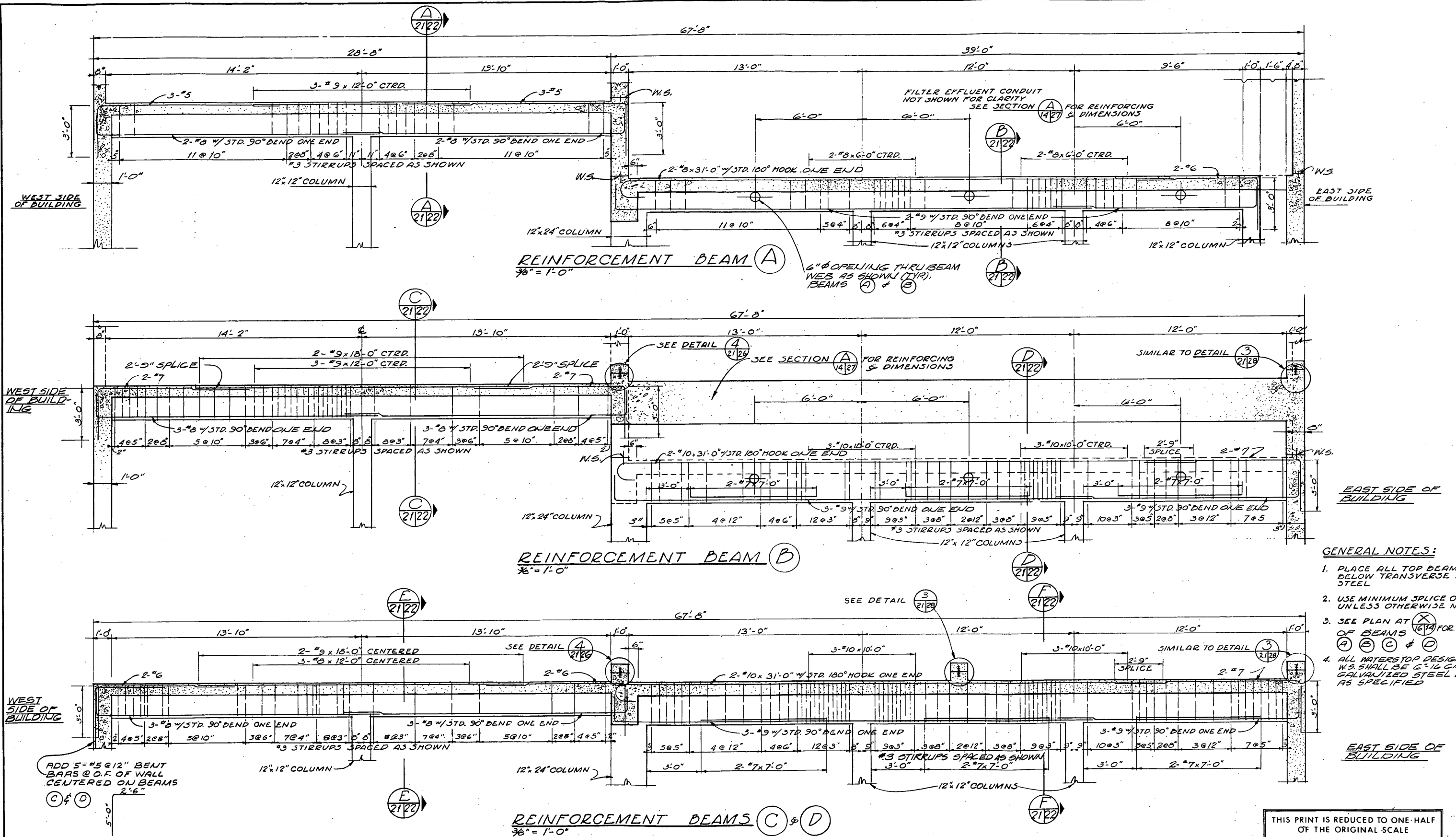
NOTE: NEW SLABS ADJACENT TO EXISTING CONCRETE OR ADJACENT TO NEW CONC. SHALL BE FASTENED TO EXISTING CONC. W/ FLUSH SHELLS & SHALL BE KEPT FREE BY APPLYING BOND PREVENTION MATERIAL AS REQ'D & AS DIRECTED.

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CITY OF NEWBERG, OREGON
WATER TREATMENT PLANT EXPANSION
FILTER BUILDING
STRUCTURAL DETAILS
SHEET 20
OF 43
JULY 1970
SCALE AS SHOWN
C 5508-1



Bruce Frank
 REGISTERED PROFESSIONAL ENGINEER
 OREGON
 JULY 9, 1965
 B. BRUCE FRANK

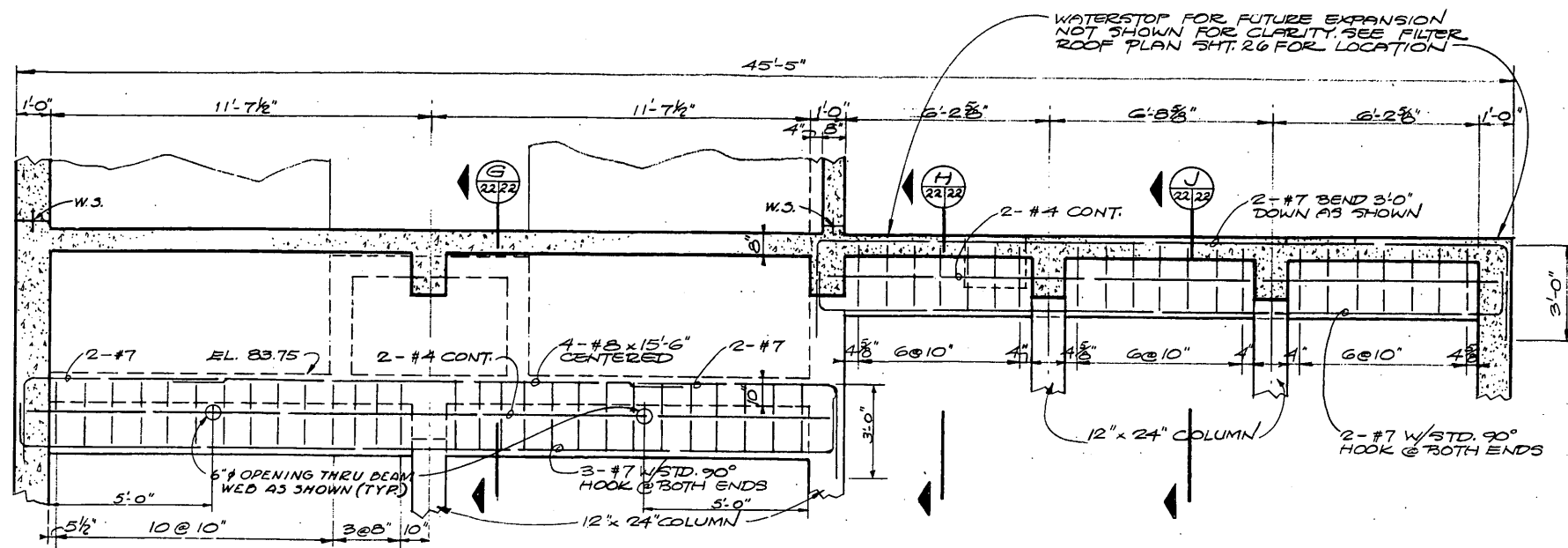


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 HOWLAND,
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CITY OF NEWBERG, OREGON
 WATER TREATMENT PLANT EXPANSION

FILTER BUILDING
 STRUCTURAL BEAM DETAILS

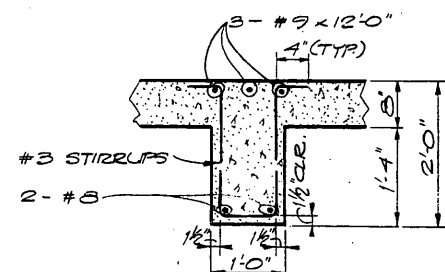
DES	21
REV	OF 43
DATE	JULY 1970
SCALE	AS SHOWN
DWG	C 5508-1



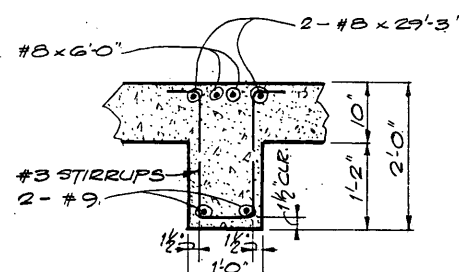
REINFORCEMENT BEAM E
 $\frac{3}{8}" = 1'-0"$

GENERAL NOTES

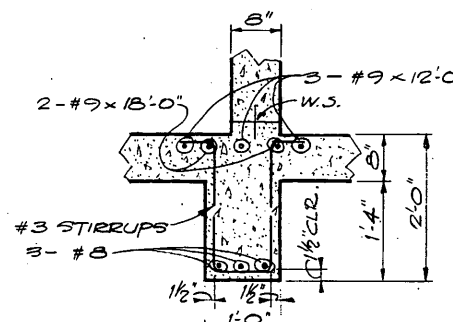
1. PLACE ALL TOP BEAM BARS BELOW DECK STEEL.
2. ALL WATER STOPS DESIGNATED "W.S." TO BE 6" W.G. GALV. STEEL AS SPECIFIED.
3. SEE PLAN $\frac{X}{16/14}$ FOR LOCATION OF BEAM $\frac{E}{21/22}$.
4. ALL REINFORCING SHALL BE CONTINUOUS FLAPPED 1'-6" UNLESS OTHERWISE SHOWN.
5. ALL REINFORCING SHALL BE CONTINUOUS AROUND CORNERS FLAPPED 1'-6" UNLESS OTHERWISE SHOWN.
6. BEND ALL TOP SLAB BARS 1'-6" INTO WALLS OR BEAMS UNLESS OTHERWISE SHOWN.
7. USE $\frac{1}{2}"$ MIN CLEARANCE FOR ALL #3 STIRRUPS.



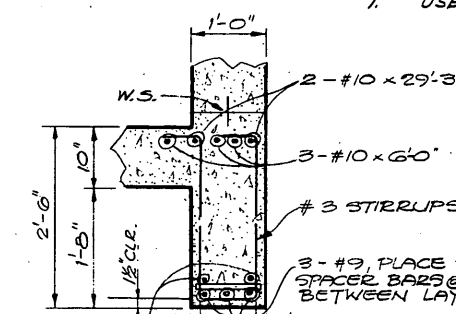
SECTION A
 $\frac{3}{4}" = 1'-0"$



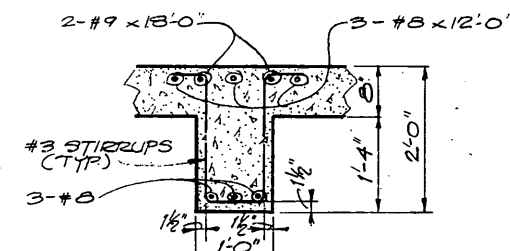
SECTION B
 $\frac{3}{4}" = 1'-0"$



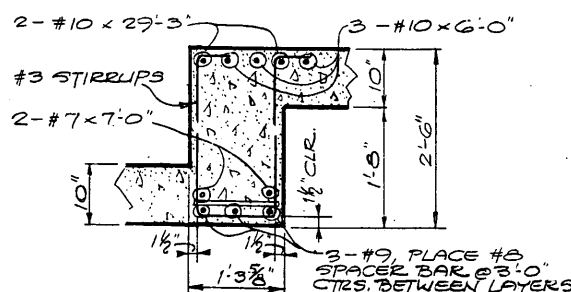
SECTION C
 $\frac{3}{4}" = 1'-0"$



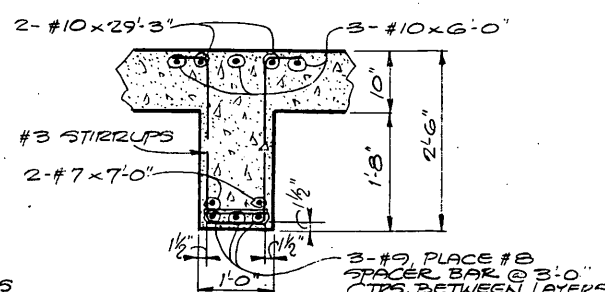
SECTION D
 $\frac{3}{4}" = 1'-0"$



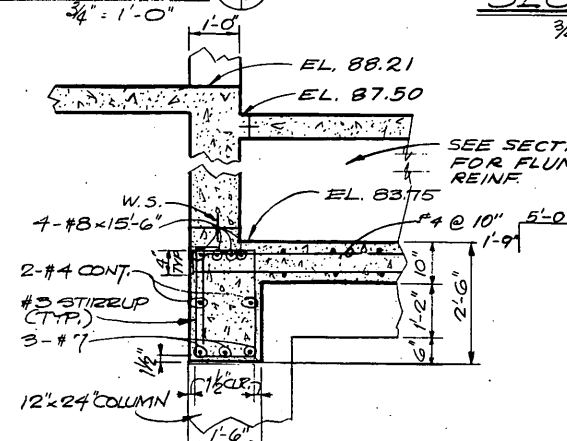
SECTION E BEAMS C & D
 $\frac{3}{4}" = 1'-0"$



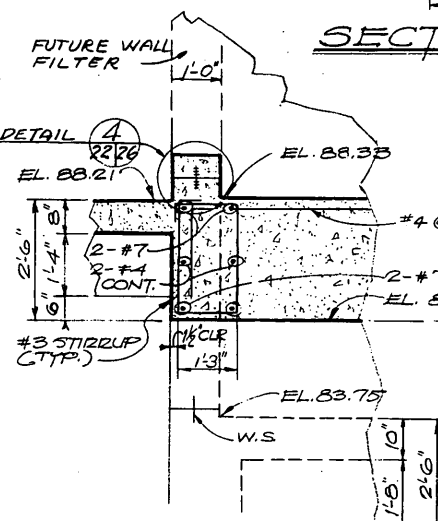
SECTION F BEAM C
 $\frac{3}{4}" = 1'-0"$



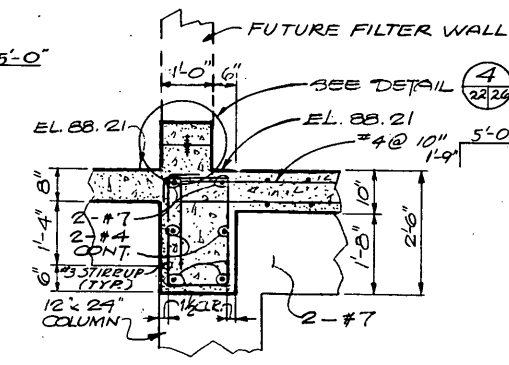
SECTION G BEAM D
 $\frac{3}{4}" = 1'-0"$



SECTION H
 $\frac{1}{2}" = 1'-0"$

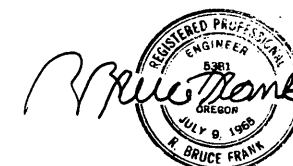


SECTION I
 $\frac{1}{2}" = 1'-0"$



SECTION J
 $\frac{1}{2}" = 1'-0"$

THIS PRINT IS REDUCED TO ONE-HALF OF THE ORIGINAL SCALE
 IF THE SCALE READS:
 $1" = 1'-0"$ USE $\frac{1}{2}" = 1'-0"$ OR $1" = 10'$ USE $1" = 20'$



CORNELL, HOWLAND, HAYES & MERRYFIELD
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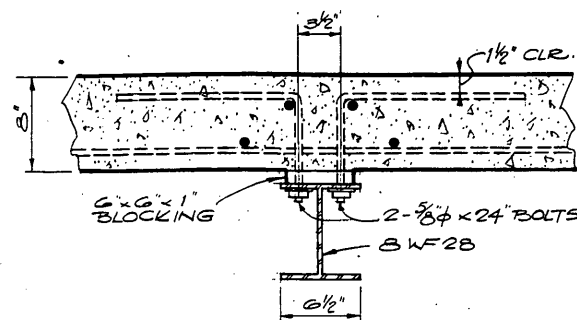
CITY OF NEWBERG, OREGON
 WATER TREATMENT PLANT EXPANSION

FILTER BUILDING
 STRUCTURAL BEAM DETAILS

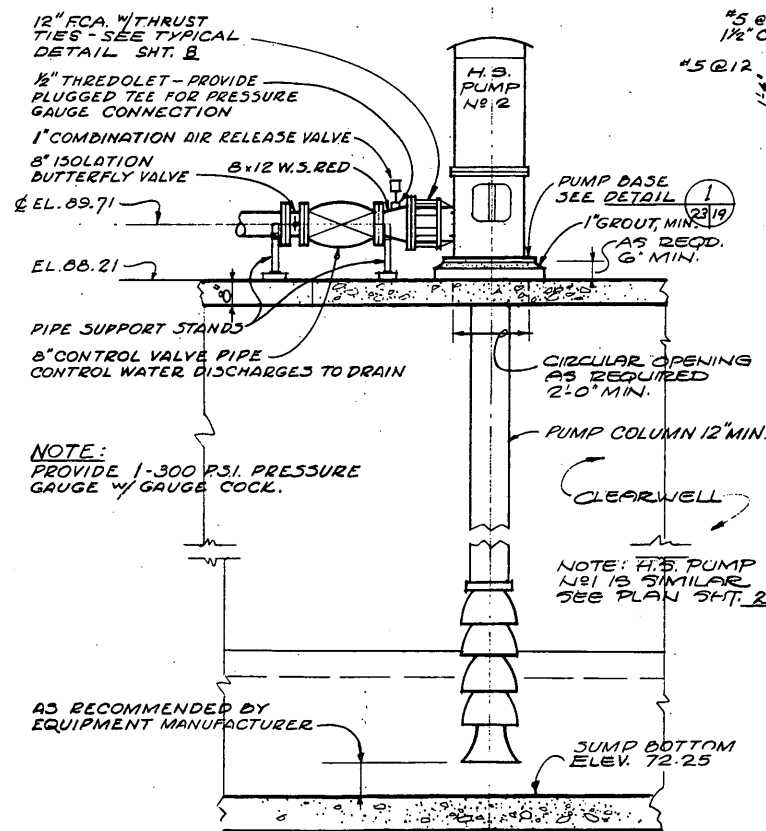
DATE	22
OF	43
DATE	JULY 1970
SCALE	AS SHOWN
PROJECT	C 5508-1

GENERAL NOTES

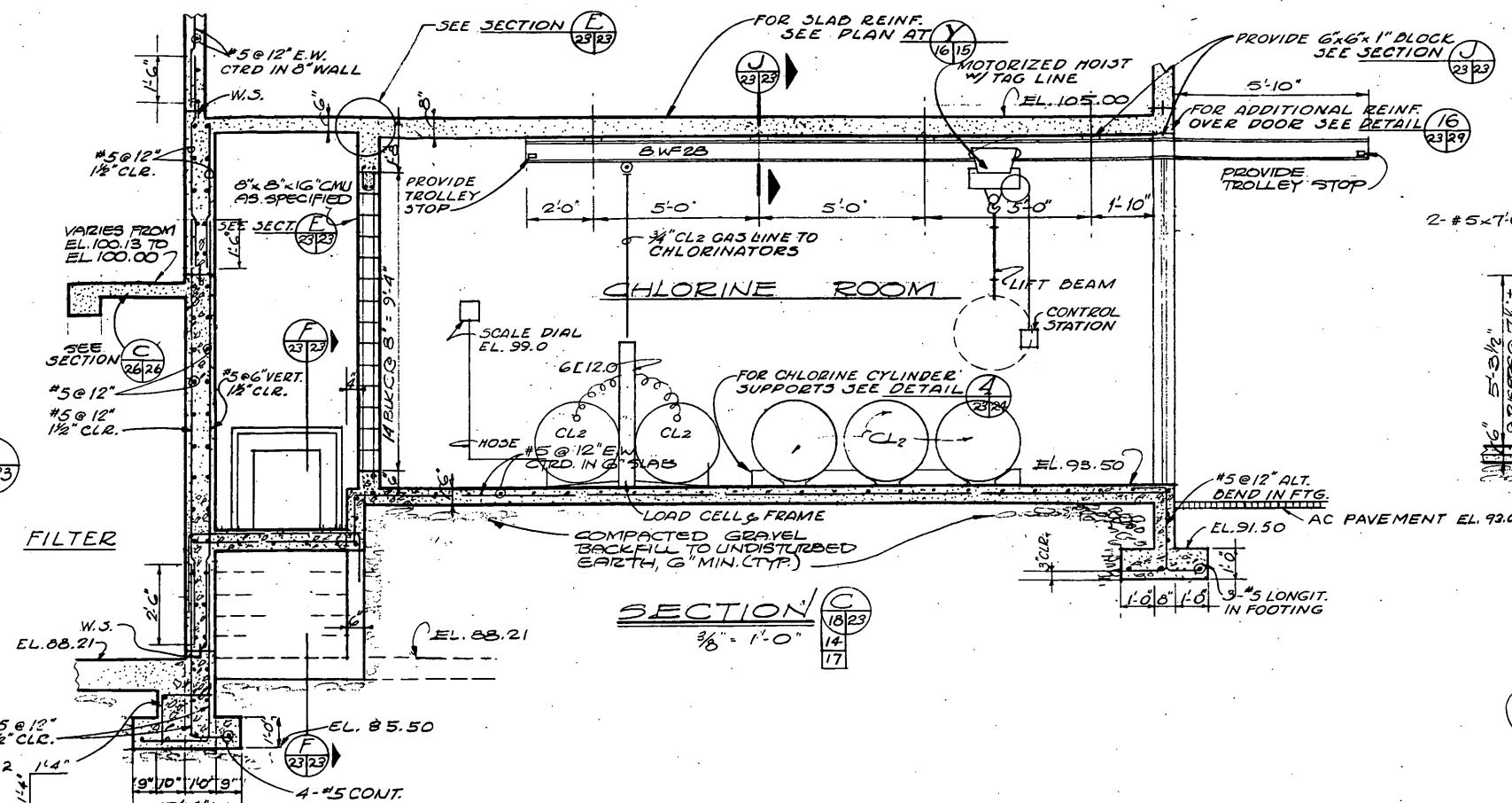
1. ALL REINFORCING SHALL BE CONTINUOUS & LAPPED 1'-6" UNLESS OTHERWISE SHOWN.
2. ALL REINFORCING SHALL BE CONTINUOUS AROUND CORNERS & LAPPED 1'-6" UNLESS OTHERWISE SHOWN.
3. BEND ALL TOP SLAB BARS 1'-6" INTO WALLS OR BEAMS UNLESS OTHERWISE SHOWN.



MONORAIL SECTION J
1 1/2' - 1'-0"



SECTION A
3/8' - 1'-0"



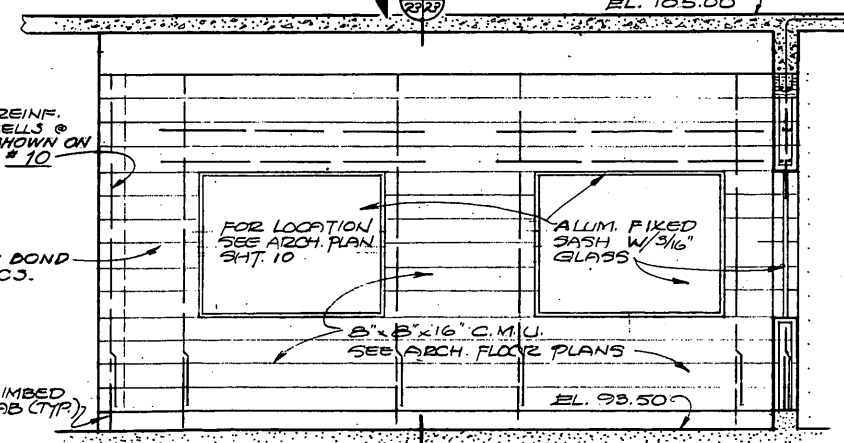
SECTION C
3/8' - 1'-0"

- GENERAL NOTES
1. INTERIOR WALLS SHALL BE LAID BEFORE SLABS & BEAMS ARE CONSTRUCTED
 2. PLACE HORIZONTAL WEB REINFORCING EVERY 3RD COURSE
 3. CONSTRUCT 16\"
 4. PLACE #4 REINF. & GROUT CELL EACH SIDE OF ALL WINDOWS

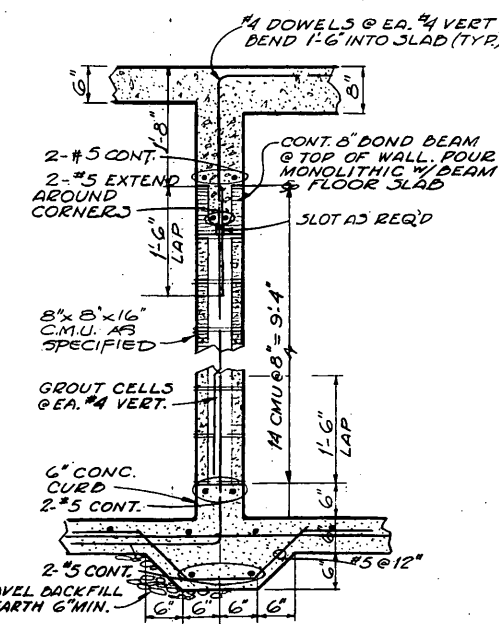
PLACE #4 REINF. & GROUT CELLS @ LOCATIONS SHOWN ON PLAN ON SHT. # 10

LAY BLOCK IN COMMON BOND SEE SPECS.

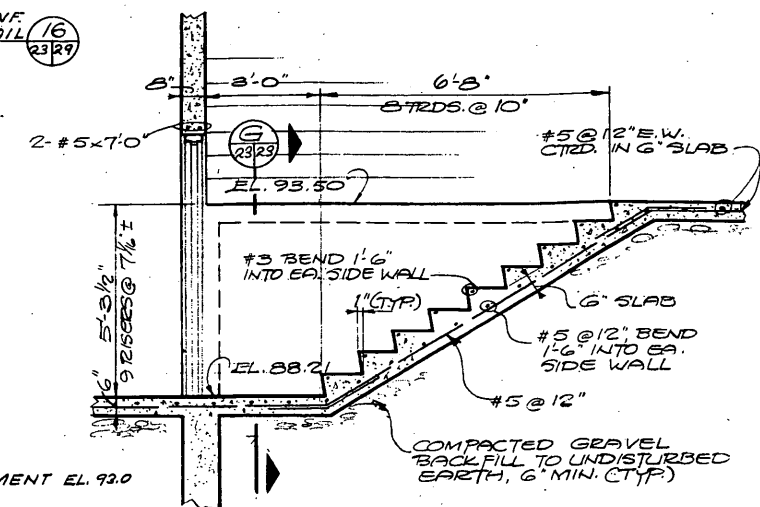
#4 DOWEL IMBED 1'-6\"



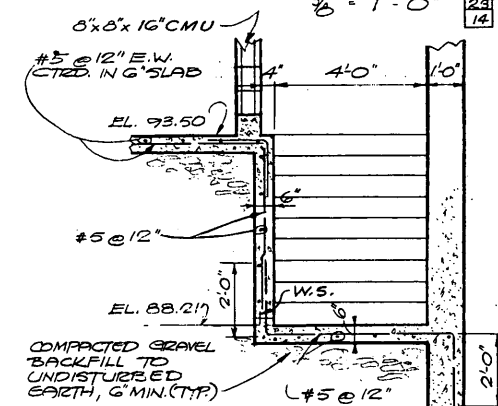
SECTION D
3/8' - 1'-0"



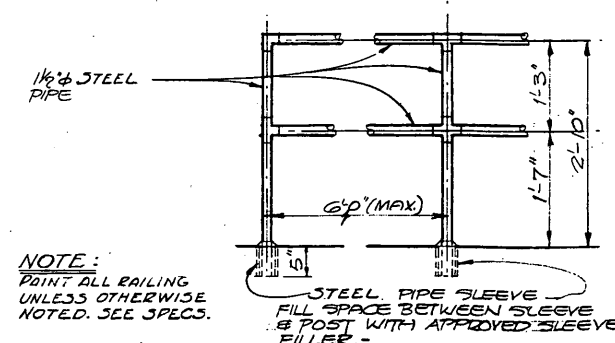
SECTION E
3/4' - 1'-0"



SECTION F
3/8' - 1'-0"

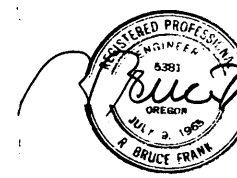


SECTION G
3/8' - 1'-0"



TYPICAL STEEL HANDRAIL AND POST DETAIL
3/4' - 1'-0"

THIS PRINT IS REDUCED TO ONE-HALF OF THE ORIGINAL SCALE
IF THE SCALE READS:
1\"/>

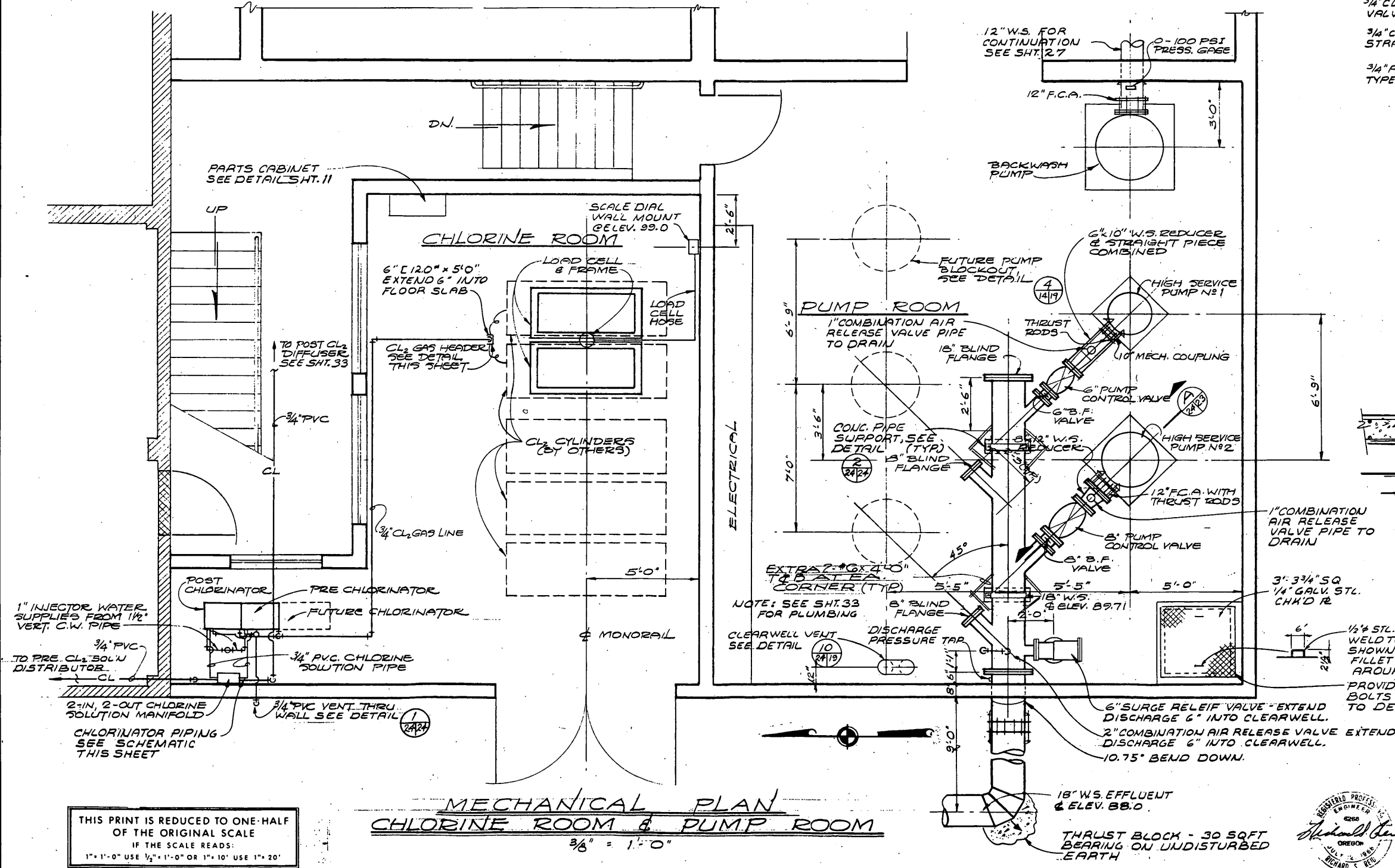
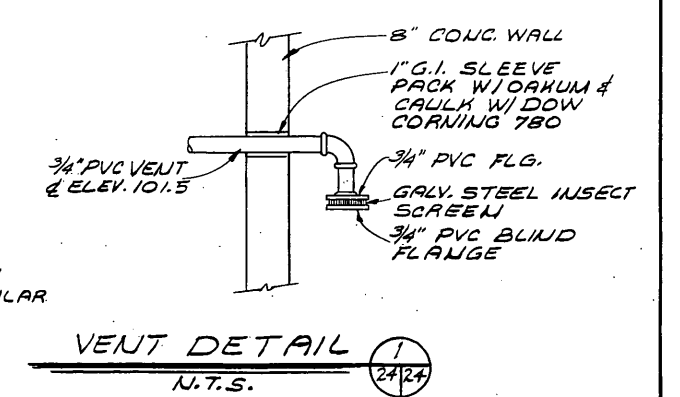
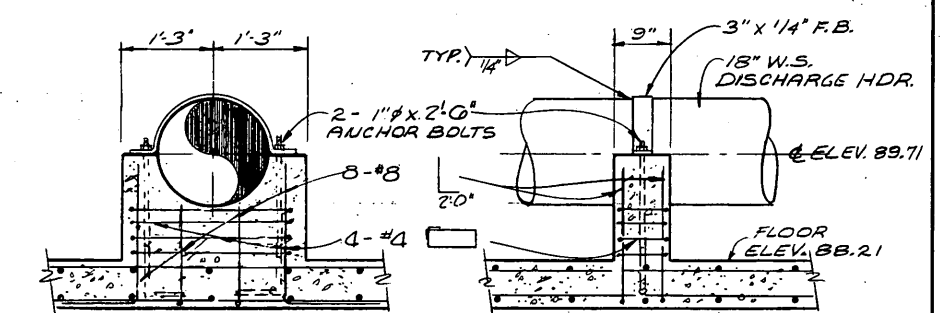
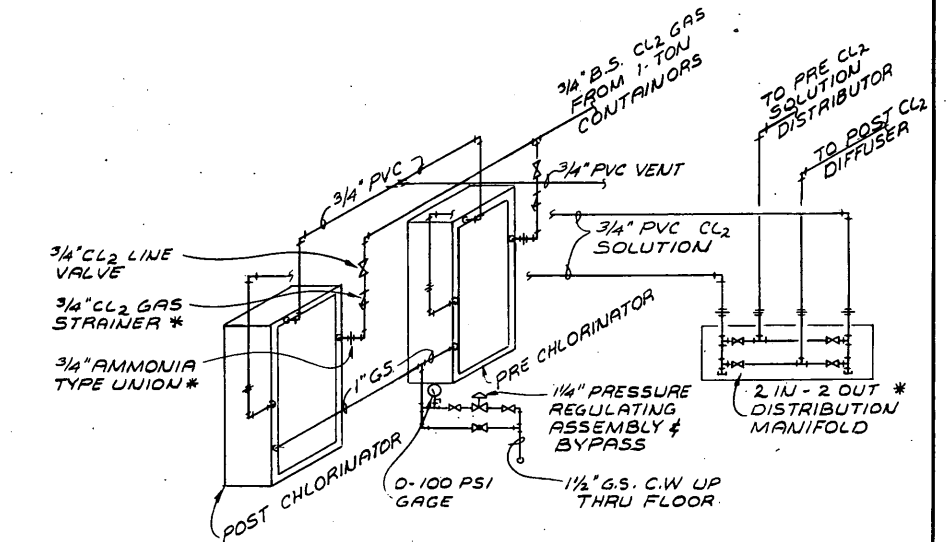
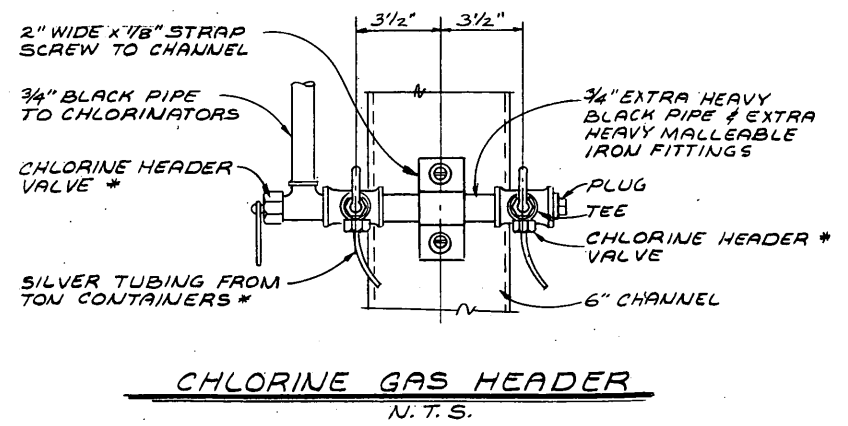
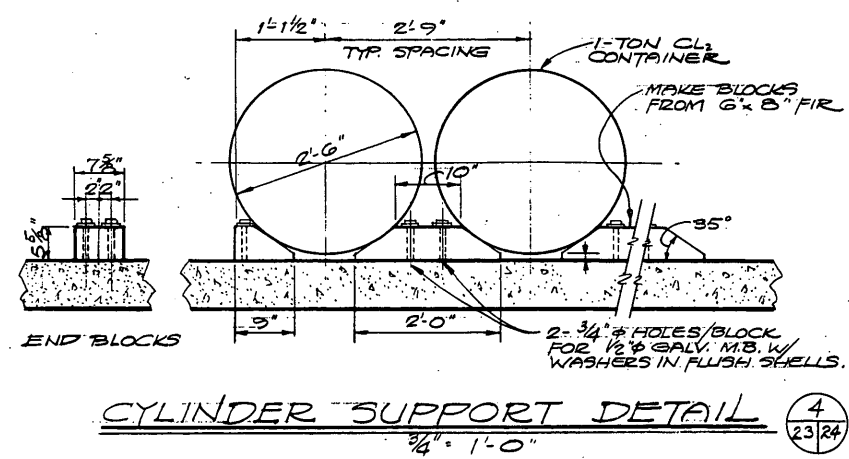


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CITY OF NEWBERG, OREGON
WATER TREATMENT PLANT EXPANSION

FILTER BUILDING
STRUCTURAL SECTIONS AND DETAILS

DES. R.D.F.
OR E.K.W.
DATE JULY 1970
BY GFD
SCALE AS SHOWN
DWG. C 5508-1

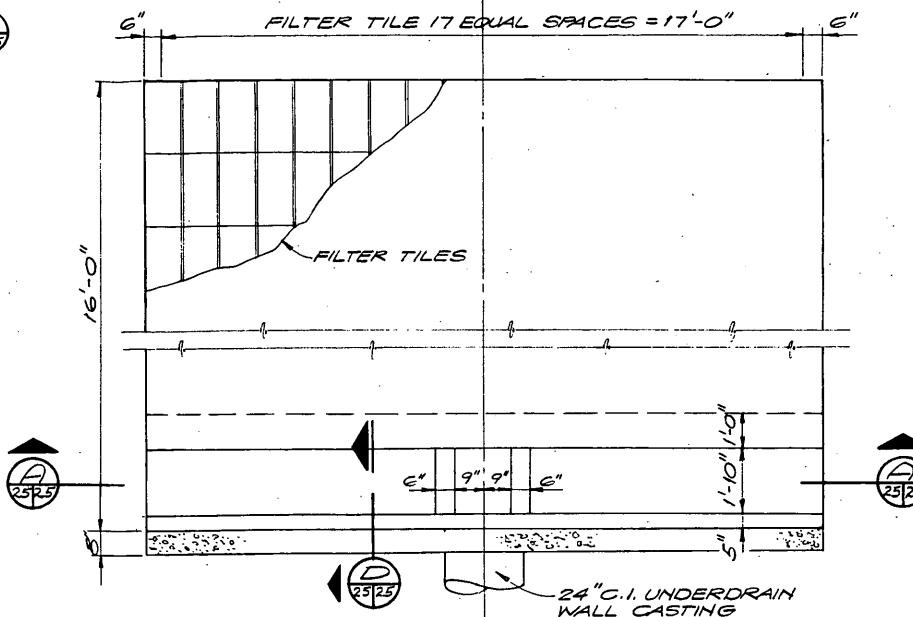


THIS PRINT IS REDUCED TO ONE-HALF OF THE ORIGINAL SCALE IF THE SCALE READS:
 1" = 1'-0" USE 1/2" = 1'-0" OR 1" = 10' USE 1" = 20'

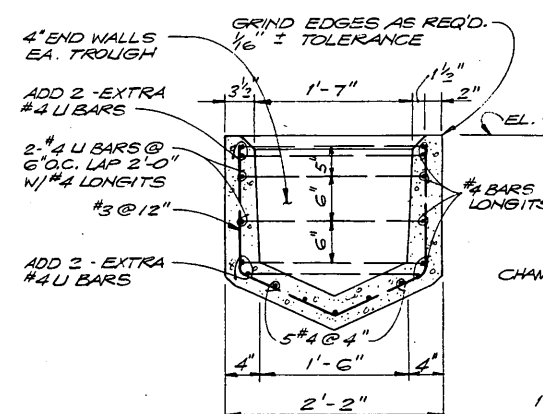
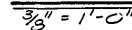
REGISTERED PROFESSIONAL ENGINEER
 CORNELL, HOWLAND, HAYES & MERRYFIELD
 ENGINEERS PLANNERS ECONOMISTS

CITY OF NEWBERG, OREGON
 WATER TREATMENT PLANT EXPANSION
 FILTER BUILDING
 MECHANICAL PLAN

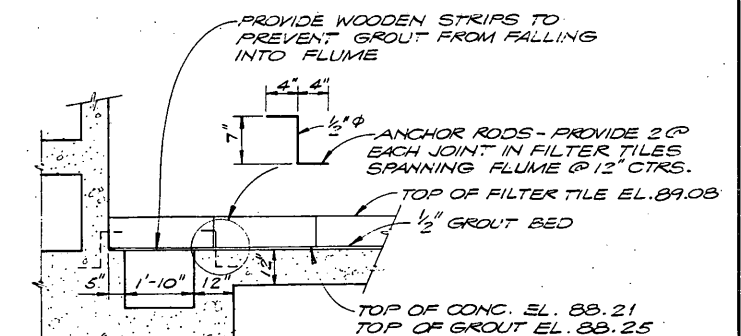
DESIGNED BY RSR	SHEET 24
ENGINEERED BY ERW	OF 43
CHECKED BY GFO	DATE JULY 1970
DATE OCTOBER 1969	SCALE AS SHOWN
DRAWN BY C 6508-1	


$$\underline{3/8'' = 1'-0''}$$

1. SET FILTER TILES ON $\frac{1}{2}$ " BED OF GROUT.
2. 18 ROWS OF FILTER TILE REQ'D. PER FILTER W/1" GROUT BETWEEN ROWS.
3. PROVIDE ANCHOR RODS FOR FILTER TILES SPANNING FLUME AREA. SEE SECTION (C)

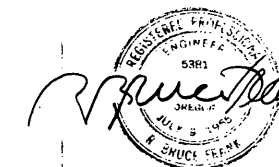


SECTION

$$\frac{3}{8}'' = 1'-0''$$

$$\frac{3}{8}'' = 1' - 0''$$

DES R.D.F.	SHEET 25
DR A.R.B.	OF 43
CK G.F.D.	DATE JULY 1970
EN C5508.1	SCALE AS SHOWN

DWG
C 5508-1



**CORNELL,
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HAYES &
MERRYFIELD**

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& PLANNERS

SEATTLE
PORTLAND

CITY OF NEWBERG, OREGON
WATER TREATMENT PLANT EXPANSION

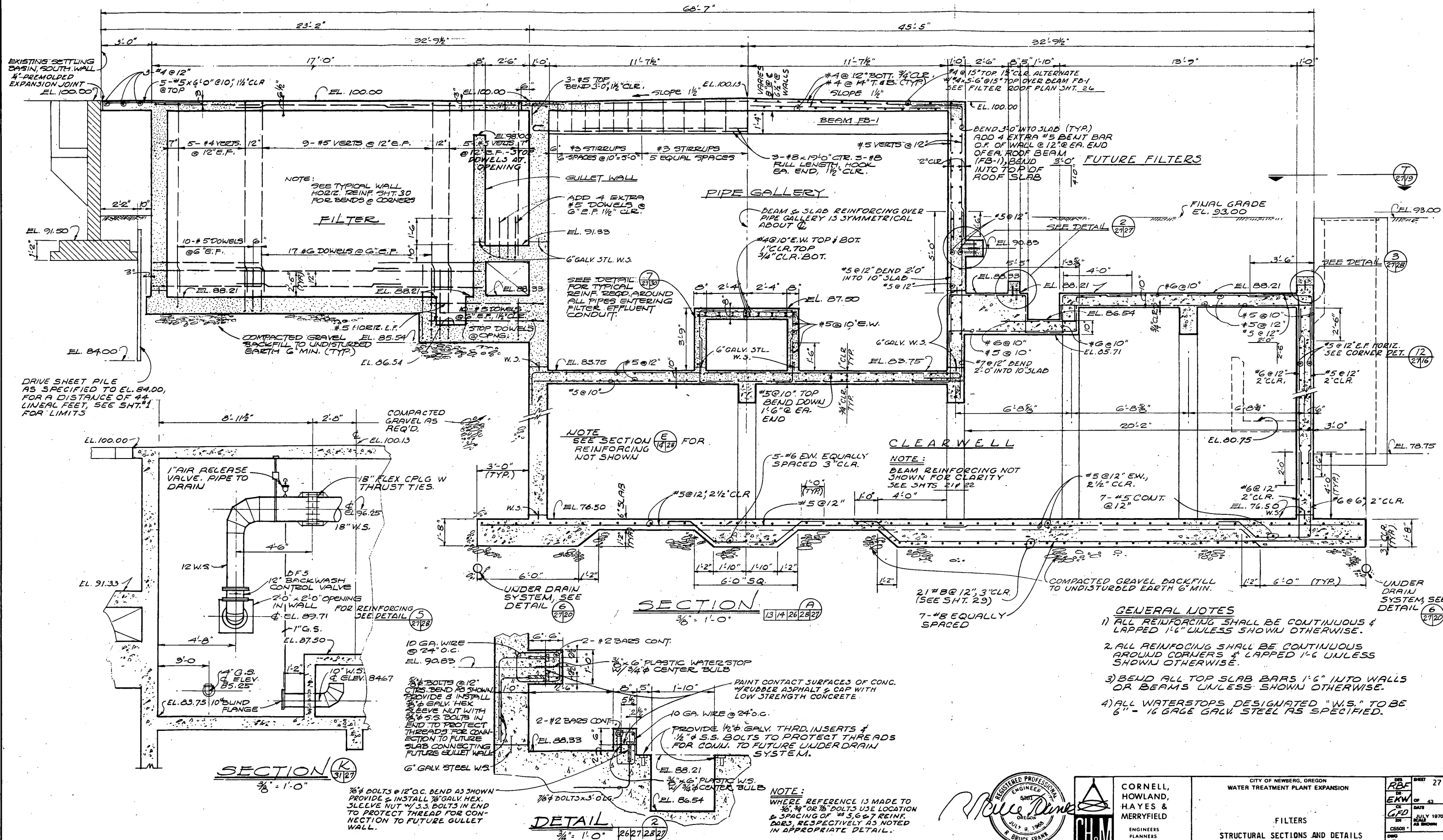
- FILTERS

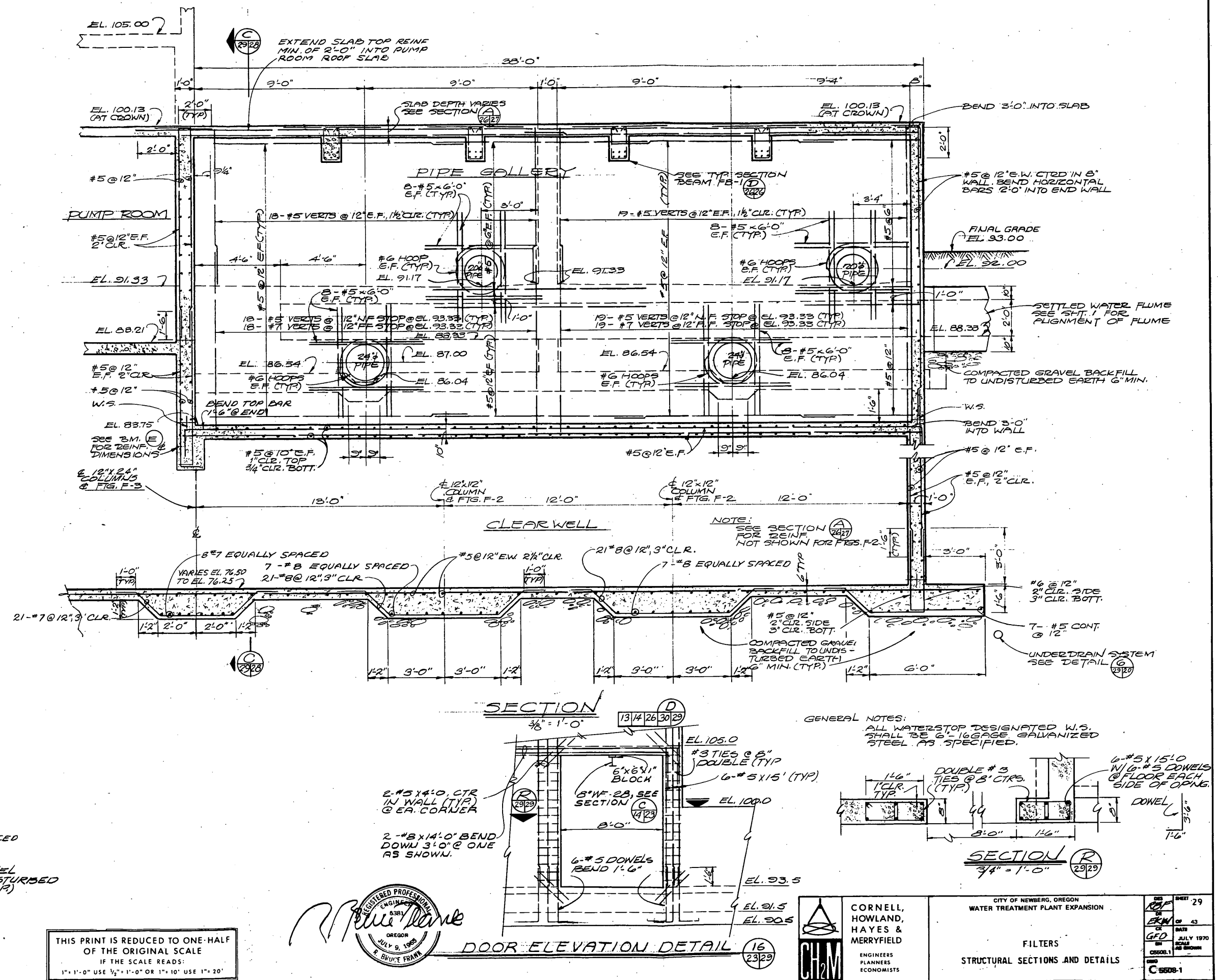
GENERAL ARRANGEMENT

DWG R.D.F.	SHEET 26
BY C.C.M.	OF 43
CHK G.F.D.	DATE JULY 19
EN C5508.1	SCALE AS SHOWN
DWG C5508-1	

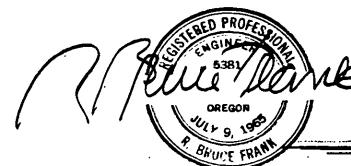
NOTE:
HANDRAIL NOT SHOWN FOR CLARITY
SEE FILTER ROOF PLAN - SHT. 26

THIS PRINT IS REDUCED TO ONE-HALF
OF THE ORIGINAL SCALE
IF THE SCALE READS:
1"=1'-0" USE 1/2"=1'-0" OR 1"=10' USE 1"=20'





THIS PRINT IS REDUCED TO ONE-HALF
OF THE ORIGINAL SCALE
IF THE SCALE READS:
1" = 1'-0" USE $\frac{1}{2}$ " = 1'-0" OR 1" = 10' USE 1" = 20'



DOOR ELEVATION DETAIL



**CORNELL,
HOWLAND,
HAYES &
MERRYFIELD**

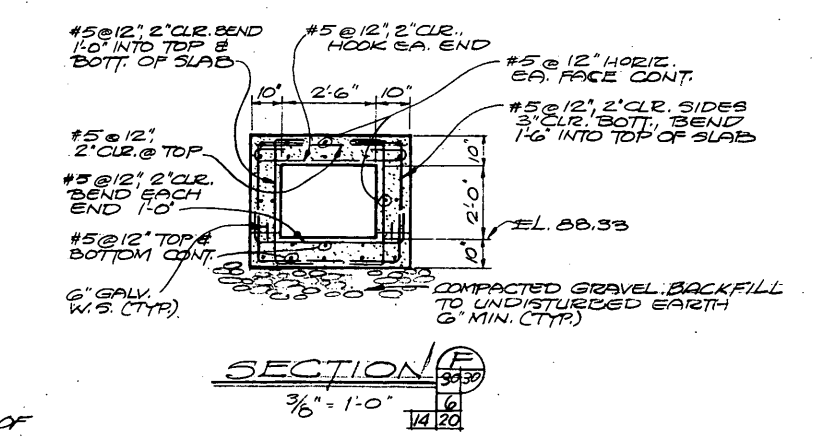
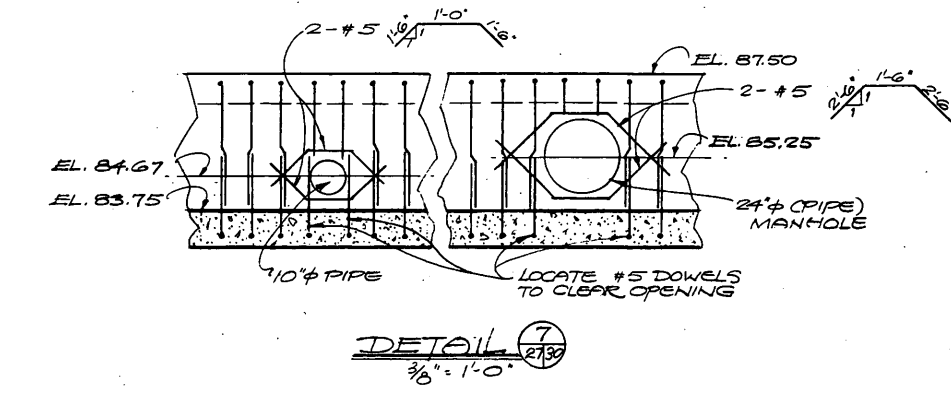
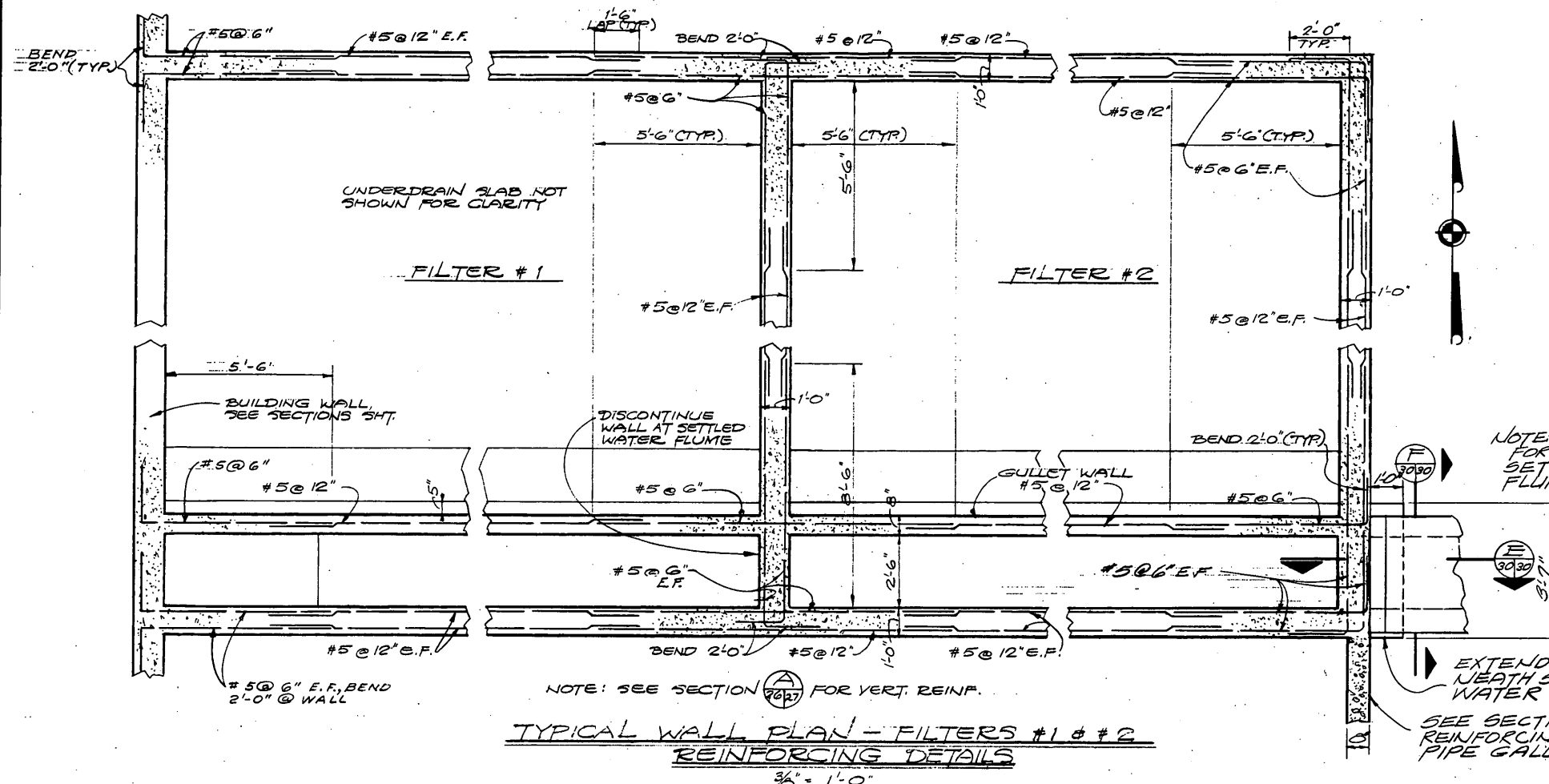
ENGINEERS
PLANNERS
ECONOMISTS

CITY OF NEWBERG, OREGON
WATER TREATMENT PLANT EXPANSION

FILTERS

STRUCTURAL SECTIONS AND DETAILS

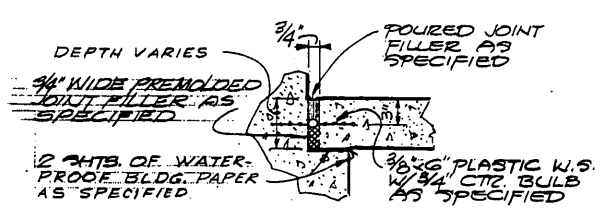
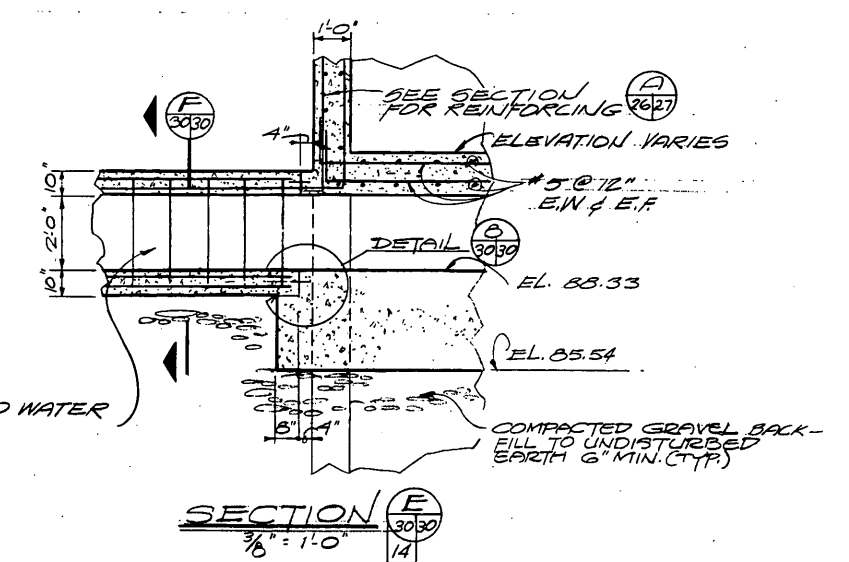
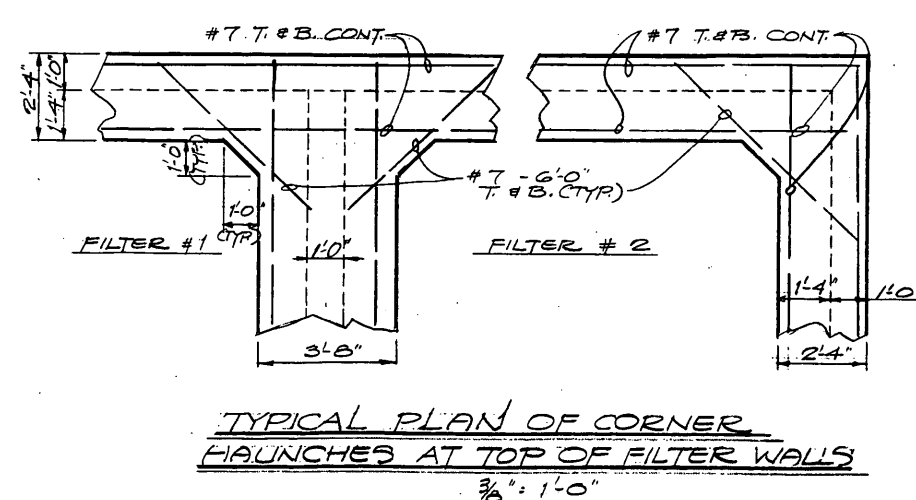
DES RBF	SHEET 29
OR EKN	OF 43
CR GFO	DATE JULY 1970
SM C6508.1	SCALE AS SHOWN



NOTE: SEE SHT. 1 FOR ALIGNMENT OF SETTLED WATER FLUME

EXTEND SLAB BE-NEATH SETTLED WATER FLUME

SEE SECTION D FOR REINFORCING IN BACKWALL OF PIPE GALLERY



DETAIL 8
 N.T.S.
 30

THIS PRINT IS REDUCED TO ONE-HALF OF THE ORIGINAL SCALE
 IF THE SCALE READS:
 1" = 1'-0" USE 1/2" = 1'-0" OR 1" = 10' USE 1" = 20'

W. H. H. H.

REGISTERED PROFESSIONAL ENGINEER
 5381
 OREGON
 JULY 9, 1968
 R. ERIC FRANK

CH2M

CORNELL, HOWLAND, HAYES & MERRYFIELD
 ENGINEERS, PLANNERS, ECONOMISTS

CITY OF NEWBERG, OREGON
 WATER TREATMENT PLANT EXPANSION

FILTERS
 STRUCTURAL PLAN AND DETAILS

DESIGNED BY	30
CHECKED BY	43
DATE	JULY 1970
SCALE	AS SHOWN
CDS08.1	
CWO	C 5508-1



THIS PRINT IS REDUCED TO ONE-HALF
OF THE ORIGINAL SCALE
IF THE SCALE READS:
1" = 1'-0" USE 1/2" = 1'-0" OR 1" = 10' USE 1" = 20'

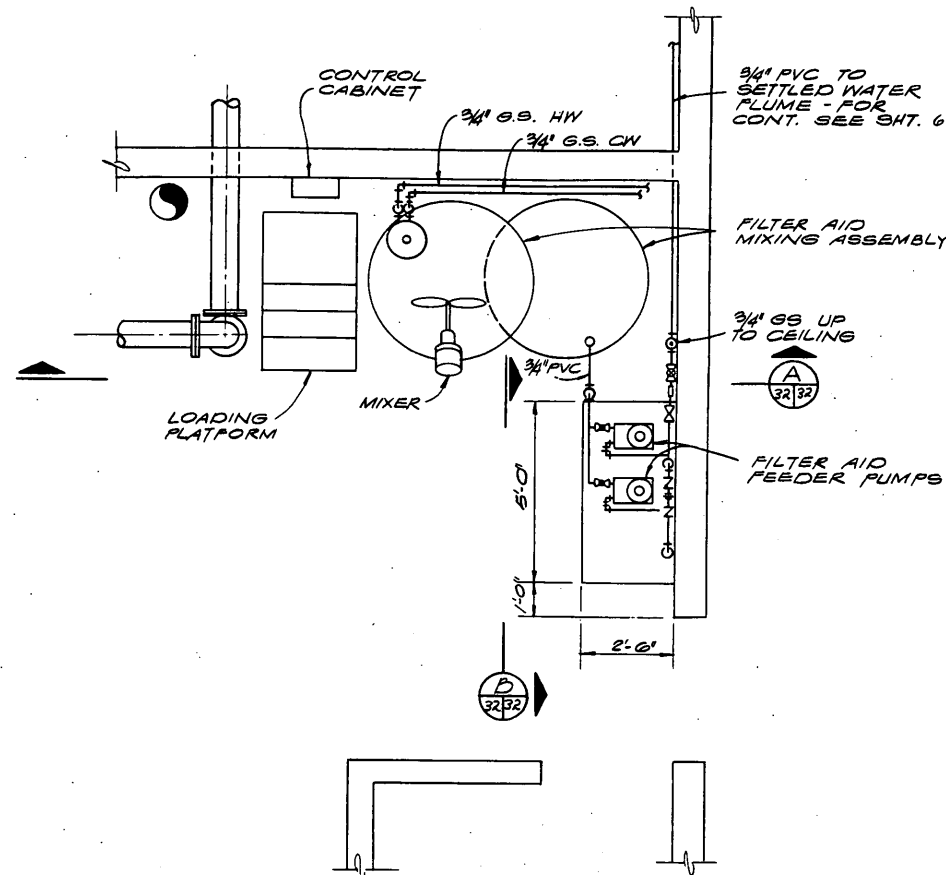


FILTER PIPE GALLERY

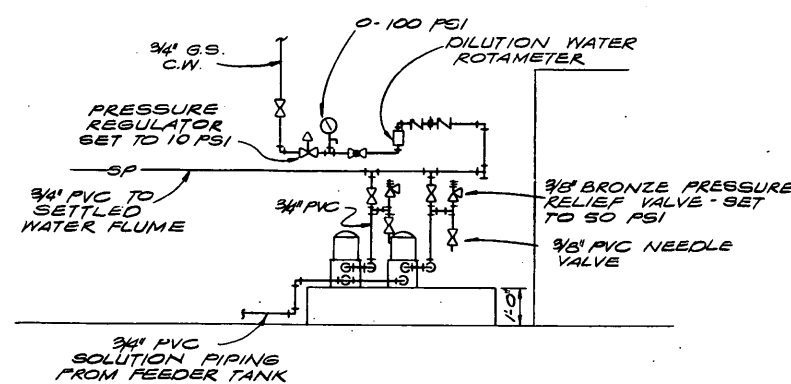
MECHANICAL PLAN AND SECTIONS

DOB RSR	SHEET 31
DE DK	OF 43
CK EYS	DATE JULY 1970
EN C5508.1	SCALE AS SHOWN

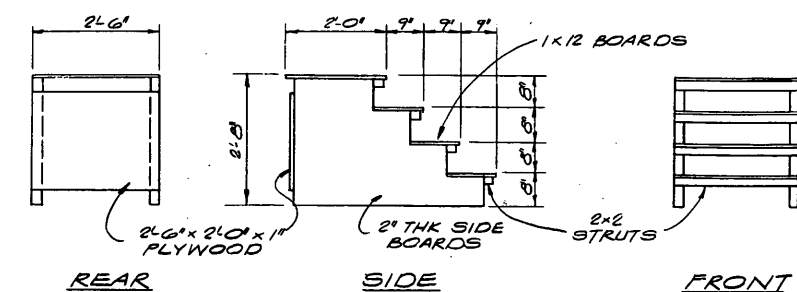
WFO
C 5508-1



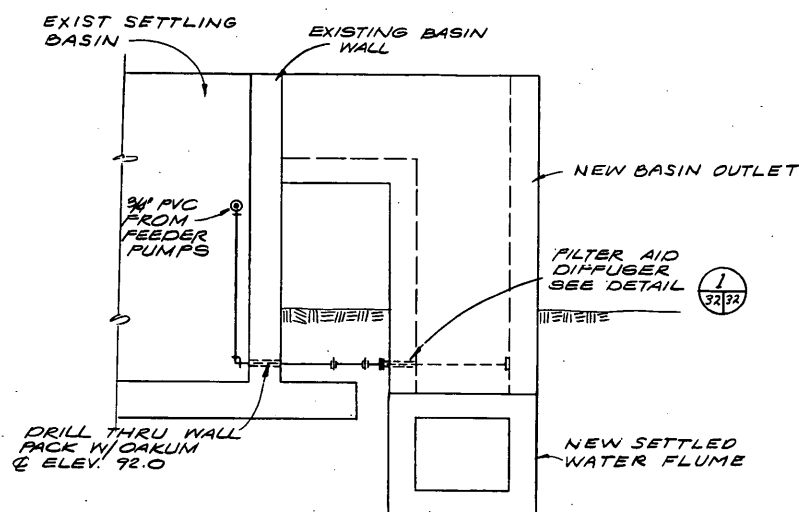
PLAN
FILTER AID EQUIPMENT LAYOUT
3/8" = 1'-0"



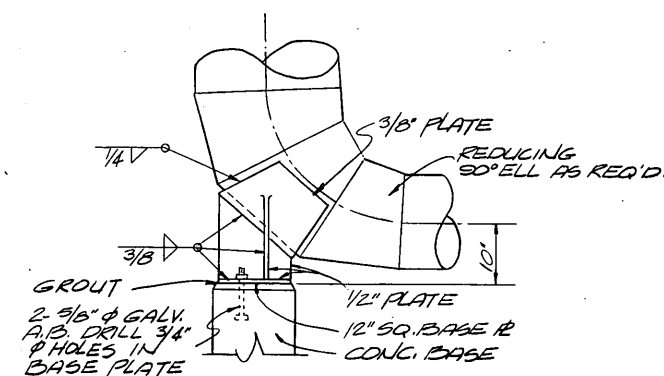
SECTION B-B
3/8" = 1'-0"



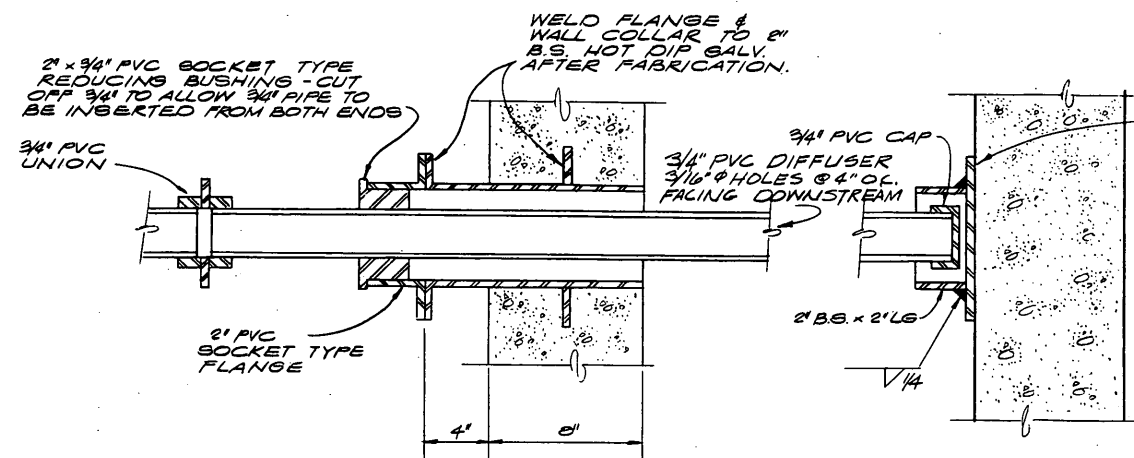
LOADING PLATFORM DETAIL
1/2" = 1'-0"



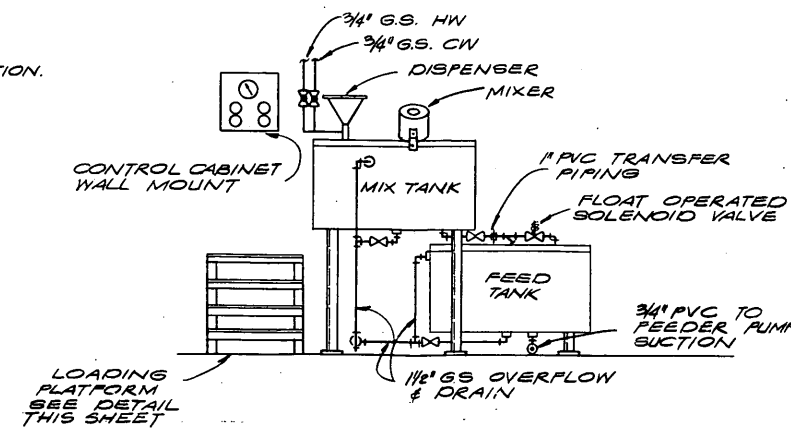
DIFFUSER INSTALLATION DETAIL
3/8" = 1'-0"



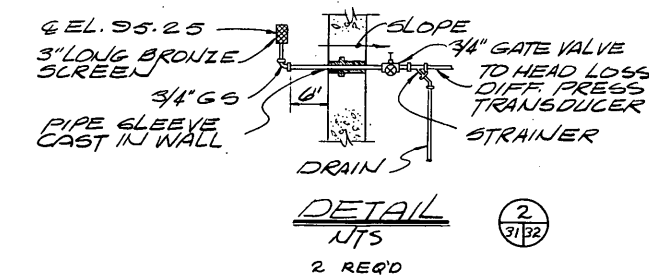
BASE DETAIL
NTS



DIFFUSER DETAIL
NTS
2 REQUIRED



SECTION A-A
3/8" = 1'-0"



DETAIL
NTS
2 REQ'D

THIS PRINT IS REDUCED TO ONE-HALF OF THE ORIGINAL SCALE
IF THE SCALE READS:
1" = 1'-0" USE 1/2" = 1'-0" OR 1" = 10' USE 1" = 20'

Richard B. Gledhill
REGISTERED PROFESSIONAL ENGINEER
STATE OF OREGON
NO. 12345
EXPIRATION DATE 12/31/95



CORNELL, HOWLAND, HAYES & MERRYFIELD
ENGINEERS
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ECONOMISTS

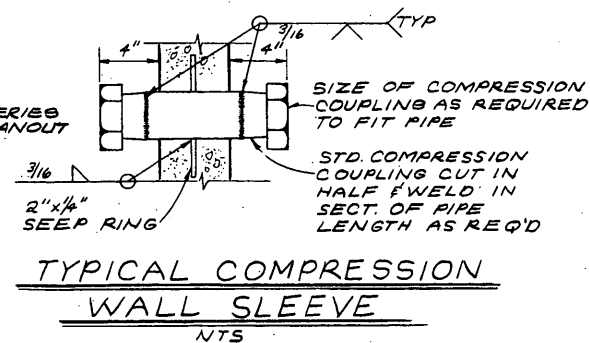
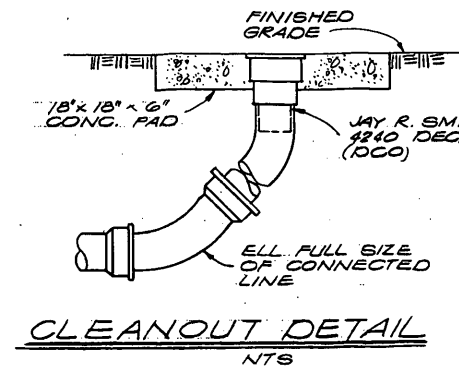
CITY OF NEWBERG, OREGON
WATER TREATMENT PLANT EXPANSION

FILTER BUILDING
CHEMICAL FEED DETAILS

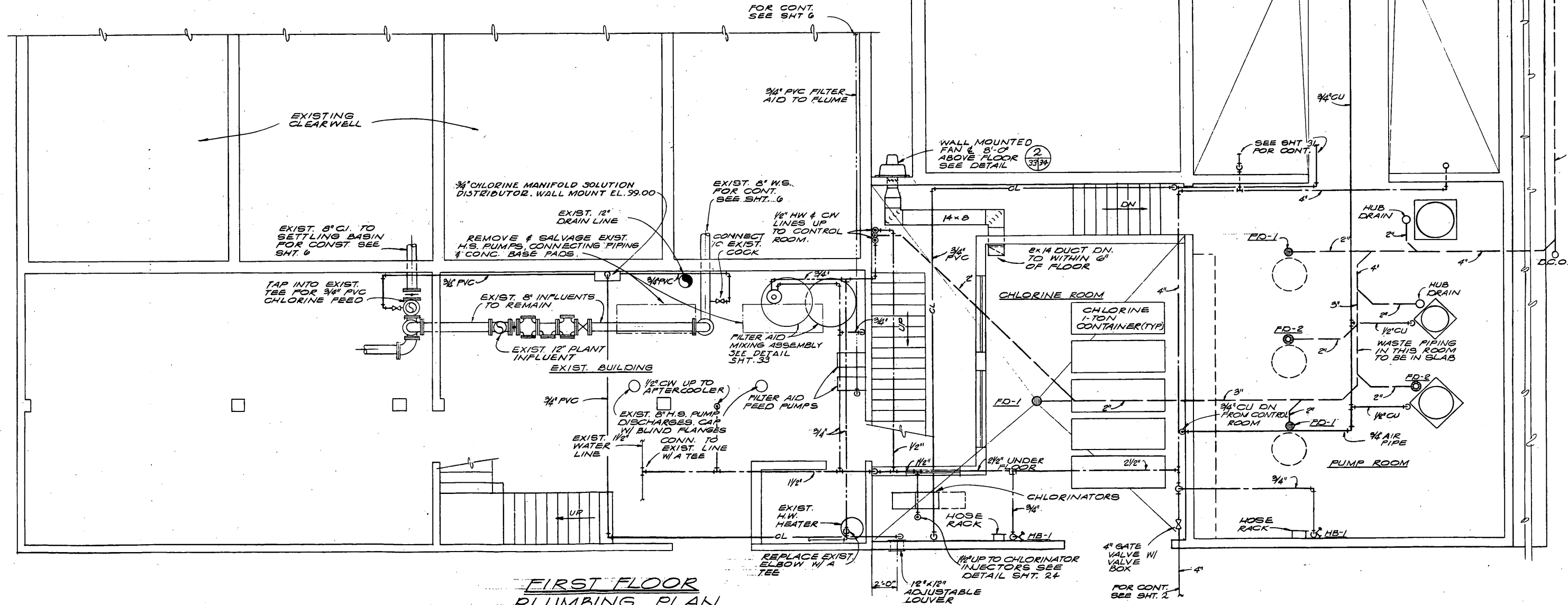
DESIGNED BY	RSR	SHEET	32
CHECKED BY	DK	OF	43
DATE	CYS	JULY 1970	
SCALE	AS SHOWN		
DWG NO.	C5508-1		

LEGEND

- WASTE
- COLD WATER
- HOT WATER
- GATE VALVE
- HOSE BIBB (HB)
- DCO DECK CLEANOUT
- DN DOWN
- VTR VENT THRU ROOF
- CL CHLORINE
- HW HOT WATER
- CW COLD WATER



FOR CONT. SEE SHT. 6



FIRST FLOOR PLUMBING PLAN
1/4" = 1'-0"

THIS PRINT IS REDUCED TO ONE-HALF OF THE ORIGINAL SCALE
IF THE SCALE READS:
1" = 1'-0" USE 1/2" = 1'-0" OR 1" = 10' USE 1" = 20'



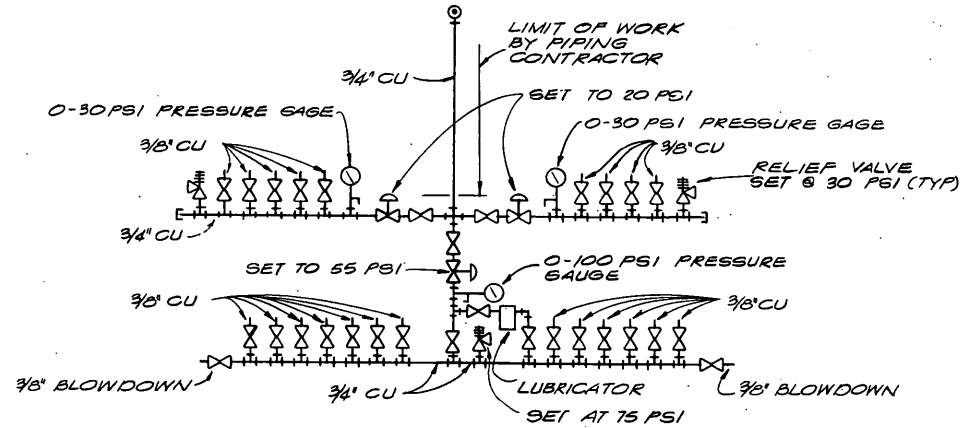
CORNELL, HOWLAND, HAYES & MERRYFIELD
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CITY OF NEWBERG, OREGON
WATER TREATMENT PLANT EXPANSION

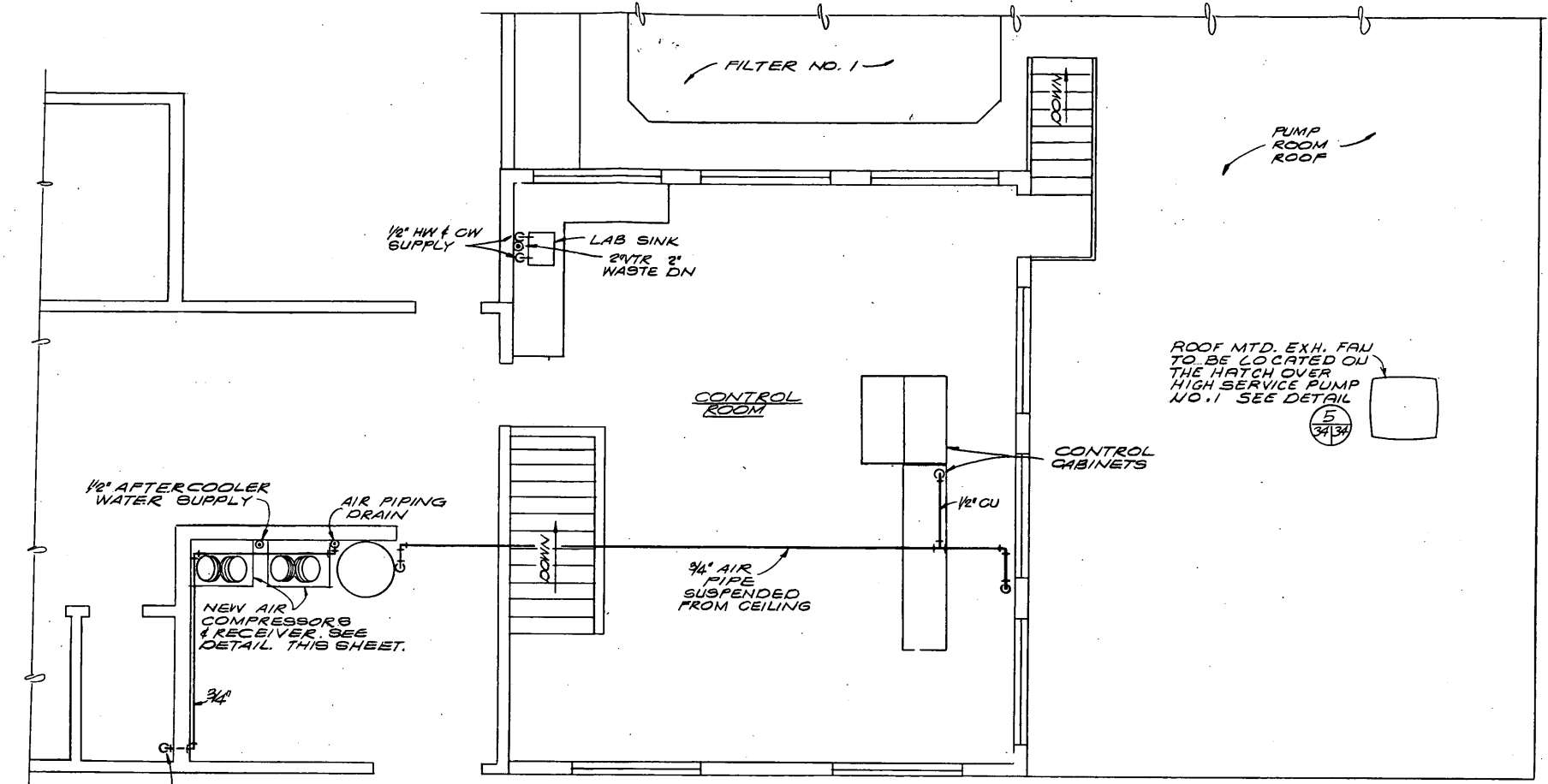
**FILTER BUILDING
FIRST FLOOR PLUMBING PLAN**

DESIGNED BY	RSR	SHEET	33
CHECKED BY	CH	OF	43
DATE	CYS	DATE	JULY 1970
SCALE	AS SHOWN		
DWG NO.	C5508-1		

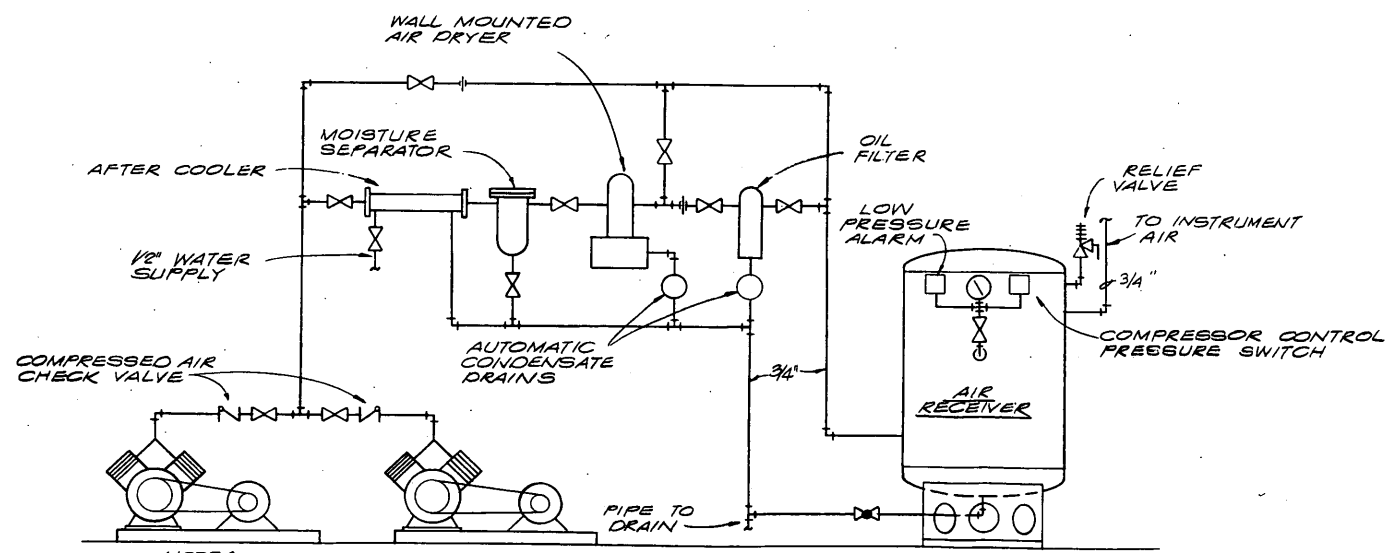
NOTE:
HEADERS AS SHOWN TO BE
PROVIDED BY CONTROL SUPPLIER



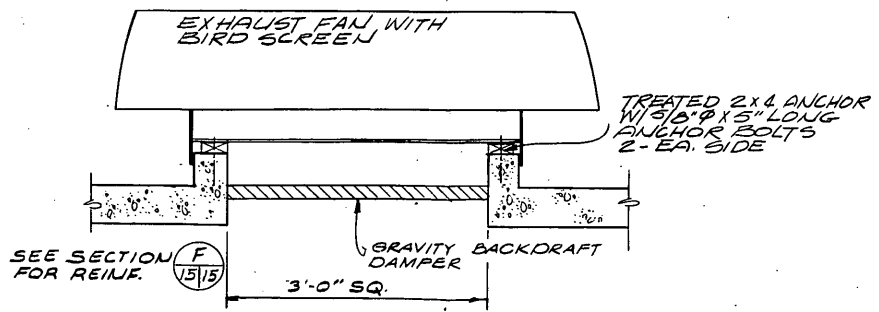
**INSTRUMENT & CONTROL AIR
HEADER PIPING DETAIL**
NTS



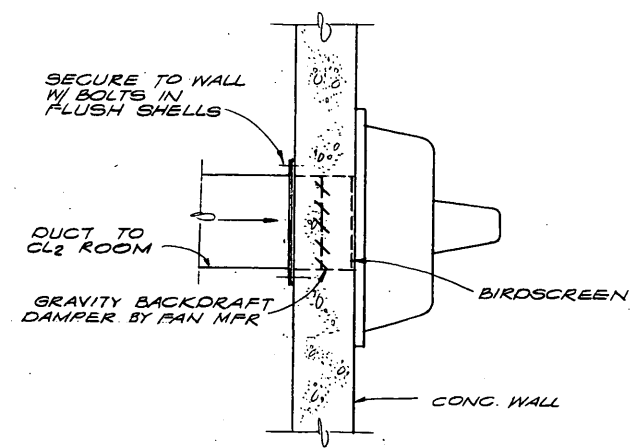
**SECOND FLOOR
PLUMBING PLAN**
1/4" = 1'-0"



COMPRESSOR SCHEMATIC
NTS



**ROOF MOUNTED EXHAUST
FAN DETAIL**
N.T.S.



**WALL MOUNTED EXHAUST
FAN DETAIL**
N.T.S.

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OF THE ORIGINAL SCALE
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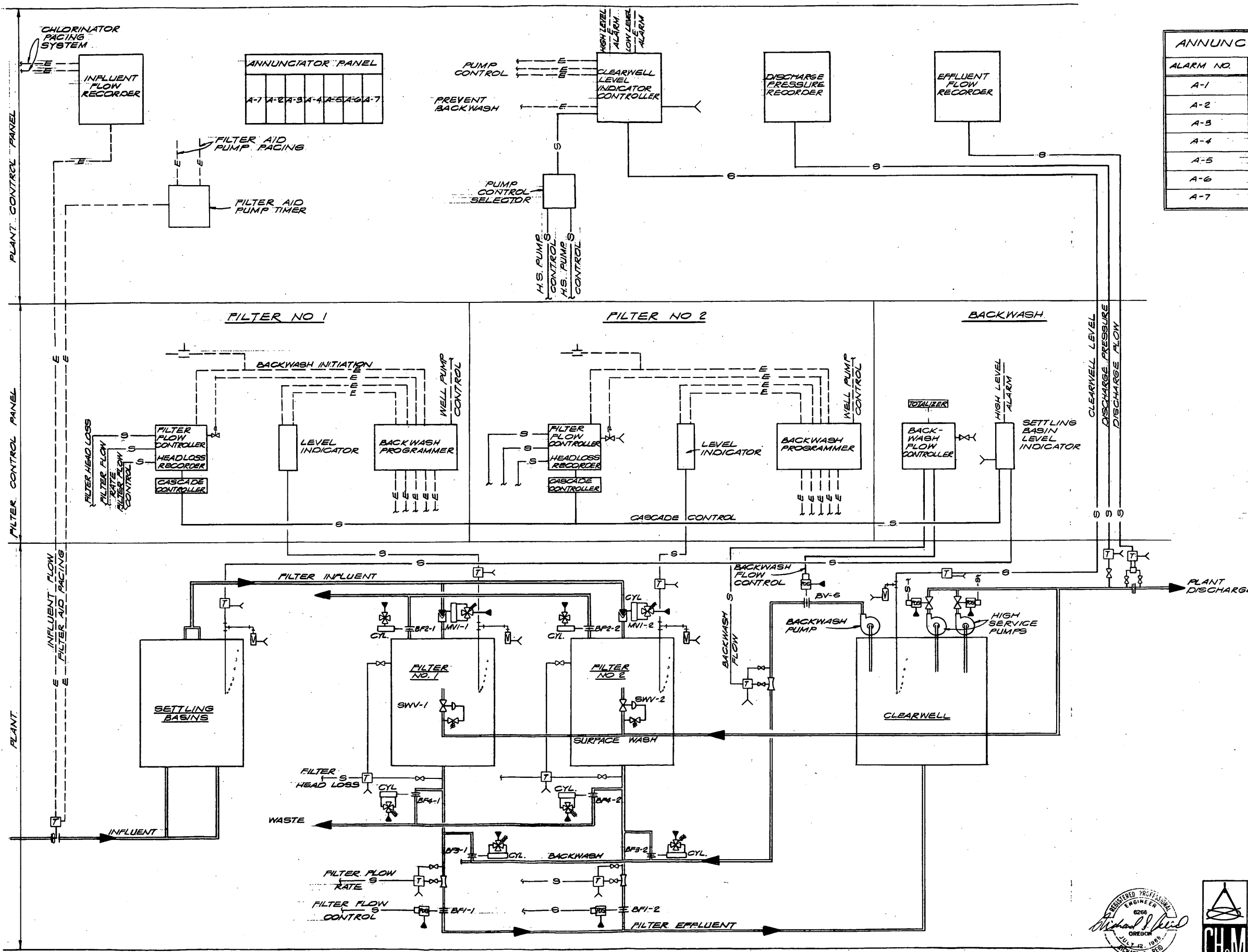


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HAYES &
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CITY OF NEWBERG, OREGON
WATER TREATMENT PLANT EXPANSION

FILTER BUILDING
SECOND FLOOR PLUMBING PLAN

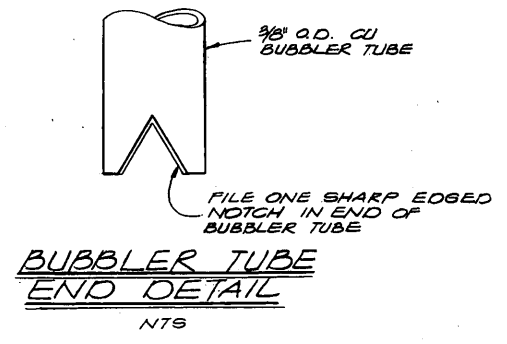
DES	RSR	SHEET	34
BY	DK	OF	43
CK	CYS	DATE	JULY 1970
IN	C5508.1	SCALE	AS SHOWN
OWN	C5508-1		



ANNUNCIATOR PANEL SCHEDULE

ALARM NO.	INSCRIPTION
A-1	INCOMPLETE BACKWASH
A-2	AIR LOW PRESSURE
A-3	CHLORINE LOW PRESSURE
A-4	SETTLING BASIN HIGH LEVEL
A-5	CLEARWELL LOW LEVEL
A-6	CLEARWELL HIGH LEVEL
A-7	RESERVOIR HIGH LEVEL

- LEGEND**
- 4-WAY SOLENOID VALVE
 - 2-WAY SOLENOID VALVE
 - PURGE ROTAMETER
 - CYLINDER OPERATED MUD VALVE
 - CYLINDER OPERATED BUTTERFLY VALVE
 - CYLINDER OPERATED BUTTERFLY VALVE WITH POSITIONER
 - DIAPHRAGM OPERATED VALVE
 - ORIFICE
 - FLOW TUBE
 - PROPELLER METER
 - TRANSMITTER
 - 20 PSIG AIR SUPPLY
 - 50 PSIG AIR SUPPLY
 - ELECTRICAL SIGNAL OR CONTROL
 - PNEUMATIC SIGNAL OR CONTROL



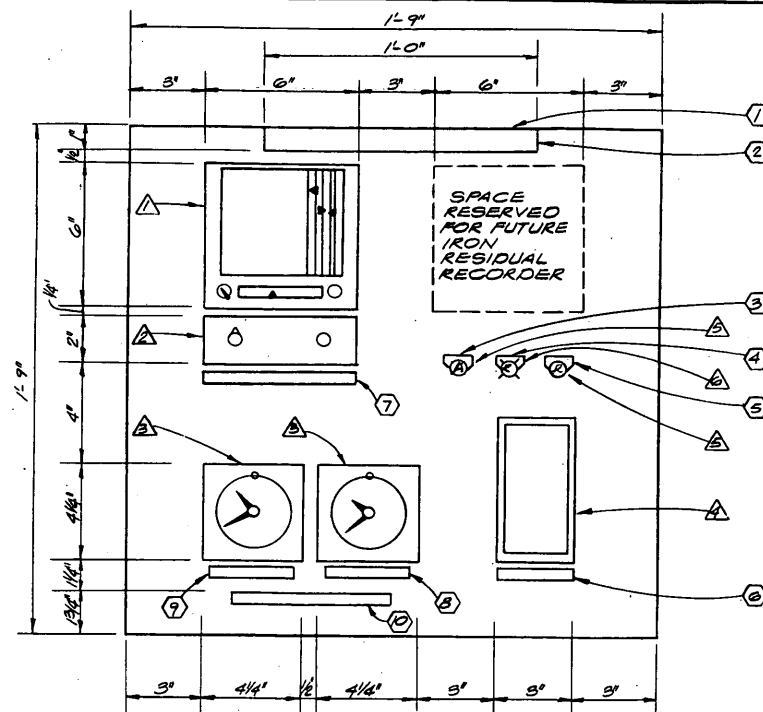
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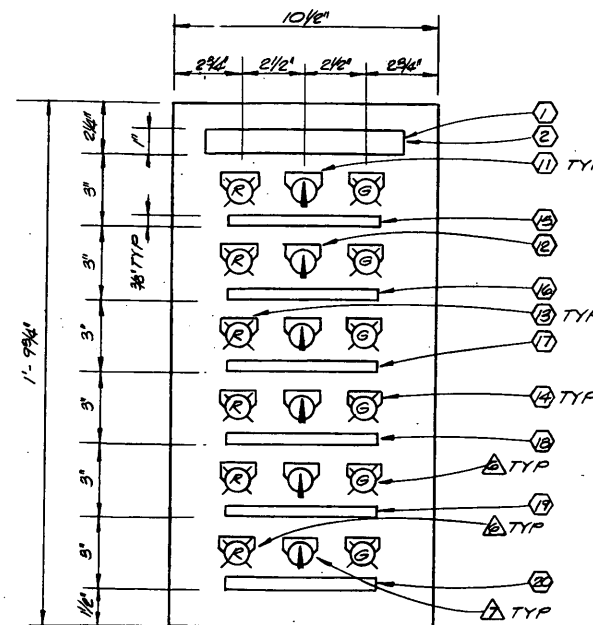
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CITY OF NEWBERG, OREGON
WATER TREATMENT PLANT EXPANSION
PLANT CONTROL SCHEMATIC

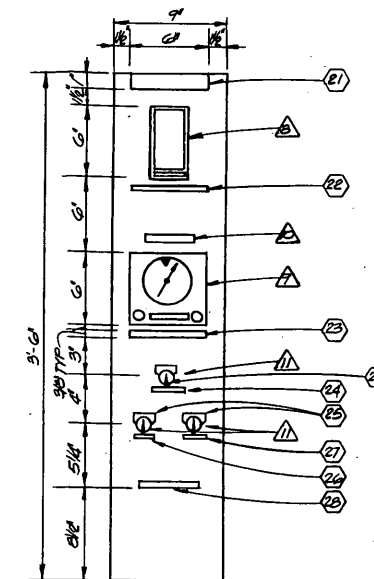
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CHK	CK	OF	43
APP	CYS	DATE	JULY 1990
SCALE	AS SHOWN		
PRO	C	NO	6508-1



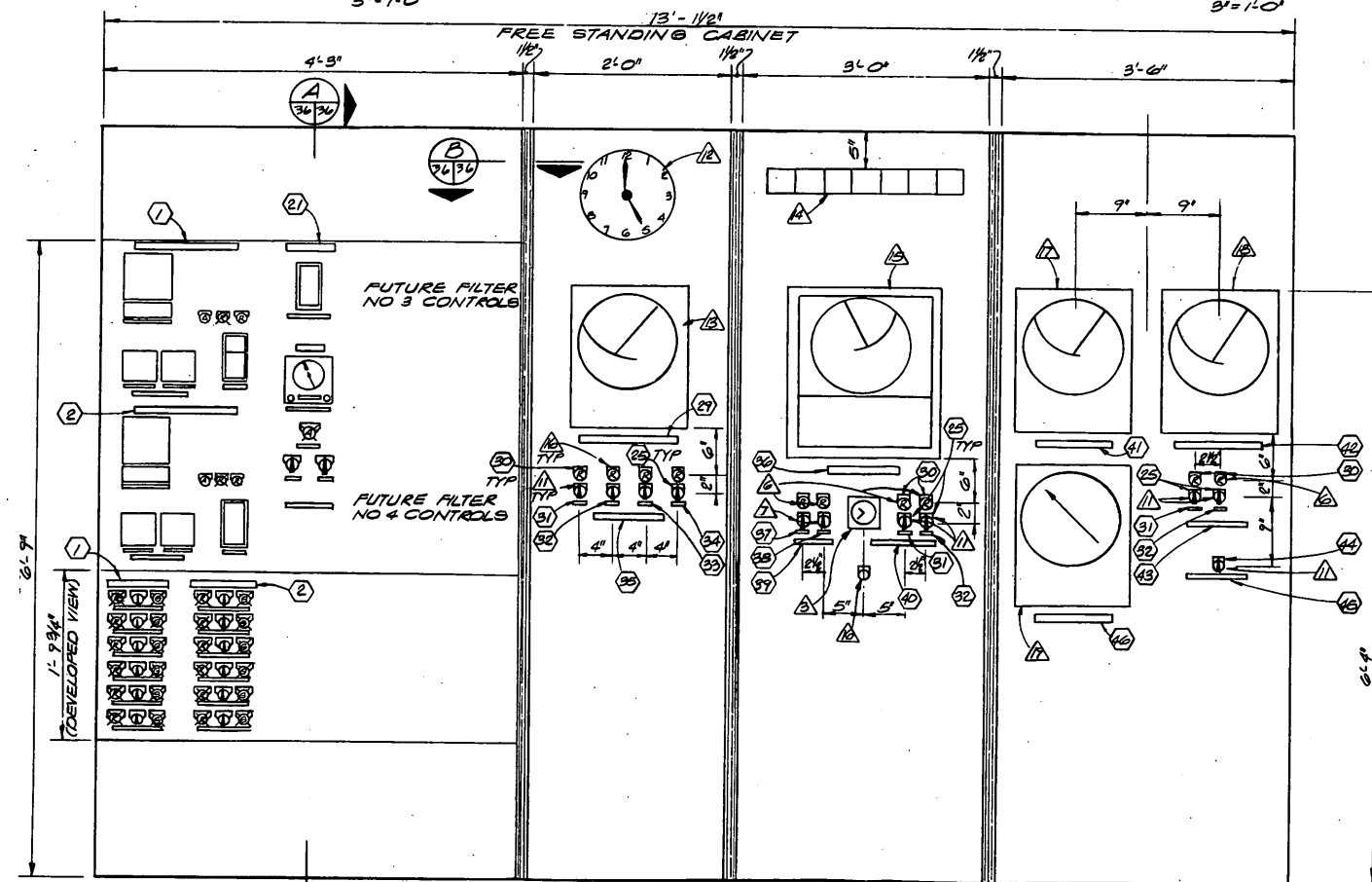
TYPICAL FILTER INSTRUMENT PANEL DETAIL



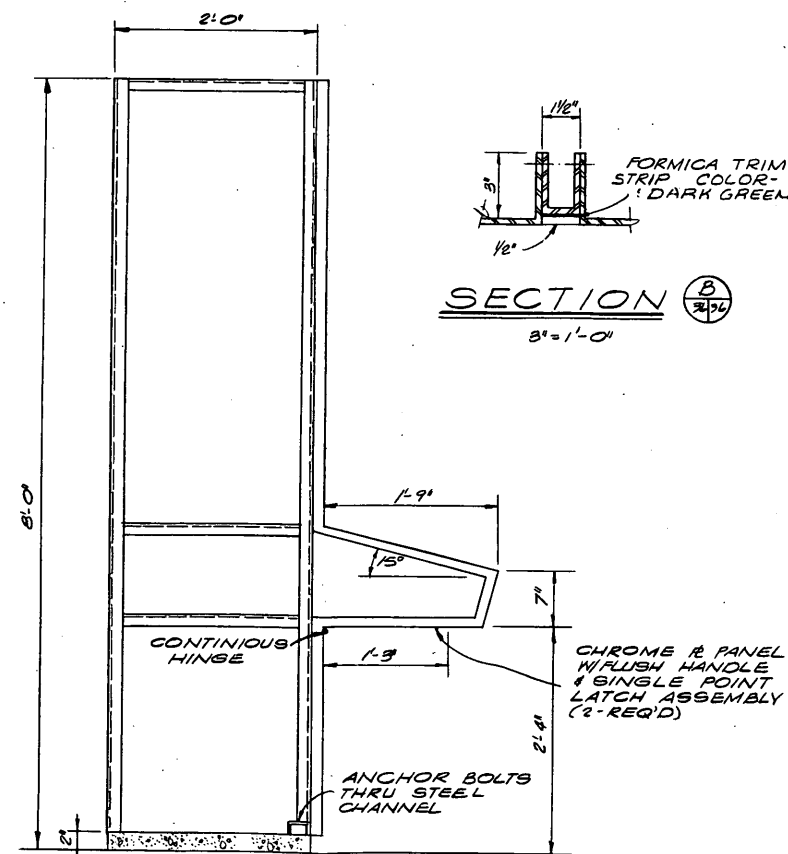
TYPICAL FILTER SWITCH PANEL DETAIL



BACKWASH CONTROL PANEL DETAIL



PLANT CONTROL PANEL



SECTION A

NAMEPLATE SCHEDULE		
MARK	INSCRIPTION	LETTER SIZE
1	FILTER NO.1	1/2"
2	FILTER NO.2	1/2"
3	INITIATE BACKWASH	
4	FILTER IN AUTO	
5	INCOMPLETE BACKWASH RESET	
6	FILTER LEVEL	
7	FLOW RATE AND HEADLOSS	
8	SURFACE WASH	1/8"
9	BACKWASH	1/8"
10	FILTER WASH TIMERS	
11	OPEN-CLOSED	
12	AUTO-CLOSED	
13	OPEN	
14	CLOSED	
15	INFLUENT VALVE	
16	EFFLUENT VALVE	
17	WASTE VALVE	
18	BACKWASH VALVE	
19	SURFACE WASH VALVE	
20	FILTER TO WASTE	
21	BACKWASH CONTROL	1/2"
22	SETTLING BASIN LEVEL	
23	BACKWASH FLOW RATE	
24	BACKWASH PUMP	
25	HAND-OFF-AUTO	
26	FILTER NO.1	1/8"
27	FILTER NO.2	1/8"
28	BACKWASH SELECTOR SWITCHES	
29	RESERVOIR LEVEL	1/4"
30	ON	
31	NO.1	1/8"
32	NO.2	1/8"
33	NO.3	1/8"
34	NO.4	1/8"
35	WELL PUMPS	1/4"
36	INFLUENT FLOW RATE	1/4"
37	PRE	1/8"
38	POST	1/8"
39	CHLORINE	1/4"
40	FILTER AID	1/4"
41	DISCHARGE PRESSURE	1/4"
42	EFFLUENT FLOW RATE	1/4"
43	HIGH SERVICE PUMPS	1/4"
44	1-2-3	
45	PUMP CONTROL SELECTOR	1/4"
46	CLEARWELL LEVEL	1/4"

* LETTER SIZES TO BE 3/16" UNLESS OTHERWISE NOTED, EXCEPT NAMEPLATE COLLARS ON ELECTRICAL DEVICES WHICH SHALL BE STANDARD SIZE LETTERS.

- NOTE:
- INDICATES NAMEPLATE MARK
 - △ INDICATES INSTRUMENT MARK
 - ⊠ RED INDICATING LIGHT
 - ⊠ GREEN INDICATING LIGHT
 - ⊠ AMBER INDICATING LIGHT

INSTRUMENT SCHEDULE	
MARK	INSTRUMENT
1	FILTER FLOW RATE RECORDER-CONTROLLER & FILTER HEADLOSS RECORDER
2	CASCADE CONTROL PANEL
3	INTERVAL TIMER
4	FILTER LEVEL INDICATOR
5	PUSHBUTTON SWITCH
6	INDICATING LIGHT
7	2-POSITION SELECTOR SWITCH
8	SETTLING BASIN LEVEL INDICATOR-CONTROLLER
9	BACKWASH FLOW RATE INDICATOR-CONTROLLER
10	BACKWASH FLOW TOTALIZER
11	3-POSITION SELECTOR SWITCH
12	CLOCK
13	RESERVOIR LEVEL RECORDER-CONTROLLER
14	ANNUNCIATOR PANEL
15	PLANT INFLUENT FLOW RATE RECORDER-TOTALIZER
16	ANNUNCIATOR PANEL PUSH-TO-TEST BUTTON
17	PLANT DISCHARGE PRESSURE RECORDER
18	PLANT EFFLUENT FLOW RECORDER
19	CLEARWELL LEVEL INDICATOR-CONTROLLER

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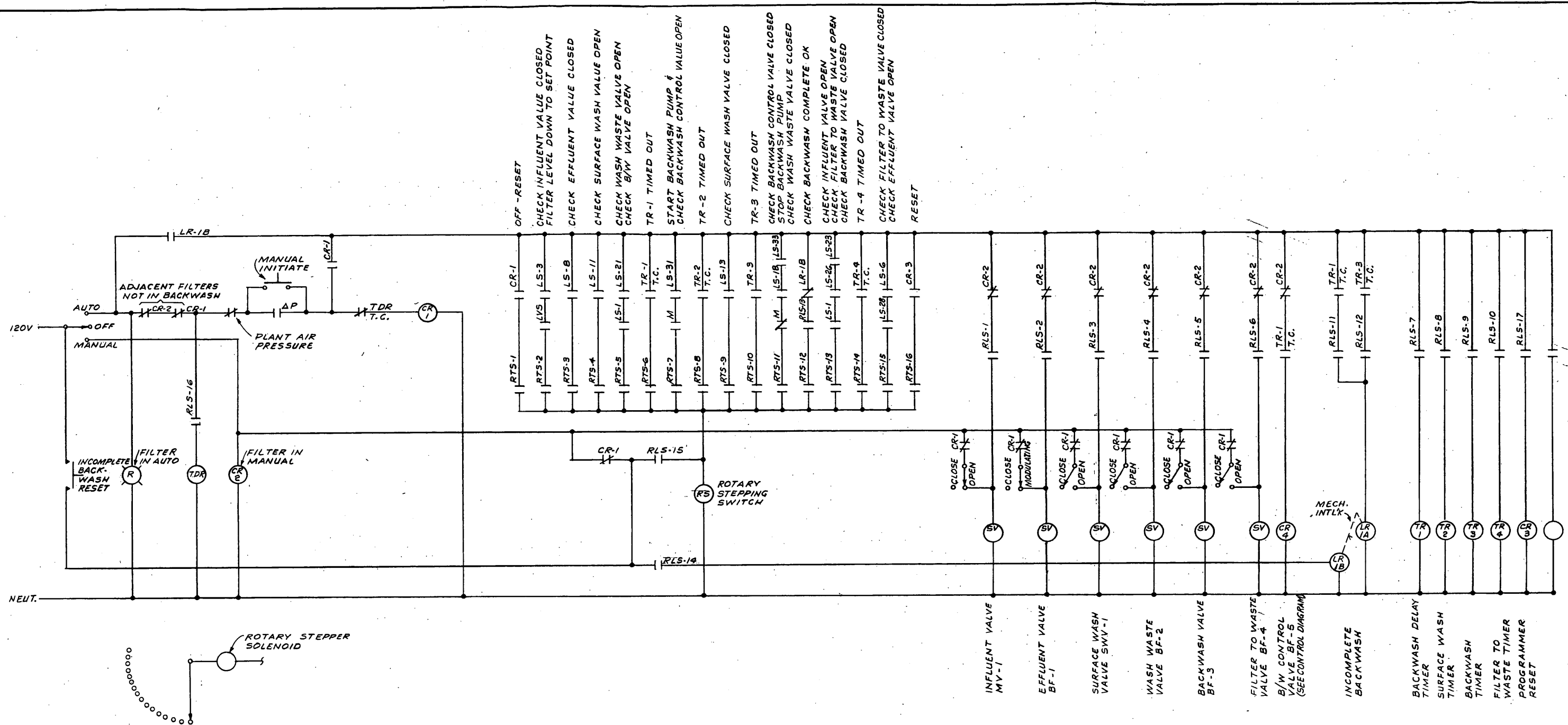


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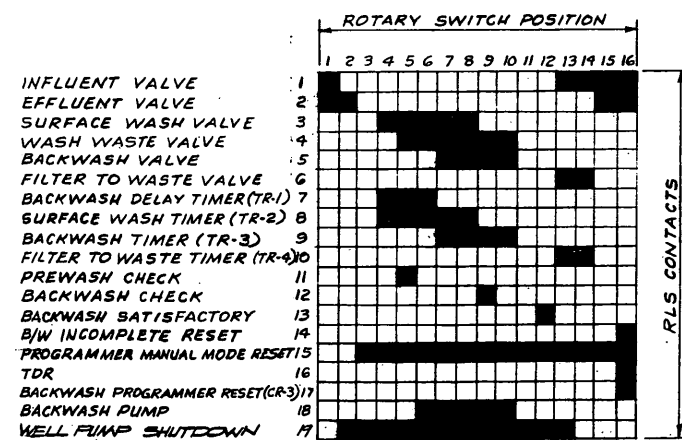
CITY OF NEWBERG, OREGON
WATER TREATMENT PLANT EXPANSION

PLANT CONTROL PANELS

DESIGNED BY RSR
CHECKED BY CH
DATE JULY 1970
SCALE AS SHOWN
DWG. C5508-1



ROTARY TAP SWITCH (RTS)



LIMITSWITCH CONTACT DEVELOPMENT									
CONTACTS							VALVE POSITION		HOW CONTACT IS USED
BACKWASH VALVE	FILTER TO WASTE VALVE	BACKWASH VALVE	WASH WASTE VALVE	SURFACE WASH VALVE	EFFLUENT VALVE	INFLUENT VALVE	FULL OPEN	FULL CLOSED	
31	26	21	16	11	6	1	■	---	FULLY OPEN CHECK
32	27	22	17	12	(NOT USED)	2	■	---	FULLY OPEN LIGHT
33	28	23	18	13	8	3	---	■	FULLY CLOSED CHECK
34	29	24	19	14	9	4	---	■	FULLY CLOSED LIGHT
35	(NOT USED)	(NOT USED)	(NOT USED)	(NOT USED)	10	(NOT USED)	---	---	OPEN LIGHT

■ INDICATES CONTACT CLOSED
 --- INDICATES CONTACT OPEN

LEGEND

RLS ROTARY LOAD SWITCH CONTACTS
 LS-1 LIMIT SWITCH - SEE SCHEDULE
 LVS LEVEL SWITCH
 TDR PNEUMATIC TIME DELAY RELAY 0-180 SEC. - BACK PANEL MOUNTED
 RS ROTARY STEPPING SWITCH
 CR CONTROL RELAY - BACK PANEL MOUNTED
 TR-1 TIMING RELAY - 0-5 MIN. - BACK PANEL MOUNTED
 TR-2 TIMING RELAY - 0-20 MIN. - FRONT PANEL MOUNTED
 TR-3 TIMING RELAY - 0-60 MIN. - FRONT PANEL MOUNTED
 TR-4 TIMING RELAY - 0-5 MIN. - BACK PANEL MOUNTED

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CITY OF NEWBERG, OREGON
 WATER TREATMENT PLANT EXPANSION

BACKWASH PROGRAMMER SCHEMATIC

SHEET 37
 DATE 04/30/68
 JULY 1970
 C 5508-1

DESCRIPTION

ELECTRICAL DEVICE - SEE DEVICE SCHEDULE IN SPECIFICATIONS

NAMEPLATE OR LEGEND PLATE - SEE NAMEPLATE SCHEDULE IN SPECS.

INDICATES RACEWAY AND CIRCUIT NUMBERS. FIRST NUMBER IS RACEWAY AND NUMBER AFTER DASH IS CIRCUIT NUMBER. [6-E] INDICATES RACEWAY NO. 6 AND "E" INDICATES THAT THE RACEWAY IS EMPTY. SEE CIRCUIT AND RACEWAY SCHEDULES.

FOR ELECTRICAL COMPONENT OR DEVICE - NAME OR IDENTIFYING SYMBOL AS SHOWN

CONTROL PANEL - (PANEL-A)

HEATER NO. 1

TER BASE

PHONE TERMINAL CABINET

CONTROLLING PANEL FOR CONTACTORS AND STARTERS CONTROLLING ELECTRICAL EQUIPMENT

TO OR FROM HOWLER

CONTACTOR - CURRENT RATING INDICATED

CONNECT SWITCH SIZE INDICATED - 3 POLE UNLESS INDICATED OTHERWISE - NONFUSED

CONTACTOR, MAGNETIC - NEMA SIZE SHOWN

CONTACTOR, MAGNETIC - NEMA SIZE SHOWN

JUNCTION BOX

TO CELL

STAT - SEE HEATER SCHEDULE

ENCLOSURE CASE CIRCUIT BREAKER, 3 POLE, IN NEMA 3R ENCLOSURE NEMA SIZE INDICATED

INDUCTION, SQUIRREL CAGE INDUCTION - HORSEPOWER INDICATED

SWITCH, SINGLE POLE, SINGLE THROW.

SWITCH, 2 - DOUBLE POLE T - TIME SWITCH
3 - THREE WAY D - DIMMER
4 - FOUR WAY P - PILOT LIGHT
WP - WEATHERPROOF M - MOTOR RATED SWITCH
K - KEY OPERATED

CONVENIENCE RECEPTACLE

CONVENIENCE RECEPTACLE - 1 - SINGLE WP - WEATHERPROOF
3 - TRIPLE C - CLOCK HANGER

RECEPTACLE

RECEPTACLE - 240V, 1Ø, AMPERAGE AS INDICATED

RECEPTACLE - 120V, 1Ø, AMPERAGE AS INDICATED

SPECIAL PURPOSE RECEPTACLE - AMPERAGE AS INDICATED

PHONE RECEPTACLE (OUTLET BOX ONLY) FLUSH IN WALL

OUTLET BOX OR CONNECTION POINT TO EQUIPMENT INDICATED MAY BE INDICATED FOR CLARITY

INSTALLATION STYLE PLUGMOLD, OUTLET SPACING AS INDICATED

SEED CONDUIT AND CONDUCTORS*

SEALED CONDUIT AND CONDUCTORS*

NOTES:

UNMARKED CONDUIT RUNS CONSIST OF TWO NO. 12 TW CONDUCTORS IN 3/4" CONDUIT. RUNS MARKED WITH CROSS HATCHES INDICATE NUMBER OF NO. 12 TW WIRE. SIZE OF CONDUIT ACCORDING TO APPLICABLE CODE.

DOWN

UP

STUBBED AND CAPPED AS SHOWN

CROSS HATCHES WITH BAR INDICATE #10 TW WIRE CONDUIT AS PER APPLICABLE CODE

RUN FROM DEVICE TO LIGHTING PANEL "LA"

UNIT NO. 12

LIGHTING LUMINAIRE - SEE LUMINAIRE SCHEDULE

RESCENT LUMINAIRE - SEE LUMINAIRE SCHEDULE

ET LIGHTING LUMINAIRE - SEE LUMINAIRE SCHEDULE

MOUNTED LUMINAIRE - SEE LUMINAIRE SCHEDULE

LIGHTS - AIM IN DIRECTION SHOWN - SEE LUMINAIRE SCHEDULE

LIGHT - SEE LUMINAIRE SCHEDULE

SYMBOL	DESCRIPTION
	ALL CONDUCTORS OF A CIRCUIT.
	CIRCUIT BREAKER, FRAME SIZE AND TRIP SHOWN, NUMBER OF POLES SHOWN IF OTHER THAN THREE POLE
	TRANSFORMER RATING SHOWN
	Δ-3Ø DELTA CONNECTION.
	Y-3Ø GROUNDED WYE CONNECTION
	COMPONENT OUTLINE
	SWITCH - CURRENT RATING AND NUMBER OF POLES INDICATED IF OTHER THAN THREE POLE
	AMMETER FULL SCALE RANGE SHOWN - CT'S (NUMBER INDICATED)
	VOLTMETER - DIRECT-CONNECT FULL SCALE RANGE SHOWN - 3Ø WITH SWITCH
	VOLTMETER FULL SCALE RANGE SHOWN - PT'S (NUMBER INDICATED)
	CAPACITOR - 3Ø KVAR INDICATED
	FUSE - CURRENT RATING INDICATED
	RESISTANCE LOAD (RATING INDICATED)
	CIRCUIT BREAKER WITH CURRENT LIMITING FUSES.
	CONTACTOR WITH NEMA SIZE INDICATED

<u>ABBREVIATION</u>	<u>DESCRIPTION</u>	<u>ABBREVIATION</u>	<u>DESCRIPTION</u>
A	AMMETER	NEC	NATIONAL ELECTRIC CODE
B	BELL	OL	OVERLOAD
CB	CIRCUIT BREAKER	PR	PUSHBUTTON SWITCH
CCC	COAGULANT CONTROL CENTER	PC	PHOTO CELL
C	CONDUIT	PCP	PLANT CONTROL PANEL
CPT	CONTROL POWER TRANSFORMER	PIP	PLANT INDICATING PANEL
CR	CONTROL RELAY INDUSTRIAL	PDP	PLANT OPERATIONS PANEL
CT	CURRENT TRANSFORMER	PP	POWER PANEL
CUH	CABINET UNIT HEATER	PS	PRESSURE SWITCH
EF	EXHAUST FAN	PT	POTENTIAL TRANSFORMER
ETM	ELAPSED TIME METER	SC	SPEED CONTROL UNIT
FM	FLASHER MOTOR	SS	SELECTOR SWITCH
FS	FLOAT SWITCH	SV	SOLENOID VALVE
GSR	GROUND SENSING RELAY	SW	SWITCH
H	HORN OR HOWLER	TB	TERMINAL BLOCK OR BOARD
J	JUNCTION BOX	TC	TIME CLOCK
LC	LIGHTING CONTACTOR	TDR	TIME DELAY RELAY
LOS	LOCKOUT STOP PUSHBUTTON	TM	TIMING RELAY
LP	LIGHTING PANEL	TR	TIMER - REPEAT CYCLE
LR	LATCHING RELAY	T	THERMOSTAT
LS	LIMIT SWITCH	UH	UNIT HEATER
M	MAGNETIC CONTACT COIL	V	VOLTMETER
MCC	MOTOR CONTROL CENTER	WP	WEATHERPROOF
MP	MOUNTING PANEL		
MSP	MOTOR STARTER PANEL BOARD		

<u>SYMBOL</u>	<u>DESCRIPTION</u>
	POWER OR CONTROL WIRE
	CONNECTION
	NO CONNECTION
	MECHANICAL CONNECTION
	COMPONENT OUTLINE

<u>SYMBOL</u>	<u>DESCRIPTION</u>
	GENERAL LOAD SYMBOL - CR - CONTROL RELAY COIL
	F - MAGNETIC CONTACT COIL, FORWARD
	R - MAGNETIC CONTACT COIL, REVERSE
	H - MAGNETIC CONTACT COIL, HIGH SPEED
	L - MAGNETIC CONTACT COIL, LOW SPEED
	S - MAGNETIC CONTACT COIL, START
	OTHER SYMBOLS SHOWN IN THE ABBREVIATIONS MAY BE USED ALSO.
	INDICATING LIGHT - LETTER INDICATES COLOR
	A - AMBER G - GREEN
	B - BLUE R - RED
	C - CLEAR W - WHITE
	MOTOR - NUMBER OF LEADS TO MOTOR SHOWN

1. THIS IS A STANDARD LEGEND SHEET. THEREFORE SOME SYMBOLS OR ABBREVIATIONS MAY APPEAR ON THIS SHEET AND NOT ON THE PLANS.
2. REFER TO THE SPECIFICATIONS SECTION FOR THE SCHEDULES.
3. REMOVE EXISTING 240 VOLT OUTLETS AND ASSOCIATED WIRING. REMOVE CONDUIT WHEN RUN IS EXPOSED. CAP ALL REMAINING CONCEALED CONDUIT.
4. INSTALL COUPLING AND PLUG FLUSH WITH FINISHED FLOOR ON ALL CONDUITS FOR FUTURE EQUIPMENT.

SYMBOL	DESCRIPTION												
	CIRCUIT BREAKER, 3 POLE												
	CIRCUIT BREAKER, 1 POLE												
	DISCONNECT SWITCH												
	OVERLOAD RELAY CONTACTS												
	OVERLOAD HEATER												
	PROCESS FUNCTION CONTACT, DEVICE ACTION SHOWN BY NOTE												
	RELAY (OR CONTACTOR) CONTACT ON CR NORMALLY OPEN, CLOSURES WHEN COIL IS ENERGIZED												
	RELAY (OR CONTACTOR) CONTACT ON CR NORMALLY CLOSED, OPENS WHEN COIL IS ENERGIZED												
	PUSHBUTTON SWITCH, MOMENTARY CONTACT, NORMALLY OPEN, FUNCTION INDICATED												
	PUSHBUTTON MOMENTARY CONTACT NORMALLY CLOSED, FUNCTION INDICATED												
	PUSHBUTTON SWITCH, MAINTAINED CONTACTS WITH MECHANICAL INTERLOCK FUNCTION INDICATED												
	SELECTOR SWITCH, THREE POSITION - HAND - OFF - AUTOMATIC.												
	TIME DELAY RELAY CONTACT NORMALLY OPEN CONTACT												
	TIME DELAY RELAY CONTACT NORMALLY CLOSED												
	TC TIME CLOSE TO TIME OPEN INST. INSTANTANEOUS												
	SELECTOR SWITCH - MAINTAINED CONTACT - CHART DEFINES OPERATION												
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POS	HAND	OFF	AUTO										
1	X	O	O										
2	O	O	X										
	X CLOSED CONTACT O OPEN CONTACT												
	VOLTAGE TRANSFORMER SEC. VOLTAGE SHOWN												
	CURRENT TRANSFORMER												
	FUSE												

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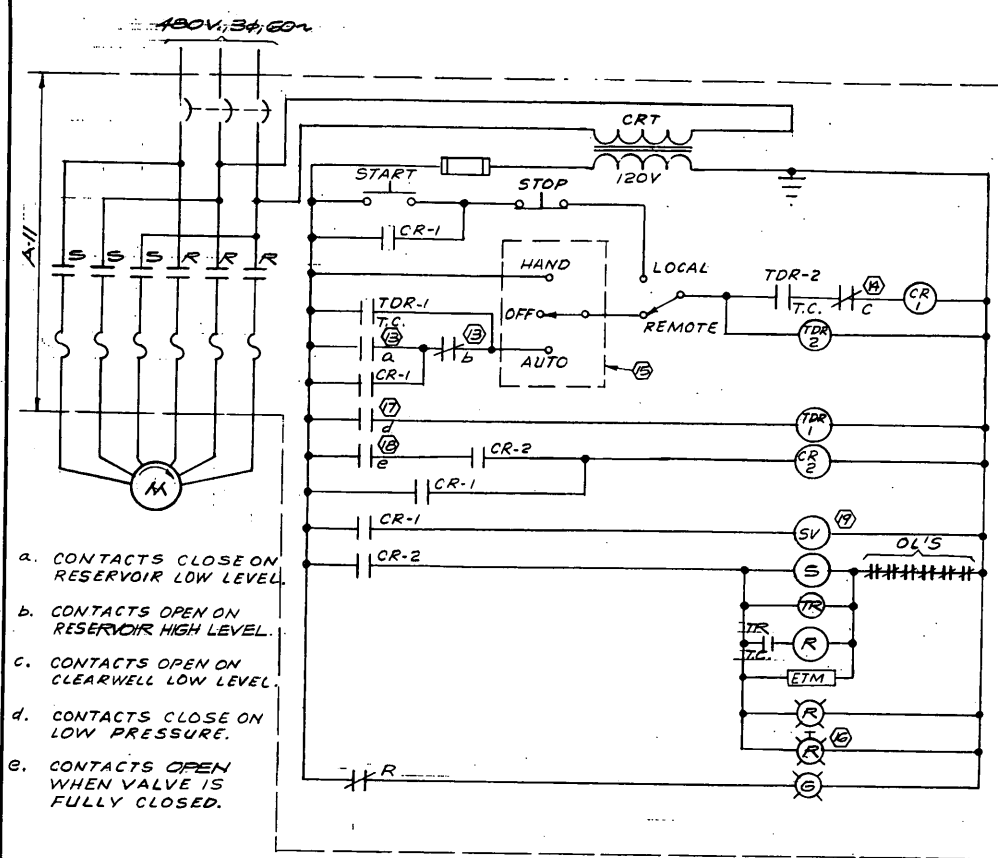
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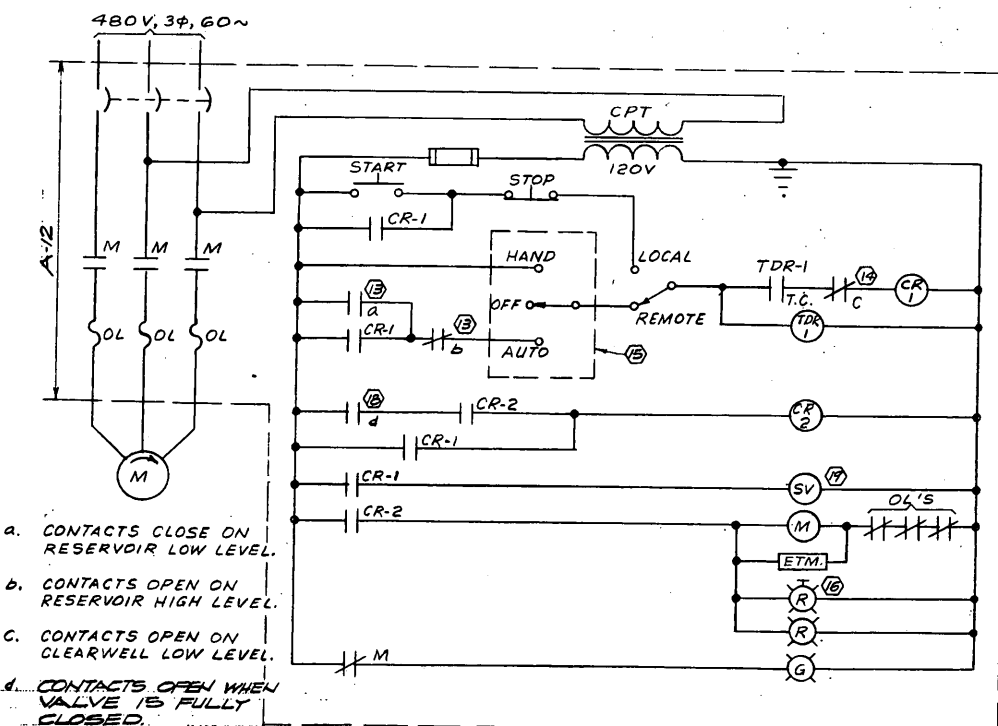
CITY OF NEWBERG, OREGON
WATER TREATMENT PLANT EXPANSION

ELECTRICAL
FIRST FLOOR

DES RWB	SHEET 40
DR ABC	OF 43
CK WGE	DATE JULY 1970
EN CS508.1	SCALE AS SHOWN
DWG C 5508-1	

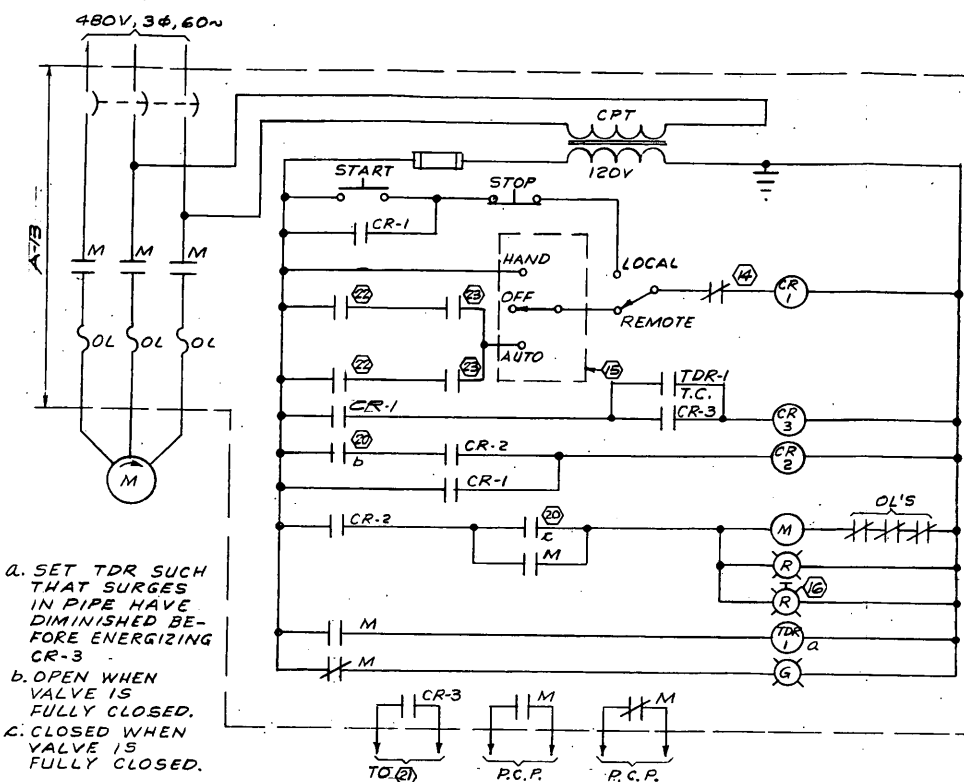


HIGH SERVICE PUMP N° 2
N.T.S.

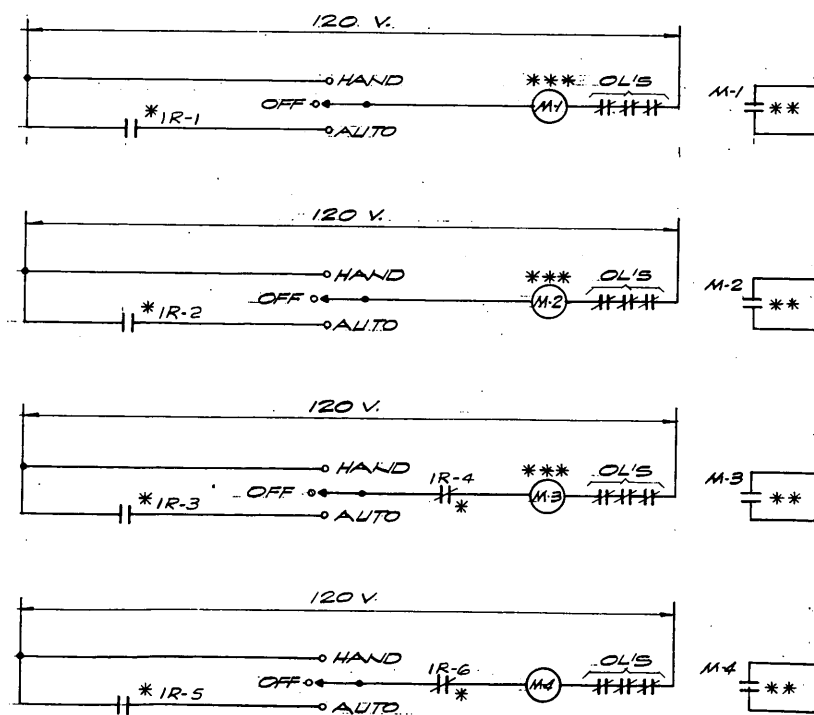


HIGH SERVICE PUMP NO. 1
N.T.S.

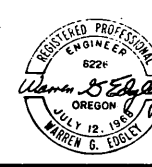
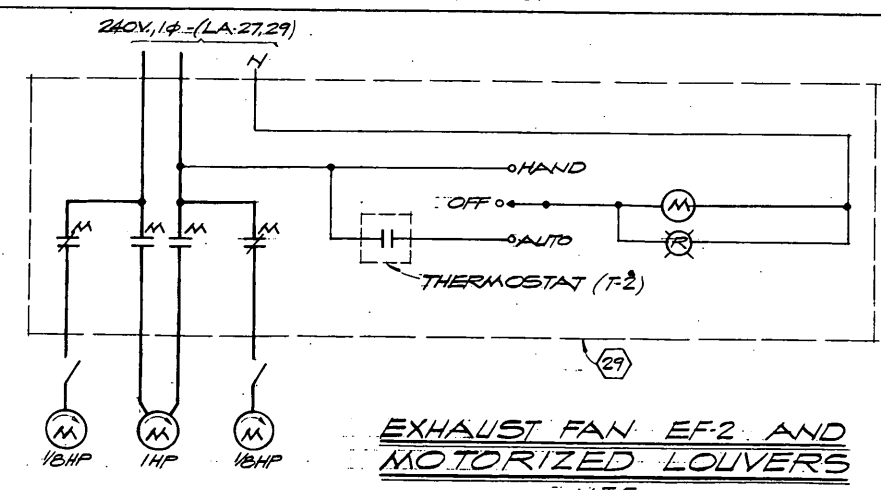
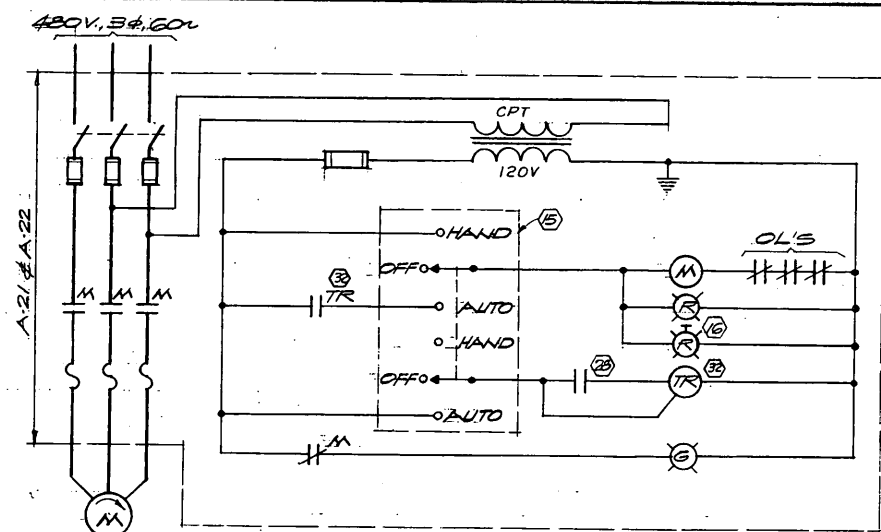
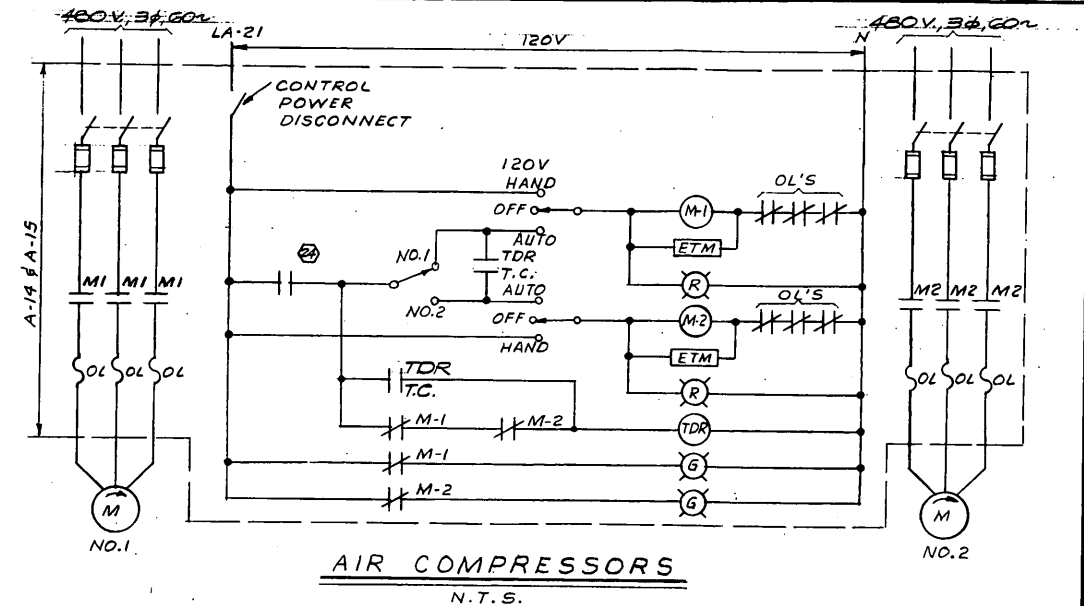
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BACKWASH PUMP
N.T.S.



WELL PUMPS N° 1, N° 2, N° 3 & N° 4
N.T.S.

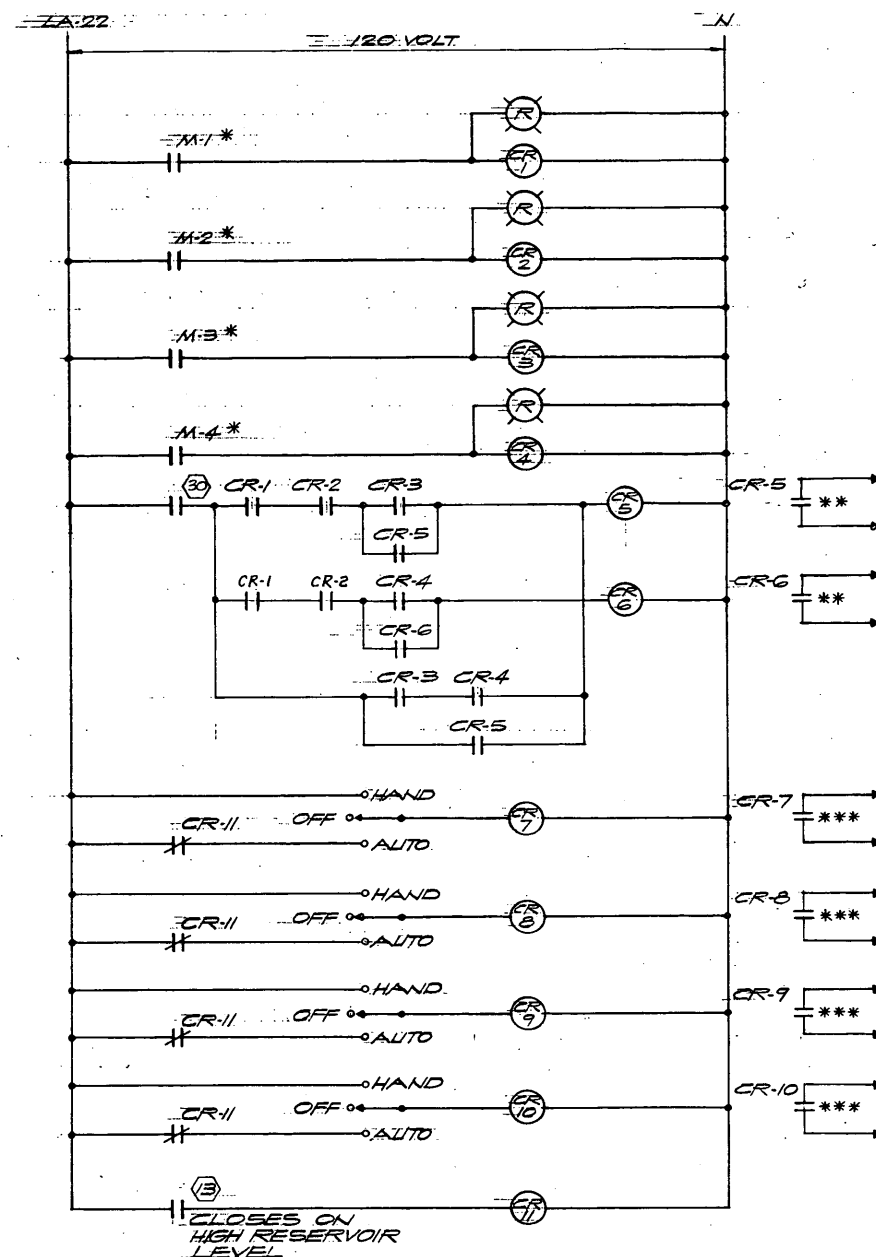
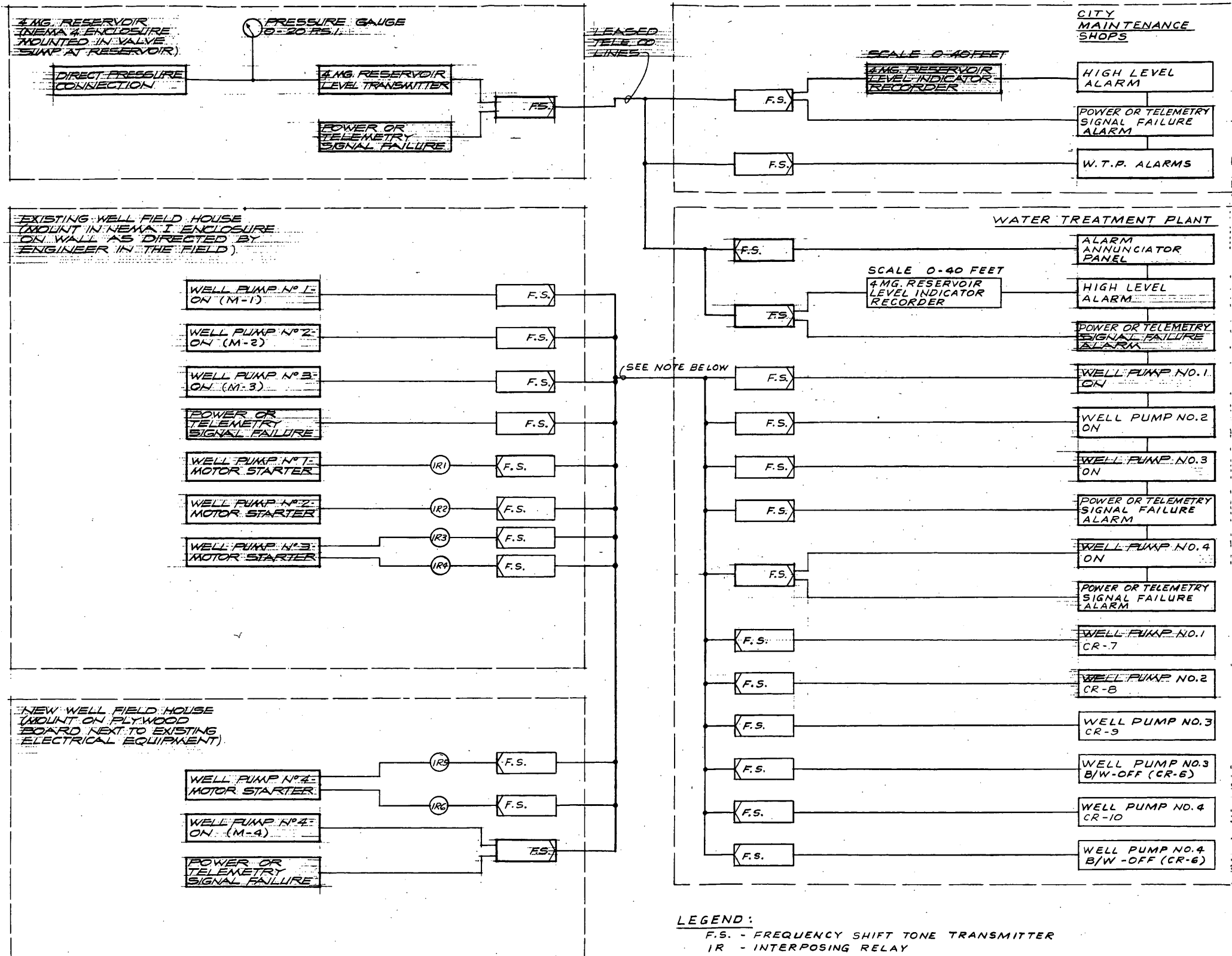


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WATER TREATMENT PLANT EXPANSION

ELECTRICAL
CONTROL DIAGRAMS

DES	RWB	SHEET	42
OR	ABC	OF	43
CK	WGE	DATE	JULY 1970
EN	C5508.1	SCALE	AS SHOWN
DWG	C 5508-1		



* REMOTE CONTACTS VIA TELEMETRY LINK.

** CONTACTS FOR REMOTE CONTROL ON PUMP MOTORS NO. 3 & NO. 4.

*** CONTACTS FOR STARTING MOTORS REMOTELY FROM WATER TREATMENT PLANT.

WELL PUMP CONTROL DIAGRAM AT WATER TREATMENT PLANT

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CITY OF NEWBERG, OREGON
WATER TREATMENT PLANT EXPANSION

ELECTRICAL
OUTPLANT SUPERVISORY CONTROL

DESIGNED BY
WGE
CHECKED BY
WGE
DATE
JULY 1970
SCALE
AS SHOWN
DWG
C 5508-1