PROJECT SPECIFICATIONS AND CONTRACT DOCUMENTS

PROJECT NO. S823040 E

67th Avenue
Lift Station & Sewer Relocation

PROJECT NO. S823042 E

55th Avenue
Lift Station & Sewer Relocation

PUBLIC WORKS/ENGINEERING DEPARTMENT

CITY OF GLENDALE

GLENDALE, ARIZONA

MAYOR

George R. Renner

COUNCILMEN

Richard Bellah
Joe A. Falbo
Bruce Heatwole
Robert L. Huffman
Quentin V. Tolby
Dillis R. Ward

CITY MANAGER

John L. Maltbie

CITY CLERK

Lavern Behm

CITY ATTORNEY

Peter Van Haren

October 3, 1984

Contract Documents
City of Glendale
Public Works/Engineering Department
Project No. S823040 E - 67th Avenue Lift Station
and Sewer Relocation
Project No. S823042 E - 55th Avenue Lift Station
and Sewer Relocation

ADDENDUM NO. 1

NOTICE TO ALL PROSPECTIVE BIDDERS:

This addendum is hereby made part of the Contract Documents in accordance with paragraph 9, Information for Bidders.

INFORMATION FOR BIDDERS:

Paragraph 12 Time of Completion: The time of completion is changed to "... two hundred and forty (240) consecutive calendar days... ".

PROPOSAL:

Page P-2 of the Proposal is revised as attached hereto.

TECHNICAL PROVISIONS:

SECTION 1A - GENERAL REQUIREMENTS:

PART 1 - GENERAL REQUIREMENTS

Revise paragraph W, add paragraph Y as follows:

W. Substitutions:

1. Materials and Equipment : Delete subparagraph (b), (1) in its entirety.

Y. Canal Crossings:

1. The construction of sanitary sewer crossing of the Arizona Canal (Project S823042 E) shall conform in all respects to SRP standard specification B-54-58 and the approved license.

SECTION 2A - EXCAVATION AND BACKFILLING:
add Part 2 - as follows.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Geotextile Fabric: Where called for material shall be Typar 3401, or equal.

SECTION 15F - FACTORY BUILT WASTEWATER LIFT STATION:

PART 2 - PRODUCTS

2.01 EQUIPMENT

F. Pump operating Control System: add paragraph 5:

5. Telemetry Equipment:

a. Equipment as specified in Section 15H, 2.01, C.

b. Alarms to be transmitted:

(1) Low air bubbler system pressure.
(2) Low wet well level.
(3) Power failure.
(4) Lag pump energized.
(5) Pump No. 1 running.
(6) Pump No. 2 running.

SECTION 15H - INSTRUMENTATION AND CONTROLS:

PART 1 - GENERAL

1.04 LINES FOR TELEMETRY:

Revise paragraph A, delete paragraph B, C & D.

A. The owner will make arrangements for leased telephone lines and installation.

PART 2 - PRODUCTS

2.01 EQUIPMENT

C. Telemetry Equipment: Revise paragraph 2, add paragraph 3 as follows:

2. Equipment: Telemetry equipment to match BIF MINI BRITE...
3. Modifications to software shall be provided to accomodate the 67th Avenue and 55th Avenue station poling sequence. The modification shall be made by exchanging prom chips at the Cholla WTP with(out) interruption to the system.

SECTION 16C - STANDBY GENERATOR:

PART 2 - PRODUCTS

2.01 MATERIALS

G. Manufacturers: Add Onan as an acceptable manufacturer.

REVISED DRAWINGS:

Project S823040 E: Revised Drawings 12/12

CITY OF GLENDALE

By: PRC ENGINEERING

Glenn DenBesten, P.E

Attachments
Proposal

Project No. S823040 E

No. S823042 E

PROPOSAL

Place _____

Date _____

Proposal of _____,

a Corporation organized and existing under the laws of the State of _____;

a partnership consisting of _____;

or an individual trading as _____.

TO THE HONORABLE MAYOR AND COUNCIL
CITY OF GLENDALE
GLENDALE, ARIZONA

Gentlemen:

the undersigned hereby proposes and agrees to furnish any and all required labor, materials, construction equipment, transportation and services for the construction of:

Project _____

_____

_____

in strict conformity with the plans and specifications for the following unit prices:

(Extension of these unit prices on the basis of estimated quantities and the totaling of these extensions are for the purpose of comparing bids only. The mathematics of such extensions and totaling will be checked and corrected by the Public Works/Engineering Department, before evaluating the bids, and the lowest of such corrected and checked totals will determine the lowest bids.)

NOTE: IN CASE OF DISCREPANCY, THE AMOUNT SHOWN IN WORDS SHALL GOVERN.

PROJECT S823040 E

Item	Description	Qty	Unit	Unit Price	Amount
1.	Built-in place sewage pump station, complete			Lump Sum	$_____
			TOTAL: Proj. S823040 E		$_____

PROJECT S823042 E

1.	10" sanitary sewer, VCP	229.0	l.f.	$_____	$_____
2.	10" sanitary sewer, VCP, conc. encased	534.3	l.f.	_____	_____
3.	Standard 4' dia. manholes	1	ea.	_____	_____
4.	Special 4' dia. drop manholes	1	ea.	_____	_____
5.	Factory built sewage pump station, complete			Lump Sum	$_____
			TOTAL: Proj. S823042 E		$_____

LUMP SUM DEDUCT

The undersigned Bidder hereby agress to accept an award of contract based on either Project, however, if awarded both Projects, the undersigned Bidder agrees to a lump sum deduction (if any) as indicated below.

TOTAL DEDUCT $_____

TOTAL: Proj. No. S823040 E,
No. S823042 E,
less deduct $_____

The undersigned hereby declares that he has visited the site(s) and has carefully examined the contract documents relating to the work covered by the above bid or bids.

Upon receipt of notice of the acceptance of this bid, we will execute the formal contract attached within ten (10) days, and will deliver a one hundred percent (100%) Performance Bond for the faithful performance of this Contract, together with a one hundred percent (100%) Payment Bond.

The bid security attached, with endorsement, in the sum of five percent (5 %) of the total bid, is to become the property of the City of Glendale, Arizona, in the event the Contract and Bonds are not executed within the time set forth, as liquidated damages for the delay and additional work caused thereby.

The undersigned has checked carefully all the above figures and understands that the City of Glendale, Arizona, will not be responisble for any errors or omissions on the part of the undersigned in making up this bid.

The undersigned understands that the Mayor and Council of the City of Glendale, Arizona, reserves the right to reject any or all bids or to waive any informalities in the bid.

Respectfully submitted,

_____
Contractor

By _____

_____

_____
(Complete business address)

Bidder shall signify receipt of all Addenda here (if any):

_____

5% PREFERENTIAL AFFIDAVIT
For Resident Bidders Only

This affidavit form is for the use of Bidders who are able to qualify under Section 34-241 of the Arizona Revised Statutes.

State of Arizona,

County of _____.

_____ being first duly sworn, upon his oath deposes and says:

That he is _____ (Title) of the _____ (Company/Corporation) _____ and that he makes this affidavit for and on behalf of the said Company/Corporation being thereunto duly authorized; that in connection with the tender of bid to furnish labor, materials, construction equipment, transportation and services, for construction of Project _____

_____

_____

_____, for the City of Glendale, Arizona.

The affiant certifies and declares that _____ (Company/Corporation)

_____ (Address)

has fully complied with the terms and provisions of the Arizona Revised Statutes, and by virtue of such compliance is entitled to the 5% preference authorized thereunder; that he makes this affidavit in order to induce the granting of the said 5% preference in connection with the hereinbefore described bid.

Signed and dated at _____, this _____ day of _____, 19 ____.

_____
Contractor

By _____

STATE OF ARIZONA)
) ss.
COUNTY OF MARICOPA)

Subscribed and sworn to by _____ before me this _____ day of _____, 19 ____.

_____
Notary Public

My commission expires: _____

PROJECT SPECIFICATIONS AND CONTRACT DOCUMENTS

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67th Avenue
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Project No. S823040 E

No. S823042 E

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NOTICE TO CONTRACTORS

Sealed bids shall be either mailed to the City of Glendale Engineering Department, 7022 North 58th Drive, Glendale, Arizona, 85301, or hand delivered to the Engineering Department office, 6402 West Glendale Avenue, Glendale, Arizona, no later than 2:30 p.m., MST, Tuesday, October 9, 1984, for furnishing all plant, material, equipment and labor, and to complete construction of: Project S823040E - One (1) built-in-place sewage pump station, standby generator and appurtenances; 67th Avenue and ACDC. Project S823042E - One (1) factory built sewage pump station, approximately 860 L.F. of 10-inch sanitary sewer and appurtenances; 55th Avenue and ACDC.

At that time, the bids will be publicly opened and read aloud in the Engineering Department conference room, 6402 West Glendale Avenue, Glendale, Arizona. Any bid received after close of bids will be returned unopened.

Plans, specifications and contract documents may be examined, and copies may be obtained at the offices of PRC ENGINEERING, INC., 4131 North 24th Street, Phoenix, Arizona 85016, 954-9191. A non-refundable charge of $ 25.00 shall be made for each set of plans and specifications issued from this office.

Each bid shall be in accordance with the plans, specifications and contract documents, and shall be made out on the Bid Form(s) included in the project specifications book; shall be accompanied by a certified or Cashier's check or bid bond for five percent (5%) of the amount of bid, made payable to the order of the City of Glendale, Arizona. All proposal guarantees, except those of the three lowest qualified bidders, will be returned immediately following the opening and checking of proposals. The proposal guarantees of the three lowest qualified bidders will be returned immediately after the contract documents have been executed.

Bids will be opened and publicly read aloud immediately after the hour of closing at the above mentioned office. Certified or Cashier's checks, or bid bond, will be given as a guarantee that the successful bidder will enter into the contract if awarded him and shall be declared forfeited as liquidated damages if said bidder refuses to enter into said contract after being requested to do so by the City of Glendale, Arizona.

The City of Glendale reserves the right to reject any or all bids or waive any informality in a bid.

The City of Glendale is an equal opportunity employer and minority business enterprises and women's business enterprises are encouraged to submit bids.

CITY OF GLENDALE, ARIZONA

By: John L. Maltbie
City Manager

Dated: September 19, 1984
Published: The Glendale Star

SPECIAL NOTICE

BIDDER'S ATTENTION IS CALLED TO THE FACT THAT NO BID IS COMPLETE WITHOUT THE RETURN OF THIS BOOK OF PROJECT SPECIFICATIONS AND CONTRACT DOCUMENTS. ADDENDA SHALL BE ATTACHED INSIDE THE FRONT COVER OF THIS BOOKLET. BIDS WILL BE RETURNED UNOPENED, IF NOT SUBMITTED PROPERLY SEALED.

BIDS SHALL BE ENCLOSED IN SEALED ENVELOPES, MARKED IN THE OUTSIDE LOWER RIGHT-HAND CORNER, INDICATING:

(1) THE BIDDER'S NAME;

(2) THE PROJECT NUMBER;

(3) THE TITLE OF THE PROJECT; AND

(4) THE TIME AND DATE THE BIDS ARE TO BE RECEIVED.

INFORMATION FOR BIDDERS

1. PROPOSAL: Bids to receive consideration shall be made in accordance with the following instructions:

Before submitting a bid, bidders shall carefully examine the plans and specifications and contract documents, visit the site of the work, fully inform themselves as to all existing conditions and limitations, and shall include sums in the bid covering the cost of each item included in the contract.

Bids shall be properly executed upon the proposal form. Numbers shall be stated both in writing and in figures, and the signatures of all persons shall be in longhand. The completed forms shall be without interlineations, alterations, or erasures. In case of a difference in written words and figures in a proposal, the amount stated in written words shall govern.

Bids shall not contain any recapitulations of the work to be done. Alternative proposals will not be considered unless called for. No oral, telegraphic, telephonic, or modified proposals will be considered.

Bids shall be delivered to the City of Glendale Engineering Department on or before the day and hour set for the opening of bids in the "NOTICE TO CONTRACTORS", as published. Bids shall be enclosed in a sealed envelope bearing the title of the work and the name of the bidder. It is the sole responsibility of the bidder to see that his bid is received in proper time. Any bids received after the scheduled closing time for receipt of bids will be returned to the bidder unopened.

2. BID SECURITY: Each proposal shall be accompanied by a certified check or bid bond acceptable to the Owner, in an amount equal at least to five percent (5 %) of the proposal payable without condition to the Owner as a guarantee that the bidder, if awarded the contract, will promptly execute such contract in accordance with the proposal and in manner and form required by the contract documents, and will furnish good and sufficient bond for the faithfuly performance of the same. The bid securities of the three (3) lowest bidders will be retained until the contract is awarded, or other disposition made thereof. The bid securities of all bidders, except the three (3) lowest, will be returned promptly after the canvass of bids.

3. WITHDRAWAL OF BID: Any bidder may withdraw his bid, either personally or by telegraphing or by written request, at any time prior to the scheduled closing time for receipt of bids.

4. LATE BIDS: Bids received after the scheduled closing time for receipt of bids, as contained in these documents, will be returned to the bidder unopened.

5. AWARD OR REJECTION OF BIDS: The contract will be awarded to the lowest and best qualified responsible bidder complying with these instructions and with the "NOTICE TO CONTRACTORS". The City of Glendale, Arizona, however, reserves the right to accept or reject any or all bids or to waive any informalities in the bid.

6. BIDDERS INTERESTED IN MORE THAN ONE BID: No person, firm or corporation shall be allowed to make, file, or be interested in more than one (1) bid for the same work unless alternate bids are called for. A person, firm, or corporation who has submitted a sub-proposal to a bidder, or who has quoted prices on materials to a bidder is not thereby disqualified from submitting a sub-proposal or quoting prices to other bidders.

7. CONTRACT, BONDS AND INSURANCE: The form of contract, which the successful bidder as Contractor will be required to execute, and the forms of bonds and insurance form which he will be required to furnish are included in the contract documents and should be carefully examined by the bidder. The contract, bonds and insurance form will be executed in four (4) original counterparts.

8. INTERPRETATION OF PLANS AND DOCUMENTS: If any person contemplating a bid for proposed contract is in doubt as to the true meaning of any part of the plans, specifications, or other proposed contract documents, or finds discrepancies in or omissions from the plans and specifications, he may submit to the Public Works/Engineering Department, a written request for an interpretation or correction thereof. The person submitting the request will be responsibile for its prompt delivery. Questions received less than ninety-six (96) hours before the bid opening time shall not be answered. Any interpretation or correction of the proposed documents will be made only by Addendum, duly issued and a copy of such Addendum will be mailed or delivered to each person receiving a set of such documents. The City of Glendale will not be responsible for any other explanations or interpretations of the proposed documents.

9. ADDENDUM: Any Addenda issued during the time of bidding, forming a part of the documents received by the bidder for the preparation of his bid, shall be covered in the bid and shall be made a part of the contract.

10. ASSIGNMENT OF CONTRACT: No assignment by the Contractor of any contract to be entered into hereunder, or any part thereof, or of funds to be received thereunder by the Contractor, will be recognized by the Owner unless such assignment has had prior approval of the Owner and the Surety has been given due notice of such assignment in writing and has consented thereto in writing.

11. PLANS AND SPECIFICATIONS TO SUCCESSFUL BIDDER: The successful bidder may obtain five (5) sets of plans and specifications for this project from the City at no cost.

12. TIME OF COMPLETION: The Contractor shall commence work under this project on or before the tenth day following receipt of the Notice to Proceed for that project from the City of Glendale and shall fully complete all work under the project within ~~[illegible]~~ 240 consecutive calendar days from and including the date of ~~receipt~~ of such notice. The Contractor shall, at all times, during the continuance of the contract, prosecute the work with such force and equipment as is sufficient to complete all work within the time specified.

13. LIQUIDATED DAMAGES: Should the Contractor fail to complete the work under this contract within the time for completion stated in the preceding paragraph under "TIME OF COMPLETION", then the Contractor shall pay the City of Glendale, Arizona, liquidated damages for each and every calendar day of delay until the work is completed or accepted, subject to the provisions of Section 108.9, Standard Specifications for Public Works Construction, Maricopa Association of Governments.

14. CITY OF GLENDALE TRANSACTION PRIVILEGE TAX: The City of Glendale transaction privilege tax shall be waived under the conditions of this contract; however, the Contractor shall be responsible for reporting and payment of all other county, state or federal taxes.

15. 5% PREFERENTIAL AFFIDAVIT: Qualifying Contractors shall complete and submit a notarized statement, to accompany the bid, that business taxes have been paid in the State of Arizona in accordance with the terms and provisions of the Preference Statute, ARS-34-241, 34-242 and 34-243. The "5% Preferential Affidavit" form is included following the Proposal for the purpose of qualification.

Contractors not completing affidavit will be presumed to not qualify for 5% preference in accordance with Statutes.

16. BASIS OF PROPOSAL: The Proposal consists of two (2) projects as follows: Project S823040 E - 67th Avenue Lift Station and Sewer Relocation

Project S823042 E - 55th Avenue Lift Station and Sewer Relocation

The proposal is based on a series of lump sum and unit prices. All work necessary for the completion of the contract, but not specifically listed as a pay item, will be considered covered under one or more of the lump sum or unit prices.

Bidders may submit proposals on one or both projects. The Owner may elect to award projects separately or in combination. Award of contract will be made on the basis of lowest total cost to the Owner.

GENERAL CONDITIONS

1. GENERAL: By Ordinance No. 1110 New Series, the City of Glendale adopted the "Uniform Standard Specifications for Public Works Construction", which are sponsored and distributed by the Maricopa Association of Governments. Copies of these documents, with revisions, are on file in the office of the Clerk of the City of Glendale, and are hereby made a part of these Contract Documents.

Whenever in the Uniform Standard Specifications, the words "The Contracting Agency" are used, the meaning shall be the City of Glendale.

In all cases where ASTM, AASHTO, AWWA, USAG, Federal, City of Phoenix, MAG Specifications, Maricopa County, Arizona State Highway, or other standard specifications are referred to, unless otherwise stated, revisions, supplements or addenda issued on or before the date of this contract, shall prevail.

In the event of any conflict between these project specifications and the requirements of the plans, detail drawings, MAG Standard Details and Specifications, these project specifications shall prevail.

2. DEFINITIONS: The following terms, as used in or pertaining to the Contract Documents, are defined as follows:

CITY: The word "City" refers to the City of Glendale, Arizona. The official representative of said City in these proceedings shall be the Principal Engineer.

CONTRACTOR: The word "Contractor" means the person, firm, or corporation with whom the Contract is made by the City.

MATERIALS: The term "Materials" includes, in addition to materials incorporated in the project, equipment and other material used and/or consumed in the performance of the work.

SUBCONTRACTOR: The word "Subcontractor" includes those having a direct contract with the Contractor and those who furnish material worked to a special design according to the plans and/or specifications for this work, but does not include those who merely furnish materials not so worked.

ENGINEER: The word "Engineer" means a person, firm, or corporation duly authorized by the City, to act for the City in staking out the work, inspecting materials and construction, and interpreting plans and specifications.

CONTRACT DOCUMENTS: The words "Contract Documents" mean the Notice to Contractors, Information for Bidders, General Conditions, Special Provisions, Proposal, Contract, Payment Bond, Performance Bond, Certificates of Insurance, Plans and Addenda thereto.

3. PERMITS: The City has obtained certain required permits which are included in the project specifications, but it will be the duty of the Contractor to determine that all the necessary permits have been obtained. The Contractor shall, at his own expense, obtain all required permits which have not been furnished by the City. A no-fee permit will be issued for work in the City of Glendale right-of-way and easement. (Also see Paragraph 14. Dust Prevention.)

4. RIGHTS-OF-WAY: The City will provide rights-of-way and easements for all work specified in this Contract, and the Contractor shall not enter or occupy with man, tools, equipment or materials any private ground outside the property of the City of Glendale, Maricopa County, Arizona, without the consent of the Owner.

5. PROPOSAL QUANTITIES: It is expressly understood and agreed by the parties hereto that the quantities of the various classes of work to be done and material to be furnished under this Contract, which have been estimated as stated in the Proposal, are only approximate and are to be used SOLELY for the purpose of comparing, on a consistent basis, the proposals offered for the work under this Contract; and the Contractor further agrees that the City will not be held responsible if any of the quantities shall be found incorrect; and the Contractor will not make any claim for damages or for loss of profits because of a difference between the quantities of the various classes of work as estimated and the work actually done. If any error, omission, or mis-statement is found to occur in the estimated quantities, the same shall not invalidate this Contract or release the Contractor from the execution and completion of the whole or any part of the work in accordance with the specifications and the plans herein mentioned, or for the prices herein agreed upon and fixed therefore, or excuse him from any of the obligations or liabilities hereunder, or entitle him to any damages or compensation except as may be provided for in this Contract.

6. PROTECTION OF FINISHED OR PARTIALLY FINISHED WORK: The Contractor shall properly guard and protect all finished or partially finished work, and shall be responsible for the same until the entire contract is completed and accepted by the City. The Contractor shall turn over the entire work in full accordance with the specifications before final settlement shall be made.

7. RESPONSIBILITY FOR DAMAGE CLAIMS: The Contractor shall indemnify and save harmless the City and its officers, agents and representatives from all suits, actions, loss, damage, expense, cost or claims of any character or nature brought on account of any injuries or damages sustained by a person or property arising out of the work done in fulfillment of the construction of the improvement under the terms of this agreement, or on account of any act or omission by the Contractor or his agents, or from any claims or amounts arising or recovered under Workmen's Compensation Laws or any other law, bylaw, ordinance, or order or decree.

8. LOSSES AND DAMAGES: All loss or damage arising out of the nature of the work to be done or from the action of the elements, or from any unforeseen circumstances in the prosecution of the same, or from any unusual obstructions or difficulties which may be encountered in and/or during the prosecution of the work, or from any casualty whatsoever of every description, shall be sustained and borne by the Contractor at his own cost and expense.

9. HINDRANCES AND DELAYS: No charge shall be made by the Contractor for hindrances or delays from any cause during the progress of the work embraced in this Contract; but such delays, if due to no fault or neglect of the Contractor, shall entitle the Contractor to an extension of time, allowed for completing the work, sufficient to compensate for the delay, the amount of the delay to be determined by the City , provided the Contractor shall give said City immediate notice in writing of the cause of such delay.

10. CHARACTER OF WORKMEN: None but skilled foremen and workmen shall be employed on work requiring special qualifications.

When required by the City , the Contractor shall discharge any person who is, in the opinion of the Engineer, disorderly, dangerous, insubordinate, incompetent, or otherwise objectionable. The Contractor shall keep the City harmless from damages or claims for compensation that may occur in the enforcement of this section of the specifications.

11. LAWS AND REGULATIONS: This Contract shall be governed by and constructed in accordance with the laws of the State of Arizona. The Contractor shall keep himself fully informed of all existing and future City and County Ordinances and Regulations and State and Federal Laws in any manner affecting the work herein specified. He shall at all times observe and comply with said Ordinances, Regulations, or Laws.

12. SUBCONTRACTS: Subcontracts shall be in accordance with, and the Contractor shall be bound by, the following provisions:

All subcontracts shall be subject to the approval of the City.

All subcontracts shall be in writing and shall provide that all work to be performed thereunder shall be performed in accordance with the terms of the Contract.

Certified copies of any and all subcontracts shall be furnished to the City Engineering Department; however, prices may be omitted.

Subcontracts shall conform to the regulations governing employment of labor.

The subcontracting of any part of the work will in no way relieve the Contractor of his responsibility under the Contract.

13. STAKING AND INSPECTION: The Public Works/Engineering Department of the City of Glendale shall be notified at least seventy-two (72) hours prior to the start of construction. Both inspection and staking shall be provided by the City. Benchmarks and survey stakes shall be preserved by the Contractor and, in case of their destruction or removal by him or his employees or agents, shall be replaced by the City at the Contractor's expense; and the Contractor and his sureties shall be liable therefore.

Staking or inspection by the City of Glendale shall not be considered as direct control of the individual workman and his work. The direct control shall be solely the responsibility of the Contractor.

14. DUST PREVENTION: The Contractor shall take whatever steps, procedures, or means required to prevent abnormal dust conditions due to his construction operations in connection with this Contract. The dust control measures shall be maintained at all times during construction of the project, to the satisfaction of the Engineer, in accordance with the requirements of the "Maricopa County Health Department Air Pollution Control Regulations" which have been adopted pursuant to the authority granted by Section 36-779, Arizona Revised Statutes.

The Contractor shall be required to obtain the necessary permit from the Maricopa County Air Pollution Control Bureau, 1845 East Roosevelt Street, (602)258-6381, extension 372.

15. EXCESS MATERIAL: Excess material shall be removed from the work site and wasted at a location approved by the Engineer. Broken concrete and asphalt may be delivered to the Glendale Sanitary Landfill located at 115th Avenue and Glendale Avenue. The prevailing regulations and fee schedule will not be waived for work under this project. All materials, to be disposed of at the landfill, shall be weighed and disposed of at the prevailing rate.

16. ELECTRIC POWER AND WATER: The Contractor shall make his own arrangements for electric power and water. Subject to the convenience of the City, he may be permitted to connect to existing facilities where available, but he shall meter and bear the cost of such power or water. Fire hydrant meters may be obtained from the City of Glendale. Installation and removal of meters should be scheduled at least twenty-four (24) hours in advance through the Public Works/Field Operations Department at 931-5561. A $325.00 deposit is required for each meter. The cost of the water is at the prevailing rate.

17. PRE-CONSTRUCTION CONFERENCE: PROGRESS SCHEDULE:

A. The Contractor shall meet with the Engineer for a pre-construction conference prior to commencing work. At this time, the Contractor shall submit a progress schedule showing the order in which he proposes to carry out the work, the dates on which he will start the several phases of the work, and the contemplated date for completion of each phase.

B. After the work is in progress, the Contractor shall submit supplementary progress schedules of the progress to date and projected to completion with each pay request submitted in accordance with Paragraph 20, "PAYMENTS TO CONTRACTOR", of these General Conditions. Schedule changes requiring an increase in the City's Engineering personnel on the project shall not be put into effect until the Engineer has made arrangements for additional personnel.

18. MAINTENANCE OF IRRIGATION FACILITIES: Where irrigation facilities interfere with construction, the Contractor shall remove and replace the affected irrigation facilities to its original condition. Final acceptance of replaced facilities will depend upon final approval of the Engineer.

19. CLEAN-UP: After all work under this Contract is completed, the Contractor shall remove all loose concrete, lumber, wire, reinforcing, debris, and other materials not incorporated in the work, from the site of the work. Clean-up shall include the removal of all excess pointing mortar materials within pipes and removal of oversize rocks and boulders left after finish grading. The Contractor shall provide for the disposal of all waste products, debris, etc., and shall make necessary arrangements for such disposal.

20. PAYMENTS TO CONTRACTOR: The measurements of quantities and the payments to the Contractor shall be in accordance with MAG Uniform Standard Specifications for Public Works Construction, Part 100 - General Conditions, Section 109 - Measurements and Payments.

Payments will be made on the basis of itemized monthly statements provided by the Contractor and shall be submitted with an updated progress schedule in accordance with the standard specifications and these General Conditions. Three (3) copies of the itemized statment should be submitted to the City Engineering Department.After verification, payments will be processed within thirty (30) days.

The City will make a partial payment to the Contractor on the basis of an estimate prepared by the Contractor, and approved by the City , for work completed through the last day of the preceding calendar month.

The City will retain ten percent (10%) of each such estimate until acceptance of the project and final payment.

Upon 100% completion and acceptance of the project, and with the request for final payment, the Contractor shall complete and submit the lien waiver form which is included in these specifications.

21. EXISTING UTILITIES: The Contractor is hereby advised that the location of all utilities, as shown on the plans, may not be complete nor exact and the Contractor shall satisfy himself as to the exact location of the utilities by contacting the utility companies before proceeding with the work. The Contractor shall be responsible for any damage done to public or private property.

Utility companies and other interested parties have been provided with construction plans and the construction schedule for this project. The Contractor shall comply with MAG Specifications 105.6 to cooperate with the utility companies.

22. ENERGIZED AERIAL ELECTRICAL POWER LINES: The utility company maintains energized aerial electrical power lines in the immediate vicinity of this project. Do not consider these lines to be insulated. Construction personnel working in proximity to these lines are exposed to an extreme hazard from electrical shock. Contractors, their employees, and all other construction personnel working on this project must be warned of the danger and instructed to take adequate protective measures, including maintaining a minimum ten (10) feet clearance between the lines and all construction equipment and personnel. (See: OSHA Std. 1926.550(a)15). As an additional safety precaution, Contractors should also be instructed to call the utility company to arrange, if possible, to have these lines de-energized or relocated when the work reaches their immediate vicinity. The cost of such temporary arrangements would be borne by the Contractor. The utility company can often respond to such requests if two days advance notice is given, but some situations may require up to sixty (60) days lead time for relocation or other arrangements.

23. SURVEY CONTROL POINTS AND MONUMENTS: Existing survey monuments indicated on the plans or found during construction shall be protected by the Contractor, and in the event removal is necessary, removal and replacement shall be performed by permission of the Engineer, under direct supervision of the Engineer or his authorized representative. Survey monuments shall be constructed to conform to the requirements of MAG Specifications, Section 405, and Standard Details.

24. APS GAS FACILITIES EXPOSED DURING CONSTRUCTION: The Contractor, upon exposing a gas line during construction, shall call Arizona Public Service, 271-7171. The APS gas patrolman will respond, usually within an hour, to inspect the line. Minor cuts or abrasions to the pipe coating will be rewrapped and tracer wire will be reconnected at no cost to the City or the Contractor.

SPECIAL CONDITIONS

1. STAKING: Construction staking will be furnished by the ENGINEER; paragraph 13 of the GENERAL CONDITION is amended accordingly.

   Staking will be provided on the following basis:

   Gravity pipeline: One (1) staking with line and grade points at each structure or appurtenance and at 100 foot intervals, with bench marks at 400 foot intervals.

   Paving: One (1) staking of base course with line and grade points for edge of course at 25 foot intervals. One (1) staking of surface course with line and grade. Points for edge of pavement at 25 foot intervals.

   Buildings and Structures: One (1) staking of base line and temporary bench mark on site.

2. INSPECTION: The ENGINEER will be the respresentative of the City for inspection services during the construction period; paragraph 13 of the GENERAL CONDITIONS is amended accordingly.

   The ENGINEER shall not be responsible for the construction means, methods, techniques, sequences or procedures, or the safety precautions and programs incident thereto, and shall not be responsible for contractor's failure to perform in accordance with the Contract Documents. The ENGINEER shall not undertake any of the responsibilities of the Contractor, Contractor's field superintendent or Subcontractors.

P R O P O S A L

Place _____

Date _____

Proposal of _____,

a Corporation organized and existing under the laws of the State of _____;

a partnership consisting of _____;

or an individual trading as _____.

TO THE HONORABLE MAYOR AND COUNCIL
CITY OF GLENDALE
GLENDALE, ARIZONA

Gentlemen:

the undersigned hereby proposes and agrees to furnish any and all required labor, materials, construction equipment, transportation and services for the construction of:

Project _____

_____

_____

in strict conformity with the plans and specifications for the following unit prices:

(Extension of these unit prices on the basis of estimated quantities and the totaling of these extensions are for the purpose of comparing bids only. The mathematics of such extensions and totaling will be checked and corrected by the Public Works/Engineering Department, before evaluating the bids, and the lowest of such corrected and checked totals will determine the lowest bids.)

NOTE: IN CASE OF DISCREPANCY, THE AMOUNT SHOWN IN WORDS SHALL GOVERN.

PROJECT S823040 E

Item	Description	Qty	Unit	Unit Price	Amount
1.	Built-in place sewage pump station, complete			Lump Sum	$_____
			TOTAL: Proj. S823040 E		$_____

PROJECT S823042 E

1.	10" sanitary sewer, VCP	229.0	l.f.	$_____	$_____
2.	8" sanitary sewer, VCP, conc. encased	534.3	l.f.	_____	_____
3.	Standard 4' dia. manholes	1	ea.	_____	_____
4.	Special 4' dia. drop manholes	1	ea.	_____	_____
5.	Factory built sewage pump station, complete	1	L.S	~~Lump Sum~~	$_____
			TOTAL: Proj. S823042 E		$_____

LUMP SUM DEDUCT

The undersigned Bidder hereby agress to accept an award of contract based on either Project, however, if awarded both Projects, the undersigned Bidder agrees to a lump sum deduction (if any) as indicated below.

~~Project S823040 E~~ $_____

~~Project S823042 E~~ $_____

TOTAL DEDUCT $_____

Total of Projects S823040E + S823042E if both are awarded to the same Contractor under one Contract $_____

The undersigned hereby declares that he has visited the site(s) and has carefully examined the contract documents relating to the work covered by the above bid or bids.

Upon receipt of notice of the acceptance of this bid, we will execute the formal contract attached within ten (10) days, and will deliver a one hundred percent (100%) Performance Bond for the faithful performance of this Contract, together with a one hundred percent (100%) Payment Bond.

The bid security attached, with endorsement, in the sum of five percent (5 %) of the total bid, is to become the property of the City of Glendale, Arizona, in the event the Contract and Bonds are not executed within the time set forth, as liquidated damages for the delay and additional work caused thereby.

The undersigned has checked carefully all the above figures and understands that the City of Glendale, Arizona, will not be responisble for any errors or omissions on the part of the undersigned in making up this bid.

The undersigned understands that the Mayor and Council of the City of Glendale, Arizona, reserves the right to reject any or all bids or to waive any informalities in the bid.

Respectfully submitted,

_____
Contractor

By _____

_____

_____
(Complete business address)

Bidder shall signify receipt of all Addenda here (if any):

_____

5% PREFERENTIAL AFFIDAVIT
For Resident Bidders Only

This affidavit form is for the use of Bidders who are able to qualify under Section 34-241 of the Arizona Revised Statutes.

State of Arizona,

County of _____.

_____ being first duly sworn, upon his oath deposes and says:

That he is _____ of the _____
(Title) (Company/Corporation)

_____ and that he makes this affidavit for and on behalf of the said Company/Corporation being thereunto duly authorized; that in connection with the tender of bid to furnish labor, materials, construction equipment, transportation and services, for construction of Project _____

_____

_____

_____, for the City of Glendale, Arizona.

The affiant certifies and declares that _____
(Company/Corporation)

_____
(Address)
has fully complied with the terms and provisions of the Arizona Revised Statutes, and by virtue of such compliance is entitled to the 5% preference authorized thereunder; that he makes this affidavit in order to induce the granting of the said 5% preference in connection with the hereinbefore described bid.

Signed and dated at _____, this _____ day of _____, 19 ____.

_____
Contractor

By _____

STATE OF ARIZONA)
) ss.
COUNTY OF MARICOPA)

Subscribed and sworn to by _____ before me this _____ day of _____, 19 ____.

_____
Notary Public

My commission expires: _____

BID BOND
(Surety Bond)

KNOW ALL MEN BY THESE PRESENTS:

That we, _____

as Principal, (hereinafter called the Principal), and the _____

_____, a corporation duly organized under the laws of the State of _____, as Surety, (hereinafter called the Surety), are held and firmly bound unto the City of Glendale, a municipal corporation as Obligee, in the sum of five percent (5 %) of the total amount of the bid of Principal, submitted by him to the Mayor and Council of the City of Glendale, for the work described below, for the payment of which sum, well and truly to be made, the said Principal and the said Surety, bind ourselves, our heirs, executors, and administrators, successors and assigns, jointly and severally, firmly by these presents, and in conformance with A.R.S. 34-201.

WHEREAS, the said Principal is herewith submitting its proposal for

PROJECT _____

_____

NOW, THEREFORE, if the City of Glendale shall accept the proposal of the Principal and the Principal shall enter into a contract with the City of Glendale, in accordance with the terms of such proposal and give such Bonds and Certificates of Insurance as specified in the Standard Specifications with good and sufficient Surety for the faithful performance of such contract and for the prompt payment of labor and material furnished in the prosecution thereof, or in the event of the failure of the Principal to enter into such contract and give such Bond and Certificates of Insurance, if the Principal shall pay to the City of Glendale the sum of money set forth above as liquidated damages for failure of the Principal to enter into the contract, then this obligation shall be null and void, otherwise to remain in full force and effect.

Signed and sealed this _____ day of _____, A.D., 19____

_____
Principal

_____
Title

Witness:

_____

_____
Surety

_____
Title

Witness:

_____

C O N T R A C T

THIS AGREEMENT, made and entered into this _____ day of _____, 19____, by and between the City of Glendale, Arizona, a municipal corporation, organized and existing under and by virtue of the laws of the State of Arizona, party of the first part, hereinafter designated the Owner, and _____

_____,

of the City of _____, County of _____,

and State of _____, party of the second part, hereinafter designated the Contractor.

WITNESSETH: That the said Contractor has covenanted, and agreed, for and in consideration of the payments made as provided for in the proposal and specifications, to the Contractor by the said Owner, and under the penalty expressed in the bond hereto attached, at his proper cost and expense to do all the work and furnish all materials, tools, labor, and all appliances and appurtenances called for by the Agreement, free from all claims, liens and charges whatsoever, in the manner, and under the conditions hereinafter specified, that are necessary for the construction of:

PROJECT _____

_____

_____

The work done and materials and equipment furnished shall be strictly pursuant to and in conformity with the specifications and plans. The specifications and drawings furnished by the Contractor with his proposal and the additional drawings or prints and other information to be furnished by the Contractor in accordance with the specifications are made a part of this Agreement when and as approved by the City of Glendale, Arizona are intended to be complementary and all specifications, plans, drawings, or prints furnished by the Contractor and approved by the City of Glendale shall be complementary therewith. Any work appearing in or upon the one and not mentioned in the others shall be executed according to the true intent and meaning of the said specifications and plans, drawings, or prints the same as though the said work were contained and described in all.

The Notice to Contractors, Information for Bidders, Special and Technical Provisions, Proposal, Bid Bond, Payment Bond, Performance Bond, Appendix, Plans and Addenda thereto, are hereby understood to be a part of this Contract.

It is further covenanted and agreed that the work shall be executed under the direction and supervision of the City of Glendale, Arizona, or its properly authorized agents, on whose inspection all work shall be accepted or rejected.

The City shall have full power to reject or condemn all materials furnished or work performed under this contract which do not conform to the terms and conditions herein expressed.

To prevent all disputes and litigation, it is further agreed by and between the said City of Glendale, Arizona, and said Contractor, that the Public Works/ Engineering Department, City of Glendale, shall determine all questions in relation to the work and the construction thereof, and it shall in all cases decide all questions which may arise relative to the execution of the work under this contract on the part of the said Contractor and its estimates and decisions shall be final and conclusive; and such estimates and decisions, in case any question may arise, shall be a condition precedent to the right of said Contractor to receive any money or compensation for anything done or furnished under this contract.

IN WITNESS WHEREOF, ( ) identical counterparts of this contract, each of which shall for all purposes be deemed an original thereof, have been duly executed by the parties hereinabove named, on the date and year first herein written.

ATTEST:

CITY OF GLENDALE, ARIZONA
PARTY OF THE FIRST PART (OWNER)

(SEAL)

_____ _____

City Clerk

_____

Title

APPROVED: (AS TO FORM)

_____

City Attorney

WITNESSES:

_____

PARTY OF THE SECOND PART (CONTRACTOR)

_____ _____

_____ _____

Title

No. S823042 E

STATUTORY PERFORMANCE BOND PURSUANT TO TITLE 34, CHAPTER 2, ARTICLE 2, OF THE ARIZONA REVISED STATUTES
(Penalty of this bond must be 100% of the Contract Amount)

KNOW ALL MEN BY THESE PRESENTS:

That, _____

(hereinafter called the Principal), as Principal, and _____

_____, a corporation organized and existing under the laws of the State of _____ with its principal office in the City of _____, (hereinafter called the Surety), as Surety, are held and firmly bound unto the City of Glendale, a municipal corporation, (hereinafter called the Obligee), in the amount of _____

_____ Dollars ($_____), for the payment whereof; the said Principal and Surety bind themselves, and their heirs, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, The Principal has entered into a certain written contract with the Obligee, dated the _____ day of _____, 19____, to construct _____

_____

which contract is hereby referred to and made a part hereof as fully and to the same extent as if copied at length herein.

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION IS SUCH, that if said Principal shall faithfully perform and fulfill all the undertakings, covenants, terms, conditions and agreements of said contract during the original term of said contract and any extension thereof, with or without notice to the Surety, and during the life of any guaranty required under the contract and shall also perform and fulfill all the undertakings, covenants, terms, conditions, and agreements of any and all duly authorized modifications of said contract that may hereafter be made, notice of which modifications to

the Surety being hereby waived; then the above obligation shall be void, otherwise to remain in full force and effect.

PROVIDED, HOWEVER, that this bond is executed pursuant to the provisions of Title 34, Chapter 2, Article 2, of the Arizona Revised Statutes, and all liabilities on this bond shall be determined in accordance with the provisions of said Title, Chapter, and Article, to the extent as if it were copied at length herein.

The prevailing party or any party which recovers judgment on this bond shall be entitled to such reasonable attorney's fees as may be fixed by the Court or a judge thereof.

Withness our hands this _____ day of _____, 19_____

_____
Principal Seal

By: _____

_____
Surety Seal

By: _____

_____
Agency of Record

_____
Agency Address

No. S823042 E

STATUTORY PAYMENT BOND PURSUANT TO TITLE 34,
CHAPTER 2, ARTICLE 2, OF THE ARIZONA REVISED STATUTES
(Penalty of this bond must be 100% of the Contract Amount)

KNOW ALL MEN BY THESE PRESENTS:

That, _____

(hereinafter called the Principal), as Principal, and _____

_____, a corporation organized and existing under the laws of the State of _____ with its principal office in the City of _____, (hereinafter called the Surety), as Surety, are held and firmly bound unto the City of Glendale, a municipal corporation, (hereinafter called the Obligee) in the amount of _____

_____ Dollars ($_____), for the payment whereof; the said Principal and Surety bind themselves, and their heirs, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, The Principal has entered into a certain written contract with the Obligee, dated the _____ day of _____, 19____, to construct _____

_____

which contract is hereby referred to and made a part hereof as fully and to the same extent as if copied at length herein.

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION IS SUCH, that if the said Principal shall promptly pay all monies due to all persons supplying labor or materials to him or his sub-contractors in the prosecution of the work provided for in said Contract, then this obligation shall be void, otherwise to remain in full force and effect.

PROVIDED, HOWEVER, that this bond having been required of the said Principal in order to comply with the provisions of Title 34, Chapter 2, Article 2, of the Arizona Revised Statutes, all rights and remedies on this

bond shall inure solely to such persons and shall be determined in accordance with the provisions, conditions, and limitations of said Title, Chapter and Article, to the same extent as if they were copied at length herein.

The prevailing party or any party which recovers judgment on this bond shall be entitled to such reasonable attorney's fees as may be fixed by the court or a judge thereof.

Witness our hands this _____ day of _____, 19____

_____
Principal Seal

By: _____

_____
Surety Seal

By: _____

_____
Agency of Record

_____
Agency Address

Project No. S823040 E CI-1

No. S823042 E

CITY OF GLENDALE, ARIZONA
PUBLIC WORKS/ENGINEERING DEPARTMENT
CERTIFICATE OF INSURANCE

The _____
certifies that the following insurance policies have been issued on behalf of
Name of Insured _____
Address of Insured _____
Name and address of Additional Named Insured:
City of Glendale, Arizona
7022 North 58th Drive
Glendale, Arizona 85301

Flood Control District of Maricopa County
3335 West Durango
Phoenix, Arizona 85009

Type of Insurance	Policy No.	Eff. Date	Exp. Date	Limits of Liability
(1) Workmen's Compenstation				Statutory
(2) Contractor(s) Protective Bodily Injury				1,000,000 ea. occur.
(2) Contractor(s) Protective Property Damage				1,000,000 ea. accid. 1,000,000 aggregate
(3) Contractual Bodily Injury				1,000,000 ea. occur.
(3) Contractual Property Damage				1,000,000 ea. accid. 1,000,000 aggregate
(4) Automobile Bodily Injury and Property Damage				1,000,000 ea. occur.

When the project includes construction of a new, or modification of an existing building (in addition to the above types):
(5) Fire and Extended Coverage plus Vandalism and Malicious Mischief - for the Full Amount of the Contract.

Policy No.	Eff. Date	Exp. Date

Policy Includes Coverage For:
(1) a. Damage caused by blasting.
b. Damage caused by collapse or structural injury.
c. Damage to underground utilities.
(2) Liability assumed in construction agreements and other types of contracts or agreements in effect in connection with insured operations.
(3) All owned, hired or non-owned automotive equipment used in connection with the insured operation.

Project No. S823040 E

No. S823042 E

It is agreed that none of these policies will be cancelled or changed so as to affect this certificate until ten (10) days written notice of such cancellation or change has been delivered to the City of Glendale.

It is further agreed that:

These policies shall not expire until all work has been completed and the project has been accepted by the City of Glendale. If a policy does expire during the life of the Contract, a renewal Certificate of the required coverage must be sent to the City of Glendale not less than five (5) days prior to expiration date.) The Contractor hereby agrees to indemnify and save harmless the City of Glendale and any jurisdiction or agency issuing permits for any work included in the project, their officers, agents and representatives from all suits, actions, loss, damage, expense, cost, or claims of any character or any nature brought on account of any injuries sustained by any person or property arising out of the work done in fulfillment of the construction of the improvement under the terms of this agreement, or on account of any act or omission by the Contractor or his agents, or from any claims or amounts arising or recovered under Workmen's Compensation laws or any other law, by-law, ordinance, or order or decree.

This Certificate is not valid unless countersigned by an authorized representative of the Insurance Company.

Countersigned by

_____

Date:

_____

_____

Signature

Project No. S 823040 E LW-1

No. S 823042 E

CITY OF GLENDALE, ARIZONA
PUBLIC WORKS/ENGINEERING DEPARTMENT

CONTRACTOR'S AFFIDAVIT
REGARDING
SETTLEMENT OF CLAIMS

PROJECT _____

_____

To the City of Glendale, Arizona

Gentlemen:

This is to certify that all lawful claims for materials, rental of equipment and labor used in connection with the construction of the above project, whether by subcontractor or claimant in person, have been duly discharged.

The undersigned, for the consideration of $_____, as set out in the final pay estimate, as full and complete payment under the terms of the contract, hereby waives and relinquishes any and all further claims or right of lien under, in connection with, or as a result of the above described project. The undersigned further agrees to indemnify and save harmless the City of Glendale against any and all liens, claims of liens, suits, actions, damages, charges and expenses whatsoever, which said City may suffer arising out of the failure of the undersigned to pay for all labor performance and materials furnished for the performance of said installation.

Signed and dated at _____, this _____

day of _____, 19_____.

_____
Contractor

By _____

STATE OF ARIZONA)
) ss.
COUNTY OF MARICOPA)

The foregoing instrument was subscribed and sworn to before me this _____

day of _____, 19_____.

_____
Notary Public

My Commission Expires _____

SECTION 1A - GENERAL REQUIREMENTS

PART 1 - GENERAL REQUIREMENTS

A. DESCRIPTION OF WORK

1. Furnishing of all plant, labor, equipment and materials for construction of:

   (a) Built-in place raw sewage pump station and appurtenances on 67th Avenue (Project S823042E).

   (b) Sanitary sewer, factory-built, raw sewage pump station and appurtenances on 55th Avenue (Project S823042E).

B. WORK BY OTHERS

1. Upstream and downstream sanitary sewers to the nearest influent and receiving manholes for the 67th Avenue project is currently under construction; plans for this work are included in the drawings for informational purposes. In addition, that work includes a temporary pumping station to be maintained by others until completion of the work under this contract.

C. STANDARD SPECIFICATIONS

1. Where standard specifications and/or details are referenced, reference is to the M.A.G. Uniform Standard Specifications and/or Details for Public Works Construction.

   By Ordinance No. 1110 New Series, the City of Glendale adopted the "Uniform Standard Specifications for Public Works Construction", which are sponsored and distributed by the Maricopa Association of Governments. Copies of these documents, with revisions, are on file in the office of the Clerk of the City of Glendale, and are hereby made a part of these Contract Documents.

   Whenever in the Uniform Standard Specifications the words "The Contracting Agency" are used, the meaning shall be the City of Glendale, Arizona.

   In all cases where ASTM, AASHTO, AWWA, USAS, Federal MAG, MAG Specifications, Maricopa County, Arizona State Highway, or other standard specifications are referred to, unless otherwise stated, revisions, supplements or aggenda issued on or before the date of this contract, shall prevail.

   In the event of any conflict between these project specifications and the requirements of the plans, detail drawings, MAG Standard Details and Specifications, these project specifications shall govern.

D. PRECEDENCE OF CONTRACT DOCUMENTS

1. In the event of conflict between contract documents, the document highest in precedence shall control. The order of precedence shall be:

(1) Permits from other agencies as may be required by law.
(2) Technical Provisions
(3) Special Provisions
(4) General Conditions
(5) Plans
(6) Uniform Standard Specifications (MAG)
(7) Reference Specifications or Standards

E. SCHEDULE

1. Within 10 calendar days after receipt of notification to proceed with the contract, the General Contractor shall submit to the Engineer for his approval six copies of a construction Progress Schedule.

The construction Progress Schedule shall show a sequence of operations agreeable to all parties; be prepared as a Bar Chart for planning, control and scheduling of submittals and work performed; and indicating completion of construction work within the agreed Contract Time.

F. BREAKDOWN OF CONTRACT PRICE

1. The successful Contractor (after award of contract) shall complete the form "Breakdown of Contract Price", included in this section for the 67th Avenue sewage pump station (Project S823040E). The approved breakdown will be used as a basis of progress payments.

Also Breakdown on S823042E
to repeat deduct, if necessary!

G. SUBMITTALS

1. The Contractor shall submit seven (7) copies of all required shop drawings, samples, product data or certifications to the Engineer for approval; the contractor shall review and approve prior to submission. The Engineer will return within seven (7) days after receipt.

2. Shop drawings shall include detail design calculations, dimensional data, operating characteristics, material type and thickness, wiring diagrams and controls and other relavent data.

3. Samples shall be physical examples to illustrate materials, equipment or workmanship, and to establish standards of quality.

H. OPERATION AND MAINTENANCE INSTRUCTIONS

1. The Contractor shall furnish to the Engineer five (5) identical sets of technical manuals. Each set shall consist of 1 or more volumes, each of which shall be bound in a standard size, 3-ring, looseleaf, vinyl plastic hard cover binder suitable for bookshelf storage.

2. The technical manuals shall include for each item of mechanical and electrical equipment.

   (a) Complete operating instructions, including location of controls, special tools or other equipment required, related instrumentation, and other equipment needed for operation.

   (b) Lubrication schedules

   (c) Preventative maintenance procedures and schedules.

   (d) Recommended spare parts lists

   (e) Parts lists, by generic title and identification number, complete with exploded views of each assembly.

   (f) Disassembly and reassembly instruction.

   (g) Name and location of nearest supplier and spare parts warehouse.

   (h) Recommended troubleshooting and start-up procedures.

   (i) Reproducible prints of the as-built diagrams, schematics, and installation drawings required under the electrical and instrumentation portions of these specifications. Schematics shall include test points shown with voltage and/or current levels identified.

I. START UP

1. GENERAL. The Contractor shall place the newly installed lift station equipment and facilities into operation and test, observe and adjust all items for a minimum period of one month or until such time as all the units are properly adjusted.

After the lift station has been put into operation, the Contractor, Engineer and Plant Operator shall go over in detail the standard operating procedures of the lift station. The work performed by the Contractor shall include, but not be limited to, the following items:

(a) Marking Valves. Each valve shall be labeled with a steel nameplate attached to the valve or valve box. Yard valves shall have the valve number painted on the lid of the valve pit. For valve numbers, see the valve schedule in the drawings.

(b) Labeling switches.

(c) Delivery of operation and maintenance instructions. (See Paragraph H of this section)

(d) Testing of pumps for proper operation and verifying capacity.

(e) Running cleaning pigs through all pipe lines so designated.

(f) Checking all electrical, electronic and remotely controlled equipment for proper operation.

(g) Making all equipment adjustments required.

2. OPERATOR TRAINING. The Contractor shall provide factory trained manufacturers' representatives to train the Owner's personnel in operation and maintenance procedures for equipment items specified below during the start-up period at no additional cost to the Owner. The representatives shall present training programs and on-site demonstrations designed to fully acquaint plant personnel with all equipment features, routine scheduled maintenance procedures, alternative operational modes, emergency procedures, spare parts inventories, and all other pertinent information. In addition, the manufacturers' representatives shall remain on-site to observe operation of the equipment and further advise plant personnel for a minimum number of days as specified below:

Equipment Item	Minimum Required Startup Time On-Site (days)
Pumps	2
Hoisting Equipment	1
Factory-Built Lift Station	As Specified, Section 15F
Generator	As Specified, Section 16C

J. TEMPORARY STORAGE

1. Provide suitable weathertight storage for all materials which would be damaged if stored in the open.

2. Submit a complete description of all proposed temporary structures.

K. TEMPORARY ELECTRICAL SERVICE

1. Make arrangements for the provision of a 480 volt, 3-phase, 60 Hz. temporary electrical service at the site, of capacity required for construction purposes, temporary lighting and testing, and pay all costs in connection therewith. Provide transformers and separate metering as required.

2. Provide power distribution as required throughout the project including 480/3/60, 3 wire and 120/240/1/60, 3 wire. Termination of power distribution for each voltage shall be in convenient locations. Provide at each termination, circuit breakers, disconnect switches, and other electrical devices as required to protect the power supply system.

3. All temporary equipment and wiring for power and lighting shall be in accordance with the applicable provisions of governing codes. Temporary wiring shall be maintained in a safe condition and shall be utilized so as not to create a hazard to persons or property.

4. Install and maintain a temporary lighting system as required to satisfy minimum requirements of safety and security.

5. When permanent electrical power and lighting systems are in operating condition, they may be used for temporary power and lighting for construction purposes, provided that the Contractor (1) obtains the approval of the Engineer, (2) assumes full responsibility for the power and lighting systems, and (3) pays all costs for operation and restoration of the system and for all electrical current consumed.

6. On completion of construction work, or at such time as the Contractor makes use of the permanent electrical power and lighting systems for construction purposes, all temporary wiring, lighting, and temporary electrical equipment and devices shall be removed.

L. TEMPORARY HEATING AND VENTILATION

1. Maintain the temperature in areas where work is in progress at no less than 50 degress F.

2. Provide all temporary heating and weathertight enclosures to protect the work from damage by freezing or frost. Ensure that areas where plumbing is installed or maintained at a temperature which will prevent freezing.

3. Temporary heaters shall be closed type, and shall have products of combusion ducted to the open air.

4. Unit heaters which are installed as part of the permanent heating system may be used for temporary heating during construction, provided the Contractor (1) obtains approval of the Engineer, (2) assumes full responsibility for the entire heating system, and pays all costs for operation, maintenance and restoration of the system and for fuel consumed.

5. Upon conclusion of temporary heating requirements, remove all temporary piping, temporary heating units, and other equipment, and repair all damage caused by installation and removal of the temporary heating system.

6. Clean and recondition all permanent heating units which were used for temporary heating.

7. Provide adequate temporary ventilation within the building during construction. Permanent ventilation systems may be used for temporary ventilation during construction, providing the Contractor (1) obtains the approval of the Engineer, (2) assumes full responsibility for the entire ventilation system, and (3) pays all costs for operation, maintenance, and restoration of the system and for all electrical current consumed.

M. TEMPORARY LADDERS, RAMPS, RUNWAYS, HOISTS

1. Provide all temporary ladders, ramps, runways and hoists required for the performance of the work.

2. Hoists shall be provided by the General Contractor for normal use of all trades. Employ skilled operators only for operating the hoists.

N. FIRE PROTECTION

1. Construction practices, including cutting and welding, and protection during construction shall be in accordance with the published standards of the Factory Insurance Association and the National Fire Protection Association, which, by reference, are made a part of these specifications.

2. Provide a suitable number of portable fire extinguishers (non-freeze type in cold weather) distributed about the project.

3. Store gasoline and other flammable liquids in U.L. listed safety containers in a location away from the building. Distribute the liquids directly from the containers.

4. Tarpaulins used for any purpose during construction shall be made from material resistant to fire, water, and weather, shall comply with Federal Specification CCC-D-746, and shall have U.L. approval.

5. The use of salamanders or other open flame fires is forbidden in and around the project.

O. PROTECTIVE COVERINGS

1. Protect all finished surfaces, including the heads, jambs, thresholds, and soffits of all openings used as passageways or through which materials are handled, against damage resulting from construction work.

2. Provide temporary doors for door openings during construction. Do not install permanent doors until all construction work, except finishes, is complete, unless written approval of the Engineer for earlier installation is obtained.

3. All finished surfaces, both factory-finished and job-finished, shall be clean and undamaged at time of handing over the building to the owner. Re-finish all marred or damaged surfaces before hand-over date.

4. Cover all finished floor surfaces in traffic areas, and where so directed by the Engineer, with reinforced, non-staining draft building paper. Provide plywood or planking over the draft paper when material or equipment is being moved and when any subsequent work in such areas is being performed. Provide wood sheathing or plywood under materials stored on finished concrete surfaces. All vehicles used in finished areas shall be rubber tired.

5. Do not allow traffic or storage of materials on finished roofs. If any work must be performed on finished roof surfaces, provide adequate protection.

P. SITE PROTECTION

1. Provide protection of the premises against unauthorized intrusion and damage due to fire, wind, rain, and other causes.

2. Provide sufficient watchmen as necessary for proper protection of the work and premises at all times.

3. Provide temporary closers on all openings in exterior walls to prevent access by unauthorized persons during the night and other non-working hours.

Q. ACCESS TO WORK

1. The Contractor shall permit access to the work, whenever it is in preparation or progress, to representatives of the City of Glendale, the State of Arizona and Maricopa County, and shall provide proper facilities for such access and inspection.

R. GUARANTEES

1. Repairs or replacements made under the guarantee shall bear an additional twelve (12) months guarantee dated from the acceptance of repair or replacement.

S. PROTECTION

1. Keep pipes and duct openings closed by caps or plugs to prevent entrance of foreign matter and cover all fixtures and equipment to protect them against dirt, water and other damage. Any damaged fixtures shall be restored to its original condition or replaced.

T. ACCIDENTS

1. The Contractor shall provide at the site, and make available to all workmen, medical supplies and equipment necessary to supply first aid services.

2. The Contractor must promptly report in writing to the Engineer all accidents whatsoever arising out of, or in connection with, the performance of the work, whether on or off the site, which caused death, personal injury or property damage, giving full details and statements of witnesses. In addition, if death or serious damages are caused, the accident shall be reported immediately by telephone or messenger. If any claim is made by anyone against the Contractor or any Subcontractor on account of any accident, the Contractor shall promptly report the facts in writing to the Engineer, giving full details of the claim.

U. CLEANING UP

1. The premises and the job site shall be maintained in a reasonably neat and orderly condition and kept free from accumulations of waste materials and rubbish during the entire construction period.

2. The Contractor shall be responsible for the general maintenance of the premises and the job site and for the coordination of the cleanup work of all trades. The Contractor shall require that each trade clean and maintain its portion of the work as required and as directed by the Contractor. If the premises and job site are not maintained properly, the Owner may have any accumulations of waste materials or trash removed and charge the cost to the Contractor as the Engineer shall determine to be just.

3. All areas of the building in which painting and finishing work is to be performed shall be cleaned throughout just prior to the start of this work, and these areas shall be maintained in satisfactory condition for painting and finishing as directed by the Engineer. This cleaning shall include the removal of trash and rubbish; vacuum cleaning of floors; and removal of any plaster, mortar, dust and other extraneous materials from and vacuum cleaning of all finish surfaces; including but not limited to all exposed structural steel, miscellaneous metal, woodwork, plaster, masonry, concrete, mechanical and electrical equipment, piping, duct work, conduit and also all surfaces visible after all permanent fixtures, covers for radiation, grilles, registers and other such devices are in place.

4. In addition to the cleaning specified above, the building shall be prepared for final inspection by washing, or cleaning by other approved methods, all surfaces on which dirt or dust has collected and by washing all glass on both sides. All equipment shall be new in an undamaged, clean, polished condition. Recleaning will not be required after the work has been inspected and accepted unless later operations of the Contractor, make recleaning necessary.

V. CONNECTIONS TO FORCE LINES AND GRAVITY SEWERS

1. Following acceptable testing of the piping at Lift Stations, Contractor shall make the connections to the proposed manholes proposed and installed by others or under this contract at the site, as shown on the drawings. Contractor will provide all adapters necessary for the connections.

W. SUBSTITUTIONS

1. Materials and Equipment:

(a) Where materials or equipment are identified in the specifications by manufacturer's name or catalog number, bids shall be based on one of the manufacturers so listed in the specifications or added thereto by addendum during the bidding period.

(b) During the bidding period, the Engineer will give full consideration to requests for substitutions, and if approved, will issue addenda to incorporate the approved materials or equipment into the Contract Documents.

(1) Requests for substitutions must be received by the Engineer not later than ten (10) calendar days before bid due date to ensure that any necessary addendum is received by all prospective bidders before submission of bids.

Delete
See Add #1

(c) After award of contract, requests for substitutions will be considered only for one of the following reasons:

(1) Increased value to Owner
(2) Decreased cost to Owner
(3) Specified item not available

Requests for substitutions shall be submitted on the form attached hereto.

(d) All requests for substitutions shall be accompanied by manufacturer's data or other description of the proposed substitute.

Add Y. Canal Crossings:
SRP Lic. See Add #1.

BREAKDOWN OF CONTRACT PRICE
FOR
PROJECT S823040E

Section Code	Item of Work/ Supplier	Material	Equipment & Labor	Total
GC	General Conditions	$_____	$_____	$_____
1A	General Requirements	$_____	$_____	$_____
2A	Excavating and Backfilling	$_____	$_____	$_____
2B	Bituminous Paving	$_____	$_____	$_____
2C	Concrete Walkways	$_____	$_____	$_____
2E	Landscaping	$_____	$_____	$_____
2F	Utilities	$_____	$_____	$_____
3A	Cast-In-Place Concrete	$_____	$_____	$_____
3B	Precast Concrete	$_____	$_____	$_____
3C	Concrete Deck Planks	$_____	$_____	$_____
4A	Miscellaneous Metal	$_____	$_____	$_____
5A	Miscellaneous Metal:			
	- Stairs & Handrails	$_____	$_____	$_____
	- Wet Wall Hatches	$_____	$_____	$_____
	- Trash Basket Assembly	$_____	$_____	$_____
	- Crane Rail	$_____	$_____	$_____
	- Floor Hatches	$_____	$_____	$_____
6A	Rough Carpentry	$_____	$_____	$_____
7A	Membrane Roofing Roof Insulation	$_____	$_____	$_____
7B	Metal Flashing	$_____	$_____	$_____
7C	Caulking & Sealing	$_____	$_____	$_____
8A	Hollow Metal Doors & Frames & Finish Hardware	$_____	$_____	$_____
9A	Painting	$_____	$_____	$_____

BREAKDOWN OF CONTRACT PRICE (cont.)
FOR
PROJECT S823040E

Section Code	Item of Work/ Supplier	Material	Equipment & Labor	Total
14A	Cranes & Hoists:			
	- Electric Crane	$_____	$_____	$_____
	- Crane Rail Trolley	$_____	$_____	$_____
	- Chain Fall	$_____	$_____	$_____
15A	Mech. General Prov.	$_____	$_____	$_____
15B	Process Equipment:			
	- Raw Sewage Pumps, Shafting and Seals	$_____	$_____	$_____
	- NPW Equipment	$_____	$_____	$_____
	- Sump Pumps	$_____	$_____	$_____
	- Site Structures	$_____	$_____	$_____
	- All other Process Equipment	$_____	$_____	$_____
15C	Miscellaneous Equip.	$_____	$_____	$_____
15D	Process Piping	$_____	$_____	$_____
15E	Plumbing	$_____	$_____	$_____
15F	Ventilation & Sheet Metal	$_____	$_____	$_____
15G	Instrumentation & Controls	$_____	$_____	$_____
16A	Electrical General Provisions	$_____	$_____	$_____
16B	Electrical Power & Lighting	$_____	$_____	$_____
16C	Standby Electric Generator	$_____	$_____	$_____

SECTION 1B - SUBSURFACE INVESTIGATIONS

A. GENERAL

Subsurface investigations have been undertaken for the Engineer's information during design of the project. The results of these subsurface investigations are presented herein only for general information to prospective bidders. The Owner makes no representation as to the correctness of the information contained in the report, nor as to the locations of the boring holes, nor that the report represents a cross-section of the material to be encountered in performing excavation and earthwork on the Project.

B. TEST HOLE LOGS

The test holes presented in the attached logs were drilled in December, 1983. Test hole locations are shown and referenced to the hole numbers indicated in the attached test hole logs.

C. BIDDER'S RESPONSIBILITY

Any use made of the report by the bidders or the Contractor is at the sole risk of such bidders or the Contractor who have the responsibility to satisfy themselves independently from other sources regarding the material, and all other material to be encountered in the work to be performed.

The use of this report shall be at the bidder's or the Contractor's discretion. Bidders or the Contractor shall recognize the fact that the determination of the types and sizes of material was limited by the size of the auger or drill used to drill these holes. Bidders or the Contractor shall make additional boring holes or use whatever other means in order to determine to their or his satisfaction the conditions that exist.

TEST DRILLING EQUIPMENT & PROCEDURES

Drilling Equipment Truck-mounted CME-55 drill rigs powered with 4 or 6 cylinder Ford industrial engines are used in advancing test borings. The 4 cylinder and 6 cylinder engines are capable of delivering about 4,350 and 6,500 foot/pounds torque to the drill spindle, respectively. The spindle is advanced with twin hydraulic rams capable of exerting 12,000 pounds downward force. Drilling through soil or softer rock is performed with 6 1/2 O.D., 3 1/4 I.D. hollow stem auger or 4 1/2 inch continuous flight auger. Carbide insert teeth are normally used on the auger bits so they can often penetrate rock or very strongly cemented soils which require blasting or very heavy equipment for excavation. Where refusal is experienced in auger drilling, the holes are sometimes advanced with tricone gear bits and NX rods using water or air as a drilling fluid. Where auger and tricone gear bits cannot be used to advance the hole due to cobbles or caving conditions, the ODEX (overburden drilling with the eccentric method) is used. A percussion down-the-hole hammer underreams the hole and 5 inch steel casing is introduced into the hole during drilling. The drill bit is eccentric and can be removed from the center of the casing to allow sampling of the material below the bit penetration depth.

Sampling Procedures Dynamically driven tube samples are usually obtained at selected intervals in the borings by the ASTM D1586 procedure. In many cases, 2" O.D., 1 3/8" I.D. samplers are used to obtain the standard penetration resistance. "Undisturbed" samples of firmer soils are often obtained with 3" O.D. samplers lined with 2.42" I.D. brass rings. The driving energy is generally recorded as the number of blows of a 140 pound 30 inch free fall drop hammer required to advance the samplers in 6 inch increments. However, in stratified soils, driving resistance is sometimes recorded in 2 or 3 inch increments so that soil changes and the presence of scattered gravel or cemented layers can be readily detected and the realistic penetration values obtained for consideration in design. These values are expressed in blows per foot on the logs. "Undisturbed" sampling of softer soils is sometimes performed with thin walled Shelby tubes (ASTM D1587). Where samples of rock are required, they are obtained by NX diamond core drilling (ASTM D2113). Tube samples are labeled and placed in watertight containers to maintain field moisture contents for testing. When necessary for testing, larger bulk samples are taken from auger cuttings.

Continuous Penetration Tests Continuous penetration tests are performed by driving a 2" O.D. blunt nosed penetrometer adjacent to or in the bottom of borings. The penetrometer is attached to 1 5/8" O.D. drill rods to provide clearance to minimize side friction so that penetration values are as nearly as possible a measure of end resistance. Penetration values are recorded as the number of blows of a 140 pound 30 inch free fall drop hammer required to advance the penetrometer in one foot increments or less.

Boring Records Drilling operations are directed by our field engineer or geologist who examines soil recovery and prepares boring logs. Soils are visually classified in accordance with the Unified Soil Classification System (ASTM D2487) with appropriate group symbols being shown on the logs.

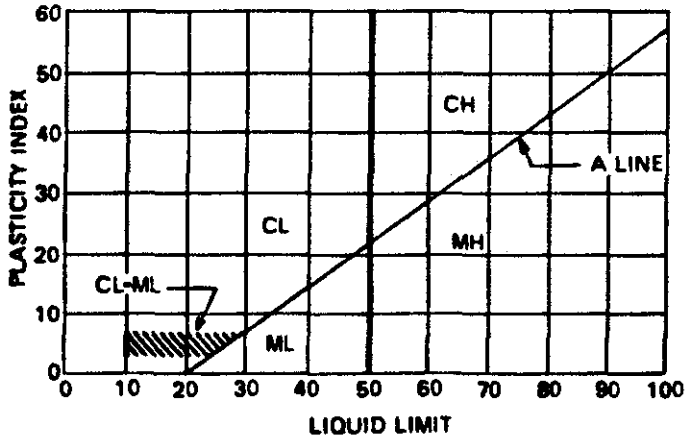
UNIFIED SOIL CLASSIFICATION SYSTEM

Soils are visually classified by the Unified Soil Classification system on the boring logs presented in this report. Grain-size analysis and Atterberg Limits Tests are often performed on selected samples to aid in classification. The classification system is briefly outlined on this chart. For a more detailed description of the system, see "The Unified Soil Classification System" Corp of Engineers, US Army Technical Memorandum No. 3-357 (Revised April 1960) or ASTM Designation: D2487-66T.

MAJOR DIVISIONS			GRAPHIC SYMBOL	GROUP SYMBOL	TYPICAL NAMES
COARSE-GRAINED SOILS (Less than 50% passes No. 200 sieve)	GRAVELS (50% or less of coarse fraction passes No. 4 sieve)	CLEAN GRAVELS (Less than 5% passes No. 200 sieve)		GW	Well graded gravels, gravel-sand mixtures, or sand-gravel-cobble mixtures.
				GP	Poorly graded gravels, gravel-sand mixtures, or sand-gravel-cobble mixtures.
		GRAVELS WITH FINES (More than 12% passes No. 200 sieve) — Limits plot below "A" line & hatched zone on plasticity chart		GM	Silty gravels, gravel-sand-silt mixtures.
		GRAVELS WITH FINES (More than 12% passes No. 200 sieve) — Limits plot above "A" line & hatched zone on plasticity chart		GC	Clayey gravels, gravel-sand-clay mixtures.
	SANDS (More than 50% of coarse fraction passes No. 4 sieve)	CLEAN SANDS (Less than 5% passes No. 200 seive)		SW	Well graded sands, gravelly sands.
				SP	Poorly graded sands, gravelly sands.
		SANDS WITH FINES (More than 12% passes No. 200 sieve) — Limits plot below "A" line & hatched zone on plasticity chart		SM	Silty sands, sand-silt mixtures.
		SANDS WITH FINES (More than 12% passes No. 200 sieve) — Limits plot above "A" line & hatched zone on plasticity chart		SC	Clayey sands, sand-clay mixtures.
FINE-GRAINED SOILS (50% or more passes No. 200 sieve)	SILTS (Limits plot below "A" line & hatched zone on plasticity chart)	SILTS OF LOW PLASTICITY (Liquid Limit Less Than 50)		ML	Inorganic silts, clayey silts with slight plasticity.
		SILTS OF HIGH PLASTICITY (Liquid Limit More Than 50)		MH	Inorganic silts, micaceous or diatomaceous silty soils, elastic silts.
	CLAYS (Limits plot above "A" line & hatched zone on plasticity chart)	CLAYS OF LOW PLASTICITY (Liquid Limit Less Than 50)		CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
		CLAYS OF HIGH PLASTICITY (Liquid Limit More Than 50)		CH	Inorganic clays of high plasticity, fat clays, sandy clays of high plasticity.

NOTE: Coarse grained soils with between 5% & 12% passing the No. 200 sieve and fine grained soils with limits plotting in the hatched zone on the plasticity chart to have double symbol.

PLASTICITY CHART



DEFINITIONS OF SOIL FRACTIONS

SOIL COMPONENT	PARTICLE SIZE RANGE
Cobbles	Above 3 in.
Gravel	3 in. to No. 4 sieve
Coarse gravel	3 in. to ¾ in.
Fine gravel	¾ in. to No. 4 sieve
Sand	No. 4 to No. 200
Coarse	No. 4 to No. 10
Medium	No. 10 to No. 40
Fine	No. 40 to No. 200
Fines (silt or clay)	Below No. 200 sieve

TERMINOLOGY USED TO DESCRIBE THE RELATIVE DENSITY, CONSISTENCY OR FIRMNESS OF SOILS

The terminology used on the boring logs to describe the relative density, consistency or firmness of soils relative to the standard penetration resistance is presented below. The standard penetration resistance (N) in blows per foot is obtained by the ASTM D1586 procedure using 2" O.D., 1 3/8" I.D. samplers.

1. Relative Density. Terms for description of relative density of cohesionless, uncemented sands and sand-gravel mixtures.

N	Relative Density
0-4	Very loose
5-10	Loose
11-30	Medium dense
31-50	Dense
50+	Very dense

2. Relative Consistency. Terms for description of clays which are saturated or near saturation.

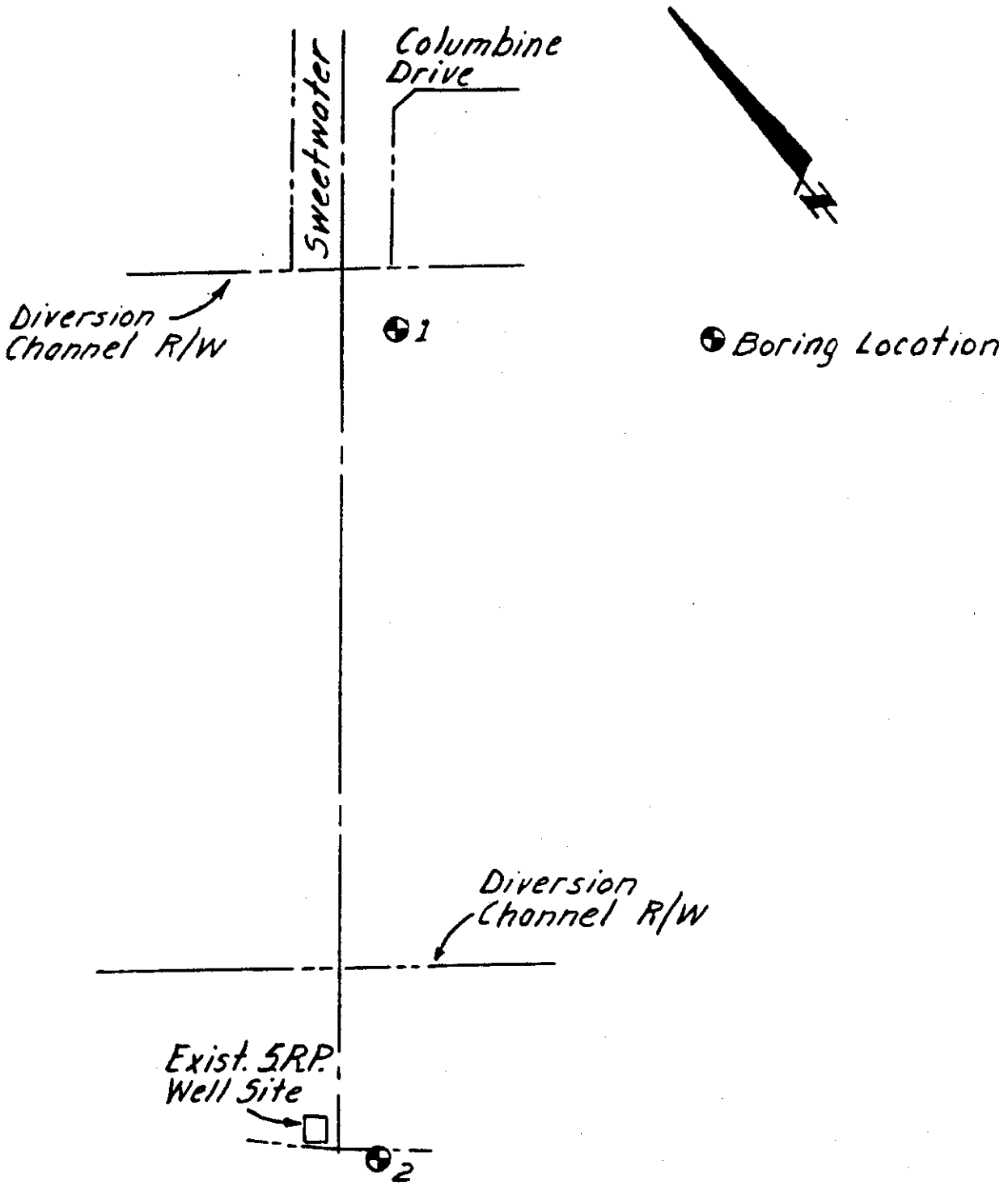
N	Relative Consistency	Remarks
0-2	Very soft	Easily penetrated several inches with fist.
3-4	Soft	Easily penetrated several inches with thumb.
5-8	Medium stiff	Can be penetrated several inches with thumb with moderate effort.
9-15	Stiff	Readily indented with thumb, but penetrated only with great effort.
16-30	Very stiff	Readily indented with thumbnail.
30+	Hard	Indented only with difficulty by thumbnail.

3. Relative Firmness. Terms for description of partially saturated and/or cemented soils which commonly occur in the Southwest including clays, cemented granular materials, silts and silty and clayey granular soils.

N	Relative Firmness
0-4	Very soft
5-8	Soft
9-15	Moderately firm
16-30	Firm
31-50	Very firm
50+	Hard

SITE PLAN

SHOWING LOCATIONS OF TEST BORINGS



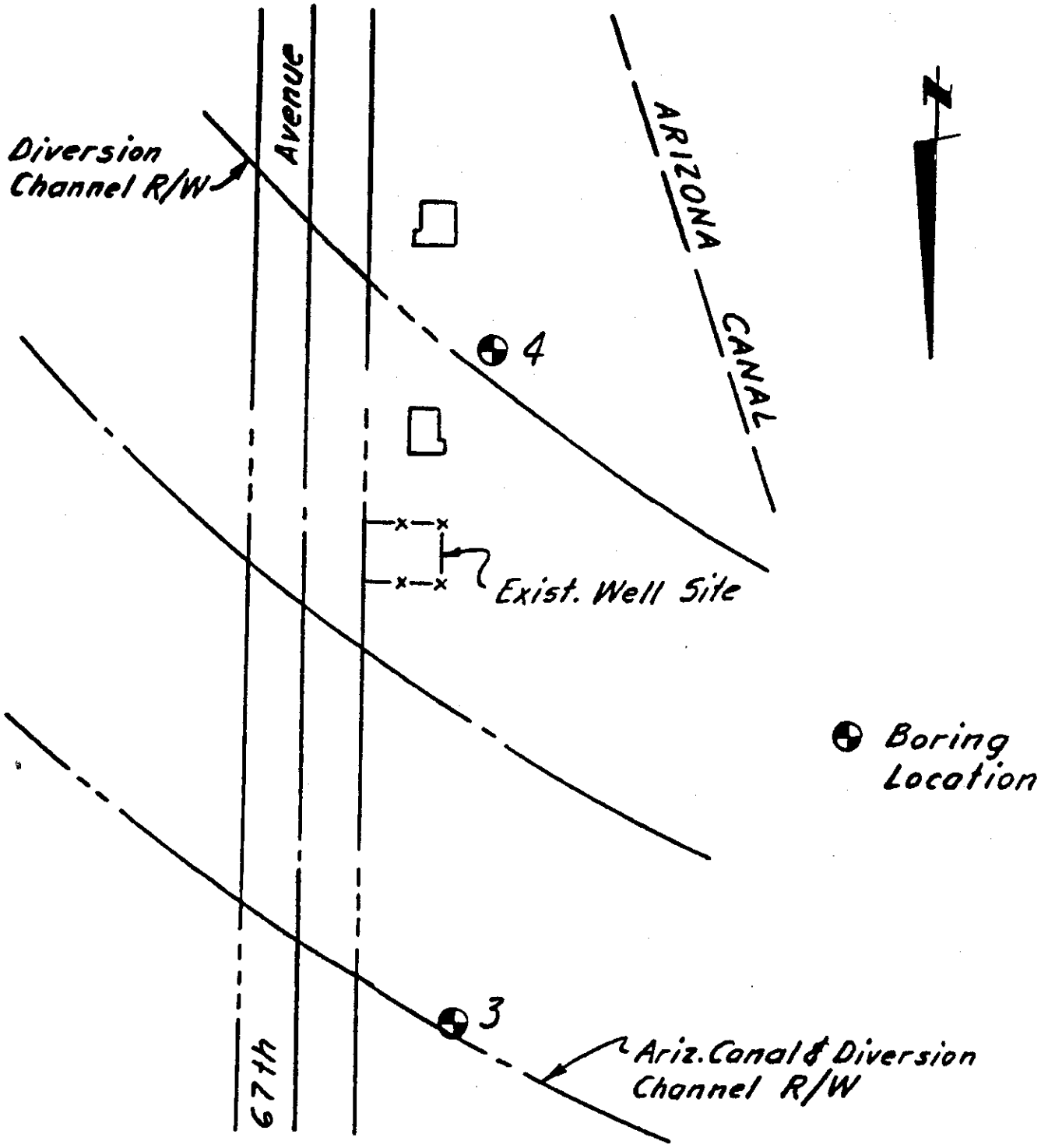
Sewage Lift Stations
55th Avenue & Arizona Canal
67th Avenue & Arizona Canal
Glendale, Arizona
SHB Job No. E83-169

SERGENT, HAUSKINS & BECKWITH

CONSULTING SOIL AND FOUNDATION ENGINEERS
PHOENIX • TUCSON • ALBUQUERQUE

SITE PLAN

SHOWING LOCATIONS OF TEST BORINGS



Sewage Lift Stations
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PROJECT Sewage Lift Stations

JOB NO. E83-169 DATE 12-15-83

LOG OF TEST BORING NO. 4

Location 55th Avenue

RIG TYPE CME-75

BORING TYPE 6½" Hollow Stem Auger

SURFACE ELEV. 1220.0'+0.2'

DATUM PRC Survey

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free-fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Per Cent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0				S	17			SM		FILL SILTY SAND & GRAVEL, some clay, well graded, rounded, low plasticity to nonplastic, brown
5				S	76 (no recovery)				slightly moist to moist firm to hard	SANDY CLAY & CLAYEY SILT, stratified, weakly to moderately lime cemented, low to medium plasticity, brown to light brown note: moderately to strongly lime cemented below 15'
10				S	44					
15				S	149			CL-ML		
20				S	87		21			
25				S	66		16			
30				U	100/9" 110		15			
35				S	50/5"			GC		CLAYEY SAND & GRAVEL, well graded, subangular, moderately lime cemented, low plasticity, brown
										Stopped auger at 34'6" Sampler refused at 34'11"

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A – Auger cuttings. B – Block sample
S – 2" O.D. 1.38" I.D. tube sample.
U – 3" O.D. 2.42" I.D. tube sample.
T – 3" O.D. thin-walled Shelby tube.

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PROJECT Sewage Lift Stations

JOB NO. E83-169 DATE 12-15-83

LOG OF TEST BORING NO. 2

Location 55th Avenue

RIG TYPE CME-75

BORING TYPE 6½" Hollow Stem Auger

SURFACE ELEV. 1217.0'+0.2'

DATUM PRC Survey

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free-fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Per Cent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0				S	14			CL	moist moderately firm	FILL SILTY CLAY, some sand & gravel, few cobbles, low plasticity, reddish brown to dark brown
5				S	50/4½"			SC	dry to slightly moist hard	CLAYEY SAND, some gravel, well graded, subangular, moderately to strongly lime cemented, low plasticity, light brown
10				S	50/3" (no recovery)					
15				S	78				slightly moist hard	SANDY CLAY & CLAYEY SILT, stratified, moderately to strongly lime cemented, low plasticity, brown to light brown
20				S	50/5"		17	CL-ML		
25				S	50/3"		16			
30				U	100/6"	117	40			
35				S	50/5"		14			
40				U	100/2"	107	12	CH	slightly moist hard	SANDY CLAY, some gravel well graded, subrounded strongly lime cemented, high plasticity, light brown
45				S	50/3" (no recovery)					Stopped auger at 44' Sampler refused at 44'3"

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A – Auger cuttings. B – Block sample
S – 2" O.D. 1.38" I.D. tube sample.
U – 3" O.D. 2.42" I.D. tube sample.
T – 3" O.D. thin-walled Shelby tube.

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PROJECT Sewage Lift Stations

JOB NO. E83-169 DATE 12-16-83

LOG OF TEST BORING NO. 3

Location 67th Avenue

RIG TYPE CME-75

BORING TYPE 6½" Hollow Stem Auger

SURFACE ELEV. 1217.0'+0.2'

DATUM PRC Survey

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free-fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Per Cent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0				S	12				dry moderately firm to very firm	SANDY CLAY, weakly lime cemented, low to medium plasticity, light brown to reddish brown
								CL		
5				S	47					
									dry	SILTY SAND & GRAVEL, some cobbles, small amount of clay, well graded, subrounded to subangular, low plasticity, brown
10				S	50/1"					
								GM-GC		
15										
									slightly moist to moist hard	CLAYEY SAND & GRAVEL, some cobbles, well graded, subrounded to subangular, low to medium plasticity, brown
20				S	50/4"					
								GC		
25				S	50/2½"					
30				S	50/5"					
									moist hard	SILTY CLAY, medium plasticity, reddish brown
								CL		
35				S	68		22			
										Stopped auger at 34'6" Stopped sampler at 36'
40										

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A – Auger cuttings. B – Block sample
S – 2" O.D. 1.38" I.D. tube sample.
U – 3" O.D. 2.42" I.D. tube sample.
T – 3" O.D. thin-walled Shelby tube.

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PROJECT Sewage Lift Stations
JOB NO. E83-169 DATE 12-15-83

LOG OF TEST BORING NO. 4

Location 67th Avenue
RIG TYPE CME-75
BORING TYPE 6½" Hollow Stem Auger
SURFACE ELEV. 1213.0'+0.2'
DATUM PRC Survey

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Per Cent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0				S	13			CL	moist moderately firm to firm	SILTY CLAY, trace of gravel, weakly lime cemented, medium plasticity, reddish brown
5				S	28 (no recovery)					
10				S	22 (no recovery)				moist firm to hard	CLAYEY SAND & GRAVEL, some cobbles, well graded, subrounded to subangular, weakly cemented, low plasticity, reddish brown
				A				GC		
15				S	55					
20				S	50/4½"		7			
25								CL	moist hard	SILTY CLAY, medium plasticity, reddish brown
30				S	113		18	SC	moist hard	CLAYEY SAND, predominantly fine to medium, low plasticity, brown
35				U	100/11"	118	3		moist dense	SILTY SAND & GRAVEL, well graded, subangular, weakly cemented, low plasticity, brown note: some thin lenses of sandy silt (ML), low plasticity, brown
40				S	50/5½"		20	GM		
45				S	37					
50										Stopped auger at 44'6" Stopped sampler at 46'

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE
A – Auger cuttings. B – Block sample
S – 2" O.D. 1.38" I.D. tube sample.
U – 3" O.D. 2.42" I.D. tube sample.
T – 3" O.D. thin-walled Shelby tube.

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SECTION 2A-EXCAVATION AND BACKFILLING

PART 1 - GENERAL

1.01 Work Included

A. 67th Avenue pump station

B. 55th Avenue sanitary sewer and pump station

1.02 Applicable Standards

A. M.A.G. - Uniform Standard Specifications
Section 206 - Structure Excavation and Backfill

SECTION 2B - BITUMINOUS PAVING

PART 1 - GENERAL

1.01 Work Included

A. Access roadway at 67th Avenue pump station site.

1.02 Applicable Standards

A. M.A.G. Uniform Standard Specifications
Section 301 - Subgrade Preparation
Section 302 - Untreated Base
Section 321 - Asphalt Concrete Pavement
Section 710 - Asphalt Concrete

SECTION 2C - CONCRETE WALKWAYS

PART 1 - GENERAL

1.01 Applicable Standards

A. M.A.G. Section 340, 505, 725 and 729

SECTION 2D - FENCING

PART 1 - GENERAL

1.01 Applicable Standards

A. M.A.G. Uniform Standard Specifications
Section 420 - Chain Link Fences
Section 772 - Chain Link

SECTION 2E - UTILITIES

PART 1 - GENERAL

1.01 Applicable Standards

A. M.A.G. Uniform Standard Specifications
Section 601 Trench Excavation, Backfilling and Compaction
Section 615 Sewer Line Construction
Section 625 Manhole Construction and Prop Sewer Connections

SECTION 2F - PAVEMENT REMOVAL AND RESTORATION

PART 1 - GENERAL

1.01 Applicable Standards

A. M.A.G. Uniform Standard Specifications
Section 336 Pavement matching and Surfacing Replacement
Section 331 Precoated Chip Seal

SECTION 2F - SITE IMPROVEMENTS PROTECTION AND RESTORATION

PART 1 - GENERAL

1.01 Applicable Standards

A. MAG Uniform Standard Specifications
Section 350 Removal of existing Improvements

SECTION 3A - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 Applicable Standards

A. MAG Uniform Standard Specifications
Section 505 - Concrete Structures
Section 725 - Portland Cement
Section 727 - Steel Reinforcement

B. American Concrete Institute
ACI 301 Specifications for Structural Steel for Concrete Buildings

1.02 Submittals

A. Mix Design: Submit for approval; provide dry weight proportions of all materials together with complete previous job strength performance (ACI 3.8 Method 2) or current 3 point curve representing relationship between water content and average 28-day compressive strength prepared by independent testing laboratory (ACI 301 3.8 Method 1).

1.03 Quality Control

A. Testing

1. Frequency: Once for each 50 cubic yards of each class of concrete placed; sample per ASTM C172.

2. Perform the following from each sample:

(a) Mold 3-6 inch cylinder compressive strength specimens (ASTM C31).

(b) Slump test (ASTM C143)

(c) Air test (ASTM C231)

(d) Yield test (ASTM C138)

(e) Strength test (ASTM C39)

3. (a) Test specimen slection shall be by the Engineer.

(b) Contractor shall deliver to an independent laboratory (approved by the Engineer) for testing required and pay associated costs.

(c) Submit test results to Owner and Engineer.

SECTION 3B - PRESTRESSED CONCRETE DECK PLANKS

PART 1 - GENERAL

1.01 Required Submittals

A. Shop Drawings

1. Prestressed Precast Concrete Deck Planks: Show details of construction, reinforcement and erection plan; list plan identification marks on the erection plan.

PART 2 - PRODUCTS

2.01 Materials

A. Prestressed Precast Concrete Planks

1. Type and Manufacturer:

(a) Hi-Stress slabs with voids running lengthwise, as manufactured by a licensee of the Flexicore Company, Precast Schokbeton, Inc., American Precas Concrete Inc., Tanner Industries or equal.

2. Materials:

(a) Portland cement: ASTM C150, Type I or Type III.

(b) Aggregates: ASTM C330

(c) Concrete mix: 5000 psi at 28 days.

(d) Admixtures:

(1) Air-entraining: ASTM C260

(2) Water reducing: ASTM C494

(3) Admixtures containing chlorides, sulfates, or nitrates shall not be used.

(4) Prestressing steel: Uncoated 7-strand, stress-relieved strand, ASTM A416.

(5) Hydrated lime: ASTM C207, Type S.

(6) Pointing mortar: 1 part portland cement, 2 parts sand, 1/4 part hydrated lime.

3. Capacity:

(a) Planks shall be designed to carry a uniform combined roof load and live load of 50 lbs/ft2 with a maximum deflection of 1/2".

PART 3 - EXECUTION

3.01 PERFORMANCE:

A. Prestressing:

1. Proportion the concrete mix to provide a minimum compressive strength of 3500 psi at time of initial prestress.

B. Openings:

1. If any opening through the deck will interfere with the prestressing strands, it shall be planned in advance and provided during fabrication.

C. Identification:

1. During fabrication, provide an identification mark on each deck unit.

D. Storage on Site:

1. Clear of the ground on level supports.

E. Erection:

1. In accordance with erection plan, properly aligned and leveled using equipment recommended or supplied by the manufacturer.

(a) The underside of the deck is the critical side for deck alignment.

2. Holes may be cut in the field in the hollow section of a unit. In no case shall a prestressing strand be cut.

3. Grout the joints between units with a 1:3 cement/sand motar ensuring that joints are filled.

4. On completion, rake joints on underside of deck to a depth of 5/8 inch.

SECTION 4A - MASONRY

PART 1 - GENERAL

1.01 DESCRIPTION:

A. Work Included:

1. Furnishing and installation of masonry work.

1.02 QUALITY ASSURANCE:

A. Concrete Masonry Units:

1. Test for conformance to ASTM C90 and ASTM C426.

1.03 SUBMITTALS:

A. Samples:

1. 18" strip of reinforcing material

B. Certificates:

1. Certified copies of test reports of masonry units.

1.04 DELIVERY AND STORAGE:

A. Masonry Units:

1. Delivery: In manufacturer's standard pallets.

2. Storage: Off the ground, covered for protection from weather.

B. Reinforcement:

1. Delivery: In manufacturer's original packing with all labels intact and legible.

2. Storage: Off the ground in covered area.

1.05 JOB CONDITIONS:

A. Protection of Work:

1. During erection, cover tops of walls and partitions with strong waterproof membrane at end of each days work or shut down.

2. Cover partially completed walls when work is not in progress.

3. Extend wall covering at least 24 inches down each side of wall. Hold covering securely in place.

B. Load Application:

1. Do not apply any loading to newly constructed masonry walls for at least 12 hours after erection or any concentrated load for at least 3 days.

C. Staining:

1. Prevent grout or mortar from staining faces of concrete masonry work.

(a) Protect sills, ledges, and projections from mortar droppings.

D. Cold Weather Protection:

1. Preparation:

(a) Heat masonry bed until surface is dry to the touch.

2. Construction Requirements:

(a) Heat sand and mixing water, and provide heat sources both sides of wall, or provide heated enclosures to maintain temperatures at working surfaces at not less than 32 degrees F.

PART 2 - PRODUCTS

2.01 Materials:

A. Concrete Masonry Units:

1. General:

(a) Aggregate: ASTM C33.

(b) Linear shrinkage: maximum 0.4 percent, ASTM C426

(c) Moisture content: maximum 40 percent at time of delivery, ASTM C427.

(d) Size 8" x 16" face. Thickness as shown.

(e) Curing:

(1) Autoclave: Minimum 5 hours at 120 psi steam pressure. Delivery: Minimum 3 days after curing.

2. Hollow load-bearing type:

(a) ASTM C90, grade N-1 for exterior exposed locations, grade N-1 or S-1, elsewhere, three core.

(b) Face block design: Split block, 4-rib.

(1) Manufacturers: Super-Lite or equal.

3. Provide bull nose units for exposed external corners, in interior partitions, other standard shapes as required.

4. Bond Beam:

(a) Single channel, hollow load bearing.

(b) Reinforcement ASTM A615, Grade 40.

Add #1 → 5. Geotextile Fabric: when called for material shall be Type 140, or equal

B. Mortar Materials:

1. Portland cement: ASTM C150, Type 1.

2. Lime: ASTM-C207, Type S.

3. Sand: ASTM C144

4. Water: Clean and potable.

5. Admixtures:

(a) Non-shrink additive: Master Builders "Omicron", Truscon Laboratories' "Mortitle:, or equal in mortar for exterior masonry.

C. Masonry Reinforcing and Anchoring:

1. Joint Reinforcement:

(a) Prefabricated welded wire units in lengths not less than ten feet, fabricated from cold-drawn steel wire conforming to ASTM A82, as manufactured by AA. Products Company, Duro-O-Wall, or equal.

(1) Truss type, 3/16 inch deformed side rods and 9 gauge cross rods.

(2) Width of unit: 1-1/2 inch less than width of wall, or partition.

(b) Right angle intersections: 1-1/4 inch x 1/4 inch x 30 inch strape anchors with 3 inch right angle bends each end.

D. Flashing:

1. Fabric-covered copper sheet, 3 ounce per square foot, Wasco Products, Inc., Phoenix Building Products,Inc., or equal.

E. Block Sealer:

1. A penetrating clear solution of hydrocarbon solvents containing non-silicone dissolved solids or a water repellent sealer formulated from a blend of polymeric resins.

2. Manufacturers: Chemstop Manufacturing Corp., "Chemstop", Raingard or equal.

PART 3 - EXECUTION

3.01 PERFORMANCE

A. General Erection Requirements

1. Tooling: Tool all exposed joints.

2. Flush cut all joints not tooled.

3. Provide in-wall flashing under sills. Set flashing in a bed of mortar and cover with a mortar bed.

4. Sealant recesses: Rake joints around outside perimeters of exterior doors, windows, and other openings.

   (a) Depth 3/4 inch, width 1/4 inch.

5. Cutting concrete masonry: Masonry saw

6. Mortar joint thickness: 3/8 inch.

B. Laying-up Concrete Unit Masonry:

1. Lay up plumb, true to line with level and accurately spaced course, in running bond, with face ribs aligned.

2. Keep chases and raked-out joints free from mortar and other debris.

3. As work progresses, build in all required anchors, wall plugs, and accessories.

4. Solidly bed the starting course, and bed subsequent course under face shells only.

5. Provide solid units under beams, slabs, and other points of concentrated loads, where bolting into tops of walls, at all points required by code.

6. Joint reinforcement: In every second course,

7. Bond Beam: Continuous, perimeter of exterior walls, 3000 pounds concrete fill. Reinforcement - 2 No. 4 bars, lap and wire minimum 9 inches.

C. Miscellaneous:

1. Build into masonry work all items indicated on the drawings, firnished by other trades, and called for under this section.

2. Fill solid with mortar around jambs and heads of metal door frames.

3. Fill solid with mortar the cores in the blocks in the top course of parapets.

D. Sealing Masonry

1. Seal all brickwork with specified sealer material, in accordance with manufacturer's recommendations and instructions.

3.02 Pointing and Cleaning:

A. Pointing:

1. Point up all exposed masonry, fill all holes and joints, and repair defective joints.

B. Cleaning:

1. Clean all concrete masonry work by wire brushing.

SECTION 5A - MISCELLANEOUS METALS

PART 1 - GENERAL

1.01 Required Submittals

A. Shop Drawings

1. Pipe Handrails
2. Stairs and grating
3. Wet Well Hatches
4. Trash Basket Assembly and accessories
5. Crane Rail
6. Floor Hatches

PART 2 - PRODUCTS

2.01 Materials

A. Pipe Handrails:

1. ASTM A53, Schedule 40, 1-1/2 inch O.D., galvanized after fabrication.
2. Where set on concrete, provide sleeve of seamless and welded steel, ASTM A53, Schedule 40.
3. Where set on steel, provide welded-on base plates drilled for bolting to steel.

B. Stairs:

1. Stringers: Structural channel with ends closed by welded on steel plates.
2. Treads: Grating type with integral safety nosing, galvanized after fabrication, designed for a live load of 150 psf.

(a) Manufacturers: Blaw Knox Equipment Co., Borden Metal Products, Reliance Steel Products, or equal.

3. Grating (Platform):

(a) All welded edge banded construction designed to support 150 psf.

(b) Galvanized after fabrication.

(c) Manufacturers: Blaw Knox Equipment Co., Borden Metal Products, Reliance Steel Products, or equal.

C. Crane Rails:

1. I-Beam with flanges trued for trolley movement.

D. Wet Well Hatches:

1. Ruggedly constructed of aluminum for heavy service and with cover capable of 300 lbs/square foot loading, watertight.

2. Cover: 1/4 inch think (minimum) aluminum diamond plate, lockable.

(a) Hinges: Heavy forged brass with stainless steel pins.

(b) Provide hold open arm with release handle for closing.

3. Provide recessed handles.

4. Provide flush, locking device, capable of unlocking from interior.

5. Bituminous coat frame on the underside where it will come in contact with concrete.

6. Manufacturers: Bilco. "Type J", Babcock-Davis "Type AM", or equal.

E. Trash Basket Assembly:

1. Trash basket assembly: See 3.04 Schedules

2. Accessories: Provide one (1) each:

   (a) Rake: Aluminum, 12 inches wide, 6 foot handle, with slots to fit bar spacing of basket.

   (b) Shovel: Flat, 16 inches wide (minimum).

F. Floor Hatches:

1. Constructed of aluminum for heavy service, with covers capable of 300 lbs/square foot loading.

2. Covers: 1/4 inch thick minimum aluminum diamond plate.

   (a) Hinges: Heavy forged brass with stainless steel pins.

   (b) Provide hold open arm with release handle for closing.

3. Provide recessed handles.

4. Provide flush, locking device.

5. Provide safety chain with swivel snaps, cadmium plated or stainless steel.

6. Bituminous coat frame on the underside where it will come in contact with concrete.

7. Manufacturers: Bilco, Babcock-Davis, or equal.

G. Hot Dipped Galvanizing: ASTM 525, coating designation G120.

H Prime Painting:

1. Shop prime all non-galvanized ferrous metal items as follows:

   (a) Interior items: Durako No. 592, Tnemec No. 99, or equal (1.5 mils).

   (b) Exterior items: Durako No. 692, Tnemec No. 95-T-Z, or equal (2.5 mils).

PART 3 - EXECUTION

3.01 Preparation

A. General:
Coat with bitumastic material all aluminum surfaces in contact with concrete or steel.

3.02 Fabrication

A. Pipe Handrails:

1. Flush welded construction with all welds ground smooth and neatly filleted.

2. Use prefabricated units at intersections.

3. Space between dual rails: 1'-9".

4. Verticals at ends and changes in direction: 4'-0" CC maximum spacing.

B. Steel Stairs:

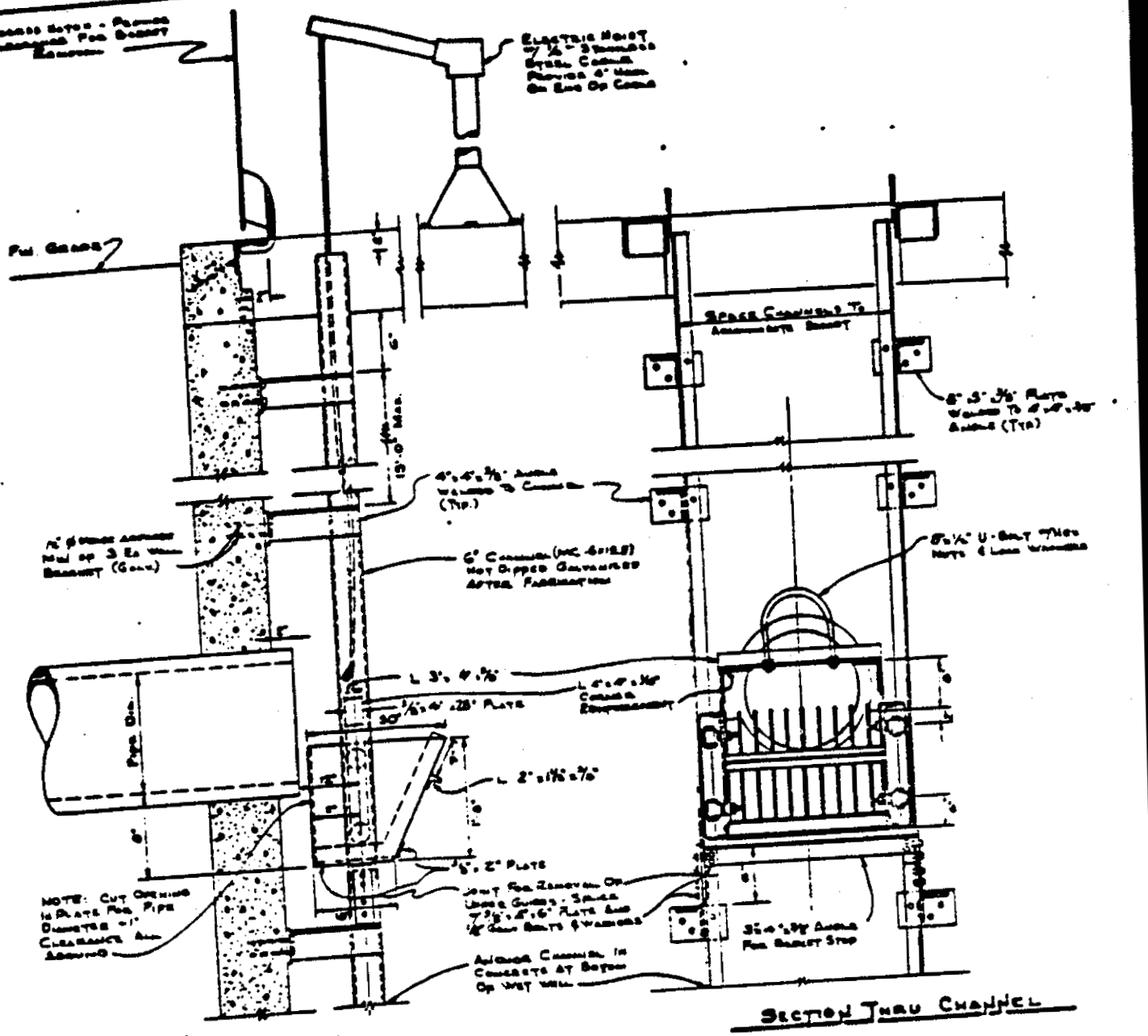
1. Weld angle tread supports to stringers.
2. Weld or bolt treads to supports.

3.03 INSTALLATION:

A. Per drawings, shop drawings, and manufacturer's recommendations.

3.04 SCHEDULES:

A. Trash Basket Assembly.



TRASH BASKET DETAILS

BUILT IN PLACE LIFT STATIONS

SECTION 6A - ROUGH CARPENTRY

PART 1 - GENERAL

1.01 DESCRIPTION:

A. Work Included:

1. Main items of work include the following:

(a) Wood blocking

(b) Rough hardware

(c) Wood nailers and sleepers

PART 2 - PRODUCTS

2.01 MATERIALS:

A. Grades and Species of Lumber:

1. Grounds and Blocking: No. 2 Grade Yellow Pine, Standard Grade Douglas Fir, Standard Grade Ponderosaand Lodgepole Pine, preservative treated.

B. Preservative Treatment:

1. Pressure treated with waterborne salt preservatives.

2. Treatment:

(a) American Wood Preservers Association Standard Specification, or

(b) Federal Specification TT-W-550 "Wood Preservative Chromated Copper Arsenate Mixture", or

(c) Federal Specification TT-W-535 "Wood Preservative, Fluoride-Chromate Arsenate-Phenol Mixture".

(d) Chemicals injected: 0.35 lbs. per cubic foot of wood.

(e) After treatment, kiln dry or air season to moisture content less than 15 percent.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Blocking and Nailers:

1. As shown on drawings.
2. Install true to line, level or plumb, securely fastended in place.

SECTION 7A - MEMBRANE ROOFING AND ROOF INSULATION

PART 1 - GENERAL

1.01 DESCRIPTION:

A. Work Included:

1. Main items of work include:

(a) Foamed-in-place insulation and elastomeric membrane:

(1) 67th Avenue Pump Station

1.02 SUBMITTALS:

A. Manufacturer's Data:

1. Roofing and roof insulation system.

B. Guarantee:

1. Requried: 2-year warranty signed jointly by manufacturer of system and applicator.

1.03 JOB CONDITIONS:

A. Weather:

1. Minimum temperature 50 degrees F. No work during precipitation.

1.04 QUALITY ASSURANCE:

A. Application of insulation and roofing shall be by an applicator licensed or franchised by the manufacturer of the roofing system.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Roof Insulation:

1. Foamed-in-place urethane of approximately 3 lb. density.

2. Manufacturer: Neogard Corporation, P.P.G. Industries, Mobay Chemical Corporation, or equal.

B. Elastomeric Coating:

1. Weather-protective liquid elastomeric urethane, in white or near white color.

C. Roof Granules:

1. Ceramic coated, opaque, in white color.

SECTION 7B - FLUID APPLIED WATERPROOFING

PART 1 - GENERAL

1.01 Description

A. Work Included: Furnishing and installation of membrane waterproofing.

1.02 Submittals:

A. Manufacturer's Data:

1. Required.

1.03 Delivery:

A. All Materials:

1. In manufacturer's original containers with seals and labels intact and legible.

PART 2 - PRODUCTS

2.01 Materials:

A. Waterproof Membrane:

1. Liquid applied type, 2-component, coal tar modified polyurethane, curing to permanent elastomeric sheet.

2. Manufacturers:

(a) Toch Bros. "Thiodeck", Tremco Manufacturing Co. "Tremproof 50", Pennwalt Corporation "Tufchem", or equal.

PART 3 - EXECUTION

3.01 Performance:

A. General:

1. Surfaces to receive membrane shall be thoroughly clean and dry.

2. Maintain adequate ventilation.

3. Do not permit welding or other operations involving open flame in the vicinity of work during application.

4. Mix the two components together strictly in accordance with manufacturer's instructions.

B. Installation:

1. Apply over concrete surface by spray to produce a dry film thickness of 60 mils. Increase dry film thickness to 120 mils for 6 inches each side of internal and external corners, and expansion joints.

2. While the waterproofing is still soft, embed therein 1/4 inch thick hardboard or 1/2 inch thick fiberboard, completely covering the membrane, as protection against damage during backfilling and other construction work.

SECTION 7C

PART 1 - GENERAL

1.01 DEFINITIONS:

A. Caulking: Filling of joints and cavaties in interior locations as required to provide good appearance or dustproof and sanitary conditions.

B. Sealing: Filling of interior and exterior expansion joints and filling of exterior joints to provide weatherproof conditions.

1.02 Required Submittals:

A. Manufacturer's data on materials

B. Samples of cured caulking and sealant, 6 inches long.
C. Manufacturer's color chart for sealants.

D. Samples of back-up and bond breaker materials.

PART 2 - PRODUCTS

2.01 Materials:

A. Caulking:

1. Oil-based

(a) Manufacturers: DAP "Architectural Calk", Tremco "Caulking Compound", or equal.

2. Acrylic and acrylic-laytex

(a) Manufacturers: Sonneborn "Sonac", Glidden-Durkee "Macco-lastic", or equal.

B. Sealants:

1. Polysulphide based on Thiokol resins and bearing Thiokol seal of approval.

(a) One-part: Percora "Synthacalk GC-9", DAP "Flexseal", or equal.

(b) Two-part: Percora "Synthacalk GC-5", Tremco "Lastomeric", or equal.

2. Polyurethane:

(a) One-part: Williams Products "Dynaseal", H.S. Peterson "Isoflex 1000", or equal.

(b) Two-part: Williams Products "Dynaseal", H.S. Peterson "Isoflex 2000", or "Isoflex 907", or equal.

C. Back-up:

1. Expanded polyethylene:

(a) Manufacturers: Williams Products, Dow Chemical Co., or equal.

D. Primers:

1. As recommended by manufacturer of sealant.

E. Bond Breaker:

1. Self adhesive polyethylene tape.

PART 3 - EXECUTION

3.01 Installation:

A. Apply to clean, dry joints.

B. Joints over 3/4" deep: Pack with back-up material to 3/4" from surface.

C. Priming: If sides of joint are porous in character (e.g. concrete or concrete masonry) or if recommended by manufacturer of sealant.

1. Thoroughly clean and prime.

D. Apply caulking and sealant material with a gun having a nozzel of proper size and shape for each particular application. Use sufficient pressure to fill completely all joints and voids.

E. Material Uses:

1. Interior:

(a) Joints between masonry or concrete and other material, at doors, windows, and other openings: Use caulking compound or one-part sealant - polysulphide or polyurethane based-in vertical joints, polyurethane based in horizontal joints.

(b) Expansion joints: One or two part polysulphide or polyurethane and one part silicone in vertical joints, one or two part polyurethane in horizontal joints.

2. Exterior:

(a) Two part polysulphide or polyurethane in vertical joints, two part polyurethane in horizontal joints.

F. Remove all surplus material and clean adjacent surfaces.

SECTION 7D - EXPANSION AND CONTRACTION JOINTS

PART 2 - PRODUCTS

2.01 Materials

A. Waterstops: Polyvinyl chloride multi-rib cross section, minimum 3/16 inch thick by 9 inches wide.

PART 3 - EXECUTION

3.01 Installation

A. Bonding joints: ACI 30/ 6.1.4.3

SECTION 7E - METAL FLASHING

PART 1 - GENERAL

1.01 Submittals:

A. Shop Drawings:

1. Required

PART 2 - PRODUCTS

2.01 Materials:

A. Metal Cap Flashing:

1. Smooth finish 5005-H34 aluminum alloy, .062" thick, designed to snap on to an anchor plate and lock without use of exposed fasteners.

2. Anchor plate: 22 gauge galvanized steel sheet.

3. Splice plate: Same material and profile as metal cap flashing, 6" long.

4. Anchor plate fasteners: Suitable for positive anchorage.

5. Manufacturers: Alcoa, Architectural Art Mfg. Inc., M.M. Systems Corporation or equal.

PART 3 - EXECUTION

3.01 Performance:

A. Installation:

1. Manufacturer's recommendations.

2. Flashing held in place with cleats, 3'0" on centers.

SECTION 8A - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.01 Work Included: Furnishing and installation of:

A. Hollow metal doors and frames.

1.02 Submittals:

A. Shop Drawings:

1. Required.

B. Manufacturers:

1. Pioneer Industries, Williamsburg, North American, or equal.

PART 2 - PRODUCTS

2.01 Materials:

A. Doors:

1. Face sheets: 16 gauge, (18 gauge for interior doors), cold rolled, annealed and streatcher leveled, steel.

2. Reinforcing:

(a) Connecting face sheets: 20 gauge Z-type.

(b) For hardware: Hinges-3/16 inch steel plate. Lock or latch sets - 16 gauge steel sheet. Other-1/8 inch steel sheet.

B. Frames:

1. 14 gauge steel sheet for exterior doors.
(16 gauge for interior doors).

2. Reinforcing for hardware: As for doors.

C. Weatherstripping (all exterior doors):

1. Head and jambs: Closed cell, neoprene foam, 3/16 inch thick with aluminum retainer, National Guard 120 NS, Zero Weatherstripping #50, or equal.

2. Bottom: Automatic drop bottom, surface mounted, National Guard 200SN, Reese SM-1-A, Zero Weatherstripping 351, or equal.

3. Provide 2 inch wide steel astragal on active leaf of pair of doors.

PART 3 - EXECUTION

3.01 Fabrication:

A. Hollow Metal Doors:

1. Weld Z type connectors to both faces, on 6" centers, forming door 1-3/4" thick.

2. Fill voids in door with sound-deadening or thermal insulation.

3. Join faces with welded interlocking seams, located on door edges. Grind welds smooth.

4. Reinforce, drill and tap door for hardware in accordance with templates furnished by hardware supplier.

5. Provide 2" x 1/8" astragel on active leaf of each pair of doors.

B. Frames:

1. Form to profile shown, with integral door stop, continuous, 1/2 inch thick minimum.

2. Miter and weld at intersection.

3. Reinforce, drill and tap for hardware.

4. Weld clip angles to bottoms of jambs.

5. Grind all welds smooth.

6. Provide temporary stretcher member between jambs.

C. Finishes:

1. Frames: Shop applied coat of rust-inhibitive paint.

2. Doors:

(a) Interior surfaces: Before assembly, apply one coat of rust-inhibitive paint to all interior surfaces.

(b) Exterior surfaces: After assembly apply a baked-on primer coat.

D. Hardware:

1. Hinges: Heavy duty wrought bronze with four ball berings and stainless steel non-rising pins.

(a) Manufacturers: Stanley BB 199, Hager BB 1193, or equal.

2. Lockset: Mortise type, Federal Specification FF-H-106 Type 85, keyed alike.

(a) Manufacturers: Sargent Series 8-7700-05, Tusswin Series A2024, or equal.

3. Rim night latch:

(a) Operation: By key outside, turn knob inside.

(b) Surface mounted with rim strike.

(c) Manufacturers: Russwin 2299, Yale Auziliary OF 5A, or equal.
(Note: Weld 1/8" plate on outside surface of door and bolt through).

4. Closers: Full rack and pinion action, heavy duty cast iron cylinder, forged steel arms, 40 psi closing action.
(a) Manufacturers: LCN-4110 series, Sargent 150 series, or equal.

5. Hold-open arms: Forged steel, friction type, 90 degrees.

   (a) Manufacturers: Sargent 1530, LCN 4110H, or equal.

6. Cremone bolts:

   (a) Rods and bolt heads: Zinc plated steel

   (b) Brass handle (inside)

   (c) Manufacturers: Stanley 1052, Lawrence SC262, or equal.

7. Hardware finishes: 26D

8. Thresholds: Extruded aluminum 5" x 1/2".

   (a) Manufacturers: Pemko, Reese, National Guard, or equal.

9. Hardware Sets:

   (a) Single Doors:
   1-1/2 pairs hinges
   1 Mortise lockset
   1 Closer
   1 Threshold

   (b) Pairs of Doors:
   3 pairs hinges
   1 Cremone bold (inactive leaf)
   1 Rim night latch (active leaf)
   1 Closer (active leaf)
   2 H-0 arms
   1 Threshold

10. Keying:

   (a) All doors shall be keyed alike. Provide three keys.

3.02 Installation:

A. Frames:

1. Plumb, align and brace securely.

2. Anchor to floor with two 3/8 inch bolts at each jamb.

3. Remove temporary stretcher.

4. Provide adjustable masonry anchors, 3 per jamb.

5. Provide 3 rubber bumpers in frame on lock side.

B. Doors:

1. Check operation. Adjust as necessary.

C. Hardware:

1. Apply all hardware.

2. Check operation. Adjust as necessary.

SECTION 9A - PAINTING

PART 1 - GENERAL

1.01 Description:

A. Work Included:

1. All field painting.

2. The work shall include interior and exterior painting of all new construction.

3. The specifications describe the required finishes on the various surfaces. Should any surface be inadvertently omitted from the specification description, it shall, nevertheless, be painted as specified for similar surfaces.

B. Surfaces not to be Painted:

1. Stainless steel and aluminum.

2. Grating steel and aluminum.

3. Items of equipment which are factory finished.

1.02 Submittals:

A. Color Chips:

1. For color verification selection.

B. Manufacturer's Data:

1. Name and brand name.

2. Catalog number or other identification of each material.

3. Descriptive literature covering material and application.

1.03 Delivery of Material:

A. In manufacturer's original containers with all seals and labels intact and legible.

1.04 Storage of Material:

A. Keep storage area clean and neat.
B. Keep paint and material containers closed when not in use.
C. Keep soiled rags and waste in closed metal containers. Empty container daily.

1.05 Equipment:

A. Provide all application equipment, including ladders, scaffolding, drop cloths, scrapers, tools, sandpaper, dusters, cleaning solvents and cotton waste.

1.06 Job Conditions:

A. Temperature:

1. Minimum 55 degrees F.

B. Relative Humidity:

1. Maximum 80 percent.

1.07 Manufacturers:

A. Durako Paint and Color Corporation; Tnemec Company; Glidden Company; Cook Paint & Vernish Company, Sherwin Williams Company. Porter Coatings; Engard, or equal.

PART 2 - PRODUCTS

2.01 Materials

A. General

1. Where a paint system calls for a prime coat and finish coat, and a suitable prime coat has been applied in the shop or factory, touch-up only of the shop applied coat will be necessary before application of finish coats.

2. Finish and color schedules are indicated below; paint types indicated are products of Tnemec Company, Inc. North Kansas City, Missouri.

3. Where not specifically mentioned, work shall be painted or finished the same as specified for similar items.

B. Finish Schedule:

1. Concrete and Masonry

Location or Item	Type Paint	No. coats	Coverage Per Gal. Per Coat	Min. Dry Mil. Thickness/coat
Interior Masonry:	Block Filler Tnemec			
Primer	#561	1	60	13.3
Finish	Tneme-Cryl		300	2.3
Concrete Floors	Tneme-Cryl	2	400	2.3
Concrete Walls	Tneme-Cryl	2	300	2.3
Exterior Concrete Below Grade	#449 Heavy Duty Black	2	80	15.0
Concrete Submerged (Wet Well)	#413 Tneme-Tar	2	140	8.3
Non-Submerged Primer	#77 Chem-Prime	1	300	2.1
Finish Interior	#66 Hi-Build Epoxoline	1	150	6.1
Exterior (M.H. doors & Frames	#2 Tneme-Gloss	2	400	1.9
Misc. Metal)		1	220	4.1
Submerged Shop Primer	#66-1211 Hi-Build Epoxoline Primer			
Finish	#66 Hi-Build Epoxoline	2	150	6.1

C. Color Schedule:

The following is based on Tnemec Color Chart #202:

1. Exterior:

   (a) Hollow Metal Doors & Frames - #1258 Tunora Gray

   (b) Miscellaneous Steel

   (c) Metal Coping & Metal Louvers - #1236 Black-#1710 Apache Brown

2. Interior:

   (a) Walls - #1257 Pebble Gray

   (b) Floors - #1259 Mesa Red

   (c) Roof Structure - #1292 Oyster White

3. Miscellaneous:

   (a) Handrails - #1258 Tunora Gray

   (b) Air Handling Equipment - #1258 Tunora Gray

   (c) Steel Stairs & Ladder - #1258 Tunora Gray

   (d) Ductwork - #1258 Tunora Gray

   (e) Equipment
   Match factory finish on factory finished items:

   On factory primed #1258 Tunora Gray items.

Equipment items to be field painted are as follows:

- o Pumps and Motors
- o Blower Housing

4. Piping:

   (a) Sewage - #1281 Ash Gray

   (b) Gas - #1288 Lead Fire Red

   (c) Non-Potable Water - #1289 Lead Fire Yellow

   (d) Potable Water - #1291 Royal Blue

5. Junction boxes, panels, and equipment not factory finished.

   (a) Paint as for ferrous metal or galvanized surfaces.

D. Ferrous Metal Piping and Supports:

1. As for ferrous metal interior

E. Submerged Concrete:

1. Two coats coal tar epoxy, 8 mils/coat.

   (a) Durako "Dura-Tar", Tnemec "Tneme-Tar" or equal.

PART 3 - EXECUTION

3.01 Performance:

A. Surface Preparation:

1. Concrete masonry and concrete:

   (a) Brush thoroughly to remove all loose particles and efflorescence.

   (b) Remove oil and grease with chemical solvent.

2. Concrete floors:

   (a) Clean thoroughly. Remove oil and grease with chemical solvent.

   (b) Etch surfaces with a 10 percent solution of muriatic acid. Wash with clean water.

3. Ferrous metal:

   (a) Previously primed surfaces:

      (1) Clean by brushing and wiping. Touch up abraded or otherwise damaged areas with same prime paint used in shop.

   (b) Unprimed surfaces:

      (1) Ferrous metal piping and fittings: Power tool cleaning SSPC-SP3-63.

   (c) Galvanized surfaces:

      (1) Solvent cleaning, SSPC-SP1-63.

B. Application:

1. Manufacturer's recommendations.

SECTION 14A - CRANES AND HOISTS

PART 1 - GENERAL

1.01 Work Included:

A. Provide one electrically operated crane.

B. Provide one portable floor crane, one crane rail trolley, and one chain fall.

1.02 Required Submittals:

A. Shop Drawings:

1. Electrically operated crane.

2. Portable floor crane.

3. Crane rail trolley.

4. Chain falls

PART 2 - PRODUCTS

2.01 Equipment:

A. Electrically Operated Crane:

1. Location: On concrete slap of wet well.

2. Capacity: 1000 lbs.

3. Boom: 36 inch reach (approx.)
   (a) Rotation: 240 degrees minimum.
   (b) Minimum height of hook: 4 feet

4. Control box: Aluminum enclosed, weatherproof, NEMA 3, for housing and energizing control cable and switch,, padlockable.

   (a) Control cable: 10 foot, with 2-push button control box. Buttons must be held down to operate hoist.

5. Bed plate: Surface amount, anchored to concrete slab.

6. Mast height: 62 inches from bed plate (approx.)

7. Cable: 1/4-inch diameter minimum, 40 feet long, stainless steel with large hook.

8. Hoist: 115 volt AC, reversible motor, complete with reversing drum control switch.

9. Manufacturers: Pacific Hoist, Venco, Thern, or equal.

B. Portable Floor Crane:

1. Rating: 144 inch lift when lifting 4,000 lbs. provide counter weights if necessary.

2. Capable of dismantling for storage, with adjustable legs and extension.

3. Wheels: 6 inch roller bearing type, width between legs 40 inches (approx.)

4. Operation: 2-speed hydraulic.

5. Boom:

   (a) Height (Hook): 77" to 140".

6. Provide one spare set of hydraulic seals and packing for each unit.

7. Manufacturers: Global Equipment Company, Standard Handling Devices, Standard Products, or equal.

C. Crane Rail Trolley:

1. Push type, 4 wheel, 2 ton capacity.

2. Frame: Rolled steel.

3. Wheels: Pressed steel, hardened tread, deep flanges.

   (a) Bearings: Ball type, lifetime lubricated.

4. Manufacturers: Standard Hanling Devices, Global Equipment Company or equal.

D. Chain Fall Hoist:

1. Manual, 4000 lb. capacity, 70 feet lift.

2. Gears: Heat treated steel.

3. Bearings: Anti-friction.

4. Brake Load: Automatic, mechanical.

5. Hand chain: Heat treated alloy steel, cadmium plated.

6. All operating parts shall be totally enclosed.

7. Manufacturers: Budget, Yale, or equal.

PART 3 - EXECUTION

A. Installation:

1. Electrically operated crane:

(a) Provide anchor bolts with templates for setting.

(b) Secure bed plate to anchore bolts.

(c) Manufacturer's recommendations.

B. Assemble and install crane rail trolley and chail fall hoist in upper level of pumping station and portable floor crane on lower level of pumping station.

SECTION 15A MECHANICAL GENERAL PROVISIONS

PART 1 - GENERAL

1.01 DESCRIPTION:

A. Scope:

1. This section includes general provisions applicable to the work specified in Division 15 of the Specifications.

B. Related Work Specified in Other Sections:

1. Electrical Work - Division 16.
2. Finish Painting, except as otherwise specified herein, - Section 9A
3. Excavating and Backfilling - Section 2A

1.02 QUALITY ASSURANCE:

A. General:

1. Comply with requirements of the Contract Documents or of the equipment manufacturer, whichever is the more stringent.

B. Referenced Standards:

1. Comply with the Standards of the following National Organizations:
   a. American National Standard Institute (ANSI)
   b. American Society of Mechanical Engineers (ASME)
   c. American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE)
   d. American Society for Testing and Materials (ASTM)
   e. American Gas Association (AGA)
   f. American Water Works Association (AWWA)
   g. Underwriters' Laboratories, Inc. (UL)
   h. National Electrical Manufacturers Association (NEMA)
   i. Air Moving and Conditioning Engineers (AMCA)
   j. National Board of Fire Underwriters (NBFU)
   k. Institute of Boiler and Radiator Manufacturers (IBR)
   l. American Welding Society (AWS)
   m. National Fire Protection Association (NFPA)
   n. National Electrical Code (NEC)
   o. Sheet Metal and Air Conditioning Contractors National Association (SMACNA)
2. Where quantities, sizes, or other requirements shown on the drawings or specified herein exceed or are of a higher standard or quality than the requirements of the referenced standards, the requirements of the drawings and the specifications shall take precedence.
3. Include items of labor and materials required to comply with above standards and codes.

1.03 SUBMITTALS:

A. Shop Drawings:

1. See Section 1A

2. Submit detailed design and construction drawings and calculations to show conformance with the Contract Documents.
3. For motors, submit schematic diagrams, outline drawings, principal dimensions, and weights for each type and size.
4. Design for engineered hanger assemblies:
   a. For pipes 2-1/2" and larger.
   b. Detail on 8-1/2" x 11" sheets.
   c. Include a location plan showing location of hanger in relation to columns or equipment.

B. Manufacturers' Data:
1. Required for all items of equipment. Submit four copies of parts lists, operating instruction, lubrication requirements, including types of lubricants, location and frequency of lubrication, recommended spare parts, disassembly and reassembly instructions.

C. Testing:
1. Submit results of all tests performed on the various systems, piping, and welds.

D. Record Drawings:
1. Maintain up-to-date accurate record of all deviations from contract drawings.
2. Show all changes to underground and other hidden work.
3. Submit to Engineer on completion of project.

E. Special Tools:
1. Provide two sets of any special tools and keys required for operation, adjustment, resetting, or maintenance.
   a. Identify each item showing its function or use.
   b. Package each set in a separate container.

1.04 Start-Up:

A. Provide qualified personnel to be present at start-up of each item of equipment or each system to ensure that proper start-up procedures are observed. See equipment specifications for further requirements.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. Caulking Material:
1. To seal duct openings and pipe sleeves.
2. Butyl rubber base, single component.
3. Manufacturers: Percora "BC-158", 3M "Butyl Sealer", DAP "Gold Label Butyl Flex", or equal.

B. Pipe Sleeves:
1. ASTM A53, Schedule 40.

C. Solder:
1. 95-5, tin-antimony

D. Joint Packing Material:
   1. Oakum (twisted jute rope, tarred)

E. Thread Lubricant:
   1. Non-hardening, non-poisonous - Crane "Thread Lubricant", Grinnell "Sprinkler Pipe Joint Compound", John Crane "Thread Tape", Permacel "Ribbon Dope", or equal.

F. Cut-in Welding Fixtures:
   1. "Thread-o-Lets" for branches from mains 2" and smaller, "Weld-o-Lets" for branches 2½" and larger.
   2. Openings cut into pipe for welded connections shall be accurately made to give carefully matched intersections.

G. Drain Valves:
   1. 3/4" brass, 150 pound SWP angle valves with 3/4" brass hose nipple, Crane #16½ w/#18 nipple, Jenkins #548P, or equal.

H. Clevis Type Hangers:
   1. Grinnell Fig. 260, Fee & Mason Fig. 239, Elcen Fig. 12, or equal.

I. Supports for Uninsulated Copper Tubing:
   1. Copper-Plated Clevis hangers, Fee & Mason Fig. 364, Grinnell Fig. CT-65, Elcen #312, or equal.

J. Saddle:
   1. Elcen Fig. 219, Fee & Mason Fig. 80, or equal.

K. Riser Clamps:
   1. Grinnell Fig. 261, Fee & Mason Fig. 241, Elcen 39, or equal.

L. Pipe Supports in Concrete:
   1. Cast-in-Place Concrete: Malleable iron, Crawford Fig. 282, Fee & Mason Fig. 2570, Elcen 65, Unistrut No. 1 with No. 11 nut, or equal.
   2. Cured Concrete: Drilled-in inserts, Wedge-It Expansion Products, U.S.M. Corporation "Parabolt", or equal.

M. Trapeze Type Hangers:
   1. Unistrut, Empco, or equal.
   2. To support multiple pipe runs.
   3. Provide all necessary supporting steel rollers to keep pipe in alignment and allow for expansion.

N. Brackets:
   1. Grinnell Fig. 195, Fee & Mason Fig. 151, Elcen Fig. 57, with adjustable pipe roll and base, Fee & Mason Fig. 169, Elcen Fig. 17, or equal.
   2. To support pipe supported from walls or columns.

O. Ells at Pumps:
   1. Long-sweep elbows at pump suction and discharge; with welded base support for ells 2-1/2" and larger.

P. Pipe Sleeves:
   1. Seamless galvanized, ASTM A120, for floors and roofs.
   2. Seamless, ASTM A53, elsewhere.

2.02 EQUIPMENT:

A. Motors:

1. Provide with all motor driven equipment, complete with drives and controls.
   a. Electrical starters will be provided by electrical trade unless part of packaged equipment. See equipment specifications.
2. Type: Ball-bearing, adequately sized, NEMA rated, with open drip-proof frames and Class B insulation (unless otherwise noted).
   a. Less than 1/2 HP: 115 volt, single phase 60 Hertz.
   b. 1/2 HP and Larger: 230/460 volt, 3-phase, 60 Hertz.
3. Electrical apparatus provided with motor driven equipment: Completely wired except for external connections. Securely attach to equipment.
   a. Electrical equipment shall conform to requirements of Division 16.

PART 3 - EXECUTION

3.01 PERFORMANCE:

A. Welding Standards:

1. Bevel piping on each end, before welding, to standard 37½ degrees leaving 1/16" band at bottom of bevel.
   a. Before starting welding, remove corrosion products and other foreign material from surfaces.
2. Welding: Manual shielded metallic arc process or automatic submerged arc process.
   a. Direct current.
   b. Electrodes to be used with manual shielded metallic arc process shall conform to ASTM A233, classification E-6010.
3. Pipe Line Welding: Chapter 4, Section IV "Welding of Pipe Joints", ANSI. Bulletin B31.1 and applicable portions of ASME Boiler Construction Code, Section IX, in accordance with latest accepted practice applicable to the particular service.
4. Weld Inspection: Visual by Engineer.
   a. Weld reinforcement shall not be less than 1/16 inch or more than 1/8 inch above normal surface of joined sections.
   b. Reinforcement shall be crowned at the center, tapering on each side to surface being joined.
   c. Exposed surface of weld shall present a workman-like appearance, free of depressions.

d. Welds judged defective by Engineer shall be tested by radiographic inspection in accordance with API Standards 104 "Standard for Field Welding of Pipe Line", or weld shall be removed and replaced.

B. Pipe Installation-General:

1. Provide maximum headroom. Coordinate with duct work pipe insulation and lighting.
   a. Give careful consideration to clearance under beams, over windows, etc., and to the locations of lines and type of fittings used to obtain these clearances.
   b. Ascertain from the drawings the heights of suspended ceiling and sizes of structural members.
   c. Coordinate piping, duct work, and lighting trades with each other and with all equipment.
   d. Install piping with clearance for pipe insulation. Insulated surfaces of piping shall clear all adjacent piping, equipment and structures without deformation. Piping installed with insufficient clearance shall be relocated at contractors expense.
2. Cut pipe accurately to measurements taken at building.
   a. Do not spring or force into place.
   b. Keep clear at window, door, and other openings.
   c. Do not cut or alter other construction.
   d. Make changes in direction with fittings and changes in main sizes with eccentric reducing fittings.
3. Remove burrs by reaming.
4. Provide for expansion and contraction.
5. Accessories:
   a. Swing joints at runouts to equipment.
   b. Shut-off valves and unions or flanges:
      (1) At each branch and in supply and return lines to pumps, tanks, coils and equipment items.
      (2) At each unit, branch circuit, and section of piping.
   c. Gate valves on capped services for extension to equipment furnished under other sections.
   d. Drain valves at low points in each system.
   e. Drain piping from pump glands, relief valves, etc., to spill over open sight drains, floor drains, or other acceptable discharge points terminating drain line.
   f. Cap or plug open ends of pipe lines during construction.
   g. Temporary cross-connections, valves, over-size flushing connections, pumps, etc., required to flush systems.
   h. Provide adequate clearance for pipes to be insulated.

6. Pipe Sizes:
   a. Water pipe sizes to fixtures shall be as shown on the drawings. Where sizes are not shown, the following table shall be used:

Fixture	Pipe Sizes Hot	Pipe Sizes Cold
Fume Hoods	3/8"	3/8"
Dishwashers	1/2"	1/2"
Lavatories	1/2"	1/2"
Sinks	1/2"	1/2"
Showers	1/2"	1/2"
Emergency Shower	1"	1"
Drinking Fountain	-	1/2"
Urinals	-	3/4"
Water Closets	-	1"
Hose Bibs	-	1"

C. Wastewater and Drainage Pipe:
   1. Underground Drainage:
      a. Comply with Section 02570 and Section 02571.
      b. Cleaning:
         (1) Keep interiors of lines clear during installation.
         (2) Keep a swab or drag in small diameter pipe and pull it forward past each joint immediately after jointing is complete.
      c. Excavating and Backfilling: Section 02200.
      d. Dewatering: Keep trenches free of water at all times.

D. Interior Waste, Drain, and Vent Pipe:
   1. Waste and Drain:
      a. Pitch: Not less than 1/8 inch per foot.
      b. Suspend on hangers.
      c. Change of direction: Long-sweep drainage fittings.
      d. Off-sets: 45 degree fittings.
      e. Make due allowance for expansion in all lines.
   2. Vent:
      a. Run parallel to drainage system from venting traps on fixtures.
      b. Connect to main vent stacks.
      c. Provide extra-heavy cast iron increasers on each vent stack at roof.
      d. Increasers: One size larger than vent stack, minimum 4 inches.

e. Extend 15 inches above roof and flash with 4 pound lead sheet not less than 24 inch square, extended up to and down 3" into tops of increasers.
f. Horizontal vent pipe: Grade to code requirements.

3. Pipe Sizes:
a. Sizes of waste, drain, vent stacks and branch piping shall be as shown on the drawings. Where drawings do not show sizes, the following table shall be used.

Fixture	"P" Trap	Drain	Vent
Fume Hood (cup sink)	1"	1-1/2"	1-1/4"
Drinking Fountain	1"	1-1/2"	1-1/4"
Dishwasher	2"	2"	1-1/4"
Lavatories	1-1/2"	1-1/2"	1-1/4"
Sink	1-1/2"	1-1/2"	1-1/4"
Service Sinks	3"	3"	1-1/4"
Showers	3"	3"	1-1/4"
Emergency Shower/ Eyewash	to 4" floor drain		
Urinals	1-1/2"	2"	1-1/4"
Water Closets	-	4"	2"

E. Joints and Connections:
1. Bell and Spigot Cast Iron Pipe:
a. Make joints by ramming rings of rope Oakum into the bell to fill bell to within 1" of the top and filling with molten lead flush with top, providing a water-tight and airtight joint.
b. For underground pipe, vulcanized rubber or Neoprene joints conforming to ASTM C564 may be used.
2. Mechanical Joints: Make up with style A plain molded rubber gaskets. Wash socket plain end and gasket with soapy water before jointing.
2. Screw Thread Joints: Apply lubricant to male threads only, and to threads exposed after jointing is complete.
3. Copper Tubing: Solder above ground, flared underground.
4. Clay Tile: ASTM C425, Type III, factory fabricated PVC with Neoprene O-rings.

F. Pipe Fittings and Valves:
1. Nipples: Match adjacent piping. Close nipples: extra heavy.
2. Flanges: Flat or raised face as required to match flange face on valves or equipment.
3. Bolts:
a. Square head, machine type ASTM A-307, Grade B, with heavy hex nuts.

b. Bolts in contact with soil shall be high strength, heat treated, cast iron tee head type with hexagon nuts, coated with rust inhibitor lubricant after threading, ANSI 21.11.

G. Cross-Connections and Interconnections:
1. Do not use or install plumbing fixtures, special equipment, device or piping which will provide cross-connections or interconnection between a distributing supply for drinking water or domestic water and a polluted supply or waste such as a drainage system or a wastewater pipe so as to make possible the back-siphonage of wastewater or polluted water into the potable water supply system.
2. If possibility of back-siphonage exists, water supply to fixture shall be introduced through a suitable vacuum breaker installed at a minimum of 7'-6" above floor.

H. Expansion Bends, Loops and Anchors:
1. Absorb pipe expansion in bends, swing joints, expansion loops, and off-sets.
2. Install piping mains, branches, and runouts so as to allow free expansion and contraction without developing leaks or undue stressing of pipe.
a. Stress shall be within allowable limits of ANSI Code B31.1 for pressure piping.

I. Hangers and Supports:
1. General: Support pipe lines with adjustable hangers, saddles, inserts, brackets, rolls, clamps, or supplementary steel.
a. Hangers:
(1) Design: Allow for expansion and contraction of pipe lines. Hangers on all insulated piping, except generator exhaust systems, shall be sized to permit insulation to pass continuously thru hangers.
(2) At tanks, pumps and other equipment, support piping independent of equipment.
(3) For Single Pipe Runs: Clevis type.
(a) Bare Copper Pipe: Copper-plated clevis type.
(4) Multiple Pipe Runs: Trapeze type, with all necessary steel rollers to accommodate expansion and contraction and to maintain alignment.
b. Supports:
(1) Saddles: Provide protection saddles at hanger points of insulated pipe.
(2) In Concrete: Cast-in threaded inserts.
(3) In Cured Concrete: Drilled-in inserts.
(4) Brackets:
(a) Support pipe from walls or columns with welded steel brackets.

(5) Hanger Rods: ASTM A6.
(6) For caulked bell and spigot piping, provide a hanger or other support at shoulder of the bell for each section of pipe.
(7) For pipe with flanged connections, provide a hanger or other support each side of the connection.
(8) Support at pumps: Welded supports at elbows in pump suction and discharge.
(a) Extend elbow support to pump foundation or to steel bracket welded to pump base.

2. Schedules:
a. Pipe support spacing and sizes of pipe handling suspension rods for steel piping shall conform to the following table:

Support for Cast Iron or Steel Pipe

Pipe Size	Pipe Support Spacing	Pipe Size	Rod Diameter
1/2" & 3/4"	Not over 6'-6"	Up to 2"	3/8"
1" & 1-1/4"	Not over 8'-6"	2½" to 3½"	1/2"
1½"	Not over 10'-0"	4" to 5"	5/8"
2" & 2½"	Not over 12'-0"	6" to 8"	3/4"
3" & 3½"	Not over 14'-0"	10" to 12"	7/8"
4" & over	Not over 16'-0"	14" & over	1"

Support Spacing for PVC Pipe

Pipe Size	Pipe Support Spacing	Pipe Size	Pipe Support Spacing
1/4"	3'-6"	2"	6'-0"
3/8"	4'-0"	2-1/2"	6'-6"
1/2"	4'-6"	3"	7'-0"
3/4"	4'-6"	4"	7'-6"
1"	5'-0"	6"	9'-0"
1-1/4"	5'-6"	8"	10'-0"
1-1/2"	5'-6"		

3. Supplementary Steel:
a. Provide as required for support and attachment of hangers.

J. Painting:
1. Saddles, supports, hangers, clamps, trapeze hangers, and

supplementary steel: galvanized, or prime painted compatible with finish paint specified in Section 09900.

2. Equipment: If furnished with a prime coat or factory finish, touch up areas abraded or otherwise damaged during shipment and in site storage.

K. Drainage Traps:
1. At each fixture or item of equipment to wastewater and drainage collection system, unless fixture or equipment is provided with integral trap or seal.
2. Provide recessed threaded cast iron drainage traps when connections are made in steel pipe.
3. Provide bell-and-spigot cast iron drainage traps when connections are made in bell-and-spigot pipe.
4. Exposed traps for fixtures: cast brass, chrome-plated.
5. Provide clean-out plug or other means of cleaning where traps are installed in accessible locations.
6. Drains subject to freezing shall not be trapped.

L. Caulking:
1. Locations:
   a. Between pipes and pipe sleeves in exterior foundation walls and concrete partitions.
   b. In openings where ductwork and piping penetrate floors, walls, and partitions.

M. Chases and Openings:
1. Provide templates or details for chases and openings in floors, walls, and partitions, to appropriate trades.
2. Caulk all openings around duct work and piping with glass wool and butyl caulking compound.

N. Inserts and Sleeves:
1. Furnish all inserts and sleeves for installation in concrete to the concrete trade prior to pouring.

O. Floor and Ceiling Plates:
1. Provide 1" split type steel plates, (prime painted where visible in finished areas).
2. Provide on all exposed pipes passing through floors, walls, and partitions in finished rooms.

P. Belt and Coupling Guards:
1. Provide removable type at chains, gears, couplings, keys, projecting set screws, and other rotating and moving parts.
   a. 16 gauge galvanized steel sheet top and bottom, and expanded metal locked into rim on both sides.
   b. Support guard rigidly with supplementary steel as necessary.
   c. Provide access openings in guard assembly.
   d. Prime paint all non-galvanized surfaces.

e. Provide guards on direct-connected units and on vertical pump drive shaft to 7'-0" above floor.
f. Guards shall enclose both pulleys and belts on exposed sides, shall comply with U.L. and OSHA safety requirements, and shall be readily removable.

Q. Sleeves:
1. Where pipes pass through walls, floors or partitions, they shall be provided with concentric metal sleeves which shall be built into the masonry or concrete.
a. Sleeves for covered pipes shall be 1" larger than the covering.
b. Sleeves for uncovered pipes shall be 1" larger than the passing pipe.
2. All sleeves in finished areas shall be flush with wall or floor, except in floors with watertight joints, when sleeves shall extend 1/2" above floor.
a. Sleeves shall extend 3" above floors in unfinished areas.
3. Spaces between pipe and sleeve shall be packed with fiberglass, or other inert insulation.
a. In fire rated walls use fire proof material which will allow some movement, (e.g. pipe insulating cement).
4. All exposed pipes, and pipes inside cabinets passing through sleeves, shall be finished off at wall, floor, and ceiling line with chrome plates.
5. Any sleeves installed in membrane waterproofed walls or floors, above or below grade, shall be provided with flashing clamps.
6. Sleeves installed in non-waterproofed floors or walls below grade shall be made watertight by sealing the space between pipe and sleeve.

R. Setting and Alignment of Equipment:
1. Installation and connection of unattached electric motors: By electrical trade.
2. Fan and motor pulleys: Align and adjust belt tension per manufacturer's instructions.
3. Pumps and Motors: Before piping or electrical connections are made, relevel and align on bases and foundations per manufacturer's instructions and recommended tolerances, using an indicating micrometer. Recheck before start-up.
a. Assure that thrust is balanced, that shaft can be freely rotated by hand and that motor is quiet in operation.
b. After all adjustments are completed, bolt tightly and grout.

c. Final checking and adjustment shall be performed by the manufacturer's representative, a qualified millwright, or machinist.

4. Furnish all motor driven equipment complete, with all electrical apparatus securely attached. Make all electrical connections except external.
5. Pumps with Mechanical Seals: Do not operate electrically until systems are filled with water.

S. Anchor Bolts:
1. Furnish, and deliver to the concrete trade, together with templates or setting diagrams.

T. Manual Valve Actuators:
1. For valves 4" and larger located 7'-0" or more above the floor, provide gear and chain operators.
   a. Chain shall extend to 3'-0" above floor.
2. For valves located less than 7'-0" above floor, 8" diameter and smaller, provide handwheel operators.
3. For all valves 10" in diameter and larger, provide gear operators.
   a. Gear operators: Worm and pinion type or threaded screw, linked, traveling nut type.
4. Operators shall provide required torque to operate valve with maximum pull of 40 pounds on rim of handwheel or chain wheel and 80 pounds on lever or operating nut.
5. Direction of operation shall be indicated on valve.
6. Gearing thread screws, traveling nuts, and linkage: Totally enclosed in gasketed, cast-iron housing, oil or grease lubricated.
   a. Provide seals on shaft to prevent entry of dirt and water and loss of lubricant.
   b. Shaft supports: Permanently lubricated bronze bearings.
7. Gear operators: Provide position indicators and air operating nut for wrench operation.
8. Control valves: Complete with factory mounted piped and prewired operators.
9. Finish: Manufacturer's standard.

U. Valve Keys:
1. Solid forged steel "T"s with handles integral with stems.
2. Provide sufficient number for all valves so operated with no key extending more than 36 inches above operating level.

V. Floor Boxes:
1. For valves below floor slabs.
2. Provide extension stems as required.

W. Flashing:
1. Flash and counter-flash as required to prevent water leaks around stacks, ventilators, pipes, and all such other mechanical equipment, devices, or projections through roof or exterior walls.
2. Flashing shall be 4 pound lead sheet, sized to extend 12 inches around edge of all pipes passing through roof. Turn flashing down 2" into pipe, or use malleable iron recessed roof coupling or approved clamping ring.

X. Field Painting:
1. Exposed piping and duct work shall be completely installed and ready for field painting by the General Contractor.
   a. Any incorrect and added work installed by the Mechanical Contractor after the General Contractor has painted the areas shall be painted or repainted at the cost of the Mechanical Contractor.

Y. Building Openings for Admission of Equipment:
1. The Mechanical Contractor shall ascertain from his examination of the Architectural and Structural drawings whether any special temporary openings in the building will be required for the admission of apparatus to be furnished under this contract and shall notify the General Contractor accordingly who shall provide such openings.
2. If the Mechanical Contractor fails to give such notification in sufficient time to make appropriate arrangements during construction, the cost of making and closing such openings at a later date shall be paid by the Mechanical Contractor.

3.02 CLEANING:

A. Piping Systems:
1. Domestic Water:
   a. Flush with chlorine solution - AWWA C601-68 "Disinfecting water mains".
2. Hot Water Heating:
   a. Clean system with a solution of one of the following:
      (1) Trisodium phospate, one pound for each 50 gallons in the system.
      (2) Sodium carbonate, one pound for each 30 gallons in the system.
      (3) Sodium hydroxide, one pound for each 50 gallons in the system.
   b. Circulate the solution through the system for a period of 8 hours, allowing temperature to reach design temperature.

c. Drain, clean strainers and refill with fresh water. Operate system at design temperature for 4 hours. Test with hydrion paper. Accept a pH of 7 or higher.
d. Test in presence of Engineer.

3. Compressed Air:
   a. Blow clear of chips and scale with 100 psi air.
4. Process Piping:
   a. Flush and visually inspect.

3.03 TESTING:

A. Pressure:
1. Each system of piping and control tubing, shall be tested by installer under superintendence of Contractor.
2. Provide pumps, gauges, instruments, test equipment personnel and clean auxiliary water. After tests have been made, remove all test equipment and drain all pipes.
3. Submit a completed test report to the Engineer.
4. Operate pumps which have mechanical seal only with water in the system.
5. Procedure:
   a. Test prior to painting, installation of insulation or concealment.
   b. Test Pressure: 150 percent of the operating pressure, or pump shut-off head pressure; minimum 50 psi.
   c. Test may be made on sections of piping as installed.
   d. Re-test repaired or revised sections.
   e. Water Test:
      (1) Entire System: Close openings except highest opening, and fill system to point of overflow.
      (2) Sections: Close openings except highest in section under test, and provide head of 10 feet.
      (3) In testing successive sections, at least upper ten feet of next preceding section shall be tested, so that no joint or pipe in the system (except uppermost 10 feet) shall have been subjected to a test of not less than 10 feet head of water.
         (a) Keep the water in the system, or in the section under test, for at least 15 minutes before inspection starts. After 2 hours (minimum) there shall be no evidence of leakage.
   f. Waste, Drain and Vent Pipe System: Test before fixtures are set. Retest after fixtures have been installed. Test as specified in e above.

g. Downspouts, Rain Leaders and their Branches: As specified in e above.

h. Chemical Feed, Non-Potable Water, All other Process Systems, Domestic Hot & Cold Water, Hot Water Heating:
(1) Test as in b above.
(2) Test Period: 2 hours minimum.

3.04 OPERATING TESTS:

A. General:

1. Test by installer of work under superintendence of Contractor.
2. Furnish gauges, instruments, test equipment and personnel required for test.
   a. Test in presence of Engineer.
3. Adjust equipment to perform with the least possible noise and vibration consistent with its duty.
4. Operate all piping systems, make all adjustments in controls and equipment, and complete necessary balance to deliver water quantities shown on drawings at each equipment item.
5. Operate all pumping equipment:
   a. Measure and record suction and discharge pressure of each pump operating alone.
   b. Measure and record suction and discharge pressure of all pumps installed as part of a parallel pumping system.
   c. Measure and record shut off head pressure of each pump.
   d. Verify pump performance by comparison with certified pump curves.
   e. Pressure and record pump horsepower or operating current for each test condition outlined in a, b, and c above.
   f. Remove and replace pumping equipment if tests show pumping equipment does not perform within 2 percent of certified manufacturers' curves for flow and horsepower.

3.05 PIPE AND EQUIPMENT IDENTIFICATION:

A. Pipe:

1. Label all piping showing contents and direction of flow:
   a. Place label adjacent to each valve and branch takeoff, at each side of a wall or partition through which pipe passes; and at 25'-0" spacing on straight runs.
   b. Label Manufacturers: Seton Name Plate Corporation, W.H. Brady, Topflight Tape Company, James H. Matthews, or equal.

B. Equipment:
1. Paint or stencil 1-1/2 inch high black enamel block type letters or numerals on all equipment items.

3.06 VALVE IDENTIFICATION:
A. Brass Tags:
1. 1" diameter, secured to each valve with brass S-hook and stamped with system designation and assigned number.
2. Provide a printed schedule, in duplicate, describing each valve by number, giving location and service for which used.

3.07 MERCURY SEALS:
A. Meter transmitters, controls, and other equipment using a mercury well in connection with head differentials for flow measurement, or units with mercury seals such as comminutors, trickling filter distributors, etc., that have a potential of loosing mercury to the waters of the State, are not permitted.

3.08 HEATING AND VENTILATING SYSTEM BALANCING:
A. After the ventilating system is operable, make adjustments to the systems to deliver the required design water and air quantities and temperatures.
B. Upon completion of all testing and balancing, the mechanical subcontractor shall prepare a report, submitted in triplicate, covering the following:
1. Air Handling Unit:
a. Blower RPM.
b. Blower motor full load amperes and voltage on each phase.
c. Discharge air cfm from Pitot Tube Traverse of duct.
d. Return air cfm from Pitot Tube Traverse of duct.
e. System static pressure, suction and discharge.
f. Outside air cfm from Pitot Tube Traverse of duct.
g. Entering air temperature.
h. Return air temperature.
i. Leaving air temperature.
2. Air Diffusers:
a. Discharge air cfm from Pitot Tube Traverse. Verify discharge to within 10 percent of design requirement.
b. Identify each diffuser as to location and record cfm.
c. Discharge air temperature. Verify discharge air temperature to within 1 percent of design requirements.
3. Other Air Handling Equipment:
a. Discharge cfm and temperature.
b. Motor rpm, voltage, and amperage.

3.09 HEATING SYSTEM HYDRONIC BALANCING:

A. After system has been completely installed, tested, and cleaned, the Contractor shall set and adjust all balancing valves to achieve proper water distribution to all components of the hydronic heating systems.

B. During heating season of the first year of operation, at times when directed, conduct operating tests and make final adjustments until all occupants are reasonably satisfied and all equipment is operating at peak efficiency.

C. Submit a written report in triplicate to Architect-Engineer before final inspection. The balance report shall include, but not necessarily be limited to, the following general items:

1. Design Data:
   a. Pump heads and flow rates
   b. Pump Motor HP, voltages and amperages
   c. Equipment flow requirements

2. Field Test Data Initial and Final Test Reading for:
   a. Pump pressures at inlet and outlet
   b. Pump motor operating voltages and amperages (each leg)
   c. Flow rates through all heating equipment where flow indicators are installed
   d. Flow rates through all secondary bridges and circuits when flow indicators are installed

3.10 LUBRICATION:

Ensure that all motors and equipment, as required, are properly lubricated before such items are accepted by the Owner.

3.11 PIPE AND EQUIPMENT IDENTIFICATION:

A. Painting Pipe - Colors:
   1. Sludge - Brown
   2. Gas - Red
   3. Potable Water - Light Blue
   4. Non-potable Water - Orange
   5. Chlorine Solution - Yellow
   6. Sewage - Gray
   7. Compressed Air - Dark Green
   8. Hot Water Heating - Dark Blue
   9. Chemical Solution - Orange
   10. Polymer Solution - Orange
   11. Aeration - Dark Green

B. Labeling - Pipe:
   1. Labels shall show pipe contents with an arrow indicating direction of flow.

2. Manufacturers: Seton Nameplate Corp., W.H. Brady, James H. Matthews, Topflight Tape Co., or equal.

C. Identification:
1. Place a label on pipe adjacent to each valve and branch take-off, at 25 foot intervals on straight runs, and at each side of a penetration through a wall or partition.
2. Mark the pipe with a band 3" wide painted in the appropriate color adjacent to each label.

D. Equipment:
1. After finish painting is completed, paint or stencil on each piece of equipment its identification in letters or numbers, 1½" high, in black color.
   a. On surfaces painted in a dark color on which black paint would not show clearly, provide a painted white background for the identifiction letters or numbers.

VALVE SCHEDULE

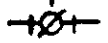
ITEM	2" and Smaller	2-1/2" and Larger
Gate Valves	150-lb. WSP, bronze, rising stem, union bonnet, hardened seat ring, screwed. Crane 431 Walworth 56 Lunkenheimer 2151 Powell 514 Stockham B-120 or equal	125-lb. WSP, TBBM, OS&Y, solid wedge disc, flanged, ASAB16.1. Crane 465 1/2 Walworth 726F Lunkenheimer 1430 Powell 1793 Stockham G-623 or equal
Globe and Angle Valves	150-lb. WSP, bronze, rising stem, inside screw, composition disc, screwed. Crane Globe 7 Angle 17 Walworth 95 96 Lunkenheimer 123 214 Powell 150 151 Stockham B-22 B-222 or equal	125-lb. WSP, TBBM, OS&Y, bolted bonnet, renewable and regrindable disc and seat ring, flanged ASA B16.1. Crane Globe 351 Angle 353 Walworth 906F 907F Lunkenheimer 1123 1124 Powell 244 243 Stockham C-512 - or equal
Check Valves	125-lb. WSP, bronze, screwed cap, renewable disc, screwed. Crane 34 Walworth 406 Lunkenheimer 2144 Powell 578 Stockham B-319 or equal	125-lb. WSP, TBBM, bolted cap, renewable and regrindable disc and seat ring, swing, flanged. Crane 373 Walworth M928F Lunkenheimer 1790 Powell 559 Stockham G-931 or equal
Balancing Cocks	125-lb. WOG, bronze, squarehead, screwed. Crane 250 Walworth 554 Lunkenheimer 454 Powell 5948 or equal	125-lb. WWP, semi-steel, squarehead, lubricated, flanged. Nordstrom 143 Walworth 1718F Powell 2201 or equal

VALVE SYMBOLS


Gate Valve


Globe Valve


Angle Globe Valve


Ball Valve


Butterfly Valve


Three Way Valve


Plug Valve


Pinch Valve


Check Valve


Slide, Knife or Sluice Gate Valve


Relief Valve - Discharge to Room

Relief Valve - Discharge to Atmosphere (thru roof unless otnerwise indicated)


Manual Air Vent


Automatic Air Vent - Pipe Discharge to Drain

Automatic Air Vent and Vacuum Relief Valve


Pressure Regulating Valve-Self Contained


Pressure Regulating Valve-External Tap


Back Pressure Regulating Valve


Flow Regulating Valve Self-Contained


Two Way Solenoid Valve Air or Electric Operated


Three Way Solenoid Valve Air or Electric Operated


Four Way Solenoid Valve Air or Electric Operated


Hose End Drain Valve


Drain Valve Piped to Open Drain


Needle Valve

Pet Cock

VALVE OPERATOR SYMBOLS

Float Operator

Handwheel Operator

Lever Operator

On-Off Motor Operator

Electronic Positioner

Pneumatic Positioner

Motor Operator With Electronic Positioner

Chain Wheel Operator

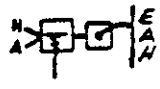
Solenoid Pilot Valve

Hydraulic Diaphragm Operator

Diaphragm - Spring to Open, Air to Close

Diaphragm - Spring to Close, Air to Open

Double Acting Hydraulic or Air Cylinder Operator with Electric, Air or Hydraulic Pilot Valve.



Spring to Open, Air or Hydraulic to Close Cylinder Operator with Electric, Air or Hydraulic Pilot Valve

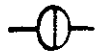
Spring to Close, Air or Hydraulic to Open Cylinder Operator with Electric, Air or Hydraulic Pilot Valve

Double Acting Hydraulic or Air Cylinder Operator With Pneumatic Positioner

EQUIPMENT SYMBOLS

Trap Assembly (as detailed or specified)

Pressure Gauge Assembly Shall Include a Shut Off Valve for All Service and a Snubber for All Pump Service and Pig Tail for Steam

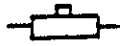


Filter

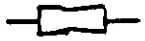
Sight Flow Glass

Base Mounted Pumps

In Line Pumps



Turbine Meter



Flow Tube

Thermostat

Rotometer

Thermometer

Dryer

PROCESS PIPING, PLUMBING AND HVAC SYMBOLS

——— A ———	Compressed Air
——— G ———	Gas
——— HWS ———	Hot Water Supply
——— HWR ———	Hot Water Return
——— RS ———	Radiant Hot Water Supply
——— RR ———	Radiant Hot Water Return
——— CHWS ———	Chilled Water Supply
——— CHWR ———	Chilled Water Return
——— CWS ———	Condenser Water Supply
——— CWR ———	Condenser Water Return
——— BF ———	Boiler Feed
——— FOS ———	Fuel Oil Supply
——— FOR ———	Fuel Oil Return
——— FOV ———	Fuel Oil Vent
——— D ———	Drain
——— V ———	Vent
— HPS(PSIG) —	High Pressure Steam
— LPS(PSIG) —	Low Pressure Steam
——— HPR ———	High Pressure Condensate Return
——— LPR ———	Low Pressure Condensate Return
——— O ———	Oxygen
——— N ———	Nitrogen
——— VAC ———	Vacuum
——— RW ———	Raw Water

——NPW——	Non Potable Water
——PW——	Potable Water
—— LSS ——	Lime Slurry Supply
—— LSR ——	Lime Slurry Return
—— AL ——	Alum Solution
——OP——	Organic Polymer
—— FCL ——	Ferric Chloride Solution
—— CLG ——	Chlorine Gas
—— CLS ——	Chlorine Solution
—— SL ——	Sludge
—— RS ——	Raw Sewage
——CE——	Clarifier Effluent
—— PS ——	Phosphate Solution
—— FLS ——	Fluoride Solution
——AS——	Activated Sludge
—— RAS ——	Return Activated Sludge
—— WAS ——	Waste Activated Sludge
—— INF ——	Influent
—— EFF ——	Effluent
——PC——	Pneumatic Conveying
—— VTR ——	Vent Thru Roof

OA — Outside Air

OAI — Outside Air Intake

SUP — Supply

EXH — Exhaust

GR — Grille

REG — Register

FD — Floor Drain

CFM — Cubic Feet Per Minute

FPM — Feet Per Minute

°F — Degrees Fahrenheit

SP — Static Pressure

HP Horsepower

ENT Entering

LVG Leaving

DB Dry Bulb

DBA Decibel - A Scale

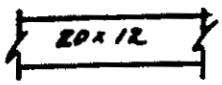
WB Wet Bulb

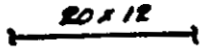
GPM Gallons Per Minute

PSI Pounds Per Square Inch

PSIG Pounds Per Square Inch Gauge

RPM Revolutions Per Minute



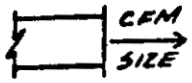


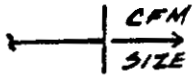
Duct (size in inches; first Figure Side Shown)

Access door (to open in on discharge side of fan and out on suction side of fan)

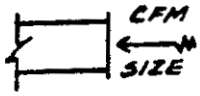
Supply duct section

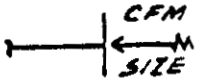
Exhaust or return duct section



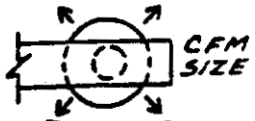


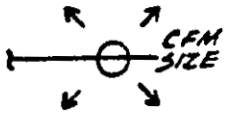
Supply grille or register



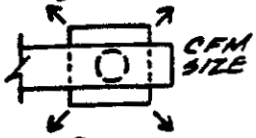


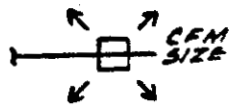
Exhaust or return grille or register



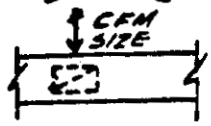


Round ceiling diffuser & cushion head (Min. 1 x neck size)

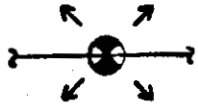




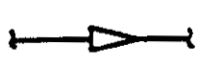
Square ceiling diffuser and cushion head (Min. 1 x neck size)



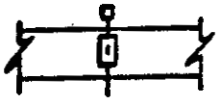
Ceiling exhaust or return air grille or register

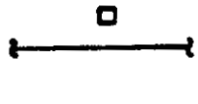


Round ceiling diffuser blanked off in shaded area

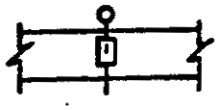


Transformation

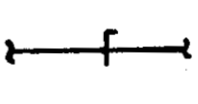




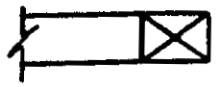
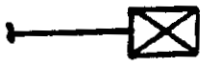
Motor operated automatic damper



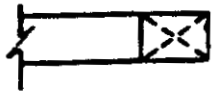
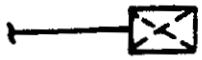
Non-motorized automatic damper



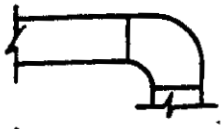
Manual damper

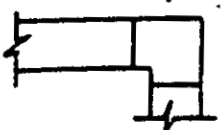
Elbow turned up

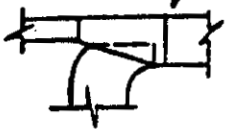
Elbow turned down




Radius type elbow (splitter as specified)

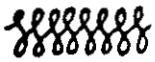
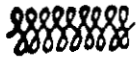



Square type elbow with turning vanes

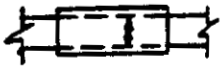



Exhaust or return air grille or register with single splitter


Combination mixing box and sound attentuator

Flexible duct (maximum four feet long)




Acoustically lined duct. Dimension shown on plan refers to inside dimension (air path)


Flexible connection


Air valve (high pressure damper)

SECTION 15B - PROCESS EQUIPMENT

PART 1 - GENERAL

1.01 Work Included: Furnishing and installation of:

A. Raw Sewage Pumps

B. Valves

1.02 Required Submittals

A. Shop Drawings

1. Raw sewage pumps, shafting seals and motors.

2. Check valves

3. Plug valves

B. Operating Instructions

1. Raw sewage pumps

2. Valves

PART 2 - PRODUCTS

2.01 Equipment

A. Raw Sewage Pumps (3 required in 67th Avenue P.S.)

1. Type: Identical, vertical, centrifugal, single, stage, single suction, non-clog pumps with intermediate shafting and constant speed motors. Station piping configuration is based on utilization of pumps with right hand discharge; the Contractor shall bear all costs of any structural or piping modification due to utilization of pumps with any alternate discharge arrangement.

2. Operating conditions:

(a) Capacity: 2750 gpm each at 35' TDH with a rotating speed of 1200 rpm; minimum capacity with two pumps operating in parallel shall be no less than 5,500 gpm when operating on the enclosed system head curve. In addition, each pump operating singly shall be capable of delivering no less than 3,000 gpm on the system head curve.

(b) Efficiency: Minimum of 75% with two pumps operating at 1200 rpm.

3. Construction:

(a) Volute: Close grained cast iron accurately machined to true and perfect alignment.

(1) Provide handholes with removable covers at volute center line.

(2) Casing connections: 125 lb. ANSI, flat face flanges, drilled and tapped for gauge and pressure swith connections - one (1) 1/4 inch IPS suction side and two (2) 1/2 inch IPS discharge side.

- Provide pressure gauges with pet cocks, snubbers and isolating diaphragm in each port.
- Provide volute with 1/2 inch plug valve for air removal.

(3) Accessories

- Provide pressure gauges with pet cocks and snubbers on suction and discharge side of pump.
- Provide volute with 1/2 inch plug valve for air removal.
- Provide pressure switch with isolating diaphragm.

- Remote mounting

- Discharge side of pump.

(b) Impeller: Cast iron, dynamically balanced, capable of passing three inch solids, keyed and locked to shaft. Provide double chrome wearing rings.

(c) Shaft: High grade alloy steel turned, ground and polished protected.

(d) Seals: Double, mechanical, "non-pusher" type, water lubricated from NPW system.

(1) Materials:

- o Rotating seals: High temperature carbon for use in water.
- o Elastomers: Viton.
- o Stationary seals: Solid tungsten carbide.
- o Metal components: 300 series, stainless steel.

(2) Accessories:

- o 50 micron filter, in transparent housing
- o Seal water meter: In-line type, 10 percent $\pm$ accuracy at any point on meter range requiring no electrical connections, range approx. three (3) times seal manufacturer's recommendations for seal water lubrication with a minimum of 6 GPH furnished by seal manufacturer, calibrated in gallons per hour.

(3) Provide a valve near top of seal housing to vent any air trapped.

(4) Provide one spare set of mechanical seals for each set of pumps.

(e) Bearings: Two sets of deep grooved ball bearings with an AFBMA B10 minimum bearing life 43,800 hours.

(f) Pump support: Pedestal base of cast iron or steel with access to suction elbow handhole.

(g) Shafting: Vertical with flexible joints between pump and motor, dynamically balanced.

(1) Quick disconnect type, designed for required horsepower, motor speed and continuous operation, sizing based on manufacturers recommendations. Universal joint life shall be minimum of 10,000 hours.

(2) Provide metal safety guards to a height of seven feet above base plate.

6. Motors: Single-speed, open, drip-proof, 40-HP minimum, 480 volt, 3 phase, 60 Hertz, 1200 rpm electric motors. Motors shall be non-overloading through entire pump operating range and conform with NEMA Class B Standards, Service Factor 1.15, 50°c rise rated.

7. Finish: Manufacturer's standard.

8. Manufacturers" Fairbanks Morse Model 8" - 5414 or equal.

B. Eccentric Plug Valves:

1. Wheel operated with position indicator on suction and chain operator on discharge extending to 3' above floor.

2. Permanently lubricated.

3. Eccentric seating, drip-tight shut-off.

4. Port area: 80 percent of pipe size, minimum.

5. Body: Cast iron or steel with Class 125 flanged end connections.

6. Bushings: Stainless steel.

7. Seating surface: 90% nickel, 300 series stainless steel or bronze, mechanically retained, or brazed to body and machined or ground.

8. Rotating element seating surface: Neoprene faced.

9. Shaft seals: Box type, repackable, 4-ring capacity stuffing box and spring loaded or adjustable bolted and gland packing follower.

10. Manufacturers: De Zurik, Dresser, or equal.

D. Check Valves:

1. Iron body full opening type, bronze mounted swing checks with outside lever and weights.

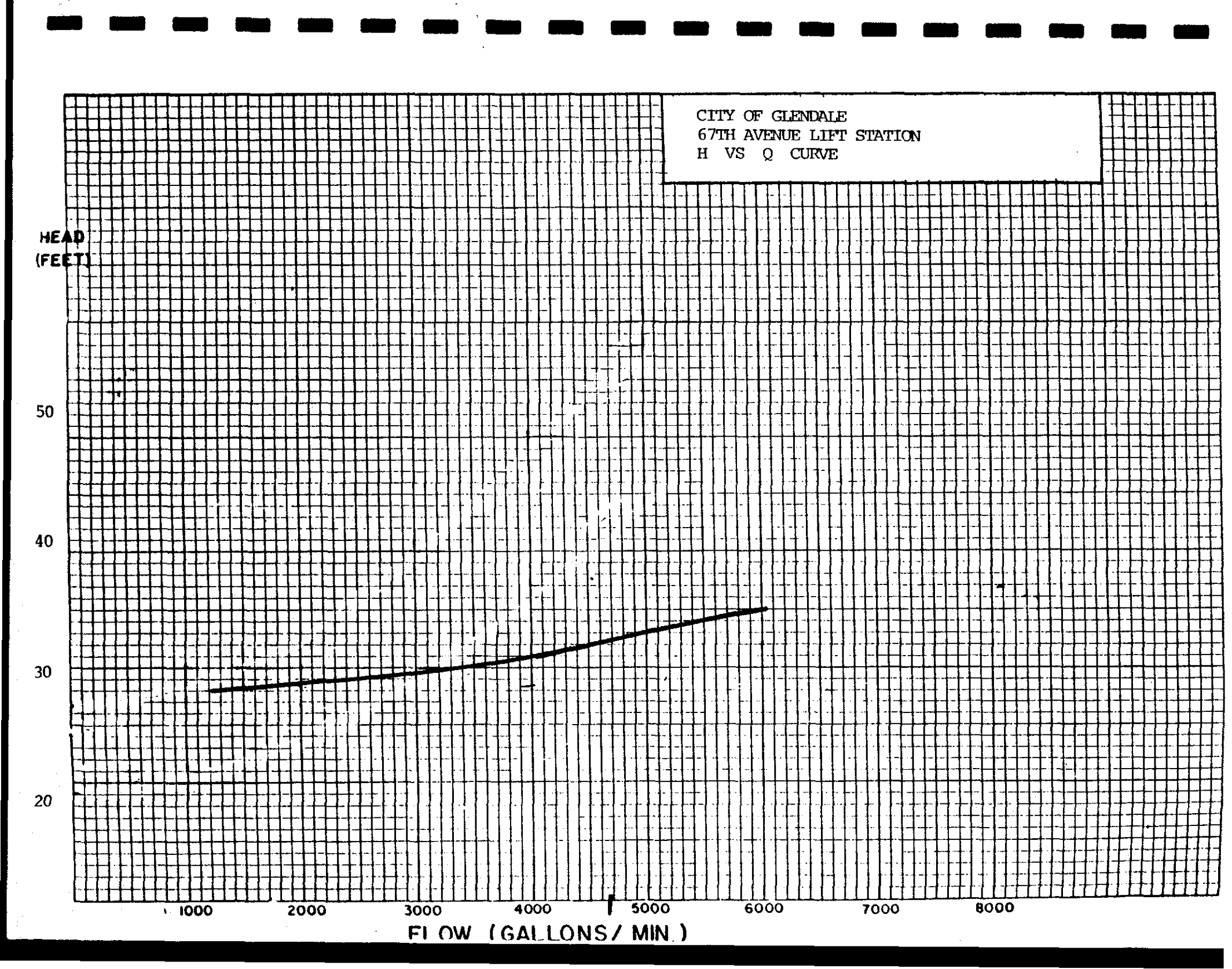
2. Manufacturers: Dresser, Clow, or equal.

PART 3 - EXECUTION

3.01 Installation

A. Drawings, shop drawings and manufacturers instructions.

3.02 Schedules: System Head Curve


CITY OF GLENDALE
67TH AVENUE LIFT STATION
H VS Q CURVE
HEAD (FEET)
50
40
30
20
1000
2000
3000
4000
5000
6000
7000
8000
FLOW (GALLONS/ MIN.)

SECTION 15C - MISCELLANEOUS EQUIPMENT

PART 1 - GENERAL

1.01 Work Included: Furnishing and Installation of:

A. Sump pump

1.02 Required Submittals

A. Shop Drawings

1. Sump pump

PART 2 - PRODUCTS

2.01 Equipment

A. Sump Pumps:

1. Furnish and install duplex, automatic controlled submersible pumps.

2. Pumps shall be vertical, free-standing with cast iron casing and impeller stainless steel shaft and permanently lubricated bearings.

3. The pump shall deliver 20 gpm against a total dynamic head of 40 feet. Pumps shall be controlled by an adjustable float switch and equipped with automatic alternator to start, stop and alternate the two pumps. Motor shall be 1750 rpm, minimum 1/4 HP, 115 volt, single phase, vertical, open drip-proof.

4. Pumps shall be furnished in a 24 inch diameter x 24 inch deep cast iron basin with removable cover plate and 3 inch diameter side inlet to be cast in concrete as shown.

5. The complete assembly shall be Clow-Yeomans with Model D-2 pumps or approved equal.

B. Pressure Gauges:

1. Bourdon tube, spring type with recalibration screws and snubbers.

2. Cases: Plain, cast aluminum, black enamel finish, screwed ring.

   (a) Dial: Minimum 4-1/2 inch diameter, white face with black lettering.

3. Provide a pet cock with each gauge, polished brass.

4. In addition to the pressure gauges furnished for the water system, and air lines as shown on the schematics, and the pressure gauges furnished with the sewage pumps on discharge and suction side as required in Section 15.B paragraph 2.01.

5. Range:

   (a) NPW System: 0-100 psi pressure.

   (b) Air: 0-50 psi pressure.

   (c) Sewage pump discharge - 0-50 psi pressure and 0-30" Hg vacuum.

   (d) Sewage pump suction: 0-30 psi pressure and 0-30" HG vacuum.

6. Manufacturers: H.O. Trerice Co., Ashcroft, or equal.

C. Isolating Diaphragm:

1. Provide diaphragm seal for each pressure switch installed in a sewage line:

   (a) Diaphragm seal:

      (1) Steel body with rust resistance finish.

      (2) Stainless steel diaphragm.

      (3) 1/4 inch N.P.T. port and bleed port on gauge side.

(4) 1/2 inch N.P.T. port and 1/4 inch flush port on pipe connection side.

(5) Manufacturers: Mercoid, Trerice, Ashcroft, or equal.

D. Pressure Switches:

1. Pump Discharge Port:

(a) Adjustable range from 5 psi to shutoff head of pump.

(b) Close on pressure rise.

(c) Differential 3.75 psi.

(d) Control: Open on pressure loss.

2. Switch: Mercury glass tube type.

3. Contact Rating: 10 ampere at 120 V.A.C.

4. Enclosure: NEMA 1.

5. Pressure Connection: 1/4 inch N.P.T.

SECTION 15D - PROCESS PIPING

PART 1 - GENERAL

1.01 Work Included: Furnishing and installation of all raw sewage piping.

PART 2 - PRODUCTS

2.01 Materials

A. Piping:

1. General: Required for wastewater force lines.

(a) Cement lining: ANSI A21.4 standard 1/2 thickness for cast iron pipe, cast iron fittings and ductile iron pipe.

2. Interior Sewage: Cast iron, ANSI A21.6, Class 22 or ductile iron, ANSI A21.50 or A21.51, Class 52, with flanged ends, ANSI A21.10.

(a) Gaskets: 1/8 inch full faced, asbestos - composition.

3. Exterior Sewage: Ductile Iron, ANSI A21.50 or A21.51, with mechanical joints, ANSI A21.11.

B. Wall Sleeve Seals:

1. Modular, mechanical, interlocking synthetic rubber links shaped to fill annular space between pipe and outer steel sleeve; Link seal, or equal.

2. Assemble Links loosely with stainless steel or corrosion resistant bolts to form continuous rubber belt around the pipe, with a pressure plate under each bolt head and nut.

3. Tighten bolts to expand the seals and form a watertight seal.

C. Grooved Pipe Couplings:

1. Locked joint, ductile iron coupler with flush gaskets to connect grooved pipe ends.

2. Manufacturers: Victualic, Napco, or equal.

PART 3 - EXECUTION

3.01 Installation:

Construction drawing, shop drawings and manufacturers recommendations.

SECTION 15E - PLUMBING

PART 1 - GENERAL

1.01 Required Submittals

A. Shop drawings:

1. Valves
2. Plumbing fixtures
3. Floor drains
4. Wall hydrants
5. Roof drains
6. Hose racks and hose
7. Hose bibs

PART 2 - PRODUCTS

2.01 Materials

A. Piping:

1. Water:

(a) ASTM D88, with wrought copper or wrought brass fittings.

(1) Interior: Hard-tempered copper type L, soldered, except threaded at valves.

(2) Exterior: Soft-tempered, copper type K, compression fittings.

2. Air (Bubbler Tube):

(a) 1/2 inch diameter, clear polyethylene, ASTM D3035 SDR17, or 3/4 inch Yoloy steel, as shown on the drawings.

3. Sump: Schedule 80, PVC, ASTM D1785, fabricated from PVC compound ASTM D1785, Class 12454-B, screwed joints.

4. Drain and Vent: PVC, ASTM D1785 for size 2-1/2 inches and larger, fabricated from PVC compound ASTM D1784, Class 12454-B, solvent welded joints.

5. Wall Sleeve Seals: See Section 15D - Process Piping, paragraph 2.02 Process piping.

B. Valves:

1. Water:

(a) Gate: 150 lb. WSP, bronze, rising stem, union bonnet, hardened seal ring, screwed ends.

(b) Globe: 150 lb. WSP, bronze, rising stem, inside screw, composition disc, screwed end.

(c) Ball Valves:

(1) Double seal type with bronze body and renewable glass fitted teflon or rubber resilient seats.

(2) Port opening: Not less than 90 percent of full pipe diameter.

(3) Lever operated.

(4) Manufacturers: Lunkenheimer, Jamesbury, or equal.

(d) Check: 125 lb. WSP, bronze screwed cap, renewable disc, screwed ends.

2. Sump Discharge:

(a) Check: 125 lb. WSP, bronze, swing, screwed ends, for vertical installation.

(b) Shut-off: 150 psi eccentric plug, lever operated.

3. Backflow Preventer:

(a) 150 psi, bronze body, stainless steel wetted parts and flange bolts, tight seating rubber check valve, sized as indicated.

(b) Conforming to ASSE Standard 1013-1971 for reduced pressure principle backflow preventers.

(c) Manufacturers: Clayton, Hersey-Spaulding, or equal.

C. Plumbing Fixtures:

1. Service Sink:

(a) Enameled cast iron with rum guard, wall hung type.

(b) Trim: Rough crome plated utility sink faucet, rigid hose and spout, indexed lever handles and 1/2-inch female union inlets with adjustable flanges, vacuum breaker, trap and tail piece.

(c) Manufacturers: American Standard "Akron" 7695-023 with 8340.242 fittings; Crane 7-564 with 8.3756 fittings, or equal.

D. Floor Drains:

1. Cast iron body with double drainage flange, weepholes, bottom outlet, round top, adjustable collar with rolled thread and anti-tilting grate.

2. Manufacturers: Josam 31200, Zurn Z-54-2, or equal, with square brass top.

E. Wall Hydrants:

1. Cast bronze, non-freeze, heavy duty, with 1-inch IPS brass casing, renewable seat, 1-inch NPT standard hose outlet, 1-inch IPS outside thread union elbow adapter, "T" handle key and vacuum breaker, polished face.

2. Manufacturers: Josam, Zurn, or equal.

F. Hoserack and Hose:

1. Rack: Heavy gauge steel, factory baked enamel finish.

(a) Manufacturers: Allen Hose, Supplex, Aeroquip, or equal.

2. Hose: Vinyl with nylon reinforcement, flexible, with bursting strength 400 psi minimum.

(a) Each rack shall have 50 feet of 1 inch hose in 25 foot sections, 1 inch NPT brass coupled ends, 1 inch NPT brass pipe nozzle.

(b) Manufacturers: Allen Hose, Supplex, Aeroquip, or equal.

G. Roof Drains:

1. Galvanized cast iron, beehive locking dome, non-puncturing clamp ring with integral gravel stop, medium sump with anchor lugs and roof flange, bottom outlet, inside caulk.

2. Manufacturers: Josam 22000, Zurn Z-100, or equal.

H. Hose Bib: 1 inch NPT outlet, rough brass.

1. Provide non-potable water sign at hose bib placed in lower level.

I. Cleanouts:

1. Locations:

(a) Each 90 degree bend in suspended and underground waste pipe.

(b) At 50 foot intervals in straight rungs.

(c) Base of each stack.

(d) Above ground "P" traps.

2. Types:

(a) Exposed concrete floors: Cast iron sectional with serrated cut-off sections.

(1) Connections: Same size as pipe, 2 inch minimum.

(2) Recessed head plug: Brass with heavy duty cover.

(b) Finished Floors: Same as (a) above.

(1) Connections: Same as (1) above.

(2) Plug: Bronze with bronze top.

(c) Finished walls: Cast brass countersunk plug, polished brass round access cover plate secured to plug with countersunk screw.

(d) Suspended pipe: Cast iron "T" branch with plated cast iron countersunk plug, lead seal, polished brass round cover plate secured to plug with countersunk screw.

PART 3 - EXECUTION

3.01 Installation:

Construction drawings, shop drawings and manufacturers recommendations.

SECTION 15F - FACTORY BUILT WASTEWATER LIFT STATION

PART 1 - GENERAL

1.01 Description:

A. Work Included: This section encompasses all work required for factory built lift stations at 55th Avenue.

B. Basis of Payment: Lump sum, complete

1.02 Related work specified elsewhere:

Section 2A: Excavation and backfilling
Section 2D: Fencing
Section 2E: Utilities
Section 2G: Site Improvements Protection and Restoration
Section 3A: Cast-in-Place Concrete
Section 15A: Mechanical General Provisions
Section 15H: Instrumentation and Control.

1.03 Testing:

A. Factory tests: The completed station shall be factory tested under simulated operating conditions. Test results shall be submitted to the Engineer prior to shipment.

B. Field tests: A trained factory representative shall performance test the completed installation in the presence of the Owner's operator and the Engineer. A minimum of one (1) day shall be provided for testing and operator training instruction; testing shall be scheduled 48 hours prior to conducting. All faculty operating components shall be repaired and testing repeated until acceptable.

1.04 Required Submittals:

A. Shop drawings: Factory built unit including size and layout of all piping and equipment seals, motors, values, sump pump, air compressors, control panel with wiring and control diagrams, ventilation and dehumidification equipment, pressure switches, pressure guages, and manlift.

B. Test Reports: Factory test prior to shipment

C. O & M Manuals: Four (4) copies of manufacturer's operating and maintenance instructions of as-built equipment with parts lists and recommended spare parts lists.

1.05 *Job Conditions*

A. Electric power connection: Station sump pump shall be operational within 24 hours of station setting.

PART 2 - PRODUCTS

2.01 Equipment

A. Pumping Chamber

1. General

a. Size: As shown on the drawings

b. Entrance tube: Minimum 4'-0" diameter, sized to permit removal of internal equipment with aluminum steel or fiberglass cover.

c. Joints: Shall be watertight

d. Design Strength: Shall be adequate for installed loadings.

2. Steel Construction

a. Steel beams: ASTM A36

b. Structural steel plate: ASTM A36, 3/8-inch bottom, 1/4-inch top and sides.

c. Grout plugs: Provide four (4) 2-inch plugs at pumps and under piping.

d. Factory coatings:

(1) Prepare and apply in accordance with coating manufacturers recommendations.

(2) Exterior below grade: coal tar epoxy of 14 mil. dry film thickness.

(3) Interior: Chromate rust inhibitive primer and 2 coats of alkyd resin enamel of 4 mil. dry film thickness.

B. Raw Sewage Pumps (2 required)

1. Type: vertical, centrifugal, single stage, single suction, non-clog pump, flexible or direct coupled to motors.

2. Operating Conditions:

a. Capacity: 550 gpm each at 33' TDH when operating at 1200 rpm with an efficiency of not less than 69%.

3. Construction:

a. Casing: Close-grained cast iron.

b. Impeller: Cast iron capable of passing 3" diameter sperical solids.

c. Shaft: High Strength carbon steel with stainless steel shaft sleeves and double chrome wearing rings.

d. Volute casing connections: 125 lb. ANSI flat face slanges, drilled and tapped guage and pressure switch connections - one (1) 1/4 inch IPS suction side and two (2) 1/2 inch IPS discharge side.

(1) Volute Accessories

(a) Provide pressure guages with pet cocks and snubbers on suction and discharge side of pumps.

(b) Provide 1/2 inch plug valve on volute for air removal.

(c) Provide pressure switch with isolation diaphragm for remote mounting on discharge.

e. Seals: Double mechanical, "non-pusher" type, water lubricated from pump discharge. Provide 50 micron ceramic screen seal filter in transparent housing.

4. Pump Drivers:

   a. Type: Vertical with thrust hearing, drip proof ball bearing, oil lubicated with lift eyes.

   b. Horsepower: Minimum 7 1/2 HP at 1200 rpm, capable of driving pump over full range of characteristic curve within service factor.

   c. Electrical: Squirrel cage induction, 230/460 volt, 3 phase, 60 hertz, 7 1/2 HP, 50 degree centigrade rise.

5. Manufacturers: Fairbanks Mase Model, 5" - 5413K or equal

C. Wastewater Piping

1. Pipe: Ductile iron, ANSI A2I. 5b, class 52, cement lined in accordance with ANSI A2I.4 for pipe and fittings. Pipe shall be flanged, ANSI A2I.1 with asbestos composition gaskets.

2. Valves:

   a. Eccentric plug valves: Cast iron or semisteel, neoprene faced plugs, permanently lubricated, corrrosion resistant bearing bushing, bolted bonnet, lever operated, 150 psi rated.

   b. Check Valves: Iron body, full opening type, bronze mounted swing checks with outside lever and weights.

D. Miscellaneous Piping:

1. Air piping: 1/2 inch I.D. flexible plastic or ASTM D88 type K copper; provide bronze plug valves where indicated.

2. Sump pump discharge: Std weight yoloy or PVC schedule 80 with threaded joints and malleable iron or PVC fittings.

3. Dehumidifier piping: 1/2 inch ID plastic tubing piped to sump.

E. Accessories:

1. Sump pump:

   a. Type: Heavy duty, hermetically sealed, submersible with permanently sealed bearings and automatic float level control.

   b. Capacity: 20 gpm at 40' TDH, 120 VAC.

2. Dehumidifier:

   a. Type: Residential type with self-contained humidistat control.

   b. Capacity: Condence 3 gallon/24 hours at 60° F and 60% RH.

3. Ventilation Blower and Ductwork:

   a. Type: Squirrel cage, 120 VAC, energized automatically when cover is raised and manually when closed.

   b. Capacity: 300 cfm at 1" S.P.

   c. Ducts: 6 inch, galvanized interior and Schedule 40 steel exterior with suction termination 1 foot above floor and discharge 2 feet above grade with screened raincap.

   d. Intake louver: 30 sq. in., screened, in entrance tube above grade.

4. Manlift/Elevator:

   a. General: Steel prefabricated hoistway supplied by the lift station manufactuer. Elevator design shall conform to requirements of ANSI Code 17-1-1928.

   b. Hoistway: Vertical cylindrical enclosure, 4 ft. inside diameter constructed of 1/2 inch ASTM A-36, grade steel plate of length to provide service at two levels in the station.

c. Drive: Warm-gear drive with gear reduction unit fitting between two grooved cable drums capable of accepting 3/8", 8 x 19 wire rope. Drive shall be 1 HP electric motor with electrically released/spring applied brake. Drive unit shall be designed for a car operating speed of 25 fpm.

d. Car: The manlift shall have a floor area of four sq. ft., a load capacity of 450 lb and shall be enclosed on top, bottom, and sides. Access shall be by folding gate equipped with electrical interlock to prevent car movement with gate not secured. The top shall be hinged for manual opening. The floor shall be two sections of steel grating, hinged to remain open, if required; an electrical platform switch shall prevent car movement when floor is in place.

Car shall be securely attached to a running frame with ball bearing guide rollers mounted to receive guiderails. A shaft shall be frame mounted, positioning two steel dogs next to guide rails capable of stopping and holding the car with rated load. The shaft shall be lever operated such that the dogs are held free of tee rails to stop the car. A slack cable shaft shall also engage an electrical switch to stop the motor drive.

e. Guide Rails: Steel T-Rails (machined for elevator service) installed true for controlled car movement, extended at top as required to prevent rollers from running off guide rails. The guide rail and fasteners shall prevent deflection of not more than 1/4 inch under normal operating conditions.

f. Mechanical safety devices: An over-speed governor shall be provided with independent 3/8", 8 x 19 cable. The governor over-speed mechanism shall release when cable speed exceed 175 fpm and shall bind the cable stopping the car.

g. Operating circuitry: Hoistway and car shall be connected by heavy duty portable cable, containing all wires required for operating and safety circuits. The car shall be moved by operating push buttons (car mounted) and by pressing call buttons at top and bottom levels. Control circuit shall automatically stop car when reaching limit of up or down travel in hoistway. Switches shall be provided

to prevent car movement with entry door open and with floor plate dis-engaged. Entry door shall be provided with keyed entry switch at each level for access.

The safety circuit shall consist of a safety relay with N.O. contacts in the main power circuit (with holding circuit and reset). Safety relay shall open the main circuit for:

(1) Overhead obstruction

(2) Below-car obstruction

(3) Open car floor

(4) Emergency stop

(5) Slack cable

(6) Upper and lower limit switch

F. Pump operating control system:

1. Type: Automatic air bubbler.

2. Operational sequence: Start lead pump. Start lag pump and activate alarm when liquid level continues to rise with lead pump on. Stop lag pump. Stop lead pump. Individual running time of pumps recorded by elapsed time meters. Alarm deactivation is manual. Pump alternation is manual.

   a. Air and electrical schematics: As shown on the drawings

3. Air Equipment:

   a. Compressors: 2 oilless 0.4 cfm at 40 psi, shelf mounted.

   b. Storage tank: One 2 gallon with moisture vent.

   c. Pressure guage: One 0-100 psi range on storage tank.

   d. Compressor pressure switch: 2 adjustable, set at 30-50 psi and 35-55 psi.

Add #1

F, S Telemetry Equip:

2 Equip as specified on Sec. 15111, 2.01, C.

b. Alarms to be transmitted:

(1.) Low air bubbler system pressure

(2.) Low wet well level.

(3.) Power failure.

(4.) Lag pump energized.

(5.) Pump No. 1 running

(6.) Pump No. 2 running

e. Air alarm pressure switch: 1 adjustable set at 25 psi.

f. Pump pressure switches: 4 industrial grade adjustable.

g. Liquid level guage: One 4 inch diameter 0-100 inch H_2O range on bubbler line.

h. Air flow meter: Rotometer calibrated 0 to 2 scfh.

i. Pressure regulator: Input 150 psi with output 0 to 15 psi set at 4 psi.

j. Blowdown valve: Ross 2426 A2012.

4. Electrical equipment:

a. Power: 120 volt single phase 60 hertz.

b. Starters: Magnetic 240/480 volt 3 phase 60 hertz with 3 bi-metal thermal overloads and 120 volt coils, hand-off-automatic switch, disconnect switch, in NEMA 1 enclosure.

c. Alarm circuit: Separate circuit with manual reset and momentary contact test switch.

d. Operating elapsed time meters: 1 for each pump.

e. Alternator switch: 2 manual double pole double throw.

f. Alternator switch sign: 1 in 1 inch letters - ALTERNATE PUMPS AND COMPRESSORS EACH WEEK.

5. See Add #1.

G. Electrical devices and wiring:

1. General: Color or number code all wiring. Cathodic, control, circuit and power wiring in separate conduit systems.

2. Cabinet: NEMA 1 enclosure hinged with cabinet type latch and separate compartments for 480 and 120 volt

equipment. Panel mount motor disconnect switches, alternator switches and sign, eleapsed time meters, breaker panel, duplex outlet, alarm reset liquid level gauge, air flow meter and blowdown valve.

3. Transformer: 480: 120-240 volt single phase 5 KVA dry type.

4. Distribution panel: Ten 15 amp. 120 volt breakers, GFI breakers on outlet circuits.

5. Lighting:

   a. General: As shown on the drawings.

   b. Operation: Automatic when cover raised and manual when cover closed.

   c. Intensity: 30 foot-candle.

6. Duplex convenience outlets: 1 on control panel and 1 at top of entrance tube.

7. Terminal blocks: Terminate wires for field connection.

8. Control wiring: Minimum conductor size #16AWG copper stranded, MTW insulation.

9. Circuit wiring (120-240 volt): Minimum donductor size #14AWG copper stranded, THW or THWN insulation.

10. Power wiring (240-480 volt): Minimum donductor size #12AWG copper stranded, THW or THWN insulation.

H. Cathodic protection:

1. General: Number code anode wiring and index in test panel.

2. System: As shown on the drawings.

3. Test Panel: Locate near electrical service entrance.

I. Spare parts and tools:

1. Keys: 3 sets

2. Filter screen, 50 micron: 2 sets

3. Valve operating handles: 1 each size valve.

4. Pump volute gaskets: 2 sets.

5. Pump mechanical seals: 2 each.

6. Pump impeller wrench: 1 each.

2.02 Materials

A. Wet well

1. Cast-in-place concrete: Class A (refer to Section 3A of these specifications).

2. Reinforcing steel: Refer to Section 3A.

3. Precast concrete pipe: ASTM C76, Class III with preformed mastic compound joints.

B. Wastewater piping:

1. Influent piping (from inlet manhole and between wet and dry wells).

(a) Pipe: Ductile iron, ANSI A21.50 Class 52, cement-lined in accordance with ANSI A21.4.

(b) Joints: Mechanical ANSI A21.11
Discharge: As specified above, harnessed for 100 psi with bolts and tie rods coal tar epoxy coated.

C. Accessories:

1. Wet well hatch: Aluminum diamond plate, bituminous coated frame, Bilco type L, or equal, with hold-open device.

2. Trash basket: See schedules, this section.

D. Electrical devices and wiring:

1. Service size: As shown on the drawings

2. Main disconnect panel: Pole-mounted NEMA 3R with service entrance breaker sized for service, emergency receptable and manual transfer switch.

   (a) Emergency receptacle: 100 amp, 3-wire, 4-pole, 600 volt rating, Crouse-Hinds, Russell Stolls, or equal.

   (b) Transfer switch: Mnaual 100 amp switch with two 600 volt circuit breakers, mechanically interlocked to allow one breaker closed at a time; minimum interrupting capacity of 14,000 amperes symmetrical.

3. Meter socket: Power company standard, mounted on service pole.

4. Conduit: Rigid hot dipped galvanized between station and service pole.

5. Connections: To station terminal blocks.

6. Control wiring: Minimum conductor size #16 AWG, copper stranded MTW insulation.

7. Circuit wiring (120-240 volt): Minimum conductor size #13 AWG copper stranded, THW or THWN insulation

8. Power wiring (240-480 volt): Minimum conductor size #12 AWG copper stranded, THW or THWN insulation.

9. Alarm light: 150 watt bulb in red weather tight globe and guard, mounted on service pole.

E. Walkway:

1. Edging: 2 inch x 4 inch treated redwood.

2. Weed barrier: 6 mil polyethylene.

3. Aggregate: crushed limestone or decomposed granite.

F. Driveway:

1. Gravel: Conform to MAG specifications, Section 7.01

G. Fencing and Gates: Refer to Section 2D

PART 3 - EXECUTION

3.01 Preparation:

A. Alignment and Grade:

1. Line and grade control:

(a) Construction stakes: By Engineer

(b) Layout: By Contractor

3.02 Installation

A. Factory-built lift station:

1. General: In accordance with manufacturing instructions.

B. Base slab: 12 inch thick on undisturbed subgrade or 2 inch mud coat; set factory furnished anchor bolts.

C. Wet well:

1. Precast concrete pipe:

(a) Placement: On base slab with full and even bearing.

(b) Openings: Maximum 6 inches greater than outside diameter of connecting pipe.

D. Cathodic Protection:

1. Anodes: Set factory furnished anodes and match to index in test panel.

E. Walkway:

1. Aggregate: 4 inch thickness over weed barrier.

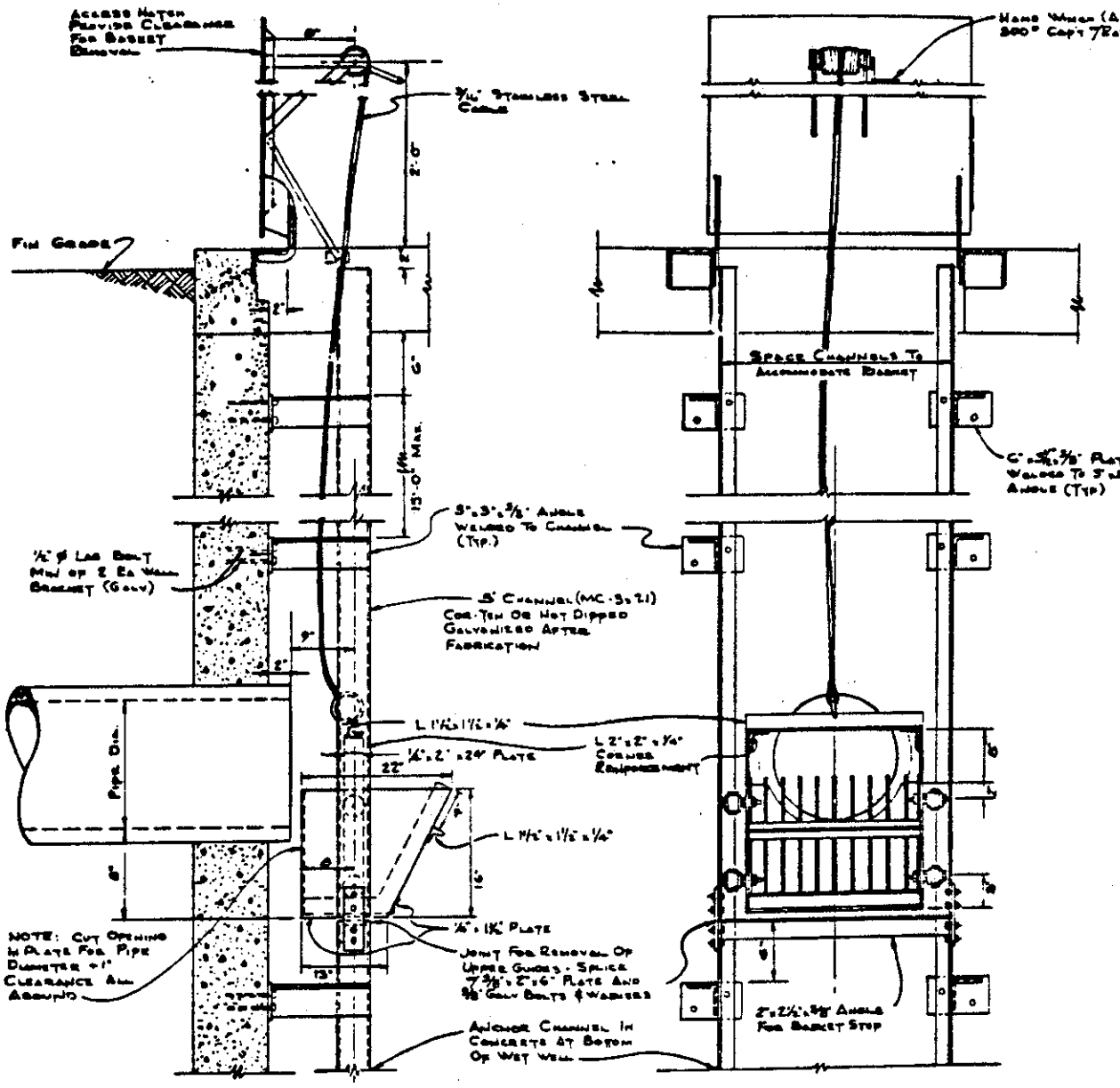
F. Driveway:

1. Gravel: Minimum 6 inch thickness.

3.03 Schedules

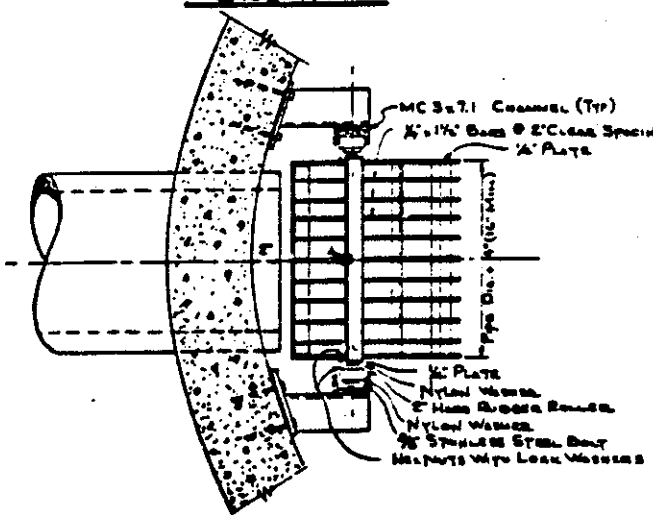
A. Details:

1. Trash Basket Assembly



SIDE VIEW

SECTION THRU CHANNEL



TOP VIEW

NOTE: Basket Shall Be Aluminum 6061-T6 Except Where Noted

Rail System And Supports Shall Be Coa-Ten Or Hot Dipped Galvanized After Fabrication

TRASH BASKET DETAILS

FACTORY BUILT LIFT STATIONS

SECTION 15G - HEATING, VENTILATION AND DUCTWORK

PART 1 - GENERAL

1.01 Work Included: Furnishing and installation of:

A. Ventilation Fans

B. Ductwork

C. Louvers and motorized dampers

1.02 Required Submittals

A. Shop drawings

1. Exhaust fan
2. Ductwork
3. Louvers
4. Motorized dampers

PART 2 - PRODUCTS

2.01 Equipment

A. Exhaust Blower

1. Belt guard and motor cover
2. Centrifugal type - single speed, belt drive.
3. Capacity: 12,900 cfm minimum at 1/8-inch S.P.
4. Motor: 460v, 3 phase, 60 Hz.Hz. 30
   (a) Permanently lubricated bearings.
   (b) 3 HP minimum

5. Wheel: Statically and dynamicly balanced

6. Manufacturers: ILG model 3000, Penn Ventilating Co., Cook, or equal.

2.02 Materials:

A. Ducts:

1. Rectangular type fabricated from galvanized steel sheet, ASTM A93, in accordance with the following table:

Low Pressure (2" W.C. Max.)	Duct Size
26 gauge	up to 12"
24 gauge	13" thru 30"
22 gauge	31" thru 54"
20 gauge	55" thru 84"
18 gauge	over 84"

2. Joint Sealer: Minnesota Mining and Manufacturing Company, "800-Premium Grade", Benjamin Foster "Fire Resistive Duct Sealer 39-02", or equal.

B. Duct Supports:

1. In concrete form work before pouring:

(a) Malleable iron threaded inserts, Crawford Fig. 282, Fee and Mason 2570, Elcen Fig. 65, Unistrut No. 1 with No. 4 nut, or equal.

2. In cured concrete:

(a) Drilled-in threaded inserts, Phillips "redhead" Molly "Parabolt", Wej-it Expansion Products "Wej-it Bolt", or equal.

(b) SMACNA Standards.

(c) Under 24-inches in width: 16 gauge galvanized steel straps, 1-inch wide.

(d) Over 24-inches in width: Galvanized angle iron saddles.

C. Dampers:

1. Construction:

(a) Frames: 13 gauge galvanized sheet steel formed into channel sections, with corner brackets to provide rigidity.

(b) Blades: Parallel design.
(1) Double 22 gauge steel.

(c) Bearings: Brass with oil impregnated sintered metal bushings.

(d) Seals: Butyl rubber on all blades and top, bottom and side stops of frame.

(e) Maximum blade width: 6 inches

(f) Maximum bland lengths: 48 inches

(g) Provide intermediate linkage at blade junctions.

(h) Design dampers to provide maximum leakage of 1 percent.

D. Damper Motors:

1. Electric, of fail spring return type, controlled by the exhaust fan.

E. Louvers:

1. Aluminum Louvers:

(a) Frames and blades: .081 inch thick extruded aluminum 6063-T5 alloy.

(1) Blades: Fixed, stormproof type, set at 45 degrees.

(b) Construction: All welded.

2. Finishes:

   (a) Factory applied conversion coat followed by a baked-on polyvinyl fluorpon (or equal) coating based on Hynar 500 resin, in color selected by the Engineer from manufacturer's standard color range.

3. Bird screens:

   (a) Aluminum wire, .063-inch thick, woven in a 1/2 inch mesh.

   (b) Mount in a folded aluminum frame.

   (c) Attach to louver frame with self-tapping stainless steel screws.

4. Manufacturers: American Warming and Ventilating, Airolite, Construction Specialties, or equal.

PART 3 - EXECUTION

3.01 Fabrication

A. Ducts: ASHRE guide "Schedule of Recommended Construction for Low Pressure Rectangular Sheet Metal Ducts."

1. Make all joints in the direction of air flow.

2. Reinforce and brace ducts with steel angles or other structural members.

3. Joints: Practically airtight, with smooth interior surface.

4. Crossbreak all ducts to prevent drumming and billowing.

3.02 Installation

A. General: Contract drawings, show drawings and manufacturers recommendations.

B. Duct Work:

1. Install in first-class and workmanlike manner, true to dimensions indicated on the drawings, straight and smooth on the inside and with neatly finished airtight joints.

2. Support ductwork on galvanized iron hangers not less than 1" wide x 16 gauge spaced maximum 8 feet on centers.

3. Provide bent angle collars to cover annular space (minimum 2"x2") where exposed ducts pass through walls or floors.

   (a) Fit collar tightly around duct and surrounding surface.

C. Louvers:

1. Provide bird screens on all louvers, mounted on exterior of frame.

D. Dampers:

1. Interlock intake air damper and exhaust air damper motors with exhaust fan.

2. According to drawings, shop drawings, and manufacturers recommendations.

SECTION 15H - INSTRUMENTATION AND CONTROLS

PART 1 - GENERAL

1.01 Description:

A. Work Included:

1. Lift station (67th Avenue) instrumentation and controls.

2. Remote transmitter (67th Avenue and 55th Avenue lift stations)

1.02 Standards:

A. Applicable Standards and Codes:

1. Institute of Electrical Electronic Engineer (IEEE)

2. Instrument Society of America (ISA)

3. Joint Industrial Council (JIC)

1.03 Submittals:

A. Shop Drawings:

1. Required for:

(a) Float switches.

(b) Control relay for float switch.

(c) Control relays.

(d) High water electrodes and relay.

(e) Instrumentation and control panel.

(1) Show all wires and tubing from field mounted components, terminating at numbered terminals and bulkheads in the panels.

(2) Schematic diagrams - JIC Standard EMP-1-67

(f) Remote transmitter

Add No. 1.

A. The Owner will make arrangements for leased telephone lines & installation.

~~D. Telephone lines shall be half duplex (2 wire) bi-directional repeaters.~~

B. After Engineer's Review:

1. Four complete bound copies of the information in A above and:

(a) Individual operating and maintenance instructions for each item of equipment.

(b) Complete parts list for each item of equipment, with sources of supply.

(c) Suggested list of spare parts, with part numbers, which the manufacturer recommends should be maintained in stock at the site (lamps, printed circuit boards, drive motors, lubrication, etc.).

(d) Wiring diagrams - JIC EMP-1-67.

1.04 Telephone Lines for telemetry:

A. Contractor shall make arrangements for telephone line rental and installation on owner's behalf.

~~B. Owner shall pay telephone company service installation fees.~~

~~C. Contractor shall pay all costs of telephone installation excluding telephone company service fees.~~

1.05 Start-Up:

A. Furnish the services of a competent service engineer to inspect the installation before being put into service and to be present during start-up and initial operation of the equipment.

B. The service engineer shall set aside two complete start-up days of 8 hours each for the purpose of instructing the Owner's operators in the maintenance and operation of the equipment.

1. Scheduling and coordination for these two days will be by written request of the Engineer.

C. In addition to these services, the manufacturer shall include two service calls, one six months after start-up and the other

one year after start-up, to inspect the installation, make any necessary adjustment, and reinstruct the plant personnel in proper operating and maintenance procedures.

1. Required for flowmeter only.

1.06 Description of Controls:

A. Lift Station Pump Control (67th Avenue).

1. Pumps shall be controlled by air bubbler system with pressure switches and manual alternator switch "1-2", "2-3", and "3-1".

2. Sequence of Pumps Operation:

(a) As the influent level in the wet well increases to the elevation shown for lead pump "on", on the plans, the lead pump shall be activated. The lead pump shall pump the wet well down to the elevation shown for lead pump "off", and the lead pump shall shut off.

(b) If the level in the wet well rises to the elevation shown for lag pump "on", the lag pump shall be activated. As the level in the wet well decreases to the elevation shown for the lag pump "off" the lag pump shall shut off and the lead pump shall continue to operate as in (a) above.

(c) If wet well is pumped down to low-level alarm pumps "off", both lead and lag pumps shall be shut-off.

(d) In "1-2" position, No. 1 is lead pump, No. 2 is lag pump, No. 3 is standby pump.

(e) In "2-3" position, No. 2 is lead pump, No. 3 is lag pump, No. 1 is standby pump.

(f) In "3-1" position, No. 3 is lead pump, No. 1 is lag pump, No. 2 is standby pump.

(g) The solenoi valve on the seal water pump is activitated, and close when the pump is deactivated.

3. Alarm conditions are to be telemetered to the water treatment plant from ICP remote transmitter in the pumping station via leased telephone line. Control and instrumentation subcontractor shall make arrangements with telephone company for telephone lines and complete all connections of telephone lines for telemetering alarm signal from lift stations to the water treatment plant.

(a) Alarms at pump station will be displayed in ICP Annunciator panel and are as follows:

(1) High wet well level

(2) Water in dry well

(3) Power failure

(4) Low pressure in air bubbler system

(5) Low pump discharge pressure

(6) Low wet well level

(b) Other condition to be transmitted:

(1) Pump No. 1 running

(2) Pump No. 2 running

(3) Pump No. 3 running

B. Building Ventilation Control:

1. Cooling thermostat activates ventilation fan when temperature rises above 100° F. (adjustable).

2. Exhaust fan is activated when upstairs switch is turned on.

3. Intake damper and exhaust louver open when exhaust fan runs.

PART 2 - PRODUCTS

2.01 Equipment:

A. Instrumentation and control panel:

1. Free standing NEMA 12 with 6" legs.

2. Enclosure:

(a) Size: minimum 72" H x 30" W x 16" D, adequate for equipment including remote telemetry equipment.

(b) Construction: Fabricated from code gauge steel sheet work all exterior seams continuously welded and welds ground smooth.

(1) Provide braces for support of flush mounted instruments.

(2) Provide sub-panels for terminal boards and rear mounted components.

(3) Provide stiffeners to prevent "oil canning" of doors.

(4) Provide lifting lugs to support the panel complete with its compliment of instruments.

(c) Painting: Thoroughly clean all surfaces, grind smooth all projections.

(1) Metal etch all surfaces before painting.

(2) Fill interior surfaces as required.

(3) Apply one coat primer to all surfaces followed by two coats of primer to exterior surfaces.

(4) Finish: One coat, air drying white lacquer to interior surfaces and 2 coats air drying lacquer to exterior surfaces in color to be selected by the Engineer.

3. Nameplate:

   (a) Provide for equipment mounted on front of panel and major groupings of control items.

      (1) Nameplates: 3-ply, white laminated plastic with engraved black lettering, 3/16 inches high.

4. Electrical Supply:

   (a) 120 volt, single phase, shall be provided for control power.

5. Control wiring:

   (a) 600 volt, No. 14 AWG, color coded.

      (1) Wiring entering or leaving a panel shall pass through terminal blocks which shall be labeled with pre-printed self-adhering labels.

      (2) Labels shall also be applied to all device wire terminals.

      (3) Wires shall be labeled at both ends.

   (b) Color coding of wires:
   DC Voltage - Blue
   Grounded Conductor - Green
   Neutral Conductor (Grounded) - White
   120 Volt Supply - Red
   Conductors energized from outside of panel - Orange.

      (1) Low voltage signal and milliampere wiring shall be run in shielded cables and to separate terminal blocks for leaving panel.

6. Pneumatic piping: Where required, shall be 1/4 inch, 3/8 inch, and/or 1/2 inch O.D. plastic tubing with brass compression type fittings. All lines leaving the panel shall be terminated at tagged bulkhead fittings.

7. Workmanship: All piping and/or wiring installation shall be executed in a workmanlike manner, and shall be grouped, bundled, supported and routed horizontally and vertically, to provide a neat appearance.

8. Testing: The instrument panel shall be factory-tested prior to shipment. Field installation by the Contractor shall consist only of setting the panel in place and making necessary pneumatic and electrical connections.

9. Wiring diagram: Prepare a complete "as-built" wiring schematic drawing, reduced to readable size, and affix to the door of the instrument panel. Cover or enclose the drawing in non-yellowing plastic.

   (a) Schematic drawings and logic diagrams shall be delivered to the owner within sixty (60) days after date of final acceptance of the control and instrumentation work.

10. Indicating lights and control switches:

   (a) Type: Oil tight, push-to-test, transformer units with color lens as shown.

   (b) Selector switch: Oil-tight, 2 or 3 position, legend plates, 10 ampere contact blocks, as required.

   (c) Push buttons: Oil-tight as required for annunciator.

   (d) Manufacturers: Allen Bradley (800T), Square D (Type K), Westinghouse (Type OT), or equal.

11. Annunciator:

   (a) 8 window type, each window measuring approximately 1-1/2 inches by 3 inches, engraved with 5/32 inch high lettering.

   (b) Flush panel mounting cabinet.

   (c) Sequence: Standard "AF" with provision for normally closed trouble signal and also normally open or normally closed auxiliary contacts for retransmission of alarm signal.

   (d) Separate "Acknowledge" and "Test" push buttons.

(e) Power supply: 120 volt AC., 60 Hertz.

(f) Alarm contact circuits shall be 120 volt AC system.

(g) Annunicator windows to be white with rear red lens.

(h) Manufacturers: Scam, Ronan or RIS.

12. Control relays used with the float switch shall be the intrinsically safe type.

13. Air Control:

(a) Flow Meter-Regulator:

(1) Regulate 60 psi air to range of 1-10 psi, 0-2 SCFH, flush panel mounting.

(2) Manufactuers: Brook, Dwyer, or equal.

(b) 6 inch flush mount liquid level gauge, 0-160 inches.

(c) 4-1/2" flush mount air pressure gauge, 0-50 psi.

(d) Check valves:

(1) 1/4 inch size, vertical type with plastic ball. No spring.

(e) Purge Valve:

(1) 3/8 inch size, manual with spring return to normal.

(2) 4 way, 5 port, panel mounting.

(3) Manufacturers: Ross 2426A2012, Versa VSI5402P, or equal.

(f) Air filter to remove particles to 50 microns and water with auto drain and transparent bowls.

(1) Pipe to bulkhead at bottom of panel

(g) Control Valves:

(1) Brass 3/8 inch, 2 and 3 way plug valves with level operator.

(h) Two 1/4 hp motor driven compressors: 0.5 scfm at 40 psi mounted on 2 gallon tank, with gauges, pressure switch control and manual alternation.

(1) Air compressors mounted on vibration isolators.

(2) Air compressor cycle 40 to 60 psi.

14. Relays:

(a) Contact rating: 10A, 120V A.C.

(b) Coil rating: 120V A.C.

(c) Types: (use plug in relays where possible)

(1) Time delay

(2) Intrinsically safe

(3) Electronic

15. Pressure Switches:

(a) Mercury switch type.

(b) Contact ratings: 10 amps at 120 VAC.

(c) Diaphragm type with adjustable set points.

(d) Pressure ranges as required by application.

(e) Contacts make or break on pressure rise as required.

(f) Manufacturers: Mercoid, Ashcroft, or equal.

16. Highwater Electrodes:

(a) High water electrodes installed in the lower dry well: Electronic high sensitivity type for water in NEMA 1 enclosure, B/W, Warrick, or equal. Molded plastic electrode holder shall be for two electrodes, B/W, Warrick, or equal, PVC insulated 1/4" stainless steel electrodes shall be 2" long with 2" differential setting.

B. Float Switch:

1. Mercury glass tube type, rated at a minimum of 100 amps at 115 volts.

2. Normally open or closed as required for the service.

3. The switch shall be potted in a solid polyurethane float, that is leakproof, shockproof and corrosion resistant to sewage.

4. Provide float switch with cable of sufficient length to reach any set depth of water level.

5. Manufacturers: Hydr-O-Matic 3900, Midland Types QS, Consolidated Model 9G, or equal.

C. Telemetry Equipment:

1. General:

(a) 67th Avenue Station: For installation in Instrumentation Control Panel (ICP).

(b) 55th Avenue Station: Furnish 24 inch x 24 inch x 12 inch deep NEMA 1 enclosure or install in factory control panel.

2. Equipment: Telemetry equipment to match BIF mini BRITE currently under contract to City of Glendale.

See Add No. 1.

Unit shall be mini-remote system consisting of four functional circuits, modem, dc-dc converter, processor, input-output. Modem shall receive data at a remote location and transmit over a communication link to a central location at the Cholla Water Treatment Plant.

Add

3. Modifications to software shall be provided to accommodate the 67th Ave & the 51st Ave LRT stations polling sequences. ~~It~~ The modifications shall be made by exchanging Prom chips at the Challa WTP with min. interruptions to the system.

Power supply shall convert 120 VAC power to a single d-c voltage. All d-c voltage shall be derived from this single voltage. An optional uninterruptable battery backup shall be available.

The unit shall be an 8 byte microprocessor. Program memory shall have available 10K bytes ROM and 2 K bytes RAM. Each mini-remote shall handle 16 discrete (dry) contacts or status input and 8 discrete solid state outputs rated at 50 milli-amps (maximum).

As part ~~A pat~~ of the standard software each mini-remote shall treat 4 of the discrete inputs as analog signals of either pulse rate ~~of~~ or timed pulse format.

Environmental and power requirements are as follows:

- Input: 120 VAC or 20-30 volts d-c. The gel-celled battery shall not be charged when power source is 120 VAC.
- Power requirements: 7 watts without battery, 12 watts when charging battery.
- Temperature limits: 0-70° C.
- Humidity: 90% maximin humidity at 40° C, non-condencing.

3. see opp sheet Add No. 1.

PART 3 - EXECUTION

3.01 Installation:

A. Drawings, shop drawings, and manufacturer's recommendations.

SECTION 16A — ELECTRICAL GENERAL PROVISIONS

PART 1 - GENERAL

1.01 DESCRIPTION:

A. Work Included:

1. This Section encompasses all general provisions for electrical work.

1.02 STANDARDS:

A. Applicable Standards and Codes:

1. Institute of Electrical and Electronic Engineers (IEEE)
2. Underwriters' Laboratories, Inc. (UL)
3. National Electrical Manufacturers Association (NEMA)
4. National Electrical Code (NEC)
5. American Society for Testing and Materials (ASTM)
6. American National Standards Institute (ANSI)
7. National Board of Fire Underwriters (NBFU)
8. National Fire Protection Association (NFPA)

10. National Electrical Contractors "Standard of Installation" (NECA)
11. Joint Industrial Council (JIC).

B. Where quantities, sizes, or other requirements shown on the drawings or specified herein exceed the requirements of the above standards and codes, the drawings and/or specifications shall govern.

1.03 SUBMITTALS:

A. Record Drawings:

1. Prepare and maintain up-to-date.
2. Show all changes to underground and other hidden work.
3. Submit to ENGINEER on completion of project.

B. Start-up Procedures, Systems Checks, Balancing:

1. Refer to 1A-General Requirements
2. Submit details to ENGINEER.
3. Submit results of tests to ENGINEER.

C. Operation and Maintenance Data:

1. Refer to Section 1A-General Requirements
2. Provide names, addresses, and telephone numbers of stocklists of spare parts.

D. Underground Direct - Buried Conductors:

1. Records of insulation test (megohm check).

1.04 FINISHES:

A. Factory Finishes:

1. Exposed Surfaces: Baked enamel.
2. Unexposed: Galvanized or sherardized.

B. For Field Finishing:

1. Prime paint.
2. Galvanized or sherardized.

1.05 CLEARANCES:

A. Equipment:

1. Maintain clearances from electric panels, and other electrical installations as required by N.E.C.
2. Maintain working clearances around electrical equipment as required for proper maintenance and operation.

1.06 EQUIPMENT FOUNDATIONS:

A. Concrete Pads:

1. Provide for all floor mounted equipment.
2. Pads: 6" high, reinforced, with level tops, and chamfered edges.
3. Set dowels or anchor bolts into pads in accordance with setting drawings or templates furnished by equipment manufacturer.
4. Concrete: Refer to Section 3A

1.07 IDENTIFICATIONS:

A. Signs:

1. Provide on all equipment, switches, breakers, and panels.

B. Circuits:

1. Provide in each distribution or branch circuit panel a typewritten schedule under glass or plastic identifying each circuit emanating from panel.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. Conduit:

1. Rigid: Galvanized or sherardized steel, aluminum or PVC, U-L listed and approved by NEC, 1/2 inch minimum size.
   a. Steel: ANSI C80.1-1966 (R1971), threaded.
   b. Aluminum: ANSI C80.5-1966 (R1971), threaded.
   c. P.V.C.: ASTM C1785, Schedule 40.
2. Flexible: High grade, interlocking, spiral strip steel with oil proof and waterproof PVC jacket.
3. Electrical metallic tubing (EMT): U.L tested, zinc coated.
4. Hangers and clamps: Type suitable for the service, galvanized steel.
5. Pull boxes and junction boxes: U.L. listed, liquid tight, dust-proof, conforming to JIC standards, hot dip galvanized steel or aluminum alloy, gasketed, with hot dip galvanized blank or nipple covers held in place with brass screws. ANSI C80.4-1966 (R 1969), sized per NEC 370-18.
6. Underground ducts:
   a. For direct burial: PVC, ASTM C1785, schedule 40, with watertight fittings.

(1) Provide concrete hand holes with cast iron covers when required by code or drawings.

B. Conductors:
1. 600 volt, THW or THWN.
2. For Underground Burial: UF or USE, 600 volt rated.
3. Control Wiring: #14 AWG minimum, color coded.
4. Wiring for Power and Lighting: Color coded. Minimum wire sizes: Lighting #14AWG; Power #12AWG.
5. Conductors forming integral part of control centers, meters, control panels, controllers, transformers, instruments, etc. shall comply with Code and industry standards applicable to such factory-wired equipment.
6. Low Voltage Purpose Wire: IPCEA standards, and UL approved.
7. Wires shall terminate in approved terminal strip, solderless lugs, or compression lugs as condition requires.
8. All conductors shall be copper unless otherwise noted.

C. Transformers:
1. Dry type, Class H, 150 degrees C. rise insulation.
2. Suitable for indoor or outdoor operation
3. For transformers above 3 KVA provide standard 2½ percent taps above and below nominal rated voltage.
4. Noise level: 45db per ANSI C89.1-1961 (R1969).

D. Wiring Devices:
1. Receptacles: Brown with brown plastic cover plates.
   a. Outdoor units: Encased in cast aluminum boxes with cast aluminum weatherproof cover plates.
   b. Duplex receptacles: 120 volt, 15 ampere, 3-pole grounded, unless otherwise shown, conforming to NEMA WD-1.
2. Plug-in-Strip: Single 3-pole grounded receptacles located on surface raceway, 12" on centers.
3. Switches: Brown with brown plastic cover plates, quiet type, 125 volts, 15 amperes, tungsten rated, 60 Hz.
   a. Outdoor units: Enclose in cast aluminum boxes with cast aluminum weatherproof cover plates.

PART 3 - EXECUTION

3.01 INSTALLATION:

A. Equipment:
1. Install per manufacturer's recommendations.

B. Wiring:
1. Install only after completion of work which might cause damage to wires or conduit.
2. Clean out or replace conduit in which dirt, water, concrete, or other foreign matter has been allowed to accumulate, before installing wiring.
3. Splices: No wire splices allowed in entire length of conduit or raceway.

a. Make splices in electrical enclosures.
b. Cable splices and underground cable terminations: Industry standards, Edison Electrical Institute Underground Reference Book, and manufacturer's recommendations.
c. Splice insulation: Equal to original factory insulation.
d. Splices in underground locations: Epoxy type.
e. Splicing copper to aluminum: Use aluminum-copper connections.

4. Direct buried cable: Minimum depth 24".
   a. Cover with 2" x 6" wood plank painted bright orange, located 12" above cable, or with yellow polyethylene marker tape continuously marked "electrical cable" located 12" above cable if allowed by drawings or specifications.
   b. Encase all direct buried cable in 6 inches of sand.
5. Common conduit: Only for same type of circuit.
   a. Provide separate conduit for each type of circuit (feeders, branches, signaling, alarm, motor, etc.).
6. Identification of insulated conductors: Mark on outer cover giving voltage, type, and size.
   a. In addition, identify each end of each conductor by wire marking tape or sleeve.
7. Termination of wires: Insulated, compression type lugs.

C. Conduit:
1. Deliver to job in bundles of full length pipes, each length marked with U.L. listing and name or trademark of manufacturer.
2. Install in accordance with manufacturer's recommendations.
3. For encasing in concrete or setting under or in concrete floor, use only galvanized steel or PVC.
4. Run conduit parallel to or at right angles to building lines, except when allowed in concrete slab or run under base slab.
   a. Support maximum 8'-0" on center.
   b. Bends: Standard ells. Maximum of the equivalent of four quarter bends in any run between pulling points.
5. Paint with red lead the ends of conduit joining couplings or threaded fittings.
6. Fasten by lock nut and bushing in the inside and lock nut in the outside all conduit entering boxes.
7. Coat all conduit installed in concrete or in contact with the earth with two heavy coats of asphaltum paint.
   a. Coat new threads with one coat of asphaltum paint, wrap with cloth, and finish with a heavy coating of asphaltum paint applied over entire joint.

8. In rooms and areas having a corrosive atmosphere, use only PVC or PVC coated conduit and enclosures for electrical devices.
   a. Conduit and enclosures shall be gas-tight.
   b. Use seal-off fittings where conduit enters or leaves such areas.
9. Use flexible conduit for final connection to each motor.
   a. Flexible conduit shall be minimum 18" in length and shall be sufficiently long to enable motor to be set on floor without disconnecting.
10. Clean all conduit thoroughly inside and outside after installation.

D. Transformers:
1. Mount to wall with sound-absorbing spacers and backing.
2. Make all connections to transformer with flexible conduit.

E. Wiring Devices:
1. Wall switches: Top at 4'-0" above floor on lock side of door on a tile or masonry joint unless otherwise shown on the drawings.
   a. Where more than one wall switch is installed in the same location, set under one cover plate.
   b. Provide permanent barriers between adjacent switches on 240 volt service.
2. Convenience outlets: Top at 16" above floor unless otherwise shown on drawings.
   a. See architectural drawings for proper centering.
   b. See mechanical drawings for coordination with mechanical equipment.

3.02 Test and Operation:

A. Equipment:
1. Thoroughly clean, lubricate, and protect from damage and dirt during operation.
2. Test and operate in accordance with manufacturer's recommendations.

B. Underground Direct - Buried Conductors:
1. Apply insulation test (megohm check) on cables, wire to wire and wire to ground.
2. Minimum test voltage, 500 volts D.C.
3. Record results of test and submit copy per paragraph 1.03 above.
4. Make test before operating voltage is applied.

3.03 Schedules:

A. Electrical Symbols ESL-1 thru ESL-4.

Recessed fluorescent fixture

Surface mounted fluorescent fixture

Wall mounted fluorescent fixture

Recessed incandescent fixture

Surface mounted incandescent fixture

Wall mounted incandescent fixture

Ceiling mounted exit light

Wall mounted exit light

Wall switch 1 or 2 pole (as noted)

Wall switch 3 or 4 way (as noted)

Key operated switch

Switch and pilot light

Thermal motor switch

Duplex convenience outlet

Floor convenience outlet

120/240V-1 ∅ outlet (amps as noted)

Junction box

Thermostat

Telephone outlet

Floor telephone outlet

Push button

Buzzer

Bell

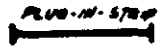
Fire alarm station

Horn (F.= fire horn)

ELECTRICAL SYMBOLS	ESL-1

Surface Mounted Lighting Panel (as noted)

Recessed Lighting Panel (as noted)



Plug-In Strip

Single phase motor w/horsepower

Three " " " " "

Disconnect switch (size & type as noted)

Motor Starter

Pressure switch

Differential pressure transmitter

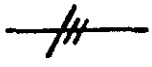
Pressure transmitter

Float control

Ph meter transmitter

Turbidity transmitter

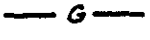
Valve number



Conduit, exposed except as note in the specifications. (approximate No. of wires noted by hash marks)

Conduit, concealed in walls, ceiling, or floor.

Wire to panel as noted. Circuit No. as noted.



Bare copper ground

Special item as noted

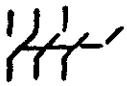
WP

Weatherproof items

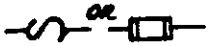
Transformer

3 position maintained selector switch.

2 position maintained selector switch.

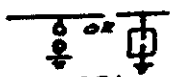

Disconnect switch, 3 pole


Circuit breaker, 3 pole

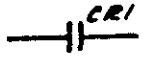


Fuse, size as noted

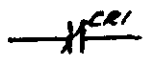

Transformer



Lighting arrester (L.A.)

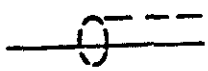


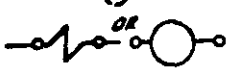
Normally open contact (NO, relay CR1)



Normally closed contact (NC, relay CR1)


Plug and receptacle (female, male)

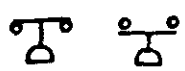

Shielded cable

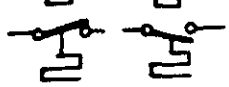


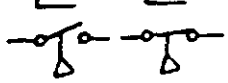
Solenoid valve

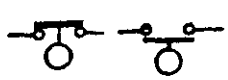

Limit switch (normally open)

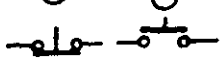

" " (normally closed)

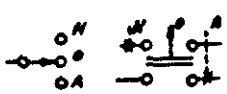

Pressure switch (NC or NO)


Thermostatic switch NC or NO)

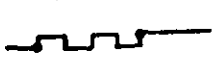

Airflow switch NO or NC)


Float switch (NC , or NO)


Push button (NC or NO)

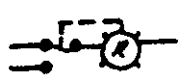


Hand-off-auto switch


Heater

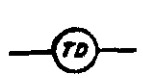

Restance

Pilot light (R-Red, G-Green, Etc.)

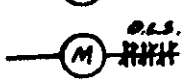


Push to test pilot light


Switch



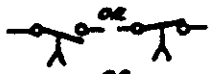
Relay coil (TD-time delay, CR-control relay, AR-alarm relay, R-relay)



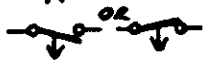
Motor Str coil with overload relay contacts

ELECTRICAL SYMBOLS	ESL-3

Terminals, wiring to remote device



Time delay on energize contact (NO or NC)



Time delay on deenergize contact (NO or NC)

Circuit continuation (A,B,C, etc.)

Diode

Connection point

No connection point

Fused disconnect switch

Overload relay

Floodlights (as noted)

Cord plug (as noted)

ELECTRICAL SYMBOLS	ESL-4

SECTION 16B - ELECTRICAL POWER AND LIGHTING

PART 1 - GENERAL

1.01 Description:

A. Work Included:

1. Power and lighting for 67th Avenue lift station.

1.02 Submittals:

A. Shop Drawings:

1. Required for the following:

(a) Motor Control Center

(b) Disconnects

(c) Fixtures

(d) Wiring devices

(e) Transformers

1.03 Electrical Service:

A. Secondary: 480 volt, 3 phase, 60 hertz:

B. Arrangements for electrical power to service pole is by others.

PART 2 - PRODUCTS

2.01 Materials:

A. Motor Control Center:

1. Main components:

(a) Enclosure

(b) Motor starters

(c) Branch circuit over-current protection

(d) Main service circuit breaker

2. Provide nameplates on main breaker, motor starters, and branch circuits.

3. Enclosure:

(a) Free standing NEMA 1 metal-type of uniform size and appearance.

(b) Finish:

(1) Chemically clean, phosphatize, and prime paint all surfaces.

(2) Apply two coats of air dry lacquer to exterior surfaces.

(3) Apply one coat of air dry lacquer to interior surfaces.

4. Construction:

(a) Class I with Type B wiring.

5. Panel:

(a) Motor control construction where grouped motor control is shown.

6. MCC - Main bus:

(a) 400A, 600 volt, 3-phase.

7. Provide lifting lugs capable of supporting weight of enclosure including installed equipment.

8. Provide support channels for skidding unit in place.

9. Main Disconnect:

   (a) 3-pole, 400 ampere, 600 volt thermal-magnetic trip circuit breaker.

   (b) Interrupting rating: Not less than 35,000 amperes symmetrical, at 480 volts, 3-phase.

   (c) Breaker: Trip-free.

   (d) Lugs: Suitable for use with copper conductors.

10. Motor Starters:

   (a) Combination, circuit-breaker type, magnetic, single or two speed, as shown, with the following accessories:

      (1) 120 volt control transformer, where required.

      (2) Nameplate

      (3) Bi-metallic overloads

      (4) Run pilot light

      (5) Selector switches - 2 or 3 position

   (b) Overload reset and tripped indicator: from front of panel.

   (c) Disconnects: Padlockable in the "OFF" position.

   (d) Wiring: Class 1, Type B.

11. Branch Circuits:

   (a) Overcurrent Protection: 3-pole, 600 volt circuit breakers with thermal-magnetic trips. Sizes as shown on drawings.

12. Accessories:

(a) Nameplates: Minimum 1 inch x 3 inch wide white plastic with engraved black lettering.

(b) Pilot Lights: 120 volt, 60 Hertz, with plastic lens and color matched rings.

(1) If special tools are needed for lamp replacement, furnish same.

(c) Selector Switches: Rated not less than 120 volts, 10 amperes, 60 Hertz with maintained or momentary contacts as required, oil-tight.

(1) "OFF-ON", "OFF-AUTO", or "ON-OFF-AUTO" as shown on drawings.

(d) Elapsed Time Meters: 120 volt, 60 Hertz providing 5-digit readout in hours of running time plus a sixth digit in tenths of an hour.

(e) Control Circuits:

(1) As shown on drawings.

(2) Contacts: Rated not less than 120 volts, 10 amperes. Plug-in type, with octal socket.

o Two or more relays are required for some functions.

(3) Time delay relays - delay on or delay off and time range as noted.

13. Transformer, motor starters and circuit breakers as shown on drawings.

14. Manufacturers: Square D, G.E. or Furnas.

B. Fixtures:

	Description	Manufacturer	Lamp
1.	Lift station interior	1. Daybrite	Flourescent
	a. Type "A": Eight foot, 4 lamp 40 W, flourescent, plastic enclosed, gasketed with acrylic lens, thermal protected low temperature CBM 4 certified ballasts, 3 wire cord & chain hangers.	R81441 2. Westinghouse #2EGL240RP or equal.	F40 WWS
2.	Outdoor lighting.		
	a. Type "B" Wall mounted, 250 watt, 120 volt, mercury lum inaire, with cast housing, integral ballasts, CWA Design, primastic lens.	1. Holophane 589120 2. Art Metal #MWBBcell or equal.	250 watt M37 Mercury

D. Lighting Panel: LPI)

1. 120/240 volt, 3 wire, single phase, 30 circuit surface mounting with door and lock, 100 ampere mains, 60 amp main breaker.

Circuit	Poles	Amperes	Description
1	1	20	Power hoist
2	1	15	Upstairs lights
3	1	15	Downstairs lights
4	1	15	First floor receptacles
5	1	15	Intermediate floor receptacles
6	1	15	Lower floor receptacles
7	1	15	Outside lights
8	1	15	Air Compressors
9	1	20	Space
10	1	15	Space
11	1	15	Space
12	1	15	Space

13	1	15	Ventilation control
14	1	15	Pump No. 1 control
15	1	15	Pump No. 2 control
16	1	15	Pump No. 3 control
17	1	15	Pump control
18	1	15	Alarm
19	1	15	
20	1	15	
21	1	15	Sump pump receptacle
22-25	1	15	Spares
26-30	1	15	Spaces

E. Disconnect Switches:

1. Single throw.
2. Non -fusible.
3. 600 VAC.
4. 3 pole.
5. Padlockable.

PART 3 - EXECUTION

3.01 Installation:

A. Lift Stations:

1. Accordance with drawings, shop drawings, and Specifications.
2. Wiring shall terminate at marked terminal blocks, in Motor Control centers, controllers, and junction blocks for connection by Instrumentation and Control sections.
3. All direct burial cables, duct runs and conduits buried outside building shall have locations recorded on drawings, to be turned over to Engineer on job completion.

3.02 Performance:

A. Ventilation Control - Lift Stations:

1. Cooling thermostat activates ventilation fan when temperature rises above 120 degrees F. (adjustable)

2. Intake and exhaust dampers operate with fan.

SECTION 16C - STAND-BY GENERATOR - LIFT STATION AT 67TH AVENUE

PART 1 - GENERAL

1.01 Description:

A. Work Included:

1. Standby generator with accessories, transfer switch, and fuel day tank for complete installation.

B. Work Specified Elsewhere:

1. Electrical and Control Connections:

a. Section 15B.

1.02 Submittals:

A. Shop Drawings:

1. Required for:

(a) Engine-generator unit.

(b) Control panel.

(c) Transfer switch.

(d) Fuel tank:

(1) Day tank.

(e) Operation and Maintenance Manual.

B. Installation Instructions:

1. One copy to the resident engineer at time of delivery of units.

C. Operation and Maintenance Manuals:

1. Four bound copies of all manufacturer's operation and maintenance instructions.

(a) Provide a list of spare parts and lubricants indicating source of supply.

D. Certified Copies of Shop Testing.

1.03 Quality Assurance:

A. Shop test at 100 percent rated load, before delivery.

B. 24 month warranty including parts and labor.

1. Manufacturer responsible for complete generator set.

PART 2 - PRODUCTS

2.01 Materials:

A. Stand-By Power Unit:

1. Type and Capacity: Automatic start with automatic transfer switch to operate on power failure.

(a) Diesel motor-generator set having capacity to start one 40 hp, 480 volt, 3 phase, 3 wire, 60 Hertz NEMA Code G motor, while powering two (2) similar 40 hp motors. Minimum 150 KW, continuous stand-by rating.

(b) Design: Completely integrated unit, free from harmful critical speeds and torsional vibration within the operating range of speed and capacity.

(c) Sound attenuation of unit to meet OSHA/MIOSHA or maximum sound level of 90 dBA at 4 feet from unit, which ever is lowest dBA level.

B. Electrical Generator Sets:

1. Self-contained and complete with accessory equipment.

2. Generator and exciter shall withstand safely 125 percent of rated speed.

C. Engines:

1. Diesel:

(a) General purpose, liquid cooled, 4-cycle, with replaceable cylinder liners and valve seats.

(1) Cylinders: Inline or "V" type, minimum number - 6.

(2) Connecting Rods: Forged steel, angle split for removal through cylinder liners and a serrated surface at the split line.

(3) Crankshaft: Forged steel, statically and dynamically balanced.

(4) Water Jacket: Full length of cylinder.

(b) Rating: Calculated at 1200 feet above mean sea level.

(1) BHP: 1.5 times KW rating.

(2) BMEP: BHP x 792 x 103/Disp. x rpm.

(c) Fuel: No. 2 fuel oil.

(1) Submit fuel consumption requirements.

(2) Fuel pump: Positive displacement type, engine driven with relief valve.

(3) Mount transfer pump on or next to generator set.

(d) Governor:

(1) Hydraulically or mechanically operated with manual adjustment of load limit and speed droop.

(2) Speed droop adjustment: 0.5 percent of rated full load speed.

(3) Under constant load there shall be no hunting.

(4) With changing load, there shall be no sustained oscillations of speed or power output following a load change.

(5) Provide governor with 24 volt D.C. shutdown solenoid.

(e) Fuel and Lubricating Oil Filters: Full flow, disposal cartridge type.

(f) Lubricating Oil Cooler: Shell and tube heat exchanger with steel shell and tubes of adequate size.

(1) Provide mounting brackets on frame.

(2) Design cooler for easy cleaning.

(g) Air Intake Filter: Engine-mounted, dry type.

(h) Exhaust Silencer:

(1) Provide critical silencing.

(2) Suitable for installation with a minimum back pressure of 20 inch water column.

(3) Conform to federal standards for exhaust emission.

(4) Quiet exhaust to maximum of 90 dBA.

(5) Provide drain port and drain cock at bottom of discharge end.

(j) Exhaust Pipe and Expansion Joints:

(1) Flexible stainless steel between engine and muffler.

(2) Stainless steel exhaust pipe through wall and to above roof with rain cap as shown.

(3) Length of flexible pipe: Per manufacturer's recommendations.

(k) Safety Devices:

(1) Shut-down devices for high water jacket temperature, low lubricating oil pressure and overspeed governor shall stop engine immediately by cutting off ignition and fuel supply.

- o Devices shall require manual resetting.

(2) Alarm switches: Normally-open; shall be actuated by engine overspeed, high water temperature, overcrank, and low oil pressure.

(3) Provide means to delay operation of low oil pressure devices until engine is brought to full speed.

(4) D.C. Overcrank

(l) Gauge Board and Gauges: Mount on engine where it will not be required to be removed during engine servicing.

(1) Water Temperature Gauge: Thermocouple or thermistor type.
(2) Oil pressure gauge.

(3) D.C. alternator ammeter

(m) Cooling System: Heavy duty type radiator with all brass water passages and fins; mounted on engine subbase:

(1) Air flow: From engine to radiation.

(2) Cooling fluid: rust-inhibiting anti-freeze with freezing point - 30 ° F.

(3) Fan: Engine driven with necessary sheaves and belts.

(4) Water jacket pump: Sized to meet engine requirements.

(5) Thermostatically controlled jacket water heater, 120 VAC, single phase, 60 Hertz.

(o) Vibration Isolators:

(1) Provide between frame and support pad.

(2) Isolators shall have internal adjusting and leveling bolts.

- Manufacturers: Korfund Co., Vibration Eliminator Company, or equal.
- Furnish anchor bolts and other fasteners required for installation.

(p) Electric Starting Systems:

(1) Automatic from storage battery, 24 volt.

(2) Storage battery capacity: 4 engine starts.

(3) Electric circuit shall include:

(a) Electric cranking motor, heavy duty with appropriate automatic engagement and drive mechanism and capacity to crank engine for starting.

(b) Storage battery and rack.

(c) Battery charger.

(d) Starting circuit devices, including test switches (for operation and testing), relays, connectors, receptacles, and wiring.

(e) Start and stop switches (located on gauge board).

(4) Automatic starting shall occur whenever there is a loss of 5 to 15 percent normal electric service (480 volt) for a period of 5 to 120 seconds and engine shall run until 100 percent power is restored for a period of one to two minutes. (All timers shall be fully adjustable).

(5) Exerciser shall automatically exercise the engine for a minimum of one 30-minute period at operating load.

(q) Battery and Battery Charger:

(1) Battery: 24 volt lead-acid, sealed in plastic type or nickel cadmium type, complete with battery rack and intercell connectors.

(2) Battery Charger: Full-wave, single phase, 60 Hertz service, fully insulated from AC system by a transformer.

(a) Capacity: Recharge depleted battery in not more than 24 hours, automatically controlling rate of charge, 10 ampere minimum rating.

(b) Operate from 120 volt AC source while unit is idle.

(3) AC-DC alternator with transistorized voltage regulator shall charge the battery while generator rotor is operating.

(a) Alternator minimum rating: 35 ampere with ammeter on engine panel.

(r) Mounting Frame: Common steel skid type for engine and generator.

(1) Integrally cast or fabricated.

(2) Provide drilled lugs for fastening vibration isolators.

(s) Fuel Tank:

(1) Day tank: Standard type and size furnished with engine.

(a) Mounted on or next to generator set.

(b) Provide seed, drawoff, engine return and fill cap, overflow and vent openings.

(2) Fill tanks with No. 2 fuel oil

(t) Housing:

(1) For outdoor location: Metal enclosure 16 gauge minimum, lined with fire resistant, acoustical material, four (4) removable locking type side panels, one lockable control access door, ventilating louvers with exhaust fan, air filter panels for 1/2 inch water column pressure drop accross filter, including weather hood.

u. Operating noise level: Maximum of 80 dba at 25 feet from all sides of generator housing.

D. Generator:

1. Type: Rotating field, open, double bearing bracket type, direct-connected to engine, with continuous type damper windings.

2. Insulation: NEMA Class F, ANSI C50.10, with special moisture-proof treatment.

3. Construction and Rating: NEMA Pub., No. MG1

4. Excitation System: Static type of rotating brushless type direct-connected to the free end of generator shaft and static type voltage regulator.

(a) Output: sufficient, without exceeding permitted temperature, to provide the following performance characteristics:

(1) Terminal voltage automatically regulated within a ban + 2 percent of rated voltage from no-load to full load and from full-load to no-load.

(2) Instantaneous voltage dip shall not exceed 20 percent upon the sudden application of a load equal to the generator rating (same power factor), and recovery time to normal voltage band shall not exceed 0.5 seconds.

(a) Stabilized voltage shall not oscillate outside the steady state band more than once for both loadings.

5. Voltage Regulator:

(a) Automatically controls generator field through action on the exciter to produce generator output performance specified, using no electronic tubes or electolytic capacitors and obtaining reference voltage from all three phases of the generator.

(b) Mount on control panel.

6. Space Heaters: Provide in generator and exciter to prevent condensation, suitable for 120 volt, single phase, 60 Hertz.

(a) Heater shall be continuously energized when engine is not running and shall be thermostatically controlled.

E. Electrical Control Cubicle: (Mounted on Generator in Housing)

1. Cubicle Shall Contain:

1 - Elapsed time meter, 5 digit with 6th digit for 1/10th of an hour.

1 - Generator main circuit breaker shunt trip control switch.

1 - Generator voltage regulator

1 - Voltage adjusting rheostate for voltage regulator

1 - Automatic voltage regulator

1 - AC ammeter; range shall include full load current

1 - Ammeter transfer switch for 3 line current readings

1 - Voltmeter switch for 3 phase to phase reading

1 - Frequency meter, dial type

1 - Battery charging rate indicating ammeter

1 - Annunciator

2. Construction: Weather tight, with 14 minimum gauge steel sheet panels on structural steel frame, all welded.

   (a) Provide removable side panels or hinged front panel for access.

   (b) Provide clamping blocks for cable support.

   (c) All equipment installed and wired at the factor.

3. Annunciator: Solid state with lamps activated from engine battery.

   (a) Push Buttons: Momentary contact type for lamp test, lamp reset, and alarm silencing.

      (1) Silencing alarm shall not prevent its subsequent sounding should another fault occur.

      (2) Provide the following alarms:

         (a) High jacket water temperature

         (b) Low oil pressure

(c) Low battery voltage

(d) Low fuel level

(e) Overspeed

(f) Overcranking cutout

(g) Spare

(h) Spare

(3) Mounted in control cubicle.

(4) Provide auxiliary contact for generator malfunction indicator in remote lift station annunciator.

(a) Contact open on alarm condition.

4. Nameplate: Furnish for all devices where circuit and function cannot otherwise be readily determined.

5. Circuit Breaker: Provide one manually operated air circuit breaker, 3-pole, 600 volt, having ampere and interrupting rating to match generator rating:

(a) Protective System: Static-sensor having adjustable tripping characteristics for long-time, short-time, and instantaneous faults.

(b) D.C. trip.

F. Transfer Switch (Wall Mounted):

1. To transfer load from preferred to alternate and from alternate to preferred source automatically.

2. Transfer switch shall be motor or solenoid operated type:

(a) Motor type to be slow transfer. (Transfers in 15-30 seconds with a neutral position).

(b) Solenoid type (fast transfer) shall have in-phase monitor type transfer.

3. Switch shall use preferred source whenever there is 3-phase and 95 percent rated voltage or better and shall transfer to alternate source in approximately 15-30 seconds, after loss of voltage on preferred line for a period of 5 to 120 seconds. (Both adjustable).

4. Switch shall transfer back to preferred line in approximately 15-30 seconds, whenever rated voltage has been maintained for 1 to 2 minutes, adjustable sources being connected together and transfer load in-rush currents without welding of contacts.

5. Switch Rating:

   (a) 400A, 480 volt minimum, 3-0, 60 Hertz.

6. Provide test button for switch.

7. Switch shall be capable of operating by manual means.

8. Enclosure NEMA 3., mounted at emergency generator.

G. Manufacturer: Kohler, Caterpillar, Onan or equal. Add #1.

   1. Manufacturer responsible for all generator components.

2.02 Spare Parts and Tools:

A. All equipment is to be delivered with a minimum of three sets of operating, maintenance, repair and adjustment data, parts lists, and any special tools, gauges, etc., required for operation, Owner maintenance and adjustment, (2) air cleaner cartridges, (2) oil filter cartridges, and (2) fuel filter cartridges.

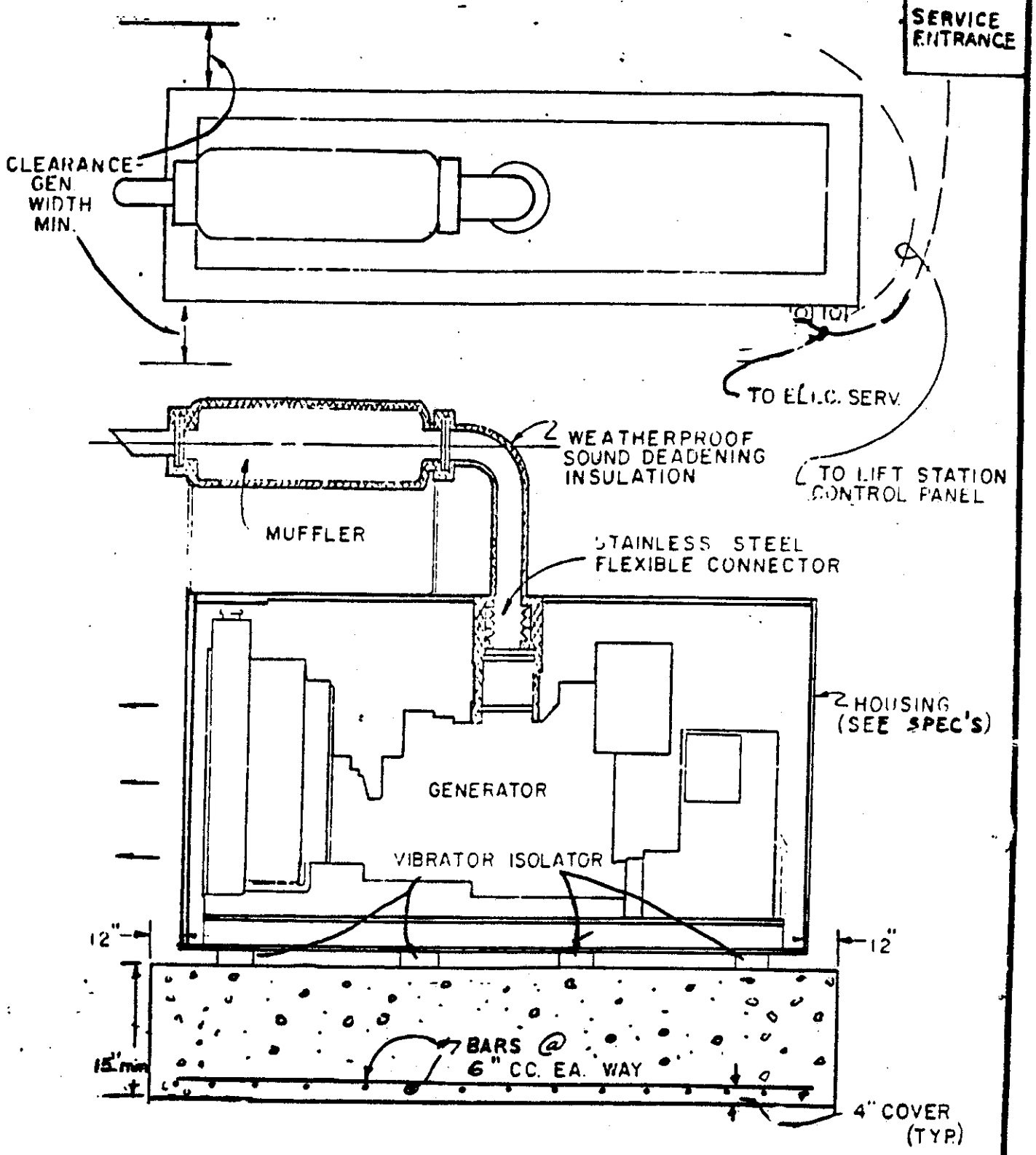
PART 3 - EXECUTION

3.01 Installation:

A. Drawings, shop drawings, and manufacturer's recommendations.

3.02 Schedules:

A. Generator.



STAND-BY GENERATOR