FENWICK SEWAGE PUMPING STATION

IN THE TOWN OF PELHAM

Project
E.O. 81481 November 1981

ADDENDUM NO. 1

November 12th, 1981

This addendum shall form part of the contract documents. The tenderer shall insert the addendum in front of the cover page of the contract documents.

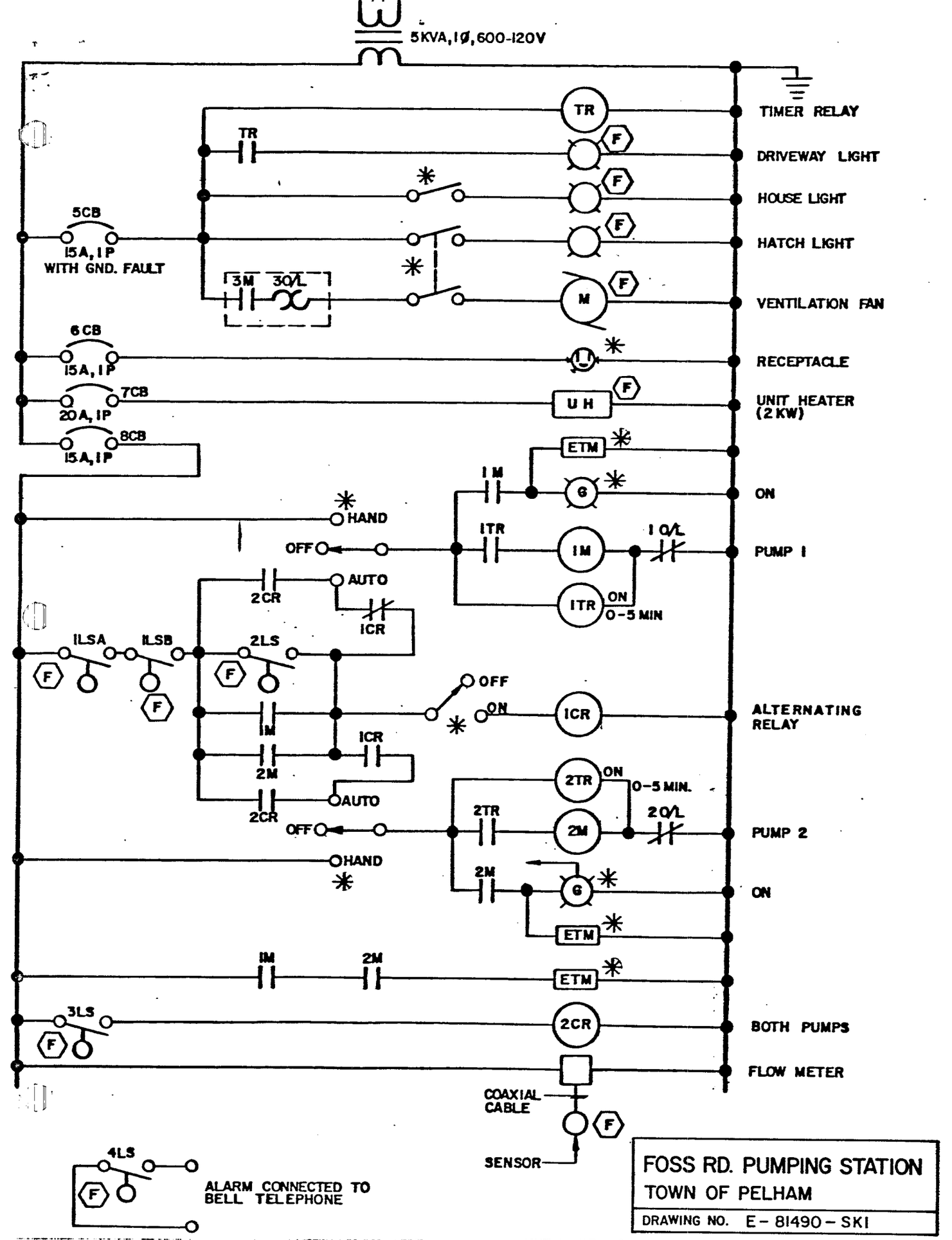
1. Section 16210, Electrical Work, Part 2.03 F.

Add paragraph (F):

Time delay relays, 0-5 minutes, knob adjust, on-delay operating mode, 120V AC, Agastat Catalogue No. SSC 12 ACA or equal.

2. Drawing A1-81490-E1, Panel Layout

Add 1TR and 2TR to the lower left hand corner as shown on attached sketch.



FOSS RD. PUMPING STATION
TOWN OF PELHAM
DRAWING NO. E-81490-SKI

CONTRACT DOCUMENTS

FENWICK SEWAGE PUMPING STATION

IN THE TOWN OF PELHAM

Project
E.O. 81490

November 1981

PROCTOR AND REDFERN LIMITED
Consulting Engineers and Planners
110 James Street, St. Catharines, Ontario
L2R 7E8

FK:RH
/tp

PROCTOR & REDFERN LIMITED
TENDERER'S CHECK LIST

Before submitting your tender, check the following points:

1. Has your tender been signed, sealed and witnessed? ☐

2. Have you enclosed the Tender Deposit, i.e. certified cheque or bid bond? (whichever is required by the Contract Documents) ☐

3. Have you enclosed the Agreement to Bond, signed and sealed by your proposed Surety? ☐

4. Have you completed all schedules and prices in the Form of Tender? ☐

5. Have you indicated and included the Contingency Allowance in the Form of Tender? (if you are required to do so) ☐

6. Have you indicated the number of addenda included in the tender price? ☐

7. Have you shown the time for completion of the work? (if applicable) ☐

8. Have you listed your Sub-Contractors? (if applicable) ☐

9. Have you listed your Experience in Similar Work? (if applicable) ☐

10. Have you listed your Senior Staff? (if applicable) ☐

11. Have you listed the Tenderer's Plant? (if applicable) ☐

12. Are the documents complete?. ☐

Note: Items 13 and 14 are for Ministry of Transportation and Communication projects only.

13. Have you completed the Qualification Rating and forwarded to the Ministry of the Transportation and Communications? (if applicable) ☐

14. Have you enclosed the Form of Tender stamped "For Tendering Purposes Only" (if applicable) ☐

Note: 1. Your tender will be informal and may be disqualified if ANY of the foregoing points (if applicable) have not been complied with.

MAKE SURE THAT YOU SEAL THE TENDER IN AN ENVELOPE AND MARK THEREON THE CONTRACT NAME AND E.O. NUMBER.

Proctor and Redfern Limited
Form CD-30 - February 1973

LIST OF CONTRACT DOCUMENTS

The following shall form the Contract Documents:

	Paper Colour	No. of Pages
Addenda Numbered 1 ~~xxx~~ only	Green	
Tenderer's Check List	Orange	1
List of Contract Documents	Pink	1
Tendering Information	Blue	3
Form of Tender	Yellow	5
Tendering Statements:		
Agreement	White	1
Agreement to Bond (CD-22)	White	1
Bid Bond (CCA Document (S)20)	White	1
Performance Bond (CCA Document (S)21)	White	1
Labour and Materials Payment Bond (CCA Document (S)22)	White	2
List of Sub-Contractors (CD-3)	White	1
Tenderer's Experience (CD-4)	White	1
Tenderer's Senior Staff (CD-5)	White	1
Tenderer's Plant (CD-6)	White	1
Supplementary General Conditions	Blue	2
General Conditions of the Contract (CD-1)	Blue	8
Project Specifications:		
Section 01010 - General	White	6
Section 02200 - Site Clearing, Excavating, Backfilling and Grading	White	6
Section 02710 - Chain Link Fencing (Vinyl Covered)	White	3
Section 11100 - Equipment and Piping	White	9
Section 16010 - Electrical General (including E-STD-16-1 and Appendix E1)	White	13
Section 16210 - Electrical Work	White	7

LIST OF DRAWINGS

Drawing No.	
A1-81490-L1	
A1-81490-E1	Electrical

LIST OF STANDARDS

E-STD-1-1	Concrete Thrust Blocks
E-STD-2-1	Pipe Bedding Details
E-STD-2-10	Aluminum Safety Ladder Rungs
E-STD-8-8	Typical Pipe Support Details
E-STD-8-30	Typical Grating Seating Details
E-STD-11-4M	Anchor Bolt Details
E-STD-11-17M	Support for Structures Adjacent to Lower Work
E-STD-11-35	Concrete Pour Release Form
E-STD-16-1	Cable Trenching Details
E-81490-1	Bar Screen Details
E-81490-2	Gate and Fence Details
E-81490-3	Meter Chamber

SECTION 00100 - TENDERING INFORMATION

TI.01 DELIVERY AND OPENING OF TENDERS

A. Sealed tenders, marked with the name of the project, will be received by -

Mr. M. Hackett, Clerk Coordinator, Town of Pelham, P.O. Box 400, Fonthill

up to 3:00 p.m., local time -

Thursday, November 26th, 1981

B. The tenders will be opened publicly as soon after the closing time as possible.

C. Tenders shall be completed on the detachable Form of Tender included in the Contract Documents.

TI.02 DISCREPANCIES

A. If a Tenderer finds discrepancies in, or omissions from the Contract Documents, or if he is in doubt as to their meaning, he shall notify the Engineer, who may issue a written addendum. Neither the Owner nor the Engineer will make oral interpretations of the meaning of the Contract Documents.

B. Should the Tenderer not agree that the materials and methods specified, or designed on the Drawings, will provide an installation to meet the requirements of the project, he shall notify the Engineer in writing, stating his reason for objection and may submit a suggested alternative. In such an event, the Engineer may choose to issue an addendum.

C. Addenda issued during the tendering period shall be allowed for by the Tenderer.

TI.03 EXAMINATION OF SITE

A. The Tenderer shall visit the site of the Work before submitting his tender and shall by personal examination satisfy himself as to the local conditions that may be encountered during construction of the Work. He shall make his own estimate of the facilities and difficulties that may be encountered and the nature of the subsurface materials and conditions.

B. He shall not claim at any time after submission of his tender that there was any misunderstanding of the terms and conditions of the Contract relating to site conditions.

TI.04 SALES TAX

A. The Tenderer shall include or exclude sales tax in accordance with current sales tax legislation taking into account any changes that have been made known by the Government and that will occur during the life of the Contract.

B. If sales taxes are increased or decreased, or other amendments are made in the legislation, during the course of the Contract, that alter tax amounts carried in the Contract price, an adjustment will be made accordingly.

C. The Contractor shall keep records and invoices of accounts subject to Federal and Provincial Sales Tax for the purpose of establishing taxes paid and for substantiation in the event of changes to the tax legislation during the course of the Contract.

TI.04 SALES TAX (Cont'd)

D. The Tenderer shall contact the Sales Tax authorities and determine what the applicable taxes are and the procedures for tax exemption and/or refunding and include related administrative costs in the tender.

TI.05 PROOF OF ABILITY

A. The Tenderer shall be competent and capable of performing the various items of Work. The Tenderer shall complete the following statement sheets, which shall form a part of the Contract Documents -

1. Tenderer's Experience on Similar Work (CD-4) with list of specific examples completed within the last 5 yrs., with appropriate references

2. Tenderer's Senior Staff to be employed (CD-5)

3. Tenderer's Plant to be used (CD-6)

B. The Tenderer may be required to furnish additional statements covering other matters, including financial resources.

TI.06 TENDER DEPOSIT

A. The tender shall be accompanied either by a tender deposit or by a Bid Bond.

Tender deposit shall be a Certified Cheque payable to the Owner in the amount of $10,000.00

Bid Bond shall be in an amount equal to 10,000.00 and shall be on C.C.A. Document (S)20.

The Tenderer shall keep his tender open for acceptance for 60 days after the closing date. Withdrawal during this period will result in forfeiture or enforcement of the tender deposit or Bid Bond.

Upon being notified that his tender has been accepted, the Contractor shall execute copies of the Agreement, supply bonds and insurance documents as specified, and start Work as specified.

Failure to execute the copies of the agreement, or to supply bonds and insurance documents, within 2 weeks of the date of acceptance of the tender, or to start Work as specified, will automatically mean the forfeiture or enforcement of the tender deposit or Bid Bond.

Tender deposits of unsuccessful Tenderers will be returned not later than 2 weeks following Contract award.

The tender deposit of the successful Tenderer will be returned with the first progress certificate.

TI.07 AGREEMENT TO BOND

A. Every tender shall be accompanied by an 'Agreement to Bond' in the form attached, and shall be completed by a surety company lawfully doing business in the Province.

TI.08 SUB-CONTRACTORS

A. The Tenderer shall submit with his tender the names and addresses of Sub-contractors he proposes to use and the value for the subtrades listed in Form CD-3 'List of Sub-contractors'.

TI.09 ACCEPTANCE OF TENDERS

A. The lowest or any tender need not necessarily be accepted by the Owner.

TI.10 EQUIVALENTS

A. When an article is specified by its trade or other name (whether such name is followed by the phrase 'or approved equal' or not), the Tenderer shall base his tender price on the supply of the named article and no other.

The Tenderer may submit with his tender suggested equivalents to those articles specified by trade or other names. Such submissions shall be made on Form CD-7 attached and shall show the name of the article specified, the name and description of the suggested equivalent, and the total revision to the tender price that would result if the equivalent were accepted.

TI.11 TEST BORINGS

A. Test borings have been made at the site of the Work and a copy of the report is available for viewing at the Engineer's office.

B. The borings were made to determine the character of the subsoil for design purposes. No responsibility is assumed for the accuracy or completeness of the information so presented.

C. Tenderers shall make such additional examination of the soil as they may feel necessary to satisfy themselves as to the conditions that may be encountered.

FORM OF TENDER

FT.01 TENDER PRICE

1. Offer by - Name - A.A. KOSTECKY CONCRETE MANUFACTURING

   Address - P.O. Box 460, Virgil, Ontario

   Date - November 26th, 1981

2. To The Corporation of the Town of Pelham.

A. We, the undersigned, having examined the site of the Work, having carefully investigated the conditions pertaining to the Work and having secured all the information necessary to enable us to submit a bona fide tender, and having inspected all the Contract Documents, hereby agree to enter into a contract and to perform all the Work in a good and Workmanlike manner in accordance with the Contract Documents to the satisfaction of the Engineer for the total tender price of ONE HUNDRED AND SIXTEEN THOUSAND

_ _ _ _ _ _ _ _00/00 dollars ($116,000.00)

FT.02 CONTINGENCIES AND ALLOWANCES

A. We agree that the tender price includes the contingency sum of $10,000.00 and that no part of this sum shall be expended without the written direction of the Engineer, and any part not so expended shall be deducted from the tender price.

FT.03 ADDITIONS AND DEDUCTIONS

A. We agree that the valuation of additions to, and deductions from, the Contract shall be made as follows -

1. The prices in the Table of Prices shall apply where appropriate.

2. If the prices in subsection 1 are not appropriate, valuation will be made by one of the following methods -

   (A) The Engineer may ask the Contractor for a quotation for the proposed Work.

   (B) If the quotation referred to in (A) above is not accepted by the Engineer, the actual cost of the Work will be determined as the total of only the following -

      (1) Actual cost of labour, including such items as Workmen's Compensation and Unemployment Insurance.

      (2) Actual cost of materials to be incorporated into the Work, including such items as freight and taxes.

      (3) For Work done by the Contractor, an amount equal to 15 percent of the totals from subsections (1) and (2) above, which shall constitute overhead and profit of the Contractor.

      (4) For Work done by Sub-contractors, an amount equal to 20 percent of the totals from subsections (1) and (2) above, which shall constitute overhead and profit of the Contractor and Sub-contractors.

      (5) Rental of equipment and plant having a new value greater than $300. Rental rates shall be as set out in the current edition of MTC form 527.

FT.03 ADDITIONS AND DEDUCTIONS (Cont'd)

A. (Cont'd)

3. Whenever extra Work is being performed under subsection 2(B) above, we agree to submit daily reports in writing, indicating the total chargeable costs incurred for the day. Valuation of the extra Work being so performed will be made only on the basis of the approved daily reports.

FT.04 ADDENDA

A. We agree that we have received addenda 1 ~~to~~ only inclusive, and the tender price includes the provisions set out in such addenda.

FT.05 COMPLETION

A. We agree to commence Work as specified, to proceed continuously to the completion and to complete all Work within twenty-five weeks from the date of issue of the written order to start Work.

FT.06 TABLE OF PRICES

A. THIS TABLE IS REFERRED TO IN CLAUSE FT.03

ITEM	DESCRIPTION	UNIT	ADDITIONS	UNIT PRICE FOR $	DEDUCTIONS
1.	Earth Excavation and Backfilling in Trenches 0 to 3 m deep	Cu. m	$	$ 3.50	$
2.	Earth Excavation and Backfilling in Trenches 3 m - 6 m	Cu. m	$	$ 6.00	$
3.	Mass Excavation for Structures in all materials except rock, including disposal of Material	Cu. m	$	$ 4.00	$
4.	Supply, Place and Compact MTC Granular 'A'	Cu. m	$	$12.00	$
5.	Supply, Place and Compact Granular 'B'	Cu. m	$	$11.50	$
6.	Supply, Place and Spread 4" deep Topsoil from an Outside Source Including Fertilizer	Sq. m	$	$14.00	$
7.	35 MPa Concrete Supplied in Place	Cu. m	$	$85.00	$
8.	30 MPa Concrete Supplied in Place	Cu. m	$	$80.00	$
9.	20 MPa Concrete Supplied in Place	Cu. m	$	$75.00	$
10.	Formwork in Place Including Bracing, Stripping and Concrete Finishing	Sq. m	$		$
	(a) for footings and floor slabs	Sq.m.		$ 7.50	
	(b) for columns, piers and beams	Cu.m.		$90.00	
	(c) for walls	u.m		$90.00	
	(d) for underside of slabs	Sq.m		$15.00	
11.	Reinforcing Steel Supplied in Place	kg	$	$ 2.00	$
12.	Supply, Place and Compact Imported Backfill Material as Directed by Engineer	Cu. m	$	$12.00	$
13.	Timber Left in Trench on Written Order of the Engineer	Sq. m	$	$60.00	$
14.	Structural Steel Supplied and Erected in Place	kg	$	$ 2.20	$

LUMP SUM BREAKDOWN OF CONTRACT PRICE

After the opening of the tenders, the two apparent low bidders will be required to submit to the Engineer, within 48 hours of tender opening, the breakdown of their Lump Sum Contract Prices. The Breakdown shall be given in the form below. The Engineer may refuse to accept any breakdown which contains prices that he considers to be unbalanced and has the right to adjust the breakdown to correct such unbalancing. A separate more detailed breakdown will be required after the Contract is awarded, for the purposes of establishing monthly payments.

ITEM	DESCRIPTION	COST
1.	Supply of Submersible Raw Sewage Pumps & Accessories	$ 15,000.00
2.	Supply of Portable Standby Pump and Accessories	$ 3,500.00
3.	Supply of all Internal Piping, Valves for Pumping Station and Miscellaneous Equipment	$ 3,600.00
4.	Supply of all Internal Piping, Valves and Miscellaneous Equipment for Bypass Chamber	$ 3,550.00
5.	Installation of (1) above	$ 2,000.00
6.	Installation of (3) above	$ 2,000.00
7.	Installation of (4) above	$ 1,000.00
8.	Excavation & Backfill	$ 7,000.00
9.	Supply & Installation of Wet Well Including Base Slab, Walls & Roof Slabs	$ 12,000.00
10.	Supply & Installation of Miscellaneous Metalwork	$ 6,500.00
11.	Supply & Installation of Bypass Chamber	$ 2,000.00
12.	Supply & Erection of Storage Building	$ 8,500.00
13.	Supply & Place Base Slab for Building	$ 850.00
14.	Electrical	$ 16,000.00
15.	External Sewer and Forcemain Work Including Connections	$ 8,750.00
16.	Access Road, Grading & Restoration	$ 3,000.00
17.	Fencing	$ 5,000.00
18.	Cost of Bonds & Insurance	$ 1,250.00
19.	Operation and Testing of Station as Specified	$ 3,500.00
20.	Lump Sum to cover all other requirements of the Contract not specifically covered by or related to the preceding items	$ 1,000.00
21.	Contingency Sum	$ 10,000.00
	Total Tender Price	$ 116,000.00

OFFERED ON BEHALF
OF THE CONTRACTOR

SIGNATURE

A.A. Kostecky

SIGNATURE

A.A. KOSTECKY CONCRETE
MANUFACTURING

COMPANY NAME

P.O. Box 460, Virgil, Ontario

ADDRESS

Dec 24/81

DATE

CONTRACTOR'S SEAL

WITNESS

Proctor & Redfern Limited
Project EO

AGREEMENT

This Agreement made in triplicate this 11TH day of JANUARY 19 82 , between

A.A. Kostecky Concrete Manufacturing hereinafter called "The Contractor",

AND

The Town of Pelham hereinafter called "The Owner".

WITNESSETH, that the Contractor agrees with the Owner to perform all the Work in accordance with the Contract Documents referred to in the tender of the Contractor dated the Twenty-Sixth day of November , 1981 , (which shall be deemed to form part of this Contract) to the satisfaction of the Engineer for the total contract price of $ 116,000.00 which Contract Documents are attached hereto and which are hereby expressly made part of this Contract.

The Owner hereby agrees with the Contractor, that in consideration of the Work being performed by the Contractor as specified, the Owner shall pay the Contractor for said Work in accordance with the prices set out in the Form of Tender attached hereto, and in accordance with the provisions set out in the attached Contract Documents.

Time shall be deemed the essence of this Contract.

IN WITNESS WHEREOF the parties hereto have executed this Agreement under their respective corporate seals and by the hands of their proper officers thereunto duly authorized.

SIGNED, SEALED AND DELIVERED
in the presence of:

OWNER

CORPORATION OF THE TOWN OF PELHAM
Name

E.G. Bergenstein
Signed

E.G. BERGENSTEIN - MAYOR
Name and Title

Murray Hackett
Signed

MURRAY HACKETT - CLERK
Name and Title

Witness

Name and Title

CONTRACTOR

A.A. KOSTECKY CONCRETE MANUFACTURING
Name

A.A. Kostecky
Signed

Pres.
Name and Title

Signed

Name and Title

Ronald Beach
Witness

Name and Title

N.B. Where legal jurisdiction, local practice or Owner or Contractor requirement calls for proof of authority to execute this document, proof of such authority in the form of a certified copy of a resolution naming the person or persons in question as authorized to sign the Agreement for and on behalf of the Corporation or Partnership, parties to this Agreement, should be attached.

AGREEMENT TO BOND

Date _____ 1981

Project No. E.O. 81490

*

Gentlemen:

Construction of Fenwick Sewage Pumping Station in the Town of Pelham, Ontario

In consideration of the Owner accepting the tender of and executing an Agreement with

_____

(hereinafter referred to as 'the Tenderer') for the construction of Fenwick Sewage Pumping Station in the Town of Pelham, Ontario subject to the express condition that the Owner receive the Performance Bond and the Payment Bond in accordance with the said tender, we the undersigned hereby agree with the Owner to become bound to the Owner as surety for the Tenderer in a performance bond and a payment bond each in an amount equal to 100 percent of the tender price, in the standard forms of the Canadian Construction Association and in accordance with the said tender, and we agree to furnish the Owner with the said bonds within 7 days after notification of the acceptance of the tender has been mailed to us.

Yours very truly

Note: This Agreement must be executed on behalf of the surety company by its authorized officers under the company's corporate seal.

*Enter name and address of surety company at the top of the page.

Form CD-22
Revised April, 1973

BID BOND

No. ..... $ .....

KNOW ALL MEN BY THESE PRESENTS THAT .....

..... as Principal

hereinafter called the Principal, and .....

a corporation created and existing under the laws of .....

and duly authorized to transact the business of Suretyship in .....

as Surety, hereinafter called the Surety, are held and firmly bound unto .....

..... as Obligee

hereinafter called the Obligee, in the amount of .....

..... Dollars ($ .....)

lawful money of Canada, for the payment of which sum, well and truly to be made, the Principal and the Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal has submitted a written tender to the Obligee, dated the .....

day of ..... 19 ..... , for .....

.....

.....

.....

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION is such that if the aforesaid Principal shall have the tender accepted within sixty (60) days from the closing date of tender and the said Principal will, within the time required, enter into a formal contract and give the specified security to secure the performance of the terms and conditions of the Contract, then his obligation shall be null and void; otherwise the Principal and the Surety will pay unto the Obligee the difference in money between the amount of the bid of the said Principal and the amount for which the Obligee legally contracts with another party to perform the work if the latter amount be in excess of the former.

The Principal and the Surety shall not be liable for a greater sum than the specified penalty of this Bond.

Any suit under this Bond must be instituted before the expiration of six months from the date of this Bond.

IN WITNESS WHEREOF, the Principal and the Surety have Signed and Sealed this Bond this .....

..... day of ..... 19 .....

SIGNED and SEALED
In the presence of

(.....
(Principal ..... (Seal)

(.....
(Surety ..... (Seal)

Endorsed by: R.A.I.C., A.C.E.C., C.C.A., E.I.C., S.W.A.C.

Approved by: INSURANCE BUREAU OF CANADA

C.C.A. Document No. (S) 21

PERFORMANCE BOND

No. ..... $ .....

KNOW ALL MEN BY THESE PRESENTS THAT .....

.....as Principal,

hereinafter called the Principal, and .....

a corporation created and existing under the laws of .....

and duly authorized to transact the business of Suretyship in .....

as Surety, hereinafter called the Surety, are held and firmly bound unto .....

..... as Obligee,

hereinafter called the Obligee, in the amount of .....

..... Dollars ($ .....)

lawful money of Canada, for the payment of which sum, well and truly to be made, the Principal and the Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal has entered into a written contract with the Obligee, dated the .....

day of ..... 19 ..... , for .....

.....

.....

.....

In accordance with the Specifications and Drawings submitted therefor which contract, Specifications and Drawings, are by reference made part hereof and are hereinafter referred to as the Contract.

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION is such that if the Principal shall promptly and faithfully perform the Contract then this obligation shall be null and void; otherwise it shall remain in full force and effect.

Whenever the Principal shall be, and declared by the Obligee to be, in default under the Contract, the Obligee having performed the Obligee's obligations thereunder, the Surety may promptly remedy the default, or shall promptly

(1) complete the Contract in accordance with its terms and conditions or

(2) obtain a bid or bids for submission to the Obligee for completing the Contract in accordance with its terms and conditions, and upon determination by the Obligee and the Surety of the lowest responsible bidder, arrange for a contract between such bidder and the Obligee and make available as work progresses (even though there should be a default, or a succession of defaults, under the contract or contracts of completion, arranged under this paragraph) sufficient funds to pay the cost of completion less the balance of the Contract price; but not exceeding, including other costs and damages for which the Surety may be liable hereunder, the amount set forth in the first paragraph hereof. The term "balance of the Contract price," as used in this paragraph, shall mean the total amount payable by the Obligee to the Principal under the Contract, less the amount properly paid by the Obligee to the Principal.

Any suit under this Bond must be instituted before the expiration of two (2) years from the date on which final payment under the Contract falls due.

The Surety shall not be liable for a greater sum than the specified penalty of this Bond.

No right of action shall accrue on this Bond, to or for the use of, any person or corporation other than the Obligee named herein, or the heirs, executors, administrators or successors of the Obligee.

IN WITNESS WHEREOF, the Principal and the Surety have Signed and Sealed this Bond this .....

day of ..... 19 .....

SIGNED and SEALED
In the presence of:

(.....
(Principal (Seal)

(.....
(Surety (Seal)

LABOUR AND MATERIAL PAYMENT BOND
(TRUSTEE FORM)

No. ..... $ .....

Note: This Bond is issued simultaneously with another Bond in favour of the Obligee conditioned for the full and faithful performance of the Contract.

KNOW ALL MEN BY THESE PRESENTS THAT .....

..... as Principal,

hereinafter called the Principal, and .....

a corporation created and existing under the laws of .....

and duly authorized to transact the business of Suretyship in .....

as Surety, hereinafter called the Surety are, subject to the conditions hereinafter contained, held and firmly bound unto

..... as Trustee,

hereinafter called the Obligee, for the use and benefit of the Claimants, their and each of their heirs, executors, administrators, successors and assigns, in the amount of .....

..... Dollars ($ .....)

of lawful money of Canada for the payment of which sum well and truly to be made the Principal and the Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal has entered into a written contract with the Obligee, dated the .....

day of ..... 19 ..... , for .....

.....

.....

.....

which contract, Specifications & Drawings are by reference made a part hereof, and is hereinafter referred to as the Contract.

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION is such that, if the Principal shall make payment to all Claimants for all labour and material used or reasonably required for use in the performance of the Contract, then this obligation shall be null and void; otherwise it shall remain in full force and effect, subject, however, to the following conditions:

1. A Claimant for the purpose of this Bond is defined as one having a direct contract with the Principal for labour, material, or both, used or reasonably required for use in the performance of the Contract, labour and material being construed to include that part of water, gas, power, light, heat, oil, gasoline, telephone service or rental equipment directly applicable to the Contract provided that a person, firm or corporation who rents equipment to the Principal to be used in the performance of the Contract under a contract which provides that all or any part of the rent is to be applied towards the purchase price thereof, shall only be a Claimant to the extent of the prevailing industrial rental value of such equipment for the period during which the equipment was used in the performance of the Contract. The prevailing industrial value of equipment shall be determined, insofar as it is practical to do so, in accordance with and in the manner provided for in the latest revised edition of the publication of the Canadian Construction Association titled "Rental Rates on Contractors Equipment" published prior to the period during which the equipment was used in the performance of the

2. The Principal and the Surety, hereby jointly and severally agree with the Obligee, as Trustee, that every Claimant who has not been paid as provided for under the terms of his contract with the Principal, before the expiration of a period of ninety (90) days after the date on which the last of such Claimant's work or labour was done or performed or materials were furnished by such Claimant, may as a beneficiary of the trust herein provided for, sue on this Bond, prosecute the suit to final judgment for such sum or sums as may be justly due to such Claimant under the terms of his contract with the Principal and have execution thereon. Provided that the Obligee is not obliged to do or take any act, action or proceeding against the Surety on behalf of the Claimants, or any of them, to enforce the provisions of this Bond. If any act, action or proceeding is taken either in the name of the Obligee or by joining the Obligee as a party to such proceeding, then such act, action or proceeding, shall be taken on the understanding and basis that the Claimants; or any of them, who take such act, action or proceeding shall indemnify and save harmless the Obligee against all costs, charges and expenses or liabilities incurred thereon and any loss or damage resulting to the Obligee by reason thereof. Provided still further that, subject to the foregoing terms and conditions, the Claimants, or any of them, may use the name of the Obligee to sue on and enforce the provisions of this Bond.

3. No suit or action shall be commenced hereunder by any Claimant:

   (a) unless such Claimant shall have given written notice within the time limits hereinafter set forth to each of the Principal, the Surety and the Obligee, stating with substantial accuracy the amount claimed. Such notice shall be served by mailing the same by registered mail to the Principal, the Surety and the Obligee, at any place where an office is regularly maintained for the transaction of business by such persons or served in any manner in which legal process may be served in the Province or other part of Canada in which the subject matter of the Contract is located. Such notice shall be given

      (1) in respect of any claim for the amount or any portion thereof, required to be held back from the Claimant by the Principal, under either the terms of the Claimant's contract with the Principal, or under the Mechanics' Liens Legislation applicable to the Claimant's contract with the Principal, whichever is the greater, within one hundred and twenty (120) days after such Claimant should have been paid in full under the Claimant's contract with the Principal;

      (2) in respect of any claim other than for the holdback, or portion thereof, referred to above, within one hundred and twenty (120) days after the date upon which such Claimant did, or performed, the last of the work or labour or furnished the last of the materials for which such claim is made, under the Claimant's contract with the Principal;

   (b) after the expiration of one (1) year following the date on which the Principal ceased work on the Contract, including work performed under the guarantees provided in the Contract;

   (c) other than in a Court of competent jurisdiction in the Province or District of Canada in which the subject matter of the Contract, or any part thereof, is situated and not elsewhere, and the parties hereto agree to submit to the jurisdiction of such Court.

4. The Surety agrees not to take advantage of Article 1959 of the Civil Code of the Province of Quebec in the event that, by an act or an omission of a Claimant, the Surety can no longer be subrogated in the rights, hypothecs and privileges of Said Claimant.

5. The amount of this Bond shall be reduced by, and to the extent of any payment or payments made in good faith, and in accordance with the provisions hereof, inclusive of the payment by the Surety of Mechanics' Liens which may be filed of record against the subject matter of the Contract, whether or not claim for the amount of such lien be presented under and against this Bond.

6. The Surety shall not be liable for a greater sum than the specified penalty of this Bond.

IN WITNESS WHEREOF, the Principal and the Surety have Signed and Sealed this Bond this .....

day of ..... 19 .....

SIGNED and SEALED
In the presence of

(.....
(.....
(.....
(..... (Seal)
(Principal
(.....
(.....
(..... (Seal)
Surety

Statement Sheet
CD-3

LIST OF SUB-CONTRACTORS

SUB-TRADE	NAME OF SUB-CONTRACTOR	ADDRESS OF SUB-CONTRACTOR	VALUE OF SUB-CONTRACT
Electrical	Galbraith Electric	St. Catharines	$14,783.00
Mechanical	Olympic Plumbing	Fonthill, Ontario	

Names and Addresses must be filled in and submitted with the Tender. If a sub-contractor is not to be used for any work listed, then show 'by own forces'.

Proctor & Redfern Limited
Consulting Engineers and Planners

Statement Sheet
CD-4

TENDERER'S EXPERIENCE IN SIMILAR WORK

YEAR COMPLETED	DESCRIPTION OF CONTRACT	FOR WHOM WORK PERFORMED	NAME OF CONSULTANT ENGINEER	VALUE
1981	X-Ray Building Foster Wheeler	Foster Wheeler Ltd.	White, Mossop and Erling	$278,000.00
1981	Concrete Work 60,000 sq.ft. building	Panelera Limited	R.V. Anderson and Associates	$130,000.00
1981	80,000 sq.ft. building Concrete Work	Fleet Manufacturing Arkton Corp.	Philips Planning and Engineering	$225,000.00

Proctor and Redfern Limited
Consulting Engineers and Planners

Statement Sheet
CD-5

TENDERER'S SENIOR STAFF

NAME	APPOINTMENT	QUALIFICATIONS AND EXPERIENCE
Office		
D. Cameron	Manager	18 years
Field		
C. Dupuis	Job Superintendent	20 years
R. Magrum	Foreman	30 years

Proctor and Redfern Limited
Consulting Engineers and Planners

Statement Sheet
CD-6

TENDERER'S PLANT

The Tenderer shall list the plant, machinery and equipment he proposes to use on the work.

PLANT OWNED:

1980 Case 580 Backhoe Loader

1978 Case 580 Backhoe Load c/w Hoe Ram

1974 Ford Diesel Dump Truck

1972 B & E Hydro Crane

Compactors

Pumps

PLANT TO BE RENTED OR LEASED:

As required

PLANT TO BE PURCHASED:

Nil

SECTION 00800 - SUPPLEMENTARY GENERAL CONDITIONS

SC.01 GUARANTEE PERIOD

A. The guarantee period for the Contract shall be twelve months, unless an extended guarantee period is called for in any specific Section.

SC.02 DEFINITION

A. 'Department of Highways' and 'DHO' means 'The Ministry of Transportation and Communications' and 'MTC'.

B. 'The Department of Transportation and Communications' and 'DTC' means 'The Ministry of Transportation and Communications' and 'MTC'.

C. The word 'provide' shall mean - supply labour, materials, equipment, handling and cartage required for complete installation of the item concerned.

D. The words 'work' or 'works' have the same meaning as for 'Work' as defined in the General Conditions.

SC.03 INSURANCE

A. Damage insurance

1. Notwithstanding the provisions of clause 28 of the General Conditions, no 'Damage Insurance' will be required on this Contract.

SC.04 LIQUIDATED DAMAGES

A. Should the Contractor fail to complete the Work in accordance with the Contract and to the satisfaction of the Engineer, within the time specified in the Form of Tender, or as amended on the written authority of the Engineer, the Contractor shall pay to the Owner the sum of $200.00 for each calendar day that the Work shall remain unfinished after such time.

B. Such payments are agreed upon and fixed as liquidated damages that the Owner will suffer by reason of delay and default, and not as a penalty. The Owner may deduct and retain the amounts of such liquidated damages out of the monies which may be due or become due to the Contractor under the Contract.

SC.05 HOLDBACK FOR RECTIFICATION AFTER ACCEPTANCE OF THE WORK

A. To cover rectification costs during the guarantee period, the Owner will retain 3 percent of the value of Work done, such amount being held back in each progress certificate. This holdback will be retained for a period of 1 year from the 'Acceptance Date' which is described in article 35 of the General Conditions. Additional monies will be held back as required by provincial statutes.

SC.06 PAYMENT BOND

A. The Contractor, together with a surety company approved by the Owner and authorized by law to carry on business in the Province shall furnish a 100 percent labour and materials payment bond to the Owner using C.C.A. Document (S) 22. The bond shall remain in effect until the issue by the Engineer of the final payment certificate.

SC.07 PERFORMANCE BOND

A. The provisions of the General Conditions shall apply except that C.C.A. Document (S) 21 shall be used.

SC.08 RELEASE OF HOLDBACK

A. Holdbacks held under the provisions of the Mechanics' Lien Act will be released upon application by the Contractor, and will be subject to the requirements of the Act. For the purpose of reducing the amount of holdback, the whole Contract is divided into two sections -

B. The statutory 15 percent holdback will apply to the Contract.

GENERAL CONDITIONS OF THE CONTRACT

SUBJECT INDEX

PROCTOR & REDFERN LIMITED
CONSULTING ENGINEERS
75 EGLINTON AVENUE EAST, TORONTO, ONT. M4P 1H3

Form CD-1
(Revised May 1978)

SECTION 01010 - GENERAL

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

A. This contract is for the construction of the Sewage Pumping Station for the Fenwick Sewerage Scheme in the Town of Pelham, Ontario, incorporating the following:

1. Precast pipe section wet well with the two submersible sewage pumps.
2. Emergency bypass and meter chambers.
3. Prefabricated steel building housing an engine driven standby sewage pump.

1.02 DEFINITION

A. The word 'Work' means supply labour, products, service handling and cartage required for complete performance of the item concerned.

1.03 LIMITS OF SITE

A. The limits of the site are indicated in the Contract. Confine operations within these limits, unless written approval is obtained from the Engineer and from the property Owners concerned.

1.04 PROJECT SIGNBOARD

A. Supply a project signboard having dimensions of 1.8 m x 1.2 m (6 ft. x 4 ft.) with portable and sufficient framework to support the sign. Prominently display the sign in an approved location.

B. Before construction of the sign, obtain approval of the wording.

C. Provide the sign complete and in place within 2 weeks of the start of the Work.

1.05 LOCAL LABOUR

A. Give preference to the hiring of local labour, provided the labour is available locally and is physically fit and properly qualified by training and experience to meet the Contractor's requirements.

B. Do not apply the foregoing to Superintendent, Timekeeper, Foreman, Machine Operators, nor until 10 days after the Contractor has actually commenced operations.

C. Always have labour rolls available for examination by the Engineer in order that he may determine the domicile of the Contractor's employees. Give necessary assistance for such purpose.

1.06 PHOTOGRAPHS

A. Take professional photographs of the Work at monthly intervals. Each month, take at least 6 different views and supply 2 sets of 203 mm x 254 mm (8 in. x 10. in.) prints to the Engineer.

PART 1 GENERAL (Cont'd)

1.07 SETTING OUT OF THE WORK

A. Perform setting out, Working from bench marks and points of reference supplied by the Engineer.

In setting out, include the preparation of grade sheets, installation of stakes, offsets, site rails and similar operations.

Be responsible for the correctness of the position, levels, dimensions and alignment of the Work, and for the provision of necessary instruments and labour in connection therewith. Checking of the setting out of line or level by the Engineer does not relieve the Contractor of his responsibility for the correctness thereof.

Carefully protect and preserve stakes, lot pins, marks and reference points, and replace if destroyed or removed.

Wherever necessary suspend Work temporarily to permit the Engineer to inspect and check the line and grade of any portion of the Work.

1.08 MEASUREMENT FOR PAYMENT

A. Unless otherwise specified, measurements will be taken in the horizontal plane.

1.09 CONSTRUCTION SCHEDULE

A. Within two weeks after being awarded the Contract, submit proposed construction schedule to the Engineer for approval. In the schedule show proposed progress in weekly stages for the main sections and subsections of the Work.

B. Comply with the dates of completion as specified.

1.10 COST BREAKDOWN

A. Within 2 weeks of Contract award, submit a breakdown of the cost of the Work. In the form of the breakdown give values against the individual trades in the Work. In addition, break down the Mechanical Work giving the cost of Process Piping and Process Equipment.

1.11 SHOP DRAWINGS

A. Submit to the Engineer in accordance with the General Conditions, one sepia (clear and legible) and one white print of each Shop Drawing and apply this procedure to the initial and subsequent submittals for review. Alternatively supply six (6) white prints of each Drawing.

B. The Engineer's review status of Shop Drawings will be marked on the Shop Drawings under the following identification:

1. 'Reviewed' or 'Reviewed as Noted'

If the Engineer's review of Shop Drawings is final, the Engineer will stamp the sepia 'Reviewed' or 'Reviewed as Noted' (appropriately marked up) and take his own required number of copies. The sepia will be returned to the Contractor for his own use and for distribution to his sub-contractors or suppliers.

2. 'Revise and Resubmit'

If the Engineer's review of Shop Drawings is not final, the Engineer will

stamp 'Revise and Resubmit' and appropriately mark up the print. The print and sepia will be returned to the Contractor. Resubmit a revised sepia and a print of the revised sepia together with the original stamped and marked up print.

1.12 SUBCONTRACTORS

A. Any Division of the Specification into Sections or subsections is only for clarity of reading and reference and is not to be taken to be a Division into trades, sub-trades or Sections of Work of any kind.

1.13 PROTECTION OF SURVEY MARKERS

A. Protect and maintain established survey markers and lot markers. Re-establish disturbed markers by an Ontario Land Surveyor at no cost to the Owner.

1.14 EQUIPMENT PRIME COATS

A. Where the specifications for prime or shop paint coats is not given, ensure that equipment is primed with paint which is compatible with the final paint coatings.

PART 2 PRODUCTS

2.01 TESTS

A. Where required by the Engineer, supply for testing, samples of materials to be used in the construction of the Work. Do not use materials until they have been so approved.

2.02 CANADIAN MATERIALS

A. Unless otherwise specifically approved, use materials and equipment of Canadian manufacture in constructing the Work.

2.03 INSPECTION OF THE WORK

A. As well as GC 35 in the General Conditions, the following shall apply:

1. Field Inspection

(A) The Contractor shall ensure that the suppliers of equipment provide a factory-trained service representative to inspect installation of the equipment, to be present during equipment start-up, and to instruct the plant operators in the proper operation of the equipment.

2. Certificate of Inspection

(A) On completion of the installation and testing of the equipment, submit to the Engineer the manufacturer's certificate of correctness of the installation and operation.

PART 3 EXECUTION

3.01 WORK ON ROADS

A. Do not perform Work on public rights-of-way without the approval of the road authority.

3.02 TRAFFIC

A. Do not perform Work on public right-of-ways without approval of the road authorities.

B. Perform traffic control on streets in accordance with the rules of the appropriate road authority. Ensure that flagmen wear fluorescent red or orange safety vests, arm bands and hats.

C. Streets may be closed to through traffic only with the written permission of the Road Authority. Adequately mark detours on adjacent streets. Erect and maintain barricades on the closed streets and light at night. Inform the Road Authority when a road is re-opened to traffic.

D. On streets that are not officially closed, always maintain one lane of traffic in each direction. Should temporary detours be constructed, comply with the requirements of the road authority as to location, dimensions, strength, road markings, signing and other relevant details. Remove detours when no longer needed, and restore surfaces to the original condition.

E. Whether streets are officially closed or not, maintain reasonable access to adjacent properties for pedestrians and vehicles.

F. Maintain traffic signs in their original positions. Be sure that the signs are not obscured.

3.03 NOTIFICATIONS

A. When streets are to be closed, or traffic restricted, notify the appropriate fire and police departments, giving at least 7 days notice of the closing or restriction.

B. If bus routes are affected, notify the bus company, giving at least 7 days notice.

C. When streets are to be re-opened, or restrictions removed, notify the fire, police and bus authorities.

3.04 USE OF HYDRANTS

A. Keep fire hydrants accessible and free of obstructions.

B. Fire hydrants may be used as a source of water only with the approval of the water authority, and subject to its rules and conditions.

3.05 ELECTRICITY AND GAS

A. Provide temporary electricity and gas as required for construction. Make arrangements with the appropriate authorities.

PART 3 EXECUTION (Cont'd)

3.06 INCLEMENT WEATHER

A. Make adequate protection and take precautions at times of inclement weather.

B. Inclement weather or extra Work caused by such weather will not be accepted as reason for additional payment.

3.07 MUD AND DUST

A. Keep streets and other construction areas clean. If it is necessary to haul wet material, use suitable watertight trucks.

B. Control dust by the use of water or calcium chloride, or both.

3.08 OTHER CONSTRUCTION

A. Other construction may be proceeding at the same time near the Work of this Contract. Extend cooperation and free access to other companies and employees who may be Working in the area.

3.09 RAILWAYS

A. Carry out Work on or near railway property to the satisfaction and requirements of the railway authority and conform to the regulations of the Canadian Transport Commission. Pay railway costs and charges except that inspection and flagmen provided by the Railway Authority will be paid for by the Owner.

3.10 EXISTING UTILITIES

A. Contact the various utility companies prior to commencing Work and become informed of the exact location of utilities and protect them during construction and assume liability for damage to utilities.

B. Utilities that require relocation will be the responsibility of the Utility Company concerned at no expense to the Contractor. Cooperate with the utility companies concerned and always provide them free access to their plant.

C. Support existing pipes, ducts, or other underground services that intersect the pipe trench, or support the pipe trench in a manner acceptable to the Engineer and the Utility Company.

D. Where existing overhead pole lines are adjacent to the excavation, temporarily support them to the approval of the Engineer and the Utility Company concerned.

3.11 TEMPORARY ACCESS

A. Where necessary for access, provide and maintain suitable safe, temporary roads, walkways and bridges. Remove temporary access facilities and restore disturbed areas, after the Work of the Contract has been completed.

3.12 CLEAN-UP AND TIDY CONDITION

A. On a daily basis as the Work progresses and on completion of the Work, clean-up and remove the rubbish and debris from the site. Remove excess material that is not required to be left on the site by the conditions of the

PART 3 EXECUTION (Cont'd)

3.12 CLEAN-UP AND TIDY CONDITION (Cont'd)

A. (Cont'd)

Contract.

B. Keep the site and the Work as tidy as practicable at all times.

3.13 OPERATION AND TESTING OF THE SYSTEM UPON COMPLETION

A. Operate the system for a minimum period of five days under the general supervision of the Owner's staff.

B. If at the end of the stipulated minimum period of operation the system is not operating as required, then extend the period of operation until such date that the operation is satisfactory.

C. During the period of operation, have available, 24 hours a day, supervisory personnel, mechanics, electricians and other workmen as necessary to attend to adjustments, corrections or operations required by the Owner to rectify faults.

D. The Certificate of Substantial Completion will be issued upon satisfactorily completing the period of operation. Have certificates provided to the Owner from the equipment suppliers, stating that they, having tested their equipment have found everything to be satisfactorily installed and in proper working order, and that the related Work outlined in the Contract Documents is complete. The date of Substantial Completion will be on or after the date of satisfactory completion of the Contractor's period of operation.

E. Bear the cost of labour, electricity, fuel, water and other material used at the Works up to and for the completion of the operation period and the commencement of the maintenance period.

F. Bear the cost of labour and materials necessary for starting up the station. Fill tanks and complete greasing, oiling and lubrication of equipment and mechanisms to ensure proper operation.

G. If insufficient house connections are available to permit station operation on raw sewage, conduct a test of station operation using water discharged into an upstream manhole. Vary the water flow as required to prove all aspects of pump operation including duty pump operation and alternation between normal wet well levels, two pump operation at higher wet well levels and high level alarm operation.

H. Test the operation of the standby engine driven unit, pumping out of the wet well into the emergency bypass chamber.

I. Do not commence the five day test until the Contractor has fully checked all equipment and components for satisfactory operation.

SECTION 02200 - SITE CLEARING, EXCAVATING, BACKFILLING AND GRADING

PART 1 GENERAL

1.01 INTENT

A. This Section covers the Work for site clearing, excavation, backfilling and grading including:

1. Clearing
2. Stripping and storage of topsoil
3. Excavation
4. Excavation for piping, conduit, ducts, cables and appurtenances
5. Dewatering and thawing
6. Sheathing, shoring and bracing
7. Fill and backfill
8. Rough grading
9. Finished grading
10. Disposal of unwanted material
11. Restoration

1.02 SHEATHING, SHORING AND BRACING DESIGN

A. Have a qualified Professional Engineer design sheathing, shoring and bracing and submit stamped and signed Drawings to the Engineer for review. Have the design comply with the requirements of authorities having jurisdiction.

1.03 TEMPORARY ACCESS

A. Provide and maintain suitable temporary roadways, walkways and bridges and remove them after the Work has been completed.

1.04 DISPOSAL OF UNWANTED MATERIAL

A. Remove unwanted material, such as spoil or excess material from the site.

1.05 ADDITIONAL EXCAVATION

A. Refill over-excavation beneath structures where such over-excavation was not authorized by the Engineer with 15 MPa concrete to the specified excavation level or as otherwise directed by the Engineer.

B. Remove foundation material which in its natural state, has good bearing strength and which has had its characteristics adversely changed by the Contractor's operations, and replace with 15 MPa fill concrete, or as otherwise directed by the Engineer. No payment will be made for such removal and replacement.

PART 1 GENERAL (Cont'd)

1.05 ADDITIONAL EXCAVATION (Cont'd)

C. When extra excavation is ordered by the Engineer, the excavation as approved by the Engineer will be paid for as an addition to the Contract.

D. The quantity of trench excavation paid for as extra work will be a maximum of 600 mm greater than the outside diameter for pipes 450 mm diameter and larger, and a maximum of 300 mm greater than the outside diameter for pipes smaller than 450 mm. Measure the trench depth used for computing the amount of extra excavation to the bottom of the specified bedding. Measure the quantity of excavation for structures paid for as extra work to the vertical planes extended from the maximum horizontal projections of the structure and to the neat surface of the underside of the structure. No overcut will be paid for.

PART 2 PRODUCTS

2.01 FILL AND BACKFILL

A. Material - Granular 'A' and Granular 'B' conforming to MTC Form 1010.

B. Use approved material from site excavations for site fills beyond the limits of excavations for structures. Use material that is inorganic, free from rocks larger than 150 mm, frozen material, debris, excessive water or other unsuitable material.

2.02 SEED

A. Use certified seed meeting requirement of the Seeds Act of Canada, No. 1 seed.

1. A mixture of -

55 percent creeping red fescue

25 percent Canada blue

12 percent perennial ryegrass

5 percent red top

3 percent white Dutch clover.

PART 3 EXECUTION

3.01 STRIPPING OF TOPSOIL AND SITE CLEARING

A. Strip topsoil and clear of trees, logs, rubbish, vegetation and other unacceptable matter from the area of the Work within the limits shown on the Drawings, including structures and areas requiring paving, excavating or filling.

B. Store topsoil, approved by the Engineer for reuse in finished grading, separately from subsoil, in approved locations on the site. Remove excess from the site.

C. Carefully protect trees, fences, shrubs and other vegetation designated by the Engineer and save from injury during the construction operation.

PART 3 EXECUTION (Cont'd)

3.02 EXCAVATION

A. Excavate below the bottom of foundations to the following depths -

1. 150 mm below, where skim slabs are required.

2. If not 1 then 75 mm below.

B. Excavate clean, and level. Remove loose material.

C. Do not place granular or concrete before examination of the excavation and the approval of the Engineer has been obtained.

D. Construct each structure on stable ground, as detailed on standard Drawing E-STD-11-17M, where structures at different elevations occur adjacent to each other.

E. Stockpile excavated materials required for use as fill or backfill so as not to interfere with construction. Do not place excavated material so as to cause pressure on newly placed structure, or pipe, or where it may cause soil slippage.

F. Moisten if necessary where the subgrade below foundations and slabs on grade is not rock, scarify and compact to 100 percent Standard Proctor Density before placing the foundations or slabs.

3.03 TRENCHING

A. Dig the trench to the alignment and depth required and only so far in advance of pipe laying as the Engineer will permit.

B. Minimum and maximum trench widths up to a point 0.3 m above top of pipe, for single pipe -

1. Minimum

(A) 0.3 m greater than the external diameter of pipe or 0.75 m for earth excavation or 1 m for rock excavation whichever is greater, excluding an allowance for shoring.

2. Maximum

(A) Not more than 0.4 m greater than the external diameter of pipe or 0.75 m whichever is greater for pipe up to and including 825 mm in dia., excluding an allowance for shoring.

(B) Not more than 0.6 m greater than the external diameter of pipe for 900 mm dia. pipe and larger, excluding an allowance for shoring.

C. The width of the trench at subgrade level is not to be less than the width at any depth in the trench. Fill overbreak and slides that have occurred during excavation with approved materials.

D. Where trench excavations are not kept within the design limits of the pipe, the Engineer may order sheathing and shoring, and/or a heavier class of pipe, and/or use of a higher class of bedding.

E. Grade and shape the pipe trench and the specified bedding to give uniform and even bearing for the length of the pipe. Dig bell holes at each joint. Make corrections in the grade with compacted granular material acceptable to the Engineer, or with fill concrete.

3.04 SHEATHING, SHORING AND BRACING

A. Provide necessary sheathing, shoring and bracing to prevent caving in of banks and excavations. Place shoring so as to be independent of footings,

PART 3 EXECUTION (Cont'd)

3.04 SHEATHING, SHORING AND BRACING (Cont'd)

A. (Cont'd)

and keep in position until forms have been removed, waterproofing completed, drains in place and approval given to proceed with backfilling.

B. Remove sheathing and bracing, as the trench or excavation is backfilled, in such a manner as to avoid caving in of the Work. Carefully fill voids by ramming, or as otherwise directed, left by the withdrawal of sheathing.

C. Where the Engineer decides that the sheathing and shoring cannot be removed without injury to the Work or to the adjoining structures, leave the sheathing and shoring in place as an addition to the Contract.

Cut off sheathing to such lengths as the Engineer may direct.

D. Where removal of sheathing and shoring is not necessary from an engineering requirement, the Engineer will consider written requests to leave sheathing and shoring in place. Make written request and obtain the Engineer's approval before commencing backfilling. No addition to the Contract will be allowed for sheathing and shoring left in place by the Contractor's preference.

3.05 DEWATERING AND THAWING

A. Control grading in the vicinity of construction to prevent surface water from entering excavated areas.

B. Keep excavations free of water.

C. Provide equipment capable of continuous operation.

D. Dispose of water removed from the excavation in such a manner as will not be injurious to the public health or property or to operations of the Work completed or under construction.

E. Provide necessary means for thawing out frozen ground and snow removal when required.

3.06 PIPE BEDDING AND BACKFILL

A. Carefully bed pipes to ensure uniform bedding of the pipe throughout its entire length.

B. Do not place bedding on frozen or unconsolidated ground.

C. Where trenches for pipes, conduit, cable, or ducts run beneath structures use Class 'AA' concrete encasement as shown on standard Drawing E-STD-2-1M for pipes, and backfill with 15 MPa concrete to the elevation of the subgrade.

D. Bedding - as shown on Drawing E-STD-2-1M, Class B. Use Granular 'B' with maximum 25 mm size.

E. Hand-place, tamp and thoroughly consolidate bedding.

F. Use a 150 mm surround of sand for bedding of conduits ducts and cable.

3.07 FILL AND BACKFILL

A. Extent of Materials

1. Use 15 MPa concrete as specified above for pipes and as required by Standard Drawing E-STD-11-17M Support for Adjacent Foundations.

PART 3 EXECUTION (Cont'd)

3.07 FILL AND BACKFILL (Cont'd)

A. (Cont'd)

2. Use Granular 'B' for fill and backfill up to 75 mm below bottom of structure.

3. Use Granular 'A' for top 75 mm of fill and backfill to bottom of structure.

4. Use Granular 'B' backfill to structures to a width equal to one-half the depth to the bottom of the structure (min. 600 mm at base) up to 300 mm below final rough grade.

5. Use site selected excavated material or suitable non-organic imported material for fill and backfill beyond the limits for the granular material.

6. Use selected site material (silt or clay) for top 300 mm below rough grade to provide a water seal for the granular backfill.

B. Where material specifications conflict use the highest density material.

C. Place backfill, fill and bedding materials in continuous horizontal layers not greater than 150 mm in thickness and compact by approved mechanical means to not less than 95 percent Standard Proctor Density at optimum moisture content as determined by the Standard Proctor Density Test (ASTM D698). Compact material beneath structures to a minimum of 100 percent Standard Proctor Density. Adjust the moisture content and maintain the material at the optimum moisture content for compaction.

D. Place a 75 mm thick layer of Granular 'A' in excavations to receive footings, concrete encasement and cradling for piping. Compact to not less than 100 percent Standard Proctor Density.

E. Do not place fill or backfill on frozen ground or topsoil.

F. Where foundation walls are filled on both sides, place backfill evenly on both sides of the wall so as to avoid unequal pressures.

G. Shore structures likely to be disturbed by nearby tamping or rolling.

H. Carefully place backfilling around piping and conduits so as to not displace nor damage the piping and conduits and take particular care to ensure that backfill under pipes and conduits leaving underground structures is thoroughly compacted, so that no settlement can take place.

I. Bench or step the surface slopes where fill is to be placed to sloped surfaces.

J. Backfill trenches from the top of the pipe bedding to the underside of surface restoration with site selected excavated material. Provide backfill free of roots, organic material and stone larger than 250 mm. Place backfill material in lifts not exceeding 150 mm. Compact to 95 percent Standard Proctor Density. Place backfill to 600 mm above top of pipe by hand.

K. If the Engineer decides that the site selected excavation material either wholly or partially, is not suitable for backfill, then provide imported material of a type approved by the Engineer. Compact to 95 percent Standard Proctor Density.

3.08 COMPACTION TESTS

A. Where compaction of sub-grade, backfill or fill is called for, the Engineer may order compaction tests by an independent testing company. Tests will be arranged for by the Engineer and paid for by the Owner.

1. Where tests show that the compaction does not meet the specified requirement, pay the costs for further compaction in a manner dictated by the Engineer, and pay for further testing to establish proof of the

PART 3 EXECUTION (Cont'd)

3.08 (Cont'd)

A. 1. (Cont'd)

specified compaction.

2. For fill or backfill compaction, tests will be made at every 450 mm max. depth, after three 150 mm lifts have been placed.

3. Co-operate with the Engineer and Testing Company by scheduling the placing and compaction of fill and backfill so that tests can be progressively taken.

3.09 ROUGH GRADING

A. Rough grade, compact and grade the site, in accordance with the Drawings, to within a tolerance of 50 mm, to receive finished grading. Remove soft areas in the subgrade and replace with suitable material as directed by the Engineer. Provide additional suitable material if necessary.

B. Grade and maintain rough grades, including slopes and ditches, to provide proper drainage.

3.10 FINISHED GRADING

A. Perform finished grading to the area designated on the Drawings.

B. Prior to finished grading, clean the area of weeds, roots, stones and other similar material and till to a depth of 200 mm.

C. Following preparation detailed in B. above, roll the area and fine grade.

D. Topsoil

1. Spread topsoil in the top 100 mm below finished grade to receive seeding.

E. Roll topsoil to an even surface.

F. Provide additional topsoil if required to complete the Work.

G. Seeding

1. Spread seed by means of a mechanical dry seeder, at a rate of 11.4 kg/ha.

2. Spread seed in two (2) intersecting directions at right angles to each other.

3. Work seed into the top 50 mm of the topsoil by raking or harrowing and compact so that the surface is smooth and firm.

4. After working the seed into the topsoil and compacting, water with sufficient amounts to ensure germination and continued healthy growth.

H. Water and maintain seed.

I. Cut grass to 75 mm when growth is established to maintain a maximum length of 125 mm.

J. Restore existing roadways, sidewalks, curbs or gutters as directed by the Engineer.

SECTION 02710 CHAIN LINK FENCING (VINYL COVERED)

PART 1 GENERAL

1.01 INTENT

A. This Section covers the Work of Fencing including -

1. Fabric
2. Posts
3. Top Rails
4. Brace Rails
5. Fittings
6. Tension Wire
7. Concrete Footings
8. Gates.

PART 2 PRODUCTS

2.01 MATERIAL - Conform to latest edition of reference standards

A. Fencing and gates as manufactured by Dominion Fence and Wire Products Ltd. or approved equal.

B. Height of fence - 1.83 m (6 ft.).

C. Fabric

1. 9 ga. galvanized steel wire PVC (vinyl) coated and woven in 38.1 mm (1-1/2 in.) mesh.
2. Provide top salvage of fabric with a twisted and barbed finish and bottom salvage with a knuckled finish.

D. PVC (vinyl) Coating (fabric)

1. Apply PVC (vinyl) coating by extrusion process with a catalytic polyester bond.

E. Posts

1. Line Posts

(a) 47.6 mm (1-7/8 in.) O.D., galvanized steel pipe PVC (vinyl) coated.

2. Terminal Posts

(a) 73.0 mm (2-7/8 in.) O.D. galvanized steel pipe PVC (vinyl) coated.

PART 2 PRODUCTS (Cont'd)

2.01 MATERIAL (Cont'd)

F. Top Rails

1. 49.2 mm (1-5/16 in.) O.D., galvanized steel pipe PVC (vinyl) coated.

G. Brace Rails

1. 49.2 mm (1-5/16 in.) O.D., galvanized steel pipe PVC (vinyl) coated.

H. Fittings

1. Galvanized steel PVC (vinyl) coated or moulded rigid PVC (vinyl).

I. Bottom Wire

1. No. 9 ga., single strand galvanized wire PVC (vinyl) coated.

J. Concrete Footings

1. Concrete - C.S.A. A23.1 min. 15 MPa (2,000 psi) compressive cylinder strength at 28 days.

2. Terminal Posts - 304 mm (12 in.) dia., 1.219 m (48 in.) deep.

3. Line Posts - 354.0 mm (10 in.) dia., 1.067 m (42 in.) deep.

K. Gates

1. Size of Gate as indicated on Drawing E-81490-2.

2. Padlocks - Key padlocks to the Regional Municipality of Niagara. Contact area superintendent will obtain master key coding.

L. Colour - Dark or Forest Green for all components.

PART 3 EXECUTION

3.01 INSTALLATION

A. As shown on Drawing No. E-81490-2.

B. Terminal and Line Posts

1. Set Terminal and Line Posts in concrete base.

2. Terminal Posts spacing - max. 30.480 m (100 ft.) O.C.

3. Line Posts spacing - max. 3.048 m (10 ft.) O.C.

C. Top Rail

1. Connect outside sleeve couplings in 3.048 m (10 ft.) min. lengths.

2. Pass Top Rail through Line Posts caps to form a continuous brace between Terminal Posts.

3. Secure to Terminal Posts with receptacle fittings.

PART 3 EXECUTION (Cont'd)
3.01 INSTALLATION (Cont'd)

D. Braces

1. Install horizontal braces spaced evenly between Top Rail and bottom of fence.

2. Braces to extend from Terminal Posts to first adjacent Line Post.

3. Corner posts - two braces, end and straining posts - one brace.

E. Fabric

1. Stretch fabric taut over Line Posts and wire tie to Top Rail and braces and Line Post at 457.2 mm (18 in.) O.C.

2. Secure fabric to Terminal Posts with tension bar and fitting. Space tension bands at max. 304.8 mm (12 in.) O.C.

F. Tension Wire

1. Stretch Bottom wire taut along bottom of fabric and wire tie to fabric at 457.2 mm (18 in.) O.C.

SECTION 11100 EQUIPMENT AND PIPING

PART 1 GENERAL

1.01 INTENT

A. This Section covers the Work of supply, installation and testing of the equipment and piping for the sanitary sewage pumping station including, but not necessarily limited to the following:

1. Raw Sewage Pumps
2. Standby Engine Driven Sewage Pump
3. Gate Valves
4. Check Valves
5. Station and Yard Piping
6. Miscellaneous Metalwork
7. Prefabricated Metal Control Building
8. Air Release Valve
9. Ventilation Fan.

B. Miscellaneous appurtenant equipment is shown and detailed on the Contract Drawings.

1.02 SHOP DRAWINGS

A. Submit Shop Drawings as specified in the General Conditions for the following equipment covered by this Section or shown on the Drawings:

1. Raw Sewage Pumps and Accessories
2. Standby Sewage Pump
3. Miscellaneous Metalwork including Grating, Handrail, Hatch Covers, Bar Screen, Ladders and Ladder Rungs.
4. Prefabricated Metal Control Building
5. Ventilation Fan
6. Sewage Air Release Valve.

1.03 RELATED WORK SPECIFIED ELSEWHERE

A. Refer to Section 02200, Site Clearing, Excavating, Backfilling and Grading for details of excavating, bedding and backfilling for sewers and forcemains.

PART 2 PRODUCTS

2.01 SUBMERSIBLE SEWAGE PUMPS

A. Two only pumps, each rated 17.4 ℓ/s at a head of 23.0 metres (275 USGPM at 75 ft.).

B. Motors suitable for use with across-the-line starters.

C. Provide 4 conductor neoprene jacketed type SOW cabtire cable properly sized for motor full load and galvanized lifting chain with each pump, each of sufficient length for the elevations and locations shown on the Drawings.

D. Completely sealed watertight cable junction box in motor to meet Ontario Ministry of the Environment Standards.

E. Locate lifting hooks on units directly over centre of gravity.

F. Pumps with cast iron bodies and cast iron impellers keyed to the shaft in hydraulic and dynamic balance.

G. Pumps and motors with totally sealed lubriction on all bearings, and lower bearings of the double row ball bearing type.

H. Oil lubricated double type mechanical seals between the pump volute and the thrust bearing.

I. Pumps capable of passing a solid of 75 mm in diameter.

J. Maximum speed 1800 RPM.

K. Power supply 575 Volts, 3 phase, 60 Hertz.

L. Motors to meet run-out horsepower demand.

M. Stator housing leakage sensor.

N. Base discharge elbow or other acceptable discharge connection complete with lower guide holder and anchor bolts.

O. One duplex aluminum pump well access frame and cover complete, with upper guide holders, chain hooks, hinges and padlock hasps.

P. 5 float type level switches each with cable, and one level regulator hanger.

Q. Pumps as manufactured by Flygt Canada, Crane Canada, ABS or approved equal.

2.02 STANDBY ENGINE DRIVEN SEWAGE PUMP

A. One self priming centrifugal gasoline engine driven sewage pump, rated 17.4 ℓ/s at 23.0 metres (5.5 m suction lift and 17.5 m discharge head), capable of passing a 2½ in. solid and equipped with electric start gasoline engine with generator kit. Mount unit on a two wheel low speed truck assembly with pneumatic tires. Engine capable of meeting demand of pump at any point on head-discharge curve.

B. Equip pump suction and discharge with 100 mm dia. Ever-Tite Coupler Part B (male thread).

C. Pumping equipment as manufactured by Gorman-Rupp Co. Toronto or approved equal.

PART 2 PRODUCTS (Cont'd)

2.02 STANDBY ENGINE DRIVEN SEWAGE PUMP (Cont'd)

D. Rubber Discharge Hose

1. Supply 6 m x 6 m lengths of 100 mm dia. reinforced rubber discharge hose complete with Ever-Tite Shank Hose couplings - Part E and Part C.

2. Supply loose one 100 mm dia. Ever-Tite Coupler Part FLB.

2.03 GATE VALVES

A. Iron body, bronze mounted, non rising stem, ASA #125 flanged end connections, Jenkins Fig. 402 or approved equal.

B. Provide handwheel operators or extension stems as shown on the Drawings.

2.04 CHECK VALVES

A. Wet Well

1. Non clog ball check valve with ASA #125 flanged end connections.

2. Gray Ball Check Valve Model 5000 or Flygt HDL Model 2016.

B. Bypass Chamber

1. Jenkins Fig. 477-L, lever operated.

2.05 INTERNAL STATION AND CHAMBER PIPING

A. Use ductile iron pipe for all internal piping shown on the Drawings.

B. Conform to latest edition of Reference Standard AWWA C151 (ANSI A21-51).

C. Flanged pipe - thickness Class 53.

D. Cement lined to AWWA C104 (ASA A21.4).

E. Supply pipe in lengths and with end connections shown on the Drawings.

F. Fittings and flanges - cast iron to ANSI B16.1, Class 125.

G. Fittings cement lined to ASA A21.4.

H. Shop paint pipe and fittings with 2 coats of an approved bituminous paint.

I. Provide all flanges with 3 mm (1/8 in.) red rubber full face punched jointing gaskets.

J. Nuts and bolts to ANSI Specification B18.2 with hexagonal heads and nuts and molybdenum anti-scuffing compound applied to the full thread length.

2.06 POLYVINYL CHLORIDE SEWER PIPE

A. PVC gravity-flow sewer pipe - ASTM D3034.

PART 2 PRODUCTS (Cont'd)

2.06 POLYVINYL CHLORIDE SEWER PIPE (Cont'd)

B. Pipe Diameter and Class - 300 mm, DR35.

C. Joints - 'Ring-Tite', 'Fluid-Tite' or approved equal.

D. Rubber rings used to seal the joints of the pipe - ASTM D1869.

2.07 POLYETHYLENE FORCEMAIN PIPE

A. Conform to the following standards -

1. Use polyethylene resin compound designated as P-34, ASTM D1248.

2. Have the pipe manufactured to CGSB. 41-GP-25M for 90 mm dia. and larger, and to CSA B137-1 for sizes smaller than 90 mm.

3. Provide certification of compliance with the above requirements, in writing by the pipe supplier.

4. Base the pressure class of pipe selected on a pipe design stress of 5.0 MPa for 90 mm dia. and larger, and 4.3 MPa for sizes smaller than 90 mm.

B. Design

1. Ensure that in both cases the relationship between design strength and dimensions is according to I.S.O. formula.

$$\frac{2S \times 10^3}{P} = \frac{Do}{t} - 1$$

where

S - design stress (MPa)

t - min. wall thickness (mm)

P - pressure (kPa)

Do - outside diameter (mm)

C. Pipe Diameter and Class - 200 mm, Series 60, Sclairpipe by Dupont.

D. Jointing Methods

1. Thermal Butt Fusion

(A) Assemble shipped lengths of pipe into suitable installation lengths by butt fusion process unless specifically stated otherwise.

(B) Make pipe so joined from same class and type of raw material made by a single raw material manufacturer.

(C) Obtain further information from the pipe manufacturer's literature.

PART 2 PRODUCTS (Cont'd)

2.07 POLYETHYLENE FORCEMAIN PIPE (Cont'd)

D. (Cont'd)

2. Mechanical Connections

(A) Where required to connect flanged valves or fittings use a flange adapter.

(B) Provide the adapter with a polyethylene stub end and a metal back-up ring in accordance with the manufacturer's recommendations.

(C) Make gaskets from 1/8 in. (3.2 mm) thick red rubber sheet or compressed asbestos with rubber compound bonding.

(D) Use - bolts with regular heavy hex head
- nuts with semi-finished hex
- length as specified by pipe manufacturer
- material compatible with metal back-up ring material.

3. Jointing to Different Diameter

(A) When jointing to other pipe products or fittings with different diameters, use ring spacers between flanges with outside diameter to fit inside the bolts and with an inside diameter tapered to suit the different diameters. Use lengths of spacer equal to twice the difference inside diameters.

2.08 MISCELLANEOUS METALWORK

A. Provide miscellaneous metalwork as detailed and specified on the Drawings.

2.09 PREFABRICATED METAL CONTROL BUILDING

A. 12 ft. wide x 16 ft. long x 10 ft. high (3.65 m x 4.88 m x 3.05 m) self framing steel building, Armco Design LS-2 or approved equal.

B. Provide 3 in. (75 mm) thick glass fibre blanket insulation for all walls finished internally with Armco Steeliner panels. Provide 4 in. (100 mm) thick glass fibre blanket insulation with vapour barrier finish laid on horizontal roof supports. Finish internally with Steeliner panels.

C. Provide roof peak ventilator.

D. Provide 6 ft. (1.83 m) double swing doors, Armco Type 6070, solid leaf with door closer and cylinder lock, master keyed to the Regional system.

E. Building design in accordance with National Building Code.

F. Colour to be selected at time of Shop Drawing review.

G. Provide hooks along one wall for storage of Rubber Discharge Hose specified in Part 2.02 D.

PART 2 PRODUCTS (Cont'd)

2.10 SEWAGE AIR RELEASE VALVE

A. Sewage air release valve, size 50 mm with 25 mm reducer bushing for connection to the discharge header as shown on the drawings. Provide 50 mm main shut-off valve.

B. Provide stainless steel float and linkage sized to withstand pump start up from static pressure of 55 kPa to operating pressure of 225 kPa with 100% shock loading.

C. Provide flushing accessories including inlet shut-off valve, blow-off valve, clear water inlet valve, rubber hose and quick disconnect couplings.

D. Golden Anderson Figure No. 2-SAR-5 or approved equal.

2.11 VENTILATION FAN

A. Vanax Series 725, 200 mm diameter, explosion-proof.

PART 3 EXECUTION

3.01 PIPING TO TIE INTO EQUIPMENT

A. Be informed of the installation requirements and dimensions of equipment required to be connected to piping. Where piping is to tie into equipment, preliminary dimensions have been shown and are not guaranteed.

B. Incorporate into the Work any valve or other fitting shown on the Drawings by a consistent symbol but not described or scheduled. Determine from the Engineer the requirements of such valve or fitting.

3.02 INSTALLATION OF INTERNAL PIPING, JOINTS, ETC.

A. Install all piping, joints, fittings, valves and other items covered in this Section in accordance with the manufacturer's recommendations, except where there is conflict between the Contract Specifications and the manufacturer's recommendations, in which case, the Contract Specifications govern.

B. Lay all piping true to line and elevation shown on the Drawings. Take care to ensure that all flanges are parallel and that no stress is induced in the pumping equipment flanges.

C. Provide pipe supports for the piping system inside the pumping station. Place supports not more than 2.5 m apart. Supports to be concrete piers reinforced and dowelled to parent concrete, unless otherwise indicated on the Drawings.

D. Provide lifting hooks, pipe straps and pipe hangers where necessary or as shown on the Drawings. Hangers to be of the solid rod type and adjustable for height. No perforated hangers allowed.

E. Place concrete thrust blocks behind all bends, tees and plugs on pressure lines. Blocks to be of 20 MPa concrete adequately dowelled to parent concrete and to the approval of the Engineer. The final decision as to the need of a thrust block to be that of the Engineer.

PART 3 EXECUTION (Cont'd)

3.03 PIPE LAYING

A. Lay, joint and test pipes and fittings in accordance with the manufacturer's instructions and in the manner hereinafter specified.

B. Lower pipe carefully into the trench. Before lowering and while suspended, inspect the pipes for defects. Remove foreign material from inside of the pipe.

C. Use temporary watertight bulkheads to prevent the flow of trench water, storm water, silt and sand within the pipe.

D. Do not deviate from line and grade except where changes in direction or the laying of pipes along a curve are limited by the pipe manufacturers tolerance for joints.

E. Connect to the sanitary sewer to the manhole constructed under another Contract.

F. For details of pipe laying requirements for polyethylene pipe refer to the manufacturer's 'recommended standards for the handling and underground installation of polyethylene pressure pipe'. Comply fully with these requirements.

G. Wrap polyethylene pipe in 6 mm thick rubber sheeting through concrete chamber walls and to 150 mm outside the wall.

3.04 CLEANING AND TESTING OF SANITARY SEWER

A. Flush and clean sewers and manholes prior to testing. Carry out testing in the presence of the Engineer. Supply water for cleaning and testing.

B. No part of the Work will be accepted until the sewers are clean and free from sand, earth, mud, or other obstructions and have successfully passed the infiltration or exfiltration tests. When required by the Engineer pass a test ball of 50 mm less in diameter than the sewer from manhole to manhole.

C. Furnish labour, tools, and equipment necessary to clean and test the sewer.

D. The alignment of sewers between manholes may be tested at each section as laid. When required by the Engineer shine a strong light through the pipe from manhole to manhole. If less than one-half of the full diameter of the pipe at the light source is visible from the far end, re-align the pipes when ordered by the Engineer.

3.05 CLEANING AND TESTING OF FORCEMAIN

A. Clean out each Section of pressure pipe or part thereof by flushing prior to testing.

B. Pressure test polyethylene pipe to 500 KPa measured at the lowest point on the line. No leakage will be allowed with fused and flanged joints. Conduct testing in strict accordance with the standards specified in 3.03 F.

3.06 INSTALLATION OF EQUIPMENT

A. Furnish any appurtenant fittings, and materials, not herein or elsewhere specifically mentioned or included, but necessary for the operation of the equipment without additional payment. Ensure that equipment suppliers are aware of the duty required of the equipment and the associated appurtenances shown on the Drawings or required by any section of the Specifications.

PART 3 EXECUTION (Cont'd)

3.07 HANDLING AND STORAGE

A. Provide all machinery and means of properly handling the equipment during off-loading, storing and erection. Accept responsibility for the rectification of any damage to equipment. Obtain approval of any such repairs from the Engineer and equipment supplier so that the guarantees are not invalidated. Adequately package, store and protect all equipment, if not required for immediate use, against weather damage and theft. Apply particular care to any corrodible items and electrical equipment. Store mechanical equipment in an area heated to a minimum of 10 degrees C.

3.08 MANUFACTURER'S DRAWINGS

A. Submit Shop Drawings, circuit diagrams, specifications and installation requirements and instructions for review before any equipment or part thereof is fabricated or installed in the Works. Submit such information as specified in the General Conditions.

B. Towards the end of the Contract, the Engineer will require more copies of all Shop Drawings, diagrams, specifications, instructions books, lubrication charts, maintenance instructions and spare parts lists for inclusion in combined 'Operating Manuals' for the Owner.

3.09 GUARANTEE

A. Guarantee all equipment in accordance with the requirements of the General Conditions.

B. Such guarantee to protect the Owner against any failure of the equipment due to faulty design, workmanship or material, and, in addition to guarantee the performance of the equipment to the specified operating conditions and other conditions implied by approval of drawings and data by the Engineer.

3.10 INSTALLATION

A. Provide all materials, labour and equipment to install complete and in full operational and guaranteed condition, all the equipment referred to above.

B. Install the equipment in strict accordance with the manufacturer's instructions and to the satisfaction of the Engineer.

C. In making up the construction schedule, and in determining the time required to complete the work, allow for the erection of all equipment.

D. Be fully acquainted with all work involved in the complete installation of all equipment. At no time make any claim that any misunderstanding existed in regard to the nature or amount of work to be done.

PART 3 EXECUTION (Cont'd)

3.11 MANUFACTURER'S SERVICES AND CERTIFICATION OF INSTALLATION

A. Allow in the tender for all the necessary services and expenses of trained personnel representing the manufacturer of the pumping equipment to ensure correctness of installation.

B. Provide all materials, labour and equipment to make any adjustments to the installation as required by the manufacturer or the Engineer to effect correct performance.

C. On completion of installation and testing, obtain from the manufacturer concerned, certification of the correctness of the installation, such certification to be submitted to the Engineer.

3.12 TEMPORARY SUPPORTS

A. Provide all necessary tempotary supports and bracings to prevent the overloading of floors and walls, while equipment is being installed. Ascertain the weights of all pieces of equipment from the manufacturer, and move equipment into position in a manner and at a time approved by the Engineer.

3.13 LUBRICANTS

A. Provide the complete initial lubrication of all equipment in accordance with the manufacturer's recommendations and a complete schedule of all manufacturer's recommended lubricants.

3.14 SMALL PIPING

A. Supply and install all small connecting pipework, fittings and valves whether shown on the Drawings or not. Perform all such work strictly in accordance with the instructions of the manufacturer whose equipment is being installed or connected, or with requirements of the Contract Documents as they apply.

3.15 ANCHOR BOLTS

A. Unless otherwise specified, supply all anchor bolts, such as anchor bolts being of a type, diameter and size recommended by the manufacturers of equipment and machinery. Generally use expansive type anchorages for setting small equipment. Set large pumps by means of bolts with sleeves cast into the concrete. Elsewhere, cast in place anchor bolts may be used subject to the approval of the Engineer; these must be properly positioned by means of substantial templates.

3.16 ERECTION OF CONTROL BUILDING

A. Erect the prefabricated metal control building in accordance with the manufacturer's requirements for a flat slab foundation, using drilled-in anchor bolts.

SECTION 16010 ELECTRICAL GENERAL

PART 1 GENERAL

1.01 GENERAL

A. The Contract Documents define the extent and Scope of Work. The Electrical Documents define the extent of electrical functions included in the Work.

B. Comply with the General Requirements Section. Provide all Work in accordance with Contract Documents and Schedules.

1.02 SCOPE

A. The Work included but not necessarily limited to -

1. Provide complete power feed system.

2. Fabrication, supply and installation of a complete distribution system.

3. Testing and commissioning.

4. Effective coordination of Work and Schedules with other trades and contractors on site and with the Engineer to ensure that the objectives of Work are realized.

B. Related Work

1. Site Clearing, Excavating, Backfilling and Grading - Section 02200.

2. Painting

(A) Repaint or refinish surfaces of factory applied finishes damaged since the initial painting.

(B) Ferrous materials including supports and hangers in high humidity areas be coated with red oxide primer before finished coat is applied.

1.03 STANDARDS, CODES, PERMITS AND INSPECTION

A. References to standards, codes, publications, documents and other specifications are to be the latest issue in effect on the date of Tender.

B. Use only commonly used abbreviations. Refer to Appendix for a short list of abbreviations.

C. Comply with the applicable requirements of CSA, EEMAC, JIC, federal, provincial, municipal and all other authorities having jurisdiction. These codes, regulations and bylaws form an integral part of the specification.

D. Provide to the authorities all documentation as required by them for their approval prior to commencing with any Work.

E. Inform the Engineer immediately in writing of any modification requested by the authorities.

F. Provide all permits, licences and certificates required by local authorities for the Work of this Division.

G. Obtain and pay for all patent, royalty and licence fees related to electrical Work as required.

H. Arrange for inspection of all electrical Work by the authorities having jurisdiction. Upon completion of the Work, furnish the Engineer with final unconditional certificates of approval by the local inspection authorities.

1.04 EXAMINATION OF SITE AND CONTRACT DOCUMENTS

A. Examine the site, Drawings and Specifications of the complete project, and become familiar with local conditions, limitations, building construction and finish affecting the electrical Work.

B. Submission of Tender confirms that the Contractor accepts the Contract and site conditions without qualifications.

C. Failure to determine existing conditions or the nature of construction is not a basis for granting compensation.

1.05 SUBSTITUTION

A. Refer to Tender Information, Section 10.

1.06 DRAWINGS

A. General

1. The Drawings supplied by the Engineer for electrical Work are performance Drawings, diagrammatic, intended to convey the scope of work and indicate general arrangement and approximate location of apparatus, fixtures and approximate sizes and location of equipment and outlets. The Drawings do not intend to show all architectural and structural details.

2. Do not scale Drawings, but obtain information involving accurate dimensions to structure from dimensions shown on architectural and structural Drawings, or by site measurements. Follow the electrical Drawings in laying out the Work. Consult general construction Drawings as well as detail Drawings to become familiar with all conditions affecting the Work, and verify spaces in which the Work will be installed.

B. Shop Drawings

1. Prepare and submit Shop Drawings for all materials and equipment proposed to be used on the project, including but not limited to -

(A) Light fixtures

(B) Control panel

(C) Instrumentation equipment

(D) Cables and wires.

Drawings are in same size as Contract Drawings or suitable for inclusion in final Documentation Manuals.

B. 2. The Drawings show -

(A) Descriptive names and numbers of equipment and mechanical and electrical characteristics as applicable.

(B) Data verifying that superimposed loads do not affect function, appearance and safety of Work.

(C) Assumed design loading, dimensions of elements and material specification.

(D) Fabrication and erection dimensions.

(E) Materials and finishes.

(F) Sections, arrangements and details which indicate complete construction and inter-connection Work.

(G) Internal panel component layout.

(H) Electrical schematics.

(I) Sequence of operation.

(J) Wiring diagram.

(K) Interconnection diagram.

(L) Material lists.

(M) Mounting details.

(N) Fault current analysis.

(O) Overcurrent devices coordination.

(P) Manufacturer's installation directions.

(Q) Other details as required.

3. Prior to submission of Shop Drawings to the Engineer, review and check them as follows -

(A) Ensure Work shown conforms to the requirement of Contract Documents.

(B) Verify Work shown. Properly coordinate with other Shop Drawings to ensure that Work adjacent to or affecting other Work is accurately detailed.

(C) Verify field measurements and construction criteria.

(D) Verify catalogue numbers.

(E) Indicate on each Drawing that it has been reviewed by applying stamp, date and Contractor's signature.

(F) Enclose notice in writing of any variation from requirements of the Contract Documents.

4. When submitting Shop Drawings, submit all assembly and sub-assembly Drawings and material list pertaining to a particular arrangement at the same time.

5. Manufacturer's printed data sheets or brochures for standard items are acceptable, provided all pertinent characteristics are identified and they relate to the specified item.

6. Drawings which mention any work or material required for a complete installation which is in accordance with the manufacturer's recommendation, automatically include such work or materials as part of this Contract.

C. Record Drawings

1. During manufacture and installation, maintain in the manufacturing plant and on the construction site, one set of white prints of all contract, construction and Shop Drawings. Make available to the Engineer on request.

2. Clearly mark on these Drawings all changes and deviations to accurately indicate installed work.

3. Final circuiting, conduit routings and number of wires in each raceway are part of the record Drawing.

4. Upon completion of the Work, transfer all the changes and marks to a reproducible set of Drawings. Submit these Drawings to the Engineer as specified herein.

D. As-built and Final Documents

1. When the electrical Work is completed, provide As-built Documents including, but not limited to -

(A) Construction Drawings

(B) Shop Drawings

(C) Material Lists

(D) Operating Manual

(E) Maintenance Manual.

The As-built Documents form part of this Contract and are required before the Work is considered complete.

2. The As-built Documents show the electrical Work exactly as installed. Identify this fact with a certification 'As-built Document' signed by the Contractor.

3. Submit As-built Documents in quantities specified elsewhere.

4. Manuals are specified elsewhere.

E. Shop Drawing Submittals & Review

1. Refer to General Section 01010, for submission of Drawings for review.

2. Final Submittals

(A) Upon completion of the electrical Work submit As-built and Final Documentation as specified elsewhere.

(1) Submit 4 white print sets and 1 sepia set of As-built Construction Drawings.

(2) Submit 4 sets of manuals.

(B) Final submissions form part of the Contract and are required before the Work is considered complete.

1.07 MANUALS

A. Prepare an Engineering Job Manual for all electrical Work supplied under this Contract.

The manual is arranged in a logical manner and includes -

1. Detailed index

PART 1 GENERAL (Cont'd)
1.07 Manuals (Cont'd)

A. 2. Complete drawing lists

3. For the control panel provide -

(A) Shop Drawing list

(B) Electrical equipment list

(C) Recommended spare parts list

(D) Sequence of operation

(E) Engineering data and final setting of adjustable items

(F) Technical literature giving technical data and general description of every item forming part of the equipment including details parts lists (explosive view) numbered for replacement ordering.

(G) Instructions for set-up, operation, preventive maintenance and corrective maintenance.

B. Use original material only in the manuals. Exception is permitted where typewritten material may be provided as photocopies.

C. Prepare pages in the manual on standard letter size paper. Bind the manual in a standard 3-hole binder. Do not over-compress material in the binders.

D. Submit 2 sets of manuals for review prior to the scheduled start of the commissioning period.

E. Submit Final Manuals as detailed elsewhere.

1.08 MATERIAL AND EQUIPMENT

A. Use only new material and equipment approved by CSA or by special inspection of the local electrical power authority.

1.09 TEMPORARY SERVICE

A. Refer to the Contract Documents regarding temporary services, contractor's shop, storage and other such facilities.

B. Do not use any of the permanent electrical systems during construction, unless specific written approval is obtained from the Engineer or where allowed elsewhere in the Contract Documents.

C. The use of permanent facilities for temporary construction service will not affect, in any way, the commencement day of the warranty. Such period will commence only when the overall project is completed and certificates of acceptance are issued.

1.10 PROTECTION

A. Protect building and structure from damage due to carrying out of this Work.

B. Protect all electrical Work from damage. Keep all equipment dry and clean at all times.

C. Cover all openings in equipment and materials.

D. Be responsible for and make good any damage caused directly or indirectly to any walls, floors, ceilings, woodwork, brickwork, finishes, etc.

PART 1 GENERAL (Cont'd)

1.11 COORDINATION

A. Confer with all trades installing equipment which may affect the Work of this Division, and arrange equipment in proper relation with equipment installed under all Divisions of the Contract.

B. Furnish all items to be built in, in time, complete with all pertinent information commensurate with the progress of the Work.

C. Store materials neatly and out of the way and clean up daily all refuse caused by Work.

D. Relocate equipment and/or material installed, but not coordinated with the Work of other Divisions as directed by the Engineer, without extra cost.

1.12 SCHEDULING

A. Job scheduling is performed as specified in Section 01010.

1.13 SUPERINTENDENCE

A. Article 42 of the General Conditions also applies to the electrical Work. Supply person to meet these requirements.

1.14 EXCAVATION AND BACKFILL

A. Trenching is specified in Section 02200 - Site Clearing, Excavating, Backfilling and Grading, but dimensioned as per E-STD-16-1.

B. Supervise and be responsible for proper execution of Work. Take precautions against damage to materials.

C. Coordinate excavating, backfill and sandbedding.

1.15 APPLICATION FOR PAYMENT

A. Article 36 of the General Conditions of the Contract also applies to the electrical Work.

B. Follow the instructions of the Engineer regarding schedule of values, and method of submission of applications which will be issued after the award of Contract.

C. Request for payment will not be approved for materials or equipment unless they are on site and accompanied by a Statutory Declaration from the supplier or manufacturer of the material or equipment, relinquishing all lien rights, when requested by the Engineer.

D. Removal of any material or equipment from the job site without the consent of the Owner or without legal order is unlawful.

1.16 TESTS AND INSPECTIONS

A. General

1. Refer to Section 01010 for required tests.

PART 1 GENERAL (Cont'd)

1.16 TESTS AND INSPECTIONS (Cont'd)

A. 2. All material is subject to inspection, examination and tests by the Engineer at any and all times during manufacturing at any and all places of manufacturing and during installation.

The Contractor is responsible for providing all reasonable facilities for inspection, including access to plants.

3. Provide, in advance, to the Engineer, written notice of the date of commencement of the Work and the progress expected including estimate of quantities to be available for inspections/tests.

4. Inspections and tests as detailed herein must be carried out. It is the Engineer's prerogative whether he attends all or none of these inspections/tests.

5. Inspection and tests are designed to ensure high quality product and confirmation to Contract Documents.

B. Shop Inspections and Tests

1. Thoroughly test proper functioning of all equipment before such equipment is shipped to site. Simulate actual operating conditions for testing purposes so that all circuits are checked and verified. Test must include proper insulation test. Complete these shop tests and correct all deficiencies on all equipment to the Engineer's satisfaction.

C. Site Test

1. Operational tests - test operation of each equipment in all operational modes. Perform full automatic tests under full load condition to facilitate adjustment of devices such as timers, brakes, overloads, sensors, instruments, etc.

D. Test Procedures

1. Prepare and submit to the Engineer for review a proposed Inspection and Test Manual for all inspection and tests of all equipment used.

2. For standard products, use standard test procedures as recommended by the manufacturer.

3. Organize the manual into a comprehensive unit tailored for this Work.

4. Inspection and test procedures must clearly identify; the purpose, set-up, sequence and success/fail criteria for each task performed.

APPENDIX E-1

LIST OF ABBREVIATIONS

USED IN SPECIFICATIONS AND ON DRAWINGS

LIST OF ABBREVIATIONS

A	Ampere
AC	Alternating Current
A/C	Air Conditioning
ACB	Air Circuit Breaker
AFF	Above Finished Floor
AL	Aluminum
ANSI	American National Standards Institute
APS	Antiplugging Switch
ASYM	Asymmetrical
AT	Ampere Trip
AUTO	Automatic
AUX	Auxiliary
AWG	American Wire Gauge
B	Blue
BIL	Basic Impulse Level
BKR	Breaker
BLDG	Building
C	Conduit
CAT	Catalogue
CB	Circuit Breaker
CCT	Circuit
CL	Centre Line
CLK	Clock
COMP	Compressor
CP	Control Panel
CR	Control Relay
CSA	Canadian Standards Association
CT	Current Transformer
CTZS	Current Transformer, Zero Sequence
CU	Copper
C/W	Complete With
DB	Decibel
DC	Direct Current
DIA	Diameter
DIST	Distribution
DN	Down
DPDT	Double Pole Double Throw
DWG	Drawing
EC	Empty Conduit
ECC	Eddy Current Coupling
EEMAC	Electrical & Electronic Manufacturers Association of Canada
ELEC	Electrical
ELEV	Elevation
EMERG	Emergency
EQPT	Equipment
ETM	Elapsed Time Meter
EXH	Exhaust
EXP	Explosion Proof
EX	Existing

F	Field Mounted
FCAN	Full Capacity Above Nominal Voltage
FCBN	Full Capacity Below Nominal Voltage
FIN	Finish
FL	Floor
FLEX	Flexible
FVNR	Full Voltage Non-Reversing
FVR	Full Voltage Reversing
FZ	Freezestat
FS	Flowswitch
G	Green
GEN	Generator
GFR	Ground Fault Relay
GL	Ground Level
GND	Ground
GFA	Ground Fault Alarm
H	Hand
HEPCO	Hydro Electric Power Commission of Ontario
HP	Horsepower
HV	High Voltage
HZ	Hertz
IC	Interrupting Capacity
ID	Inside Diameter
IEEE	Institute of Electrical and Electronic Engineers
IND	Indicating
INST	Instantaneous
INSTR	Instrument
IOL	Instantaneous (Current) Overload
IPCEA	Insulated Power Cable Engineers Association
JB	Junction Box
KV	Kilo Volt
KVA	Kilo Volt Ampere
KVAR	Reactive KVA
KW	Kilo Watt
LB	Load Break
LP	Lighting Panel
LR	Latch Relay
LS	Limit Switch
LSS	Limited Switch Safety
LTG	Lighting
LV	Low Voltage
M	Magnetic Starter or Motor
M	Meters
MAN	Manual
MAX	Maximum
MCC	Motor Control Centre
MCM	Thousand Circular Mil

MCP	Motor Control Panel
MD	Motorized Damper
MF	Magnetic Starter - Forward
MR	Magnetic Starter - Reverse
MH	Magnetic Starter - High
ML	Magnetic Starter - Low
MIN	Minimum
mm	Millimeters
MTG HT	Mounting Height
MVA	Mega Volt Ampere
NA	Not Applicable
N.C.	Normally Closed
N.C.T.O.	Normally Closed Timed To Open
N.C.T.C.	Normally Closed Timed To Close
N.O.	Normally Open
N.O.T.C.	Normally Open Timed To Close
N.O.T.O.	Normally Open Timed To Open
NO	Number
NTS	Not to Scale
O	Off
OCB	Oil Circuit Breaker
OD	Outside Diameter
O/H	Overhead
O/L	Overload
ONAF	Oil Immersed Forced Air Cooling
ONAN	Oil Immersed Natural Air Cooling
OPS	Operating Station
P	Pole
PB	Push Button
PF	Power Factor
PL	Pilot Light
PRI	Primary
PS	Pressure Switch
PT	Potential Transformer
PVC	Polyvinyl Chloride
Ø	Phase
SP	Single Pole
R	Red
RDS	Remote Disconnect Switch
REC	Receptacle
REQD	Required
REV	Revision
RMS	Root Mean Square
RPM	Revolution per Minute
R/V	Reduced Voltage
SEC	Secondary
SPDT	Single Pole Double Throw
SPST	Single Pole Single Throw
STN	Station
SW	Switch
SYM	Symmetrical
SYN	Synchronous
SWBD	Switchboard

T	Thermostat
TACH	Tachometer
TB	Terminal Block
TEL	Telephone
TEMP	Temperature
TERM	Terminal
TXR	Transformer
TR	Timing Relay
TS	Temp. Sensor
U/H	Unit Heater
V	Volt
W	Watt
WP	Weatherproof
XLPE	Cross-Linked Polyethylene

SECTION 16210 - ELECTRICAL WORK

PART 1 GENERAL

1.01 INTENT

A. This Section describes the Work required for supply, installation and placing into service of the pumping station.

B. This Section covers the following:

1. Hydro service to the panel
2. Telephone hook-up to high level alarm
3. Control panel located in heated storage building
4. Instruments located in the pit and flow chamber
5. Wiring
6. Grounding.

PART 2 PRODUCTS

2.01 HYDRO SERVICE

A. 600/347 V service is supplied by local Hydro upto the existing pole at north side of the property. Provide trenching, wiring and metering from that point to the control panel.

B. Wiring is 4 #2 in 50 mm rigid PVC conduit, in trench. Provide rigid steel conduit on the service pole. Terminate wiring in metering cabinet located in the storage house, next to the control panel.

C. Metering - provide disconnect switch and cabinet for Hydro metering as shown on drawing. Coordinate with local Hydro as to exact requirements.

2.02 TELEPHONE HOOK-UP

A. Provide 38 mm in rigid PVC conduit with pull-wire from the telephone pole to a location near the control panel. Terminate the conduit next to a backboard 30 cm x 30 cm, for Bell Telephone equipment.

B. Provide 25 mm rigid PVC conduit with 3/19 cable from the backboard to the alarm float sensor LS-4 in the well.

PART 2 PRODUCTS (Cont'd)

2.03 CONTROL PANEL

A. The panel is EEMAC-4 construciton, watertight heavy duty, standard grey outside, white inside, with mounting panel and data pocket. Hammond or approved equal.

B. The panel contains:

1. Breakers and control transformer

2. AC starters

3. Control relays and control devices

4. Flow meter
5. Duplex receptacle

All devices are identified as shown on the drawings, with plastic lamacoids placed on the mounting panel.

C. Breakers

Distribution breakers are rated as shown with:

(a) Thermal magnetic trip

(b) Number of poles and sizes as indicated

(c) Bolt-on type

(d) Quick-make, quick-break action

(e) Suitable for panelboard mounting

(f) Common trip with single handle for multi-pole breakers

(g) Minimum interrupting rating 18,000 A RMS symmetrical.

D. Motor Breakers

Breakers in motor branch circuits are:

(a) interrupter type

(b) 600 V, 30A, 3p rating

(c) adjustable, magnetic trip

(d) Westinghouse type Mcp.

E. Starters

1. Full voltage 600 V, 3 pole starters sized to suit motor with:

(a) 1 N.O. and 1 N.C. auxiliary spare contacts

(b) ambient compensated thermal overload relay, with manual reset and 1 N.O.; 1 N.C. auxiliary contacts.

2. Manual Starter

(a) manual starter, 120 V, 1 pole suitable for operation from panel door.

PART 2 PRODUCTS (Cont'd)

2.03 CONTROL PANEL (Cont'd)

F. Relays

Relays are industrial type heavy duty with:

(a) 4 convertible, 300 V, 10 A contacts minimum

(b) 2 spare contacts minimum

(c) manual/visual operator/indicator

(d) same manufacturer as starters

(e) timer relay, 0-24 hour, C.G.E. Cat. No. T-101

G. Control Devices

1. Mount the following control devices on the panel door:

(a) 'Hand-off-Auto' maintained selectors

(b) 'On' push-to-test green pilot lights

(c) overload 'reset' push buttons

(d) elapsed time meter, 4 digit in hours, non-resettable

(e) flow indicator, see Instruments Section.

(f) 'on-off' maintained selector.

2. All devices are heavy duty, oil type suitable for EEMAC-4 application.

3. Provide suitable name plate for each device.

2.04 INSTRUMENTS

A. For floats see other Division.

B. Flow meter

1. The flow meter is Doppler effect type:

(a) suitable for EEMAC-4 application

(b) 120 V, AC power

(c) front cover mounted flow indicator, 0 - 20 L/S scale

(d) complete with co-axial cable, long enough to reach the sensor without splices.

PART 2 PRODUCTS (Cont'd)

2.04 INSTRUMENTS (Cont'd)

B. (Cont'd)

2. Meter is Andco AD-5 (CanAir Instruments Ltd.)

3. Operating conditions:

raw sewage flow of approximately 76.2 cm/sec. in Series 60, polyethylene pipe. Suspended solids concentration of 150 - 200 mg/l.

2.05 WIRING DEVICES

A. Wire and Cable

1. Conductors - annealed stranded copper unless otherwise noted.

2. General wiring - RW90 XLPE insulated for 600 V unshielded and phase colour coded. Single conductors unless otherwise noted.

3. Control circuit feeders - No. 14 RW90 XLPE minimum, all others #12 minimum.

B. Conduit and Fittings

1. Conduit - rigid PVC, 20 mm or larger.

2. Conduit bends - factory made for 50 mm and larger conduit except where conduits are grouped and the bends are concentric.

3. Conduit strap for supporting exposed conduit - malleable iron, one hole conduit straps or two hole stamped galvanized steel conduit straps, PVC coated.

4. EYS conduit seals - Crouse-Hinds or Appleton.

5. LB conduit fittings.

6. Outlet boxes - PVC.

7. CGB conduit connectors and bushings - Crouse-Hinds

8. Terminal adapters - Scepter.

C. Light Fixtures

1. Provide wall mounted fixture, suitable for Class I, Group D, Divsion II location, coated with a corrosion resistant epoxy paint, baked-on and with stainless steel guard holding screws. (Equal to Crouse-Hinds VXHBF25GP). Locate the fixtures near the ladder or suitable access point for lamp replacement and secure to the wall with stainless steel or nylon screws.

2. All equipment mounted inside the well are suitable for Class I, Group D Division II location, including the ventilation fan.

3. Provide wall mounted fixtures for utility shed for both indoor and outdoor applications. Location to suite best reflected light for utility shed and site layout. 100 WATT Sylvania or General Electric.

PART 2 PRODUCTS (Cont'd)

2.06 UNIT HEATER

A. Blower Unit Heater

1. Install unit by mounting to ceiling or wall.

2. Provide a thermostat to regulate utility shed temperature.

3. Chromalox type BUH-21 or approved equal.

PART 3 EXECUTION

3.01 HYDRO SERVICE

A. Carry all work related to Hydro service in coordination with local authorities.

B. Carry all trenching and back fill work as specified in Section 16010.

3.02 TELEPHONE CONNECTION

A. Coordinate with local Bell Telephone office all work related to the alarm hook-up.

B. Coordinate with Welland Pollution Control Plant at 505 River Rd., Welland and provide all material and labour required for proper operation of the alarm hook-up.

3.03 CONTROL PANEL

A. Set the panel on the wall inside the building as shown, on channel frame, rigid square to the building lines.

B. Obtain approval from the Engineer as to the exact location.

3.04 CONDUIT AND WIRING

A. General

1. Do not include more than the equivalent of four quarter bends between outlets for draw-in points.

2. Leave nylon fish cord in spare conduits.

3. Cap open ends of conduit.

4. Pull wires when the conduits are dry.

5. Avoid damage to cable. Repair damaged sheath immediately in a manner approved by the cable manufacturer.

6. Install exposed conduits and cables square to building structure.

7. Identify wiring and cables at both ends.

B. Wiring inside the well to float switches and submersible pumps:

1. Wiring to float switches and submersible pumps is by approved Cords type STW, SOW, SWTW, SGOW, or SWOW.

PART 3 EXECUTION (Cont'd)

3.04 CONDUIT AND WIRING (Cont'd)

B. Wiring inside the well to float switches and submersible pumps: (Cont'd)

2. Sufficient cable slack is provided to permit adjustment or removal of the equipment.

3. Arrange for a cable loop where the cables leave the elbow of the conduit.

4. Where cable is run around the walls, support it by nylon clip hangers every 1.0 m maximum, secured by stainless steel or nylon screws to the wall.

5. Terminate the conduits, carrying flexible cables, where they enter the well. Terminate horizontal conduits with an elbox pointing downwards. Place less stress on the cable.

6. DO NOT seal these conduits in the well. Allow them to breathe and drain.

7. Install CG cable and cord connectors at end of conduit in the well. Provide adaptors if necessary for conduit to CG terminators. See Crouse-Hinds catalogue for fitting sizes.

C. Conduit runs inside the well for lighting, etc.:

1. Provide runs to lighting fixtures and other fixed equipment rigid PVC conduit with a green insulated copper ground wire.

2. Secure the conduit to the ceiling and/or walls with PvC clips and stainless steel or nylon screws.

3. Use an aluminum close nipple and a rigid PVC female adapter to connect the lighting fixture box to the rigid PVC conduit. Coat the nipple with epoxy paint.

4. DO NOT seal the conduits where they enter the well. Provide an open tee fitting at the conduit low point in the well to allow it to drain and breathe.

D. Conduit runs from junction box to well:

1. Run rigid PVC conduits from the bottom of the junction box to the wet well. Run the conduits underground NOT through a non-hazardous room.

2. Slope the horizontal runs so as to drain any moisture into the well.

3. After wiring, seal the end of the conduit at the junction box with a "Duxseal" mastic plug.

4. Provide the conduits large enough so that one flexible cable can be replaced without damaging other flexible cables in the same run.

5. Provide separate conduits for, and with recommended minimum sizes:

(a) each submersible pump for power (and sensor), 75 mm minimum.
(b) float cables, 25 mm minimum for 2 cables, 38 mm minimum for 3 cables.
(c) control cables, 50 mm minimum

E. Junction box:

1. Provide a rigid PVC junction box, hazardous indoor water-proof type for all power, sensor and lighting conductors going to the wet well. Select Crouse-Hinds sizes 8" x 12" x 18" to suit PVC conduits.

PART 3 EXECUTION (Cont'd)

3.04 CONDUIT AND WIRING (Cont'd)

E. Junction box: (Cont'd)

2. Ensure the box is adequately sized to permit splicing of the conductors under in-service conditions, without damaging the other conductors.

3. Locate the box indoors with at least 1/2 m clearance above floor, and below pump control panel. Position the box to present few bends in the conduit runs to the wet wall, and pump control panel.

4. Terminate all wires inside the junction box on a marked terminal strip. Number the wires on each side of the terminal. The wire number and terminal numbers are identical to the ones shown on the schematics.

5. Set junction box on the wall inside the building as shown.

6. Obtain approval from the Engineer as to the exact location.

F. Conduit runs from junction box to control panel, etc.:

1. Provide conduit seal fittings, straight or angle type, at the junction box.

2. Run PVC conduit from the seal fitting to the control panel, etc.

3. After the building wires are installed, tested and the installation approved, install the cement in the seal fittings.

G. Conduit run from panel to flow sensor:

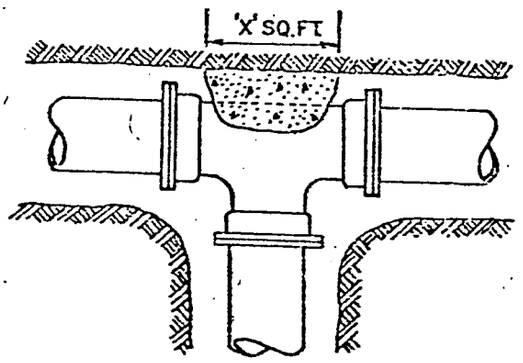
Provide 25 mm minimum rigid PVC pipe.

3.05 GROUNDING

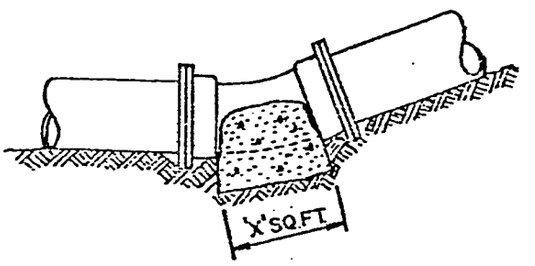
A. Ground electrical equipment to ensure safety of personnel, protection of equipment, and to permit the proper functioning of protective devices under fault conditions.

B. Install a complete grounding system. Use ground wires and terminal lugs. Keep the number of joints and splices to a minimum and make connections to structures and equipment using approved connectors.

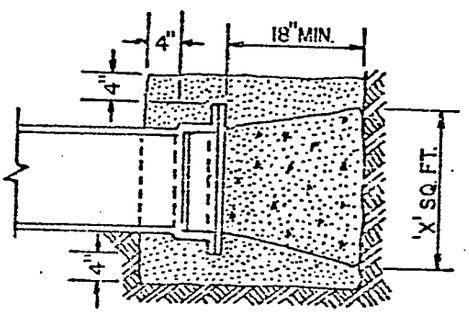
C. Run a separate insulated ground wire in all PVC conduits.



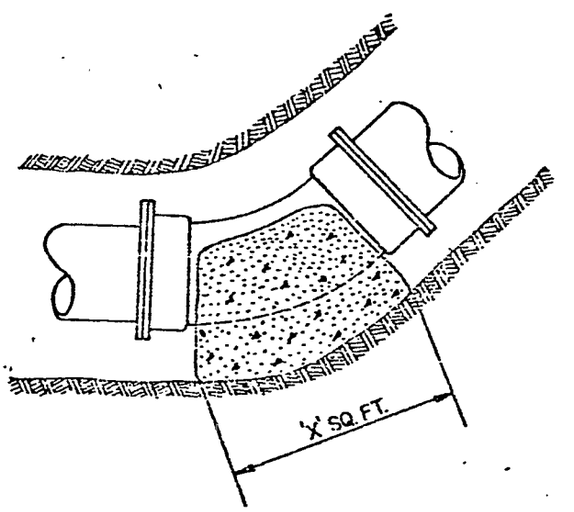
TEE OR CROSS



VERTICAL BEND UP



END PLUG
(USE ALSO ON PLUGGED CROSS)



HORIZONTAL BEND

SIZE OF THRUST BLOCK IN SQUARE FEET

TYPE OF SOIL	1/32 (11-1/4°) & 1/16 (22-1/2°) BEND					1/8 (45°) BEND					1/4 (90°) BEND					TEE, CROSS & END PLUG				
	≤ 6"	8"	10"	12"	16"	≤ 6"	8"	10"	12"	16"	≤ 6"	8"	10"	12"	16"	≤ 6"	8"	10"	12"	16"
LOOSE SAND & GRAVEL, SOFT CLAY.	2	3	5	7	12	4	6	9	13	23	6	10	16	24	42	4	8	12	17	30
COMPACTED SAND & GRAVEL, DENSE SILT FIRM TILL AND STIFF CLAY.	1	1	2	3	4	1	2	3	5	8	2	4	6	8	14	2	3	4	6	10
VERY STIFF CLAY, DENSE TILL, SHALE OR ROCK.	1	1	1	2	2	1	1	2	3	4	1	2	3	4	7	1	2	2	3	5

NOTE: (1) BLOCKS DESIGNED FOR 150 P.S.I. PRESSURE; FOR HIGHER PRESSURES AREAS SHOULD BE PRO-RATED UPWARDS.

(2) VERTICAL BENDS DOWNWARDS SHOULD BE INDIVIDUALLY DESIGNED USING CLAMPS OR STIRRUPS WITH CONCRETE DEADMAN.

(3) CONCRETE FOR THRUST BLOCKS TO BE 3000 P.S.I. LAID TO UNDISTURBED GROUND.

SIGNS

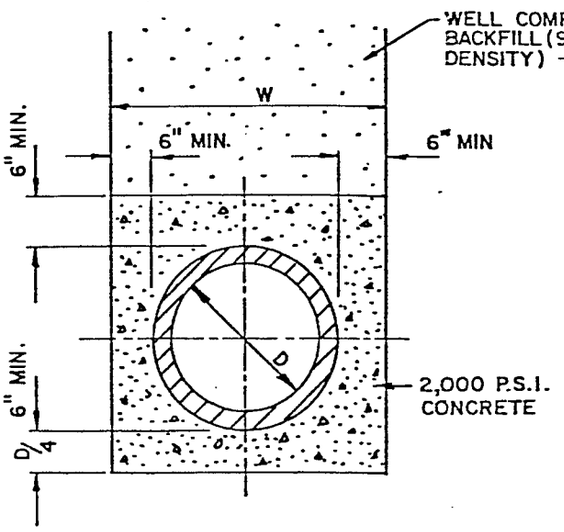
APPROVED BY

CONCRETE THRUST BLOCKS

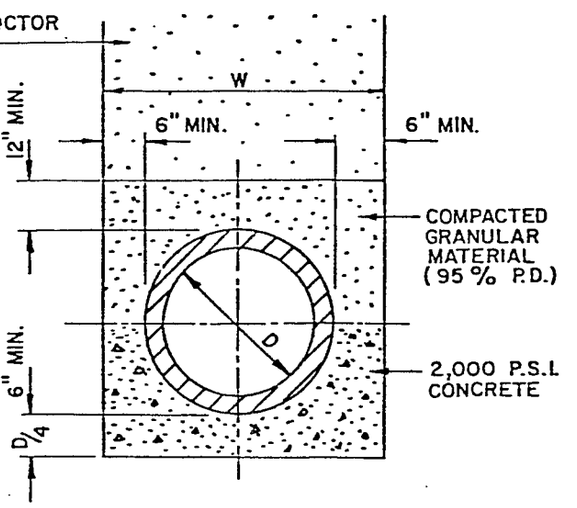
Proctor & Redfern [illegible]
Consulting Engineers
Toronto

DATE JUNE, 1973

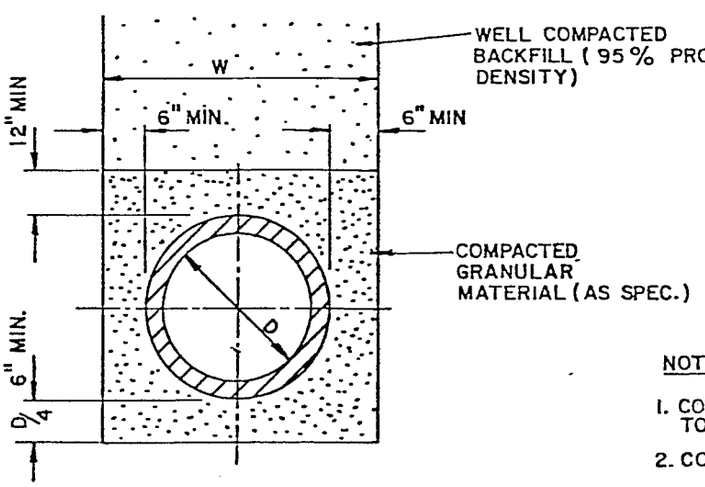
E-110-1-1



CONCRETE ENCASEMENT
(CLASS 'AA')



CONCRETE CRADLE
(CLASS 'A')



GRANULAR BEDDING
(CLASS 'B')

NOTE:

1. CONCRETE OR GRANULAR MATERIAL TO EXTEND TO UNDISTURBED TRENCH WALLS.
2. COMPACTION – 95% PROCTOR DENSITY MINIMUM.
3. BACKFILL HANDPLACED TO 2'-0" ABOVE TOP OF PIPE & CAREFULLY TAMPED IN 6" LAYERS, REMAINING TO BE PLACED IN LAYERS & THOROUGHLY CONSOLIDATED ACCORDING TO SPECIFICATION.
4. FOR TRENCH WIDTH 'W' REFER TO SPECS..

REVISIONS	3-30/11/76	4-16/2/77	5 – D/4 ADDED 3/6/77

APPROVED BY Feb 21/77 R.S.T.

PIPE BEDDING DETAILS
(PIPE SIZES UP TO D = 48"Ø)

Proctor & Redfern Limited
Consulting Engineers
Toronto

JUNE 1973

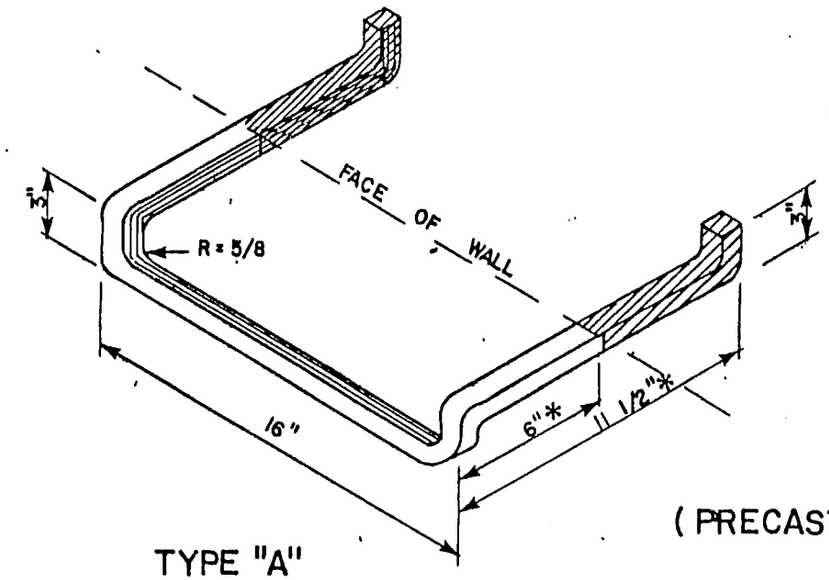
DRAWING NO. E-STD.-2-1 REV 5

APPROVED BY

REVISIONS

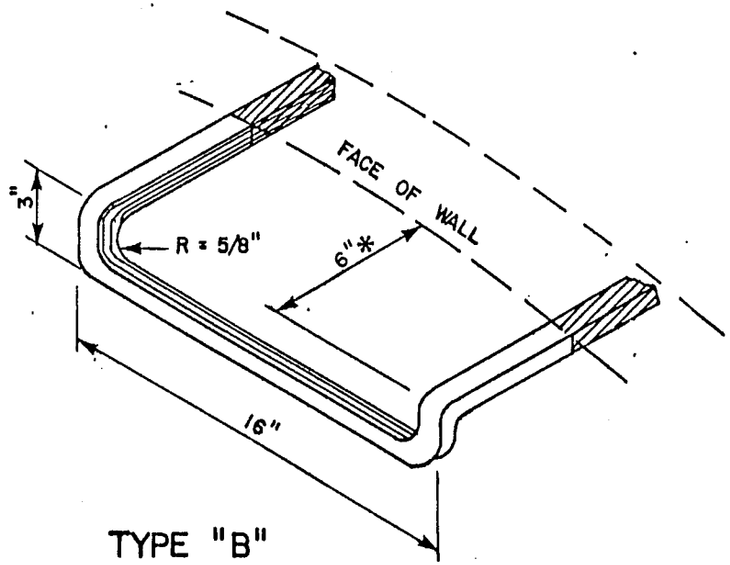
*DIMENSION REV. 1 CHANGED 3/6/77

ALUMINUM SAFETY LADDER RUNGS



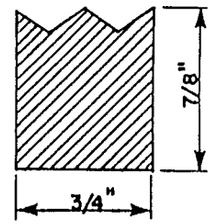
TYPE "A"

(CAST IN PLACE CONCRETE)

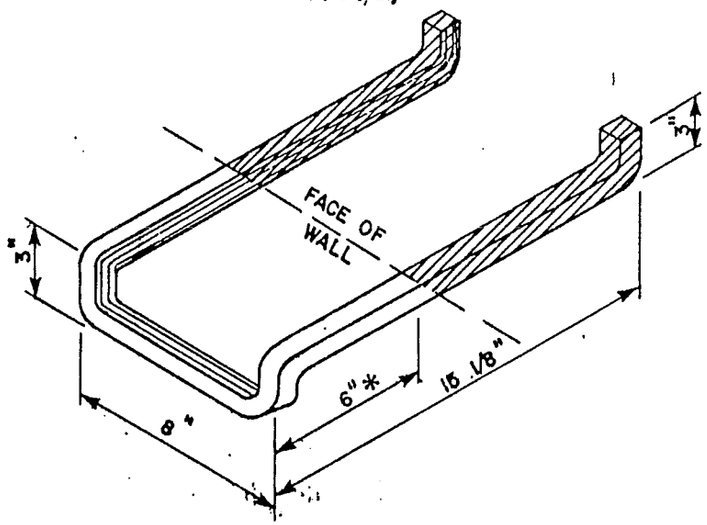


TYPE "B"

(PRECAST CONCRETE)



SECTION THROUGH
ALUMINUM STEPS



TYPE "C"
(MASONRY)

NOTES:

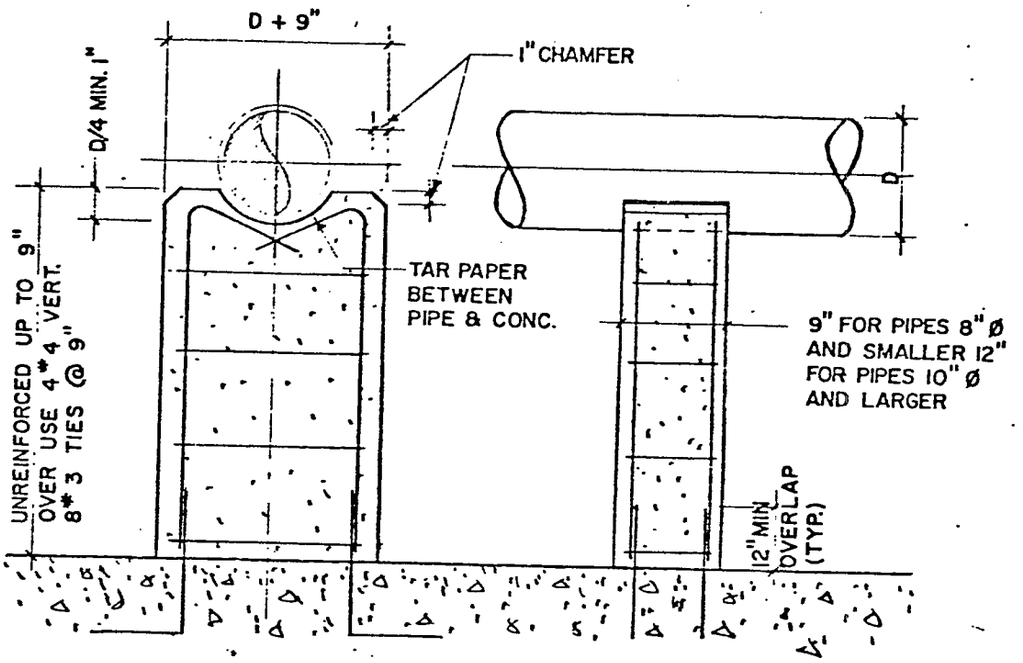
1. MATERIAL FOR STEPS TO BE ALUMINUM ALLOY 65 ST 4 (ALUMINUM CO. OF CANADA SPECIFICATION)
2. ALL ALUMINUM IN CONTACT WITH CONCRETE OR BRICKWORK TO HAVE 2 COATS FLINTKOTE C-12 STATIC ASPHALT PAINT OR APPROVED EQUAL
3. CONTRACTOR TO SUPPLY SHOP DRAWING SHOWING PIPE MANUFACTURERS METHOD OF SECURING STEPS IN PRECAST UNITS
4. LADDER RUNGS TO BE SPACED 12" CENTER TO CENTER ON FACE OF WALL

Proctor & Redfern Limited
Consulting Engineers
Toronto

DATE JUNE, 1973.

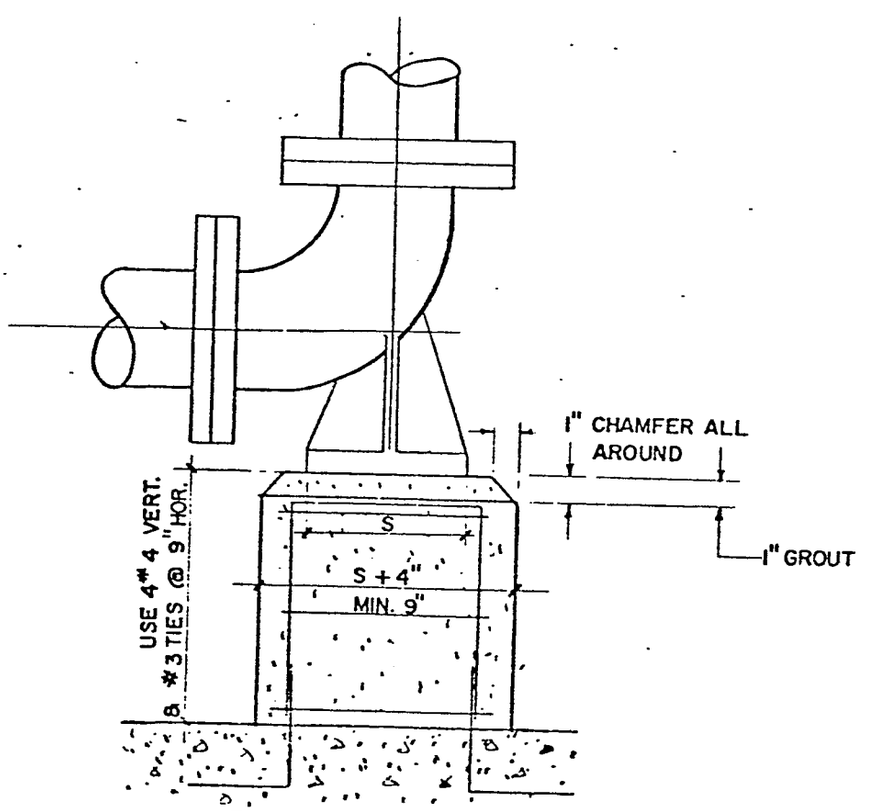
DRAWING NO. E-STD.-2-10.

REV. 1



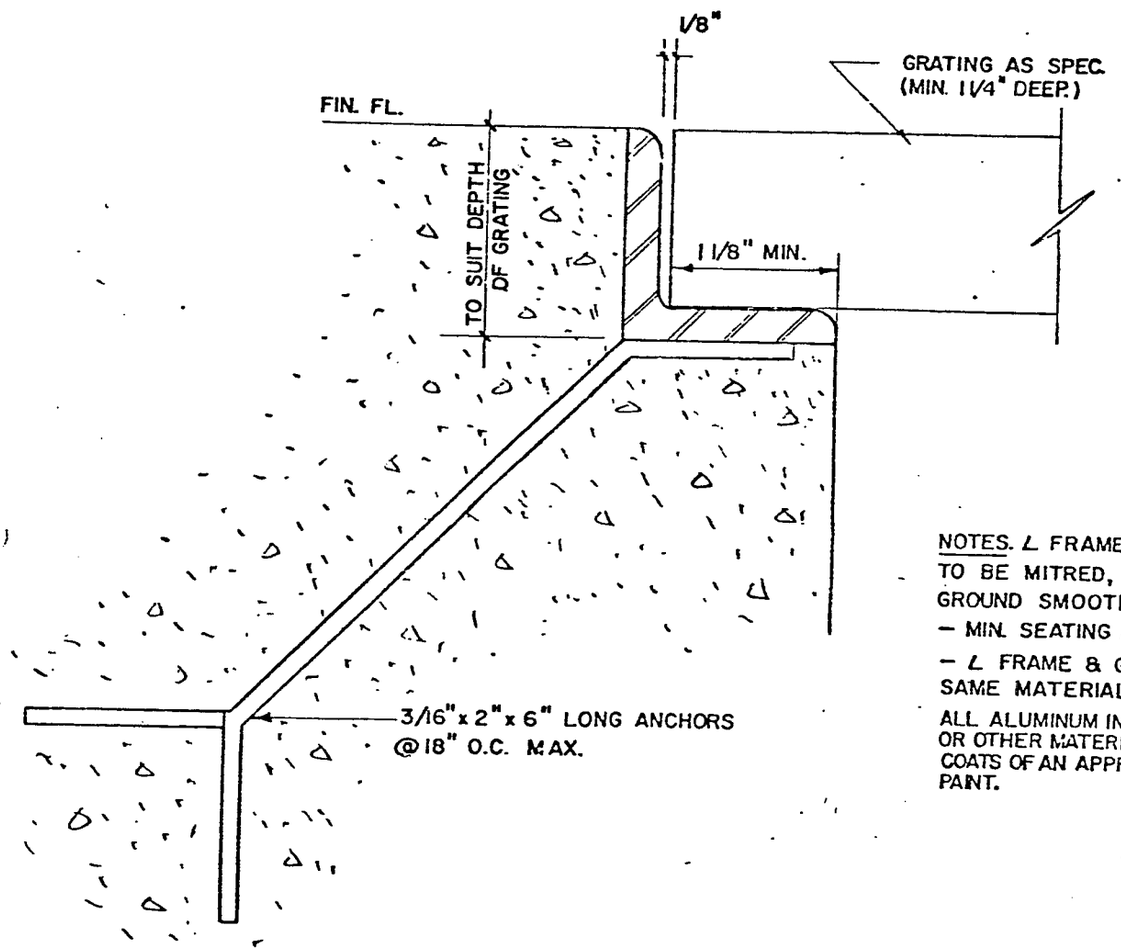
STRAIGHT PIPE

(FOR PIPES 12" Ø & OVER)



BASE ELBOW OR TEE

ISIONS		
APPROVED BY: A.D.T.	TYPICAL PIPE SUPPORT DETAILS N.T.S.	Proctor & Redfern Limited Consulting Engineers Toronto Date. July 1973 Drawing No. E-STD-8-8 Rev



NOTES. ∠ FRAME CORNERS ARE TO BE MITRED, WELDED & GROUND SMOOTH

– MIN. SEATING ∠ THICKNESS 1/4"

– ∠ FRAME & GRATING TO BE OF SAME MATERIAL.

ALL ALUMINUM IN CONTACT WITH CONC. OR OTHER MATERIALS SHALL HAVE 2 COATS OF AN APPROVED BITUMASTIC PAINT.

TIONS	NOTES ADDED – FEB. 14, 1974	
APPROVED BY:	TYPICAL GRATING SEATING DETAILS. N.T.S.	Proctor & Redfern Limited Consulting Engineers Toronto Date: July 19/73
		Drawing No. E – STD – 8 – 30 Rev. 1

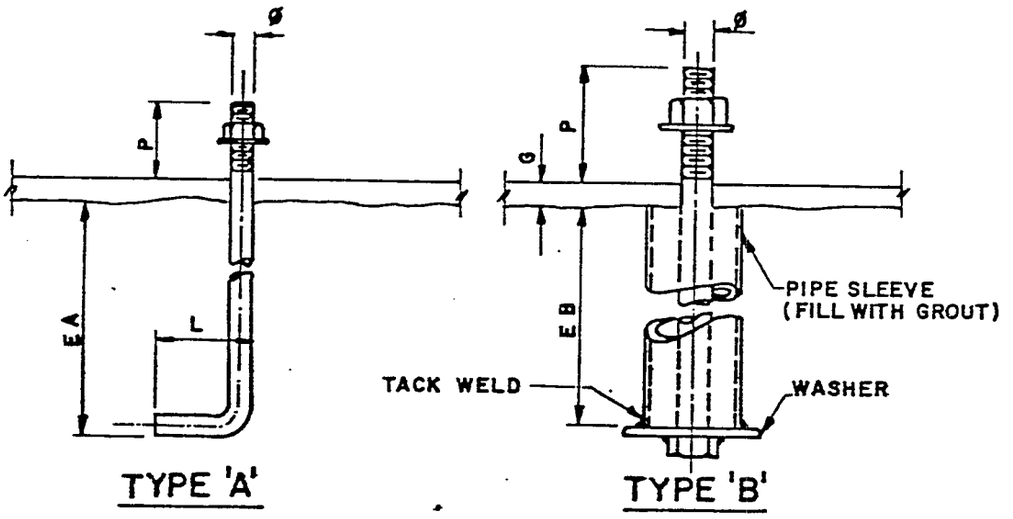
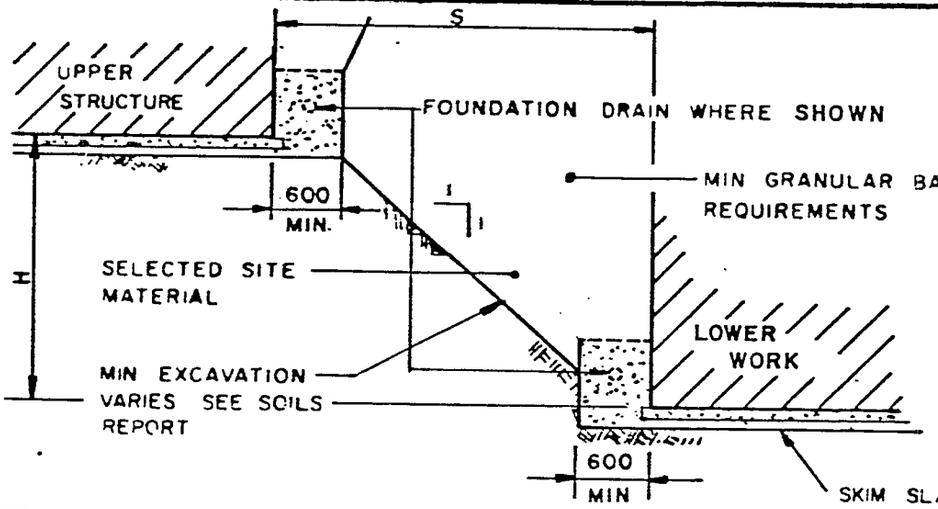


TABLE OF BOLT & FITTING DIMENSIONS

BOLT Ø	TYPE 'A'		TYPE 'B'		
	EA	L	SLEEVE	WASHER	EB
13 (1/2")	230	80	40	90 x 90 x 6	200
16 (5/8")	330	80	50	110 x 110 x 10	260
19 (3/4")	410	80	50	130 x 130 x 10	360
22 (7/8")	480	100	50	150 x 150 x 13	410
25 (1")	560	100	65	170 x 170 x 13	480
29 (1 1/8")	660	100	65	190 x 190 x 16	530
32 (1 1/4")	710	150	80	220 x 220 x 16	610
35 (1 3/8")	760	150	80	230 x 230 x 19	740
38 (1 1/2")	910	150	80	250 x 250 x 19	790
41 (1 5/8")			80	280 x 280 x 22	790
44 (1 3/4")			100	300 x 300 x 22	840
48 (1 7/8")			100	320 x 320 x 25	910
51 (2")			100	340 x 340 x 25	990

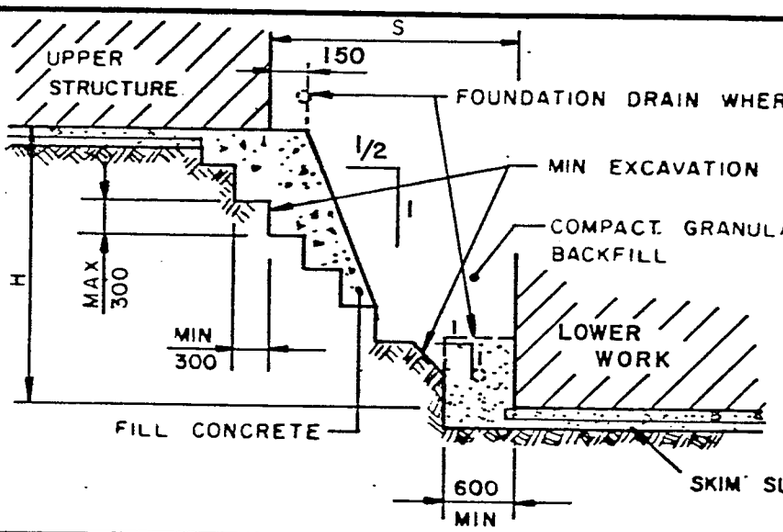
- GROUT THICKNESS 'G' AND BOLT PROJECTION 'P' AS SHOWN ON THE DRAWING OR P = BASE ℄ + 50
- THREADED LENGTH TO EQUAL PROJECTION 'P'
- SIZES ARE IN MILLIMETERS

REVISIONS		
APPROVED BY	ANCHOR BOLT DETAILS	Proctor & Redfern Limited Consulting Engineers Toronto DATE MAR, 1980
		DRAWING NO. E-STD-11-4M REV.



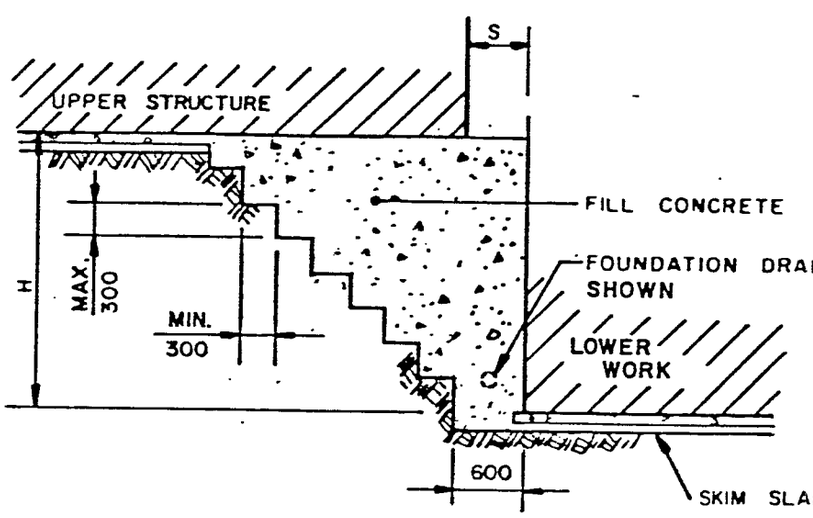
CASE 1.

S > H + 1200



CASE 2.

H + 1200 > S > 600



CASE 3.

S ⩽ 600

NOTES:

2 ALTERNATIVE METHODS USING SHEET PILING OR SHORING SYSTEMS MAY BE ACCEPTED BY THE ENGINEER.

3. ALL DIMENSIONS IN MILLIMETERS

JAN. 1978	3	CONVERTED TO METRIC & GENERAL REVISION
SEPT. 27. 76	2	GENERAL REVISION
APR. 6 76	1	GENERAL REVISION

APPROVED BY

SUPPORT FOR STRUCTURES ADJACENT TO LOWER WORK

Proctor & Redfern Limited
Consulting Engineers
Toronto

DATE JUNE, 1973

DRAWING NO. E-STD.-11-17M REV.3

CONCRETE POUR RELEASE FORM

PROJECT NAME ..... E.O. .....

OWNER'S PROJECT NO. .....

LOCATION OF POUR .....

DATE OF POUR .....

TIME OF POUR .....*

---

* NOTE: Engineer is to be given 24 hours notice before time of pour

---

1. All items of work have been completed for this pour and the following foremen have approved their work ready for inspection:

   REBAR STEEL: ..... TIME .....

   MECHANICAL SLEEVES
   INSERTS AND PIPING: ..... TIME .....

   ELECTRICAL SLEEVES
   INSERTS AND PIPING: ..... TIME .....

   LINE AND LEVELS: ..... TIME .....

2. The formwork has been inspected by the formwork design engineer or his authorized designate for conformance to the formwork design.

   ..... TIME .....
   Formwork Design Engineer

3. I have checked all items for this pour and request your inspection before pouring.

   ..... TIME .....
   Contract Superintendent

4. The items of work have been inspected:

   The pour may proceed subject to the Contractor being responsible for the work in accordance with the Contract ☐ (Check)

   or

   Corrections are required as noted below ☐ (Check)

   ..... TIME .....
   Resident Supervisor

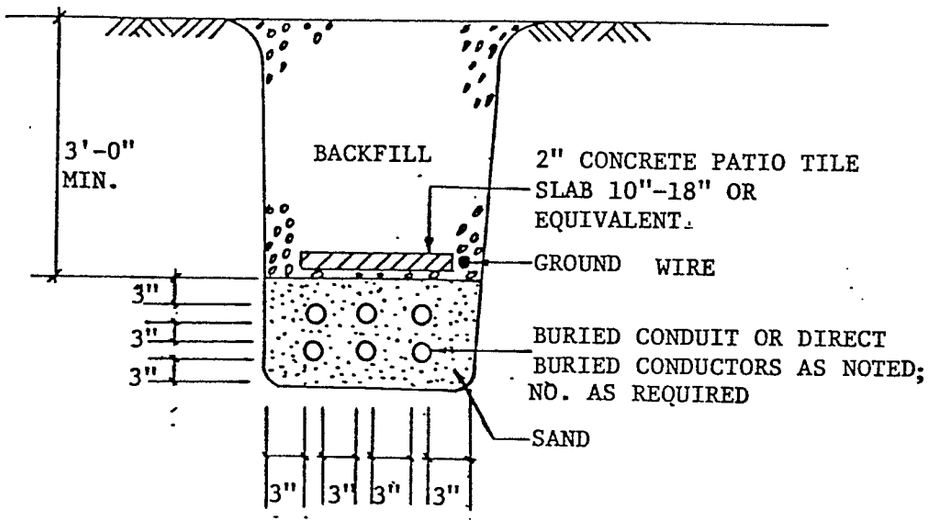
   NECESSARY CORRECTIONS AND REMARKS:

   .....

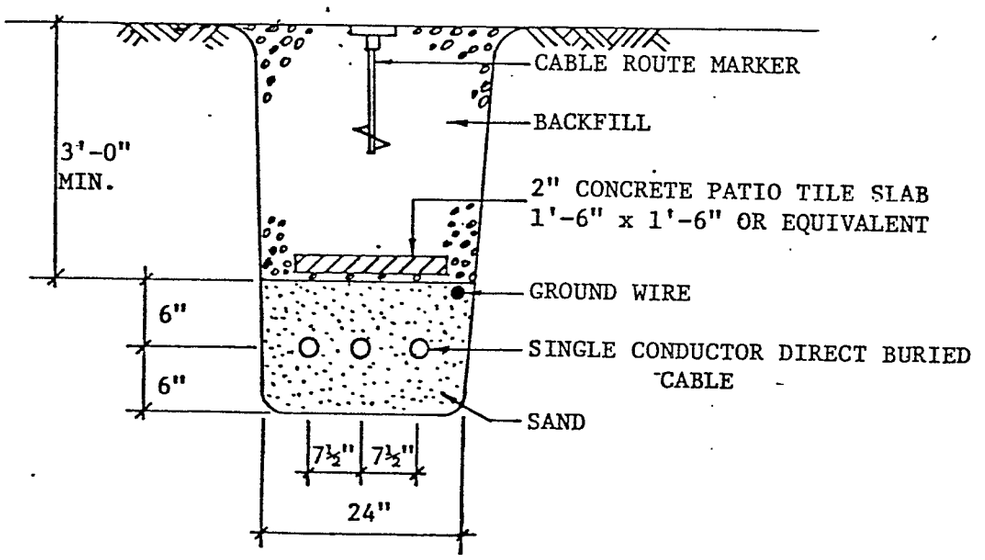
   .....

   .....

REVISIONS	1. May 6, 1977		
APPROVED BY	CONCRETE POUR RELEASE FORM	Proctor & Redfern Limited Consulting Engineers Toronto	
		DRAWING NO. E-STD.- 11-35	REV.

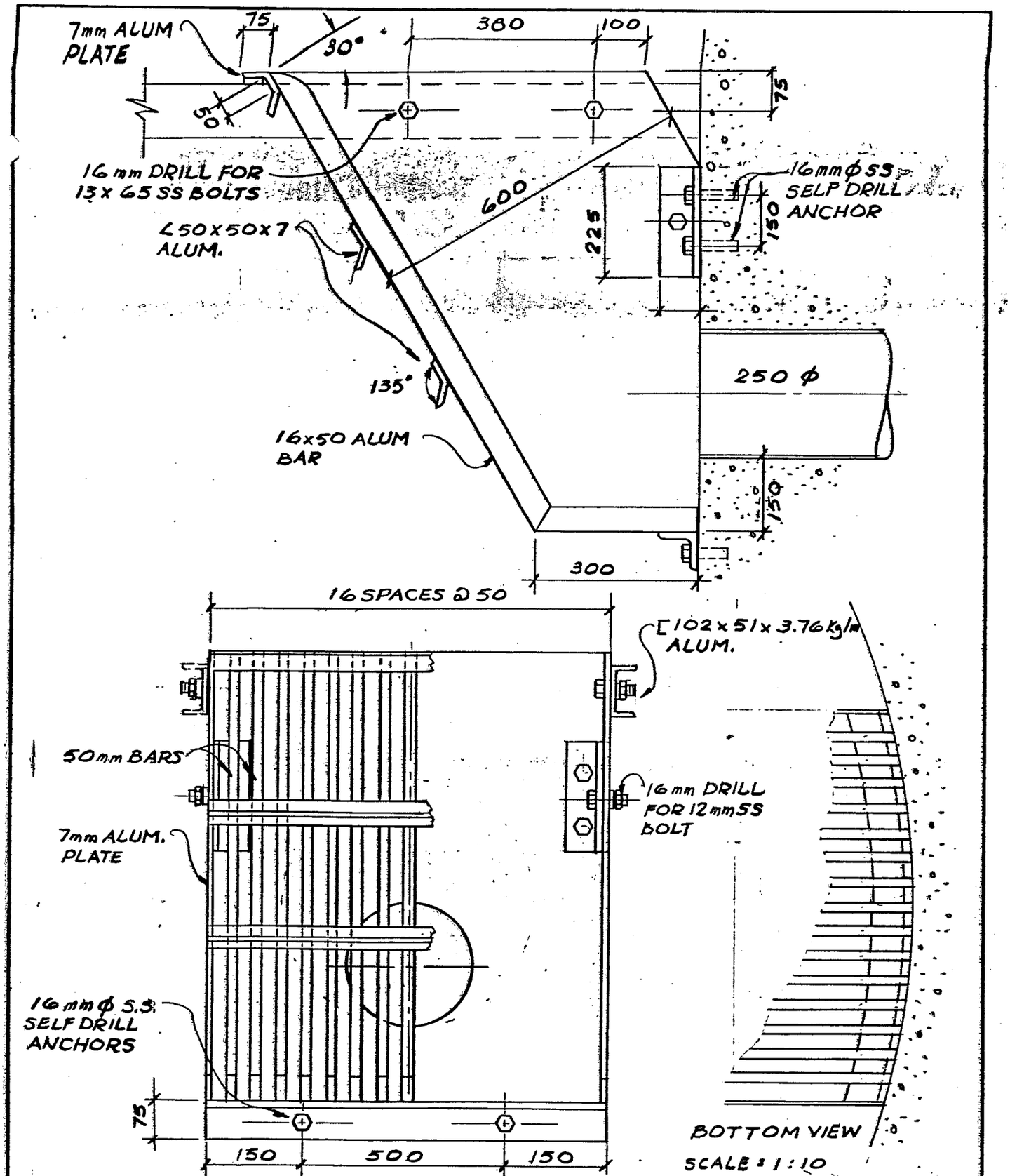


L.V. CABLE TRENCHING



H.V. CABLE TRENCHING

REVISIONS			
APPROVED BY KST 4/3/76	CABLE TRENCHING DETAILS	Proctor & Redfern Limited Consulting Engineers Toronto	DATE FEB. 1976
		DRAWING NO E-STD.-16-1	REV. 0



REVISIONS	
APPROVED BY	BAR SCREEN DETAILS

The Proctor & Redfern Group
Consulting Engineers and Planners

DRAWING NO. E-81490-[illegible].1 REV.