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OCCIDENTAL CHEMICAL CORPORATION

OLIN CORPORATION

REVISION OF FORCEMAIN ROUTING

REMEDIAL DESIGN DRAWINGS

AND

SPECIFICATIONS

102ND STREET LANDFILL SITE

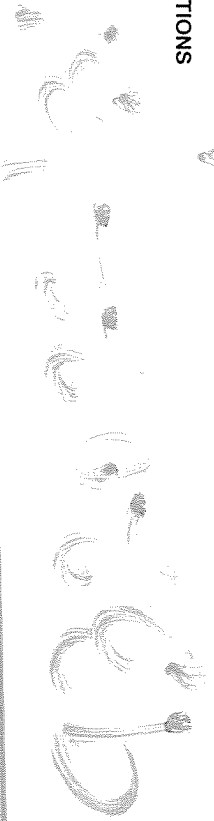
NIAGARA FALLS, NEW YORK

June 30, 1998

FLUOR DANIEL GTI

OCCIDENTAL CHEMICAL CORPORATION
OLIN CORPORATION
REVISION OF FORCEMAIN ROUTING
REMEDIAL DESIGN DRAWINGS AND SPECIFICATIONS
102ND STREET LANDFILL SITE
June 30, 1998

102ND STREET





P.O. BOX 248, 1186 LOWER RIVER ROAD, CHARLESTON, TN 37310

Phone: (615) 336-4000

June 30, 1998

Mr. Paul Olivo, Proj. Mgr.
New York/Caribbean Response Superfund Branch II
Emergency and Remedial Response Division
U.S. Environmental Protection Agency
290 Broadway
New York, NY 10007-1866

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RE: 102nd Street Landfill Site
Niagara Falls, New York
Revision of the Forcemain Routing
Remedial Design Package

Dear Mr. Olivo:

Enclosed are three (3) copies of the signed and sealed Final Revisions of the Forcemain Routing Remedial Design Package for the 102nd Street Landfill Site in Niagara Falls, New York. This design package reflects revisions to the drawings and specifications as indicated in the U.S. Environmental Protection Agency (EPA) June 9, 1998 correspondence.

Occidental Chemical Corporation (OCC) and the Olin Corporation (Olin) (collectively the "Companies") have included in and incorporated into this final version the responses to comments of the June 9, 1998 EPA letter. However, one point we would like to clarify further is Comment 1 of the General Comments.

The design of the forcemain and its current routing specifically recognize the concerns regarding encountering of contaminated soils. Every effort was made to insure a clear pathway from the 102nd Street Site tie-in, across Buffalo Avenue, the LaSalle Expressway and Frontier Avenue, and the Love Canal Treatment Facility tie-in. Our contractor and construction management chosen for this project will be experienced and trained in investigation/remediation work. Appropriate personal protective and monitoring equipment are locally available should any unforeseen condition be encountered.

Forcemain construction at the 102nd Street Site will commence at a point already remediated (or outside of the area requiring remediation, and Love Canal tie-in is planned in the clean cap. Work on the Love Canal Site will be conducted in compliance with the existing Love Canal Operation and Maintenance Health & Safety Plan.


If any unplanned chemical presence within the soil were encountered during the project, a visual inspection would first be made by qualified staff to determine the potential hazards and the impacted area. If a visual inspection is inconclusive, work will be stopped. Samples of the material will be collected by trained personnel in appropriate protective equipment and analyzed to determine if the material is hazardous. Air monitoring will be instituted if appropriate. Any suspicious excavated material or cuttings will be characterized and disposed of at a permitted TSD facility, or if characterization shows the material is not hazardous, will be replaced in the excavation as appropriate.

Our staff and contractors are well experienced in this type of work, and we expect that any material encountered will engage procedures in an essentially routine manner. Agency personnel would be kept advised of any such event if it should occur. Consequently, we believe that our existing Health & Safety

Plans, our contractor's expertise, and our Company representative's knowledge and expertise are more than adequate and appropriate and that a separate Contingency Plan is not necessary.

We believe the final version of this Report is thorough and complete and addresses the USEPA comments, however should you have any questions or comments, please contact us at 423/336-4549 or 716/773-8304.

Very truly yours,



for David L. Cummings
Manager, Environmental Remediation
Olin Corporation



for James C. Thornton, P.E.
Project Manager
Glenn Springs Holdings, Inc.

cc: Gary Kline - NYSDEC
Vincent Funigello - Malcolm Pirnie

SPECIFIC COMMENTS:

1. Comment:

Specifications, Page 1, "Specifications & Drawings".

The Companies shall provide Specification 02728, Earth Boring and Jacking as referenced on Dwg. No. 594010-10U-07, General Note 9. Also to be added shall be specifications for concrete, hatches, ladder-up safety post, electrical work, metering equipment and leak detection equipment.

Response:

Specifications have been added for: Horizontal Earth Boring and Jacking (02728) and Precast Concrete (03400). Ladder-up safety post and hatches have been specified on Drawing 30K-08A. Electrical information has been added for leak detection with Drawing 23594010-SK-270-105. The metering equipment is existing and was part of the previously approved package.

2. Comment:

Specifications, Page 1, "Specifications & Drawings".

The Companies shall add to drawing to drawing lists, and also provide, Dwg. No. 30K-08 as referred to on Dwg. No. 594010-10U-07, General Note 11; on Dwg. No. 594010-30K-08A, Force Main to Love Canal Routing Plan; on Dwg. No. 594010-30K-08A, Plan View on Inline Cleanout Manhole Detail; and on Dwg. No. 594010-30K-08A, Section on Inline Cleanout Manhole Detail.

Response:

The references for this drawing have been removed since the applicable details have been moved to Drawing 594010-30K-08A.

3. Comment:

Specifications, Page 4, "Specific Scope of Work/Pipe Sleeve":

The Companies shall change "pipe sleeve" references to "casing pipe" for consistency to drawings.

Response:

This wording has been modified as recommended.

4. Comment:

Specifications 02200:

The Companies shall attach Owner's Site Specific Health and Safety Plan (SSHSP)(Love Canal Area Only) as referred to on page 1 of 12, Section 1.1,B.

Response:

Please refer to response for General Comment Number 1 as detailed herein. This reference has been deleted from the specification.

5. Comment:

Specifications 02200:

On page 4 of 12, Section 2.1.A, the Companies shall specify soil classification that is acceptable for Select Granular Fill/Backfill for Structures or Piping.

Response:

Soil classification has been added to this section of the specification

6. Comment:

Specification 02200:

As referred to on page 4 of 12, Section 2.1,B. Bedding material shall be as indicated on drawing 30K-08A. The Companies shall add bedding material requirements to Dwg. 30K-08A.

Response:

Bedding material has been indicated on the cross section details on Drawing 102PROF1 and the drawing has been cross-referenced on the specification.

7. Comment:

Specification 02513:

On page 3 of 7, Section 2.1, H. and Section 2.2, A., 2., the Companies shall change coarse pavement to NYSDOT type 7 as shown on Dwg. 30K-08A, not Type 6F.

Response:

The wearing course has been modified to NYSDOT Type 7 as shown on Drawing 30K-08A and in Specification 02513.

8. Comment:

Specification 02513:

On page 3 of 7, Section 2.1, the Companies shall add base-course pavement specifications.

Response:

Section 2.0, I. has been added to Specification 02513 that addresses Type 1 material for the base course.

9. Comment:

Specifications 02725:

On page 1 of 4, Section 1.2, the Companies shall delete 3. "ASTM D3212 Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals," as it is not applicable.

Response:

The ASTM D3212 standard for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals has been removed from Specification 02725.

10. Comment:

Drawing 10U-07:

The Companies shall change the Love Canal Treatment Facility label to "Existing Love Canal Treatment Facility Tie-In. See Enlarged Plan on Dwg. 30K-08A."

Response:

This label has been modified as recommended.

11. Comment:

Drawing 10U-07:

The Companies shall label the 8'x8' Sample Shed; the Metal and Sampling Manhole; and the (2) 2" HDPE Containment Pipe Outside Slurry Wall to Meter and Sampling Manhole, located along the west side of the Site, as "Existing."

Response:

Existing has been added to these labels as recommended.

12. Comment:

Drawing 10U-07:

General Note 10 shall read as "All new lines to have a minimum of 48" of cover."

Response:

The General Notes have been edited to reflect information pertinent to this Force Main Project. Former General Note 10 is now General Note 3 and has been modified to designate 48" of minimum cover over the new lines.

13. Comment:

Drawing 102PROF1:

The Companies shall provide details of overhead wire connection at existing utility pole on Dwg. No. 30K-08A as referred to on Dwg. No. 102PROF1.

Response:

The details requested have been added to Drawing 102PROF1.

14. Comment:

Drawing 102PROF1:

The Companies shall provide diagram for electrical work, flow meter and leak detection probes. The Companies shall also show where "Over Head Wire to RTU," as shown at the existing utility pole, continues to and terminates at the Love Canal Facility.

Response:

The electrical work and the flow meter have been installed and are existing and were part of the previously approved package. Drawing 23594010-SK-270-105 has been included herein that provides electrical/control information on the leak detection system. The "Over Head to RTU" tie-in detail has been added to Drawing 102PROF1.

15. Comment:

Drawing 102PROF1:

The Companies shall correct Love Canal Cap label at right end profile to read "Love Canal Cap – Clay with a Geosynthetic Liner."

Response:

This label has been modified as recommended.

16. Comment:

Drawing 102PROF1:

The profile shall show that the Love Canal Cap is 54" thick as shown on the Cross Section of New Forcemain at Love Canal.

Response:

This dimension has been verified and further detailed on the profile as recommended.

17. Comment:

Drawing 102PROF1:

The profile at Buffalo Avenue shows a concrete base for the pavement and the Pavement Restoration Detail on Dwg. No. 30K-08A shows an asphalt concrete base. The Companies shall correct these inconsistencies in accordance with the City of Niagara Falls Standards.

Response:

This is not an inconsistency. The existing base for Buffalo Avenue is concrete. The City of Niagara Falls Standard for road restoration in asphalt concrete.

18. Comment:

Drawing 102PROF1:

The profile shows a fence on the south side of Buffalo Avenue, but the Routing Plan on Dwg. No. 30K-08A does not show a fence. The Companies shall correct this inconsistency.

Response:

The fencing has been added to Drawing 30K-08A.

19. Comment:

Drawing 102PROF1:

The Companies shall show the depth of bury for the "8 Pair 16 Shielded Armored Cable."

Response:

The depth of bury for the Cable has been noted on the profile.

20. Comment:

Drawing 102PROF1

The Companies shall show the elevation of the new 6-inch containment pipe at the existing Sampling and Metering MH.

Response:

This elevation has been added to the Sampling MH detail on Drawing 30K-08A.

21. Comment:

Drawing 102PROF1:

The Companies shall show all utilities, both abandoned and not abandoned, on the south side of Buffalo Avenue.

Response:

Utilities have been located on Drawing 102PROF1.

22. Comment:

Drawing 102PROF1:

On the Cross Section of New Forcemain at Love Canal, it shall be noted that the existing HDPE liner shall be patched with in kind HDPE material and after welding, the welds shall be vacuum box tested.

Response:

This note has been added to the Cross Section of the New Force Main at Love Canal on Drawing 102PROF1.

23. Comment:

Drawing 102PROF1:

The Companies shall provide trench detail, bedding detail and casing pipe detail.

Response:

The trench and bedding details have been added to Drawing 102PROF1. The contractor performing the boring and jacking will submit a detailed Boring and Jacking Plan. This submitted plan will contain the casing pipe detail.

24. Comment:

Drawing 30K-08A:

The Companies shall change the Love Canal Treatment Facility label to “Existing Love Canal Treatment Facility Tie-In.”

Response:

This label has been modified as recommended.

25. Comment:

Drawing 30K-08A:

The Companies shall correct the stationing of the new forcemain on the Fore Main to Love Canal Routing Plan that does not conform with the Point of Intersection Stations, the plan scale and the profile on Dwg. No. 102PROF1.

Response:

The stationing on these drawings has been verified and modified to be consistent.

26. Comment:

Drawing 30L-08A:

On the Force Main to Love Canal Routing Plan in the lower right hand corner, the Companies shall state that the slurry wall, 8” plug and 8” containment pipe are “existing.”

Response:

These labels have been modified as recommended.

27. Comment:

Drawing 30K-08A:

On the Inline Cleanout Manhole Detail, the top of the manholes shall be above grade so that the aluminum hatch drain is above grade and to prevent runoff from entering the manhole.

Response:

The Manhole detail has been modified as recommended.

28. Comment:

Drawing 30K-08A:

The Companies shall provide Dwg. No. 23594010-SK-270-105 as referenced on the Plan View of the Inline Cleanout Manhole Detail.

Response:

This drawing is provided.

29. Comment:

Drawing 30K-08A:

The pipe support shown on the Section of the Inline Cleanout Manhole Detail shall be anchored to the wall on the manhole since the access hatch covers the entire top of the manhole. The Companies shall provide a detail of the pipe support.

Response:

A note and detail have been added.

30. Comment:

Drawing 30K-08A:

A waterstop joint can not be used on precast manholes. The Companies shall revise the Section of Inline Cleanout Manhole Detail with a watertight joint for precast concrete.

Response:

This detail has been revised as recommended.

31. Comment:

Drawing 30K-08A:

The inline cleanout manholes shall have precast bases.

Response:

This detail has been revised as recommended.

32. Comment:

Drawing 30K-08A:

The Companies shall delete the scale bar on the Inline Cleanout Manhole Detail since there is no scale.

Response:

This scale bar had been deleted.

33. Comment:

Drawing 30K-08A:

On the Plan of the Existing Metering Sampling Manhole Detail, the Companies shall identify the type and shall provide specifications for the new valve.

Response:

This valve is existing and was part of the previously approved package. The Sample MH Details on Drawing 30K-08A have been modified to reflect this.

34. Comment:

Drawing 30K-08A:

The Companies shall label the Metering Sample manhole Detail, the precast concrete manhole, the manhole access hatch, the (2) 2" HDPE pipe with 8" HDPE containment pipe, and the manhole steps as "Existing."

Response:

These labels have been modified as recommended.

35. Comment:

Drawing 30K-08A:

The Companies shall provide Dwg. 594010-65U-04 with Electrical Details as referenced on the Section of the Meter and Sampling Manhole Detail.

Response:

This reference has been deleted since the electrical at the Sampling and Metering Shed is existing and was part of the previously approved package.

36. Comment:

Drawing 30K-08A:

The Companies shall provide Dwg. No. 594010-30K-06D with Piping Details as referenced on the Section of the Meter and Sampling Manhole Detail.

Response:

This reference has been deleted since the piping is existing and was part of the previously approved package.

37. Comment:

Drawing 30K-08A:

The analyzing element sample port and the 2"x2"x2" tee for sampler connection as shown on the Existing Metering Sample Manhole Detail shall be provided with a shutoff valve and cap.

Response:

This piping is existing and was part of the previously approved package. The Sample Manhole Detail has been modified to reflect existing conditions versus new work.

38. Comment:

Drawing 30K-08A:

The 6" HDPE containment pipe and the 2" HDPE carrier pipe shall be labeled on the Existing Metering Sample Manhole Detail.

Response:

The piping is labeled on this detail.

39. Comment:

Drawing 30K-08A:

The Companies shall show that the concrete curb and the 6" underdrain shown on the Pavement Restoration Detail complies with the City of Niagara Falls Standards.

Response:

The Companies have verified that that the detail conforms with the City of Niagara Falls Standards. The 6" curb has been revised to be granite to match existing curb along Frontier Avenue. Curb will be replaced along Frontier Avenue only.

40. Comment:

Drawing 30K-08A:

The Companies shall show that the existing concrete manhole on the Enlarged Plan of the Forcemain Tie-In Detail shall be core-drilled and link-sealed for installation of the new 6" HDPE containment pipe.

Response:

The existing concrete manhole is not water tight, therefore a link seal will serve little purpose. A note has been added to this detail to show that it will be core-drilled.

41. Comment:

Drawing 30K-08A:

The Companies shall clarify the meaning of the label "6" from flange face discharge pump chamber No. (existing)" as shown on the Enlarged Plan of the Love Canal Treatment Facility Forcemain Tie-In Detail.

Response:

This label has been removed from the detail and additional notation has been added for clarification.

42. Comment:

Drawing 30K-08A:

The Companies shall provide information on the Enlarged Plan of the Love Canal Treatment Facility Forcemain Tie-In Detail regarding the size, depth, access, and operating levels of the existing chamber no. The Companies shall provide a detail of the termination of the new 2" HDPE forcemain in the chamber.

Response:

The size, depth, access, operating levels, and detail of the existing chamber No. 3. The 2" inch carrier pipe enters the manhole within the existing 4" pipe and extends six inches beyond the end of the existing pipe. This note has been added to the Enlarged Plan Love Canal Treatment Facility Forcemain Tie In which explains this.

43. Comment:

Specification (General):

The Companies shall expressly state in the Specifications that all necessary permits and ancillary agreements will be duly obtained by the Companies prior to the initiation of any construction activity.

Response:

This notation is provided in the Scope of Work (A., 6.).

OCCIDENTAL CHEMICAL CORPORATION
OLIN CORPORATION

REVISION OF FORCEMAIN ROUTING

REMEDIAL DESIGN DRAWINGS
AND
SPECIFICATIONS

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102ND STREET LANDFILL SITE
NIAGARA FALLS, NEW YORK

June 30, 1998

FLUOR DANIEL GTI

A. SCOPE OF WORK

1. The Scope of Work for this contract involves but is not limited to all work required to provide the necessary labor, materials, tools, equipment, and professional supervision required to install a double walled force main from the metering and sample manhole on the south side of Buffalo Avenue to the new Love Canal Treatment Facility tie-in north of Frontier Ave (Site).
2. The piping will be 2" diameter HDPE within 6" diameter HDPE containment piping except for the final segment of the run before the tie-in to the Love Canal Treatment Facility, where 2" diameter HDPE piping will be installed inside an existing 4" diameter pipe.
3. The force main will be installed in new trenches to be dug under this contract. The portion of the new force main that crosses the LaSalle Expressway will be installed using horizontal boring techniques to tunnel under the highway so as not to interfere with traffic.
4. All work shall be in accordance with applicable codes, rules, and regulation of New York State, Niagara County and the City of Niagara Falls.
5. Jim Thornton (716) 773-8304, will be the Glenn Springs Project Manager on this project, representing Occidental Chemical Corporation. John Burns (423) 336-4057 will be the Olin Project Manager.
6. Work shall include obtaining all necessary permits and approvals from the government agencies.

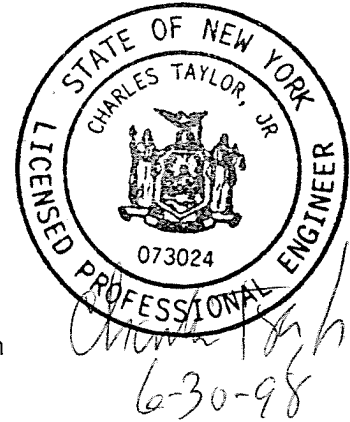
B. SPECIFICATIONS & DRAWINGS

All work shall be performed in accordance with the following specifications and drawings:

1. Specifications (attached)

01340	Submittals
01400	Quality Control
02200	Earthwork
02513	Bituminous Concrete Paving
02725	Underground Piping Systems
02728	Horizontal Earth Boring and Jacking
03400	Precast Concrete
02776A	HDPE Lining Repair
70002	General Requirements - Instrument Installation
2. Drawings (attached):

30K-08A	102ND STREET - FORCE MAIN FROM METERING/SAMPLING MH - PLAN & DETAILS
102PROF1	102ND STREET - FORCE MAIN FROM METERING/SAMPLING MH TO L.C. FACILITY - PROFILE
10U-07	FORCE MAIN ROUTING PLAN
SK-270-105	MANHOLES 8, 9, & 10 & SAMPLE PIT WIRING DIAGRAM



C. SCHEDULE

1. Contractor shall provide an estimate of elapsed time for completion of this contract after contract award. Work sequence shall be determined by the Contractor, subject constraints on working hours. The Contractor shall comply with the following schedule:

Receive Contract Award	_____
Provide Pre-Construction Submittals	_____
Begin Construction	_____
Finish Construction	_____

The timing of this project has a very high priority and the Contractor shall schedule his work to ensure minimum elapsed time,

2. Normal working hours shall be from 7:00 a.m. to 5:00 p.m., Monday through Friday. The Contractor shall conclude work and leave the site by 5:00 p.m. Requests for working overtime must be submitted in writing at least 48 hours in advance to the Oxy/Olin Site Representative.
3. The contractor will be required to coordinate his work with other contractors and personnel that may be working in the area simultaneously. Contractor is required to provide traffic control and barricades as necessary during construction.
4. Contractor shall note that weekly progress meetings will be held once the contract has been awarded. Meetings will be used to resolve design and construction issues and discuss schedule impacts. A brief safety meeting (5 minutes) will be conducted for all on-site workers each day. Safety topics pertinent to the planned work for that day will be discussed. Attendance at the daily safety meeting by all on-site employees is required and shall be documented.

D. EXAMINATION OF SITE

1. The Contractor is required to visit the work site and examine the premises so as to fully understand all the existing conditions relative to the work. Gary Catlin, the owner's site representative, must accompany contractor personnel on the site walkthrough.
2. Contractor shall note the extent of the required work, any access restrictions or obstructions, and shall design and construct the work accordingly.
3. Contractor shall abide by all OSHA, City of Niagara Falls, and OxyChem Safety Regulations while on site.

E. CONSTRUCTION - GENERAL CONDITIONS

1. All construction layout is the responsibility of the contractor. The location with coordinates of the new force main and manholes are shown on the attached drawings but the final position may be slightly modified as agreed upon by the contractor and site representatives.
2. All conflicts or inconsistencies found during layout and construction shall be immediately brought to the attention of the Site Representative.

3. All existing electrical poles, underground lines, structures, trees, etc. shall be protected at all times during construction. Obtain utility mark-outs for all concerned utilities prior to commencing work.
4. The contractor shall maintain the work site in a clean and safe condition at all times. Roadways and shoulders shall be barricaded and left safe at the end of each work day. Provide protection at all times against rain, wind, storms, frost, freezing, condensation or heat so as to maintain all work from damage.
5. The contractor is to notify the Owner's Site Representative prior to the delivery of all materials. Exterior storage space is limited and the contractor is to follow the directions of the Site Representative concerning storage.
6. All field authorized changes shall be indicated on an as-built set of drawings maintained by the contractor and returned to the Site Representative at the end of the project.
7. The contractor will be required to furnish and maintain adequate guard rails, flags, and flashing lights around the perimeter of any excavation until completion of the contract work.
8. The Contractor shall make available all aspects of the work for inspection by the Site Representative and his staff for conformance with the specifications and drawings. All materials and equipment furnished and work performed shall be properly inspected by the Contractor and shall at all times be subject to quality and safety inspections.
9. Take all necessary measures to prevent soil erosion during the work, as required by State and local regulations.
10. It is the contractor's responsibility to verify depth of all underground utilities.

F. SPECIFIC SCOPE OF WORK

Work shall include, but is not necessarily limited to, all work required to design and construct all items as described below or shown on the attached sketches:

1. **Submittals:** Provide all required pre-construction Submittals as listed in the Contract Documents. Obtain and provide copies of all permits, licenses, etc. necessary to perform the work to the Owner's Site Representative. In addition, submit for approval a detailed Boring Plan to the Site Representative describing the methodology for installing the 12" carbon steel pipe sleeve and HDPE pipe under the LaSalle Expressway between CO-MH9 and CO-MH10 at the location shown on Drawing 30K-08A.
2. **Mobilization:** Deliver to the site all personnel, equipment and materials required for performing the Work. Survey the site to locate critical features required for the Work.
3. **Force Main Piping:** Install double walled high density polyethylene (HDPE) piping from the existing metering and sampling manhole at Sta. 0+00 to the existing manhole at Sta. 6+62.11, and single walled HDPE piping inside an existing 4" pipe to the connection point at the Love Canal Treatment Facility. Connect pipeline at the existing metering and sampling manhole and at the Love Canal Treatment Facility tie-in. Furnish and install cleanouts. Perform all necessary clearing and grubbing to prepare for the excavation work. Remove and properly dispose of all existing pavements required for installation of

the pipe. Provide all excavation, trenching, boring, backfill, compaction, etc. necessary for the Work. Furnish all necessary select fill pipe bedding material, marking tape, etc. Furnish and install pavement repair over trench where it crosses Buffalo and Frontier Avenues. Install leak detection cable in piping system. Perform all required field inspections and tests. Provide for protection of the trench and public during excavation work. Provide for traffic control in accordance with all applicable rules of New York State, Niagara County, and the City of Niagara Falls.

4. **Casing Pipe:** Furnish and install the casing pipe beneath the LaSalle Expressway segment of the pipe run. Installation shall be in accordance with approved Boring Plan (see Submittals).
5. **Manholes:** Furnish and install three (3) new pre-cast manholes (COMH-8, COMH-9, and COMH-10) and lockable aluminum covers.
6. **Demobilization:** Remove from the site all equipment, materials and debris used during the construction activities.

G. DISPOSAL

1. Segregate concrete and asphalt from other material and place in the laydown area in Griffon Park as directed by the Owner's Site Representative.

SUBMITTALS

1.0 GENERAL

1.1 Summary

A. Scope of Specification

This specification prescribes the quantity and form of submittals summarized in the Submittal Summary at the end of this specification section, or as required herein.

1.2 Submittals

- A. Employee OSHA Training Certificates** - When construction is within the limits of the Love Canal fence, submit copies of OSHA 40-hour training certificate for each construction contractor employee or proposed subcontractor employee a minimum of 10 days before that employee performs work at the Love Canal facility only. Other project work does not require this training certification.
- B. Employee Certificate of Annual Physical** - Submit copies of Physicians annual physical examination certificate for each construction contractor employee or proposed subcontractor employee a minimum of 10 days before that employees performs on-site activity. Submit copies of follow-up Physicians physical examination certificate for each construction contractor employee or subcontractor employee within 30 days following demobilization from the site for each employee that performed on-site activity.
- C. Construction Schedules** - Submit a construction schedule with milestones and dates. Submit the initial construction schedule a minimum of 15 days before mobilization to the site.
- D. Contractor Health and Safety Plan** - Submit Construction Contractor's Health and Safety Plan a minimum of 15 days before mobilization to the site.
- E. Fitness Statement** - Submit after lost time illness or injury of employee during contract period a fitness statement signed by a physician prior to allowing the employee to reenter the job site.
- F. Maintain and submit on request a log of:**
- Safety activities
 - Accident Investigations
 - Employee instruction
 - Training
 - Toolbox safety meetings
 - Equipment inspection, etc.
- G. Excavation Plan** - Contractor shall submit an Excavation Plan 15 days prior to performing any excavation activities, prepared by a competent person. The Excavation Plan will identify trenching methods, layback requirements, sheeting, and/or shoring requirements. All excavations will be performed in accordance with OSHA requirements.

SUBMITTALS

2.0 PRODUCTS

Not applicable.

3.0 EXECUTION

3.1 General - Construction Contractor shall assume risk and cost of rework for any work performed in association with a submittal required under this Specification until such submittal has been approved according to the requirements of this specification.

3.2 Submittal Requirements - Submittals required by this contract are summarized in the Submittal Summary attached at the end of this specification section.

A. Construction Contractor's Review of Submittals - As follows:

1. Construction Contractor shall affix its review stamp and shall date and sign each individual submittal, certifying that the item(s) submitted has been reviewed and is in accordance with contract requirements. Submittals received by Construction Manager directly from suppliers, vendors or manufacturers without Construction Contractor review will be considered incomplete and will be disapproved.
2. Test reports from independent testing firms, as required in the separate Specification Sections, shall be sent directly to Construction Manager without Construction Contractor review.
3. Any revisions or options selected in manufacturers' literature or catalog drawings which Construction Contractor proposes shall be clearly indicated on the submittal.

B. Group of Submittals - Unless otherwise specified, Construction Contractor shall make submittals in groups containing all associated items to ensure that information is available for checking each item when it is received. Partial submittals may be rejected. Such rejection shall not constitute grounds for a time extension.

1. When possible, submittals shall be grouped by specification section with all requested items submitted at one time. Construction Contractor's transmittal shall note any items from the submitted section remaining outstanding which are intended to be submitted at a later date.

C. Number of Submittal Copies - The following number of copies of each submittal shall be provided:

1. One copy to the Owner's Site Representative field office address.
2. Two copies to:
Fluor Daniel GTI
Attn: Mr. Cliff Mars, PE

SUBMITTALS

A-4-323
301 Lippincott Centre
Marlton, NJ 08053

One marked up copy will remain in the permanent job files. The other marked up copy will be returned to the Contractor noting the approval status as defined herein.

- D. Identification of Submittals** - Accompany each submittal or group of submittals with a transmittal form showing all information required for identification and checking.
1. Consecutively number all transmittals. When material is resubmitted for any reason, transmit under a new transmittal form with a new transmittal number. On resubmittals, cite the original submittal and transmittal numbers for reference.
 2. Maintain an accurate submittal log for the duration of the work, showing current status of all submittals at all times. Make the submittal log available to Construction Manager for review upon request.
- E. Review** - Submittal comments and/or approvals will be provided to the Contractor within seven (7) calendar days after receipt.
1. The following definitions will assist the Construction Contractor in understanding the approval status:
 - a. Approved (APP). Submittal is approved without comment.
 - b. Approved as Noted (AAN). Submittal is approved provided that the comments shown are followed for fabrication and installation. Typically, this type of approval provides some additional clarification, such as: (i) a reminder of related code or specification requirement affecting installation; (ii) specify a color selection; and/or (iii) provide an explanation about the desired product. Resubmittal of the document is not required.
 - c. Approved as Noted and Resubmit (ANR).
Submittal is approved as discussed in AAN above; however, due to the extent or nature of the comments, Construction Contractor shall incorporate comments and resubmit document within 14 calendar days for final approval. If comments have been correctly interpreted and incorporated, the resubmitted document will be approved. If the comments have not been correctly interpreted and incorporated, the resubmitted document may be DISAPPROVED.
 - d. Disapproved (DIS). Submittal is disapproved for reasons shown on the documents. Construction Contractor shall correct problem and submit acceptable document within 7 calendar days.
 - e. Information Only (IO or I/O). Approval of submittal is not required by

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contract, however it is required/submitted "for the record."

2. Review and approval of submittals is only for conformance with the design concept of the work. Approval of a specific item shall not indicate approval of an assembly of which the item is a component. Construction Contractor remains liable for accuracy of submittals, dimensions, quantities, and coordination with other trades. Approval is subject to all contract requirements and does not authorize any changes. If a change is inadvertently or purposefully indicated on a submittal, the change shall not be effective until ratified separately by a Contract Modification or Notice to Proceed.

F. Summary of Submittals - Submittals shall conform to the requirements described herein.

1. Shop Drawings: Construction Contractor shall prepare shop drawings accurately to a scale sufficiently large to show all pertinent aspects of the item and its method of connection to the work. Review comments will be shown on a set of shop drawings to be returned to the Construction Contractor. Construction Contractor shall make and distribute copies as required for its purposes.
2. Manufacturers' Literature: Where contents of submitted manufacturers' literature includes data not pertinent to the submittal, clearly show which portions of the contents are being submitted for review.
3. Samples: Provide sample(s) identical to the precise article proposed to be provided. Identify as described under "Identification of Submittals" above.
4. Certificates of Compliance: Provide certificates of compliance as required by these specifications. Certificates of compliance shall be signed by an official authorized to certify on behalf of a manufacturing company or an independent testing firm and shall contain 1) name and address of Construction Contractor, 2) project name, 3) reference to this project number, 4) description of product, 5) quantity and date of manufacture.

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5. Operational Plans: Provide a narrative description of the method, materials, and equipment that will be used to perform the Work described in the subject plan. Operational Plans are identified in various specifications, summarized in Attachment 01 to this Specification, and shall describe Work such as Waste Treatment, Contaminated Water Management, and Non-contaminated Water Management.

End of Specification

QUALITY CONTROL

1.0 GENERAL

1.1 Summary

A. Scope of Specification

This specification prescribes the requirements to control and document the quality of Construction Contractor's Work and the work of its subcontractors.

B. Terminology

Terminology and definitions are also addressed in the Contract, Part I, Scope of Work; additions are as follows, and apply wherever such terms are used:

1. Owner: OxyChem/Olin Site Representative and Construction Manager.
2. Construction Contractor or Contractor: Appropriate individual, partnership, company, or corporation as established by contract
3. Any: The term "any" in the Contract Documents shall be interpreted as "any and all" whenever more than 1 item would be applicable for completion of the Work of the Project; for example, "any other general expenses."
4. Design Drawings: Drawings, diagrams, schedules, and other data specifically issued for the work by the Owner, to illustrate some portion of the work.
5. Samples: Physical examples which illustrate materials, equipment, or workmanship, and establish standards by which the work will be judged.

1.2 Submittals

A. **Independent Testing** - When independent testing and/or inspection are required in other sections, submittals of tests, certificates or other required documents shall comply with the requirements of this Section.

1. For approval, submit the name, address, telephone number, qualifications (including references with names and phone numbers), and items to be tested/inspected for each firm the Construction Contractor plans to use. Owner's approval of the firm is required prior to Construction Contractor use of any material or construction methods that requires testing/inspection.
2. Test reports prepared by the independent testing firm shall be sent directly to Owner by the independent testing firm in the quantity of documents specified in Specification 01340, Submittals, within three calendar days after the test results are determined. Copies provided to Owner are in addition to copies provided to the Construction Contractor.

2.0 PRODUCTS

QUALITY CONTROL

Not applicable.

3.0 EXECUTION

3.1 Requirements

- A. The requirements for sampling and testing or inspection are specified in the individual technical divisions of these Specifications. Construction Contractor shall maintain a complete and up-to-date file of all quality control documentation at the jobsite.
- B. Where no testing requirements are described or specified, and the Construction Manager deems that testing is required, the Construction Manager may request such tests be performed in accordance with the applicable or pertinent standards that may normally apply to the test. Payment for such testing will be made to the Construction Contractor through an executed Contract Modification.

3.2 Construction Contractor Inspection and Testing

Construction Contractor shall maintain an adequate inspection system and perform such inspections as will ensure that the work performed under the contract conforms to contract requirements. Inspection and testing services to be provided by the Construction Contractor will include, but not necessarily limited to:

- A. Provide adequate personnel for routine inspections of work performed by the Construction Contractor's workforce, suppliers and subcontractors.
- B. Provide test reports, design mixes, certificates of analysis or other documents on products, assemblies or bulk materials as required the in Submittals section of the individual Specifications of this document.
- C. Provide compaction testing on installed select fill material, crushed limestone, gravel, and non-contaminated material used in the construction of fills.
- D. Provide testing of concrete including tests for slump, unit weight, temperature, air entrainment and compressive strength of molded cylinders.

3.3 Inspection and Testing by Owner

Inspection and testing services to be provided by the OxyChem/Olin Site Representative will include, but not necessarily limited to:

- A. Random inspections as the work is in progress. Inspection or non-inspection of the work by Owner, or a representative thereof, does not relieve the Construction Contractor of his full obligation to ensure the work is performed as in accordance with the Design Drawings, Specification and Contract Documents.
- B. When material is proposed for use which is specified to be either certified or tested, but cannot be identified with specific certification or test reports, the Construction

QUALITY CONTROL

Manager may, at his discretion, select random samples from the lot for testing. These samples shall be prepared in accordance with the referenced test specification and furnished by Construction Contractor to the Construction Contractor's testing firm at Construction Contractor's expense. The number of samples and tests will be at the discretion of the Construction Manager. The cost of testing the samples shall be solely the responsibility of Construction Contractor. Modifications to the Contract Time or Price will not be considered as a result of any delays that may be caused by the requirements of this paragraph.

3.4 Non-conformance and Retesting

Retesting due to non-conformance with the Specifications shall be as follows:

- A. Retesting of non-complying products, assemblies or bulk materials as required in Submittals of the individual Specification Sections of this document shall be provided by the Construction Contractor at no cost to the Owner.
- B. The Owner may, at his discretion, require that an installed item or portion of work be uncovered or tested if he suspects non-compliance with the requirements of the contract documents. If uncovering or tests reveal non-compliance, all costs associated with securing compliance of the item or work, including replacement, repair, uncovering and covering shall be borne by the Construction Contractor at no cost to the Owner. However, if uncovering or testing reveals full compliance with the requirements of the contract documents, Owner shall be responsible for all costs associated with testing, uncovering and covering.

3.5 Quality Control

- A. Construction Contractor shall provide on-site quality control personnel for the duration of the project. The appointed quality control person shall be responsible for scheduling, requesting and monitoring tests as may be required of the Construction Contractor under this or other Specification Sections.
- B. Construction Contractor shall monitor quality control of suppliers and subcontractors to ensure the quality of work is as specified.
- C. Construction Contractor shall follow all manufacturer's instructions concerning handling, installation, fabrication and application.
- D. Construction Contractor shall contact Construction Manager concerning any conflicting requirements between the contract documents and manufacturer's instructions before proceeding with the work.
- E. Construction Contractor shall ensure that all work is performed by qualified craftsmen capable of producing the end product or service as specified.

3.6 Surveying

QUALITY CONTROL

A. Record and Quantity Surveys

1. The Contractor is responsible for the initial and final surveys at the site which shall form the basis for final quantity determination.
2. The survey firm shall have sufficient equipment and personnel to accommodate and service the needs of this contract. The firm and its members shall not be an employee of, nor affiliated with the construction contractor's ownerships, own nor have stock interest in or in anyway related to the Construction Contractor.

B. Construction Surveys - Surveys to provide horizontal and vertical control for performance of the Work may be performed by the Construction Contractor's workforce. This representative shall have a minimum of two years experience in Construction Surveying layout and maintenance of as-built construction drawings with a record of performing horizontal and vertical control requirements as stated in this contract, and required by specific state Land Surveying Laws.

C. Horizontal Control - Establish site horizontal control and grid system as defined below as part of site mobilization:

1. Field survey work shall be performed with sufficient precision to ensure that the required accuracy of the finished map is achieved. The computed coordinate position of each horizontal control point used in compiling the map shall be correct within the limits of third order accuracy (that is, the horizontal error of closure of the control traverse shall not exceed 1 in 5,000, and the angular error of closure shall not exceed 1 minute times the square root of the number of instrument stations in the traverse, all before adjustment).

D. Vertical Control - Shall be as follows:

1. The elevation of control bench marks shall be correct within the limits of third order accuracy (that is, the vertical error of closure of the control level circuit shall not exceed plus or minus 0.05 feet times the square root of the length of the circuit in miles, before adjustment).
2. Elevations shall be tied to the bench mark elevation by looping or tying between two established benches. (Opened level nets not permitted.)

QUALITY CONTROL

4.0 ATTACHMENTS
Not applicable.

End of Specification

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1.0 GENERAL

1.1 Summary

A. Scope of Specification

This specification prescribes the requirements for excavation and fill associated with the following:

1. Transportation and placement of excavated soil not suitable for reuse as backfill to be placed in the laydown area at Griffon Park at the Owner's direction.
2. Trenching and backfill for installation of underground piping, conduit, cable and appurtenances.
3. Install erosion control features.
4. Quality Control Requirements.

B. Terminology

The following terms are defined as stated, unless otherwise indicated:

1. *Soil Classification Symbols:* Symbols based on the Unified Soil Classification System as determined per ASTM D2487 or ASTM D2488 (such as GW, SW, and CH).
 2. *Cohesive Materials:* Soils classified per ASTM D2487 or ASTM D2488 as GC, SC, ML, CL, MH, CH, or materials classified as GM or SM when their fine fraction (material passing a No. 40 sieve) has a plasticity index of 4 or greater.
 3. *Cohesionless Materials:* Soils classified per ASTM D2487 or ASTM D2488 as GW, GP, SW, SP, and materials classified as GM or SM when their fine fraction (material passing a No. 40 sieve) is non-plastic or has a plasticity index less than 4.
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4. *Proctor Density*: The maximum dry density achieved per ASTM D698 when testing a sample of material representative of that to be compacted in the field.
5. *Optimum Moisture Content*: The moisture content at which the Proctor Density is achieved.
6. *Inspection and Testing Agency*: The company, partnership, or corporation retained to perform the inspections and tests required to determine and verify compliance of the work with the requirements of this specification.
7. *Relative Density*: The degree of compactness of a free draining granular soil with respect to the loosest and densest conditions of the soil as determined by ASTM D4253 and ASTM D4254.
8. *Unyielding Subgrade*: Rock or soil containing large stones (over 3 inches in any dimension) that if allowed to remain at the trench bottom, would likely cause uneven or point loading on the pipe.
9. *Unstable Subgrade*: Material in the trench bottom that lacks sufficient firmness to maintain the alignment of the pipe. This may be material that is otherwise satisfactory but has been disturbed or is saturated with water.
10. *Pipe Embedment Zone*: The area of the trench in the immediate vicinity of the installed pipe, including special foundations when required, where special materials and construction techniques are required by this specification to ensure proper installation of the pipeline.
11. *Load-bearing Subgrade*: The soil lying beneath and up to 5 feet outside of the edge of pavements and structures (either existing or to be constructed), and the soil lying within such other limits of load-bearing subgrade as may be indicated on the drawings or elsewhere in the contract documents.

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1.2 References

The publications listed below form part of this specification. Each publication shall be the latest revision and addendum in effect on the date this specification is issued for construction unless noted otherwise. Except as modified by the requirements specified herein or the details of the drawings, Work included in this specification shall conform to the applicable provisions of these publications.

A. *Applicable Codes*

1. American Society for Testing and Materials (ASTM)

- a. ASTM 698: Test Methods for Moisture-Density Relations of Soil and Soil-Aggregate Mixtures using 5.5 pound (2.49 kg) Rammer and 12-inch (305 mm) Drop.
- b. ASTM D2487: Standard Test Method for Classification for Soils for Engineering Purposes.
- c. ASTM D2488: Standard Practice for Description and Identification of Soils (Visual-Manual Procedure).
- d. ASTM C33: Concrete Aggregate
- e. ASTM C88 Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
- f. ASTM C150 Standard Specification for Portland Cement
- g. ASTM C535 Standard Test Method for Resistance to Degradation of Large-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
- h. ASTM D422 Standard Test Method for Particle size Analysis of Soils
- i. ASTM D2216 Standard Method for Laboratory Determination of Water (Moisture) content of Soil, Rock, and Soil-Aggregate Mixtures
- j. ASTM D2434 Test Method for Permeability of Granular Soils (Constant Head)
- k. ASTM D2922 Standard Test Method for Density of Soil and Soil Aggregate in Place by Nuclear Methods
- l. ASTM D3017 Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods
- m. ASTM D4318 Standard Test Method for Liquid Limit, Plastic Limit,

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and Plasticity Index of Soils

2. **State of New York, Department of Transportation, Standard Specifications for Construction and Materials (NYDOT)**

Section 203 - Excavation and Embankment

Section 610 - Turf and Wildflower Establishment

Section 703 - Aggregates

3. **City of Niagara Falls, Engineering Department, Standard Specifications (City of Niagara Falls Standards)**

1.3 Quality Assurance

An inspection and testing agency will be retained by the Owner to perform field and laboratory testing and soil evaluations to verify compliance of the work with the requirements of this specification and to ensure the achievement of the intents and purposes of the work. The performance or lack of performance of such tests and inspections shall not be construed as granting relief from the requirements of these specifications or the other contract documents.

2.0 PRODUCTS

2.1 Materials

A. *Select Granular Fill/Backfill for Structures or Piping*

Fill/backfill material shall be free from frozen lumps, refuse, rocks larger than three (3) inches in any dimension, or other material that might prevent proper compaction or cause the completed fill/backfill to have insufficient bearing capacity for the expected superimposed loads. Soil classified per ASTM D2487 or D2488 as GW, SW, GP, or SP with not over 12 percent passing the No. 200 Sieve.

B. *Bedding Material for Piping*

Bedding material shall be as indicated on drawing 102PROF1.

C. *Backfill Under Buffalo Avenue and Frontier Avenue Pavement*

Backfill within the R.O.W. shall be in accordance with the City of Niagara Falls Standards, No. 2 Crusher Run Stone per NYDOT 703.02.

D. *Fill/Backfill*

Acceptable backfill material for any excavation or fill for grading, outside the limits of

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the slurry wall and excluding the top six (6) inches of topsoil, shall consist of a fine grained material with a minimum of 50 percent passing the No. 200 sieve and shall be classified as CL or ML under the Unified Soil Classification System (ASTM D2487). The backfill material shall be free of unsuitable materials which include, but are not limited to:

1. frozen material or material containing ice lenses;
2. refuse or debris;
3. stones or rocks larger than three (3) inches in any dimension;
4. clays classified as CH or MH according to ASTM D2487;
5. frost susceptible soils;
6. swelling clays;
7. material containing organic matter or roots; and
8. organic soils classified as OL, OH or Pt according to ASTM D2487.

E. Plastic Marking Tape

Plastic marking tape shall be acid and alkali-resistant polyethylene film, 6-inches wide with minimum thickness of 0.004 of an inch. Tape shall have a minimum strength of 1750 psi lengthwise and 1500 psi crosswise. The tape shall be manufactured with integral wires, foil backing or other means to enable detection by a metal detector when the tape is buried up to 3 feet deep. The tape shall be of a type specifically manufactured for marking and locating underground utilities. The metallic core of the tape shall be encased in a protective jacket or provided with other means to protect it from corrosion. Tape color shall be as specified in Table 1 and shall bear a continuous printed inscription describing the specific utility.

Table 1. Tape Color

Yellow	Forcemain
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F. Portland Cement

Portland Cement shall be according to ASTM C150, Type I or II.

G. Sand

Sand shall be fine aggregate per ASTM C33.

H. Seeding

Temporary (if needed) and permanent grass seeding types and mixtures shall be submitted to the Owners for approval prior to its use. Permanent grass mixture of

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seed, fertilizer, lime and mulch, application rate, planting dates and maintenance requirements shall be as specified in Section 600 of NYDOT Specification 610 for Construction and Materials.

I. Fertilizer

Fertilizer shall be uniform in composition, free flowing, and suitable for application with approved equipment. Use of liquid fertilizer is subject to approval of OxyChem/Olin prior to its use. The fertilizer shall be delivered to the jobsite in bags or other convenient containers, each fully labeled, including the following information:

1. name and address of manufacturer,
2. name brand or trademark,
3. number of net pounds or ready mixed material in the package, and
4. chemical composition or analysis and guarantee of analysis.

If lime is required to adjust soil pH to 6.5, it shall be ground limestone containing no less than 85 percent of total carbonates and ground to such fineness that 50 percent will pass through a No. 100 sieve and 90 percent will pass through a No. 20 sieve.

J. Organic Mulches

Organic mulches shall consist of, but not be limited to the following:

- straw from oats, wheat, barley, or rye;

Mulch all seeded areas in accordance with the requirements of the New York Guidelines for Urban Erosion and Sediment Control (NYUSCE).

3.0 EXECUTION

3.1 Examination

A. General - Site Examination

Before starting work, thoroughly examine the site to ascertain certain conditions under which the work must be performed. Notify the Owner of any existing conditions which might prevent the performance of the work indicated on the drawings.

3.2 Preparation

A. Construction Layout

Unless otherwise stipulated elsewhere in the contract documents, the work covered by this specification shall include the performance of calculations, and the setting of marks and stakes necessary to ensure that the work conforms to the required lines, grades, and dimensions. Relate such layout to the coordinate grid system, elevation datum, and related survey control monuments and bench marks identified on the

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drawings or elsewhere in the contract documents.

B. Pavement Removal

Where trenches must be excavated in areas of existing paving, remove the pavement using neat, straight, and square or parallel saw cuts no less than one (1) foot outside of the line of intersection between the excavation sidewall and the pavement subgrade surface. In the case of Portland cement concrete pavement, the line of removal may be the nearest existing pavement joint outside of the one (1) foot limit. Cut steel reinforcement projecting within the removed area to allow for the lap splice with the new replacement reinforcement required for restoration of the pavement.

3.3 Protection

A. Survey Monuments

Locate and protect from damage survey monuments within the work area. Properly relocate or witness any monument that must be disturbed by the work. After completion of the work, restore monument witnesses.

B. Buffalo Avenue/LaSalle Expressway/Frontier Avenue Utilities

Existing live and abandoned underground (as well as overhead) mechanical and electrical/telecommunications utilities will be encountered. Contractor is responsible to provide suitable protection for all utilities adjacent or within the work area. Any utilities damaged shall be repaired. Interruptions in service required to make tie-ins shall be coordinated with the impacted utility companies. Provide/install supports for all utilities uncovered or potentially undermined during installation of new work. Provide suitable cover to avoid damage from superimposed loads.

C. Excavation Slopes

1. Stabilize or lay back the side slopes of all excavations or trenches as necessary to prevent slope failure in conformance with OSHA regulations.
2. Shoring, sheeting and bracing, etc. (as may be required to support the side of the excavation and prevent any movement which may in any way endanger personnel, injure or delay the work or endanger adjacent building or other structures), shall be put in place and maintained. Trench sheeting shall remain in place until pipe has been laid, tested for defects, repaired if necessary and the fill material around it compacted to a depth 1 foot over the top of the pipe. Steel or wood sheeting and bracing shall be removed in such a manner as not to disturb or endanger the constructed force main or other structures, utilities or property, whether public or private. A trench shield or trench box made of steel or wood adequately braced may be used. This shield shall be pulled along the trench and the pipe bedded and jointed inside the box. Care shall be exercised in moving the shield so that previously laid pipe and backfill are not disturbed. All work shall be in compliance with local, state and federal rules and regulations relating to this type of work.

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3.4 Control of Water

A. *General*

Prevent or control water flow into excavations, or other accumulation in excavations, to ensure that the bottoms and sides of all excavations remain in a firm and stable condition throughout construction operations.

B. *Surface Waters*

Precipitation/runoff shall not be allowed to accumulate in the excavations or trenches. Plan and conduct excavation operations so as to minimize the disruption of work. Provide diversion ditches, dikes, and other suitable measures to control and direct runoff around and away from the excavation. Protect the sides of excavations from erosion and sloughing caused by stormwater runoff. Promptly remove any stormwater accumulation from excavations. The systems and equipment for control of surface water shall be of sufficient capacity to accommodate the runoff rate that can be expected from the two (2) year (50 percent annual chance) rainfall event, with no significant disruption of the construction schedule, or damage to existing features or facilities in the vicinity of the work.

C. *Infiltration*

When the bottom of a trench must be carried to an elevation below the groundwater piezometric surface, or to such proximity to the piezometric surface that the excavation bottom will become soft due to its being saturated by groundwater, take measures to lower the piezometric surface sufficiently to maintain the stability of the excavation bottom. Design the groundwater control system using accepted professional methods of design and engineering consistent with the best modern practice. The system shall include such equipment and appurtenances necessary to achieve the groundwater control needs of the work. Carefully design and operate the system to avoid damage to existing structures and other facilities in the vicinity of the work.

D. *Disposal of Removed Water*

The Contractor shall review design and operation of all systems with Site Representative prior to use.

E. *System Removal*

After completing construction operations needing water control, remove materials, equipment, and other facilities used for that purpose, and clean up and restore affected areas as required.

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3.5 Excavation and Backfill

A. General

1. Stockpiling

Stockpile excavated materials in an orderly manner at a distance from the banks of the excavation sufficient to avoid overloading the bank. Arrange stockpiles so as not to obstruct drainage or other construction operations in the vicinity of excavation.

2. Moisture Control

Compact backfill material at a moisture content suitable for that material using the compaction equipment employed. Compact cohesive materials at a moisture content within plus or minus four (4) percent of optimum.

When water must be added, distribute it uniformly over the surface of the layer, and thoroughly incorporate it into the soil by manipulation (plowing, discing, raking, or blading) to achieve a uniform distribution of moisture throughout the material. When the moisture content is excessive, defer compaction until the material has dried to a suitable moisture content. Natural drying may be accelerated by manipulation to increase the rate of evaporation, or by blending in a dry material. If drying is accomplished by blending in a dry material, take care not to exceed the specified maximum layer thickness for compaction. Remove any excess material from the layer before compaction.

B. Foundations/Footings and Appurtenances

1. Excavate pits for constructing cast-in-place concrete foundations, footings, and other structures to permit the placement of each monolithic element of the structure to the full width and length required with a full horizontal bed. If the excavation sidewalls are to be used to form the sides of the structure, take special care during excavation to secure a true surface conforming to the lines and dimensions indicated on the plans for the structure. Corners and edges of the excavation shall be true and square, not rounded or undercut.
2. Do not excavate the final six (6) inches of material until just before the structure is to be placed. When the bottom of the excavation must be exposed for an extended period of time, during which time inclement weather may damage it, lower the bottom of the excavation approximately one inch below the indicated bottom of the structure, and backfill the overexcavated area with lean concrete. If the bottom of the excavation is not firm and stable, notify Engineer immediately so that appropriate corrective measures may be developed and implemented.
3. Step excavation side slopes with each layer of backfill to avoid the development of unnecessary loads against the structure caused by backfill wedging between the structure and the excavation sidewalls.

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4. Backfill of Structures

As soon as practical after completing construction of the related structure, including expiration of the specified minimum curing period for cast-in-place concrete, backfill the excavation to restore the required finished grade. Backfill by placing and compacting satisfactory backfill material or select granular backfill material, when required, in uniform horizontal layers of no greater than six (6) inches loose thickness. Thoroughly compact each layer to a uniform dry density of no less than 95 percent of Standard Proctor Density; or, when backfilling with select granular material, compact each layer to firm and stable condition with a vibrating plate type or vibrating roller type compactor, suitable for the material and lift thickness, and operated in accordance with the manufacturer's instructions for effective compaction. Thoroughly compact each layer before the placement of materials for the subsequent layer.

Insofar as possible, place and compact backfill symmetrically about the structure so as to avoid the development of unbalanced earth pressure loads on the structure.

C. *Trenching for Forcemain Installation*

1. Carefully excavate trenches to the minimum depths and widths necessary for installing the forcemain and associated appurtenances in accordance with the requirements of this specification, and the lines and grades indicated on the plans or elsewhere in the contract documents. In the embedment zone, the trench sidewalls shall be as nearly vertical as practical. From the top of the embedment zone to the surface, the trench sidewalls shall be either sloped sufficiently to prevent sloughing or cave-in, or shall be properly supported.

2. Unstable Subgrade

When soft, yielding, or otherwise unstable soil conditions are encountered at the required trench bottom elevation, overexcavate the trench to a depth of no less than 24 inches below the specified bedding as shown on the drawings, install 16 ounce geotextile fabric, and backfill with No. 2 stone. If conditions are so severe that overexcavating and backfilling will not achieve a stable condition, notify the engineer immediately so that appropriate corrective measures may be identified.

3. Unyielding Subgrade

If rock, stone, masonry, or other hard, unyielding material is encountered at or above the required trench bottom elevation, remove it to provide a clearance of no less than 6 inches below and on each side of pipes and associated fittings, valves, and other appurtenances. Backfill the overexcavated area with granular bedding material.

4. Backfill

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Coordinate initial and final backfilling with the applicable piping system installation specification testing requirements to ensure that required visual examinations are accomplished before the pipeline is obscured by backfill.

Bedding and backfill shall be as shown on the drawings.

Backfill within the Buffalo Avenue R.O.W. shall be in accordance with the City of Niagara Falls Standard Specifications.

5. Pavement Restoration

Restore removed concrete pavement to a condition equal or superior to that existing prior to its removal in accordance with the Standard Specifications of the City of Niagara Falls and NYSDOT Standard Specifications.

3.6 Dust Control

Contractor shall make every effort to control dust for the duration of the Work. This effort shall include minimizing the area of disturbed soil exposed at any one time, and installing temporary or permanent surface stabilization measures immediately after completing a land grading unit of the overall Work. For disturbed areas not subject to traffic, temporary or permanent vegetation shall be installed according to the drawings. For other areas subject to traffic, dust control measures shall include mulching, sprinkling water, spraying adhesive or calcium chloride, and surface roughening by tillage. The measures implemented shall be maintained until all disturbed areas have been stabilized with vegetation.

3.7 Field Quality Control

Contractor shall be responsible for ensuring that earthwork materials and execution meet the requirements of this specification. The Contractor is responsible for providing material testing submittals. An Independent Inspection and Testing Agency will be engaged by the Owner for the purpose of inspecting and testing placed materials in the field.

End of Specification

BITUMINOUS CONCRETE PAVING

1.0 GENERAL

1.1 Summary

A. Scope of Specification

This specification prescribes the requirements for the construction of plant-mixed, hot-laid bituminous concrete binder course and top wearing surface course on a prepared aggregate base or concrete pavement base at the locations and to the lines, grades, thicknesses, and other dimensions shown on the drawings.

Bituminous paving will be required to replace the Buffalo Avenue and Frontier Avenue pavement that will be removed to install the force main in the locations shown on Drawing 594000-30K-08A.

1.2 References

The publications listed below form part of this specification. Each publication shall be the latest revision and addendum in effect on the date this specification is issued for construction unless noted otherwise. Except as modified by the requirements specified herein or the details of the drawings, all Work included in this specification shall conform to the applicable provisions of these publications.

A. ASTM (American Society for Testing and Materials)

1. ASTM D242 Standard Specification for Mineral Filler for Bituminous Paving Mixtures
2. ASTM D692 Standard Specification for Coarse Aggregate for Bituminous Paving Mixtures
3. ASTM D1073 Standard Specification for Fine Aggregate for Bituminous Paving Mixtures
4. ASTM D2172 Standard Test Methods for Quantitative Extraction of Bitumen from Bituminous Paving Mixtures
5. ASTM D3381 Standard Specification for Viscosity-Graded Asphalt Cement for Use in Pavement Construction

B. NYDOT, State of New York, Department of Transportation Standard Specifications for Construction and Materials

1. Section 401 Plant Mix Pavements - General
2. Section 403 Hot Mix Asphalt Concrete Pavement
3. Section 407 Tack Coat
4. Section 702 Bituminous Materials

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5. Section 703 Aggregates

1.3 Submittals

A. Product Data

Submit the following to the Oxy/Olin Site Representative for approval prior to beginning asphalt placement:

- Aggregate and mineral filler gradations
- Certificate of compliance for each asphalt product
- Bituminous concrete mix design

B. Test Results

Submit results of the tests required during the performance of the work to the Oxy/Olin Site Representative.

1.4 Quality Assurance

Services of an inspection and testing agency to perform inspections and tests necessary to ensure that the work complies with requirements of the specifications will be retained by the Contractor.

2.0 PRODUCTS

2.1 Materials

- A. Fine aggregate shall be natural or manufactured sand conforming to ASTM D1073.
- B. Coarse aggregate shall be crushed stone, crushed slag, or crushed gravel conforming to ASTM D692. That portion of the coarse aggregate material retained on the Number 4 sieve shall contain not less than 50 percent by weight of crushed pieces having at least 1 fractured face.
- C. Mineral filler shall be limestone dust, dolomite dust, or portland cement conforming to ASTM D242.
- D. Asphalt cement for bituminous concrete shall be viscosity grade AC 15 conforming to NYDOT Section 702.
- E. Liquid asphalt for prime coat shall be MC-30 conforming to NYDOT Table 702-4.
- F. Asphalt emulsion tack coat shall meet the requirements of NYDOT Table 702-9.

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- G. Binder Coarse shall be NYDOT Type 3.
- H. Wearing Coarse shall be NYDOT Type 7.
- I. Coarse Base shall be NYDOT Type 1.

2.2 Mixes

A. Job Mixes

1. Bituminous concrete for base, binder, and surface courses shall be a mixture of asphalt cement, coarse aggregate, fine aggregate, and, if required, mineral filler. Job mix formula shall be established using the Marshall mix design method based on the following parameters:

Stability	1,500 lbs. (min.)
Flow	0.08 to 0.18 inches
Voids in mineral aggregate Type 7	15.5% (min.)
Air voids	2.0 - 4.0 percent

2. Type 3 mix shall have an asphalt content between 4.5 and 6.5 percent as measured by ASTM D2172. Type 7 mix shall have an asphalt content between 5.8 and 7.0 percent as measured by ASTM D2172.

B. State Approved Mixes

In lieu of performing new tests to certify materials and mix designs, materials and mixes certified for use by NYDOT may be furnished provided all requirements of this specification are met and complete certified documentation of such compliance is submitted and approved.

3.0 EXECUTION

3.1 Examination

Examine the surface of the area to be paved before placing the bituminous concrete mixture to ensure that it is properly prepared, intact, firm, cured, and dry. Correct conditions detrimental to proper and timely completion of the work. Do not proceed until unsatisfactory conditions are corrected.

3.2 Preparation

- A. Clean surface of the area to be paved before placing the bituminous concrete mixture, and keep the surface from accumulating materials that would contaminate the mixture, prevent bonding, or interfere with spreading operations.

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- B. Correct the deficiencies where the subgrade or previously constructed pavement courses are loose, rutted, or otherwise defective prior to placing materials for a subsequent pavement course.
- C. Cover the surfaces of curbs, gutters, manholes, and other structures that bituminous concrete mixture will be placed against with a thin, uniform coat of asphalt emulsion tack coat. Where the bituminous concrete mixture will be placed against the vertical face of an existing pavement, clean the vertical face to remove foreign substances and apply a coating of asphalt emulsion tack coat at a rate of approximately 0.25 gallons per square yard.

3.3 Application

A. Limitations on Application

1. Do not begin placing bituminous concrete mixture if air temperature is below 40 degrees F, if there is evidence of the aggregate base being frozen, or if there is fog, rain, or other unsuitable conditions.
2. Do not place bituminous concrete mixture when the wind is blowing at such a rate that proper compaction cannot be attained due to cooling of the mixture; or when sand, dust, or other debris is being deposited on the underlying surface to such an extent that proper bonding cannot be achieved.
3. The temperature of the bituminous concrete mixture shall be 290 degrees F minimum and 320 degrees F maximum leaving the mix plant, and 280 degrees F minimum at time of placing.
4. Do not incorporate into the work bituminous concrete mixture that is discolored, indicating the bitumen has been overheated.
5. Do not spread any mixture that cannot be finished and compacted during daylight hours.

B. Prime Coat

1. Apply prime coat to the surface of the existing aggregate base in advance of the placement of new bituminous paving course on the same day.
2. Apply prime coat with a pressure distributor designed, equipped, maintained, and operated so the rate of application shall be between 0.25 and 0.50 gallons per square yard.
3. Use sufficient bitumen to seal the voids, but not more than can be readily absorbed. Cover any excess bitumen that does not penetrate the aggregate base with sand.
4. Keep prime coat surface free from traffic until placement of bituminous paving course.

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C. Tack Coat

1. Apply tack coat to the surface of concrete pavements and to previously placed bituminous pavement courses just before placing new bituminous paving course, in accordance with NYDOT Section 407.
2. Apply tack coat with a pressure distributor designed, equipped, maintained, and operated so the rate of application is between 0.1 and 0.2 gallons per square yard.
3. Apply tack coat sufficiently in advance of the spreading operation of the bituminous concrete mixture to permit volatiles to evaporate from the asphalt cement, but not so far in advance that the tack coat becomes covered with dust or other foreign substances.
4. Keep tack coat surface free from traffic, except asphalt trucks required to feed the paving, until the subsequent paving course is spread.

D. Bituminous Concrete Courses

1. Spread and finish in accordance with NYDOT Section 401.
 - a. Spread the bituminous concrete mixture using a self-propelled paver capable of spreading and finishing the mixture to the required width and thickness; true to line, grade, and cross section; and with a smoothly struck finish, uniform density, and texture, without the need for an undue amount of back dressing to correct irregularities.
 - b. Coordinate the spreading operation with the rate of production and delivery and with the rate of compaction to attain the most uniform and continuous progress possible.
 - c. Where the thickness of finished paving will be 3 inches or less, spread in one layer.
2. Compact in accordance with NYDOT Section 401.
 - a. General
 - (1) Start compacting the bituminous concrete mixture as soon as the mixture will bear a roller without undue displacement. Operate rollers at a slow and uniform speed not exceeding 300 feet per minute. Correct at once any displacement resulting from reversing the direction of a roller, or from other causes, by raking and adding fresh mixture as required.
 - (2) Keep the wheels of the rollers moistened with water to prevent the mixture from adhering to the wheels. Compact the areas

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inaccessible to rollers with hot mechanical hand tampers. Protect the surface of the pavement from drippings of oil, kerosene, or other materials used in paving and cleaning operations. If the bituminous concrete mixture becomes loose and broken, mixed with dirt, or defective in any other way, remove the unsatisfactory mixture and replace it with fresh, hot bituminous concrete mixture. Complete rolling before the temperature of the bituminous mixture drops below 140 degrees F.

b. Initial Rolling

Perform initial rolling of each course using a self-propelled, steel wheel roller weighing 8 to 12 tons. Begin each course at edges and work toward the center. During initial rolling, the entire pavement surface shall receive at least 2 passes of the roller in an overlapping pattern (1/2 the width of the roller on adjacent passes).

c. Intermediate Rolling

Perform intermediate rolling using a self-propelled, pneumatic tire roller weighing 6 to 10 tons and equipped with at least 7 smooth tread, low pressure tires inflated at 50 to 55 pounds per square inch. Intermediate rolling shall consist of no less than 5 passes of the roller over the entire area of the pavement.

d. Final Rolling

Perform final rolling using a self-propelled, steel wheel roller weighing 8 to 12 tons. Continue final rolling until all roller marks are eliminated.

3. Joints

a. General

(1) Place each bituminous paving layer as continuous as possible to keep the number of joints to a minimum. Create joints between old and new pavements, between successive days' work, or where the mixture has become cold (less than 140 degrees F). Make these joints in such a manner as to create a continuous bond between the old and new pavement construction courses.

(2) When the pavement construction involves 2 or more courses, offset successive courses by at least 6 inches.

b. Transverse Joints

If placing of material is discontinued or if material in place becomes cold, make a joint running perpendicular to the direction traveled by the paver.

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Before placement continues, trim the edge of the previously placed pavement to a straight line perpendicular to the paver and cut back to expose an even vertical surface for the full thickness of the course. When placement continues, position the paver on the transverse joint so that sufficient hot mixture will be spread in order to create a joint after rolling that conforms to the required smoothness. If the temperature of the previously placed pavement material drops below 140 degrees F before paving is resumed, give the exposed vertical face a thin coat of liquid asphalt just before paving is continued.

c. Longitudinal Joints

Coat longitudinal joints that are not completed before the previously laid mixture has cooled to a temperature below 140 degrees F, with liquid asphalt just before paving is continued.

3.4 Field Quality Control

A. Smoothness Test

Check the finished surface of the bituminous concrete mixture with a 10 foot straight edge as rolling progresses. Variations in the finished surface shall not exceed plus or minus 1/8 inch in 10 feet. Correct any portion of the pavement showing irregularities greater than the acceptable variation by removing materials, replacing with new materials, and reworking or recompacting as required. A tolerance that permits water to pond shall not be acceptable. Finished surfaces adjoining other pavements shall be even with finished surfaces of abutting pavements.

B. Thickness Test

The average thickness of the course, or of combined courses shall be within 1/4 inch of the indicated thickness. Where the deficiency is greater than the specified tolerance, remove the pavement and replace it with new pavement.

3.5 Adjustment and Cleaning

A. Adjustment

To correct deficiencies for smoothness and thickness, remove sufficient material to allow at least 1 inch of bituminous concrete to be placed. Skin patching for correcting low areas or planing for correcting high areas is not permitted. Edges of the fill shall be feathered so that the joint between fill and original surface is invisible.

B. Cleaning

Remove all debris, rubbish, and excess material from the job site.

3.6 Protection

Protect the pavement from traffic until it has cooled to air temperature, and does not pick up

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under foot or wheeled traffic.

End of Specification

UNDERGROUND PIPING SYSTEMS

1.0 GENERAL

1.1 Scope of Specification

This specification prescribes the work necessary to furnish and install underground piping for the Force Main System specified herein and as indicated on the Drawings.

1.2 References

The following documents are a part of this section. Where this Specification section differs from these documents, the requirements of this section shall apply.

1. ASTM D1248 Polyethylene Plastics Molding and Extrusion Materials.
2. ASTM D3350 Polyethylene Plastics Pipe and Fittings Materials.
3. ASTM F714 Polyethylene (PE) Plastic Pipe (SDR-PR) based On Outside Diameter.

2.0 PRODUCTS

2.1 APL Collection System

A. *Pipe - Dual Wall Pipe for APL Collection System*

1. The pipe for dual wall pipe systems shall be extruded from a polyethylene compound and shall conform to the following requirements:
 - The polyethylene resin shall meet or exceed the requirements of ASTM D3350 for PE 3408 material with a cell classification of 355434C.
 - The polyethylene compound shall be suitable protected against degradation by ultraviolet light by means of carbon black, well dispersed by precompounding in a concentration of not less than 2 percent.
 - The maximum allowable hoop stress shall be 800 psi at 73.4°F.
 - Pipe sizes shall conform to ASTM F714.
 - The carrier and container pipe shall conform to the following schedule:

UNDERGROUND PIPING SYSTEMS

CARRIER PIPE		CONTAINER PIPE	
Nominal Pipe Size-Inch	SDR	Nominal Pipe Size-Inch	SDR
2	11	6	17

B. Joints for APL Collection System Piping

Carrier pipe shall be jointed by thermal butt-fusion, except where connecting to flanged pipe or equipment.

1. Flanges

ASTM A216, cast steel backing flanges with 150-pound, ANSI B16.1 Standard drilling. Flanges shall be complete with one-piece, molded polyethylene stub ends. Flanges shall be primed and coated as specified for buried steel piping.

2. Gaskets

Flat ring, 1/8 inch ethylene propylene rubber (EPR).

3. Bolting

Type 316 Stainless Steel, ASTM A193, Grade B8M hex head bolts; and ASTM A194, Grade 8M hex head nuts. Bolts shall be fabricated in accordance with, ANSI B18.2 and provided with washers of the same material as the bolts.

3.0 EXECUTION

3.1 Transportation

Care shall be taken during transportation of the pipe that it is not cut, kinked, or otherwise damaged.

3.2 Storage

Pipes shall be stored on level ground, preferably turf or sand, free of sharp objects which could damage the pipe. Stacking of HDPE pipe shall be limited to a height that will not cause excessive deformation of the bottom layers of pipes under anticipated temperature conditions. Where necessary due to ground conditions, the pipe shall be stored on wooden sleepers, spaced suitably and of such widths as not to allow deformation of the pipe at the point of contact with the sleeper or between supports.

UNDERGROUND PIPING SYSTEMS

3.3 Handling HDPE Pipe

The handling of the joined HDPE pipeline shall be in strict accordance with the pipe manufacturer's written instructions and in such a manner that the pipe is not damaged by dragging it over sharp and cutting objects. Ropes, fabric, or rubber-protected slings and straps shall be used when handling pipes. Chains, cables, or hooks inserted into the pipe ends shall not be used. Two slings spread apart shall be used for lifting each length of pipe. Pipe or fittings shall not be dropped onto rocky or unprepared ground. Slings for handling the pipeline shall not be positioned at pipe joints. Sections of the pipes with cuts and gouges exceeding 10 percent of the pipe wall thickness or kinked sections shall be removed and the ends of the pipeline rejoined.

3.4 Joining HDPE Pipe Section

- A. Carrier pipes shall be joined to one another, to the polyethylene fittings, and to the flange connections by means of thermal butt-fusion. Polyethylene pipe lengths, fittings, and flanged connections to be joined by thermal butt-fusion shall be of the same type, grade, and class of polyethylene compound and supplied from the same raw material supplier.
- B. Mechanical connections of the carrier pipe to flanged equipment and other piping systems shall be through flanged connections which shall consist of the following:
1. A polyethylene "stub end" shall be thermally butt-fused to the ends of the pipe.
 2. Provide case steel backing flange.
 3. Bolts and nuts of sufficient length to show a minimum of three complete threads when the joint is made and tightened to the manufacturer's standard. Retorque the nuts after four hours.
 4. Gaskets as specified in section 2.1 of this specification.
- C. *Butt-Fusion Joining HDPE Piping*
- Butt-fusion of pipes and fittings shall be performed in accordance with the pipe manufacturer's recommendations as to equipment and technique. Depending on site conditions, butt-fusion joining shall be performed in or outside of the excavation at the Contractor's option.
- D. HDPE Container pipes shall be joined by using electrically activated couplers. Prepare pipe ends by scraping to remove oxides and other contamination and install couplers in strict accordance with coupler manufacturer's written installation instructions.

UNDERGROUND PIPING SYSTEMS

3.5 Installation

1. All excavation and backfill shall conform to requirements specified in Section 02200 - Earthwork of the Specifications and as shown on the drawings.
2. The underground systems shall be installed at locations, line and grade, shown on the Drawings.
3. No piping shall be installed in water.

3.6 Hydrostatic Testing of Piping

1. Before pressure testing, remove or isolate all equipment that could be damaged by the hydrostatic test fluid or pressures used.
2. Test pressure piping hydrostatically in accordance with AWWA C600 at 220 psi or the maximum allowable working pressure of the piping materials, whichever is smaller.
3. Pipe installation will not be accepted until the leakage for the section of line tested is less than the rate of leakage specified below:
 - Flanged, welded, screwed, and soldered: No measurable leakage for one hour.
 - Push-on, mechanical joints or caulked bell, and spigot piping: in accordance with AWWA C600.
4. Locate and repair defective joints and/or pipe until the leakage is within the specified allowance.
6. Retest the section of piping which required repairs.

End of Specification

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HORIZONTAL EARTH BORING AND JACKING

1.0 GENERAL

1.1 Summary

A. Scope of Specification

This specification prescribes the requirements for the installation of underground pipe by horizontal boring and jacking methods.

B. Related Specifications

The following specification prescribes items of related Work:

- 000.210.02200: Earthwork

Coordinate Work prescribed by this specification with Work prescribed by the above listed specification.

1.2 References

The publications listed below form part of this specification. Each publication shall be the latest revision and addendum in effect on the date this specification is issued for construction unless noted otherwise. Except as modified by the requirements specified herein or the details of the drawings, Work included in this specification shall conform to the applicable provisions of these publications.

A. AASHTO (American Association of State Highway and Transportation Officials)

1. Standard Specification for Highway Bridges

B. New York State Department of Transportation

1. Standard Specifications- Construction and Materials

C. ASTM (American Society For Testing Materials)

D. AWS (American Welding Society)

1. AWS D1.1

E. NUCA (National Utility Contractors Association)

1. Horizontal Earth Boring and Pipe Manual No. 2

F. OSHA (Occupational Safety and Health Administration)

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1.3 Submittals

- A. Submit for review complete working drawings showing details of the proposed method of construction and the sequence of operations to be performed during construction. Show the method of excavation, spoil removal, and disposal; type and method of installation of the casing, access pit locations, construction shoring and bracing; and proposed dewatering method to be used. Make drawings sufficiently detailed to allow Engineer to judge whether or not the materials and procedures meet the contract requirements.
- B. Furnish a plan showing the proposed method of jacking operation. Include the design of the jacking head, the jacking support or backstop, pipe lubrication, the arrangement and position of jacks, pipe heads, and other elements, complete and in assembled position.
- C. Pipe shall be reviewed by the Contractor for applied construction loads and jacking forces.
- D. Submit for review the layout and design of the access shafts. Submit a certification that the structural design of the shoring and bracing meets the design criteria.
- E. Submit for review manufacturer's drawings of casing insulators. Drawings shall be to scale and consist of a cross sectional view with all dimensioning, clearances, etc. relative to casing pipe, carrier pipe and insulator assembly.
- F. Structural designs shall be sealed by a professional engineer registered in the state of New York.
- G. Review by Engineer shall not be construed in any way of relieving Contractor of contractual responsibilities.

1.4 Quality Assurance

A. General

- 1. The Contractor shall be held responsible for protecting against surface subsidence, damage or disturbance to adjacent property and facilities from his construction methods. In case loose material is encountered and cave ins occur or are anticipated, all jacking or boring shall be discontinued. Shoring approved by the Engineer shall be provided and all voids filled by methods approved by the Engineer before jacking or boring is continued.
- 2. The method of boring (auger boring or pipe jacking) shall be at the discretion of contractor, provided appropriate techniques are used that result in a successful installation with no unsatisfactory effects to surrounding properties.
- 3. The method of construction shall ensure the safety of the work, Contractor's employees, the public, and adjacent property, whether public or private.
- 4. Excavating, casing, grouting, and construction shall be executed to minimize ground settlement. The completed casing shall have full bearing against earth, and no voids or pockets shall be left in any portion of the installation. Ensure that there is full bearing of soil against pipe by promptly grouting any voids between soil and pipe for the entire length of the installation.

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5. Jack the pipe from the low or downstream end. The final position of the pipe may vary only 1/2 inch in 10 feet, in any direction from original design position. Any variation must be regular and in only one direction. The final grade of the flow line shall be in the direction indicated on the plans.
6. For large diameter installations, once jacking is begun, continue the operation without interruption, insofar as practical, to prevent the pipe from becoming firmly set in the embankment.
7. Remove and replace any pipe damaged in jacking operations.
8. As soon as the pipe is completely in place and all equipment and appurtenances have been removed, backfill pits or trenches that have been involved to aid in the operations. Compaction shall be in accordance with Specification 000.210.02200.
9. Contractor shall be responsible for checking the pipe and pipe joints for anticipated thrust of the jacks or pulling mechanism loads. Note that any design indicated on the drawings considers in-place loads only and does not take into account construction loads.

1.5 Product Delivery And Handling

A. Delivery

Load, transport, and unload pipe in a manner that will prevent damage. Pipe shall have in place from the fabricator sufficient interior strutting, cross bracing, and support to prevent deflection under its own weight.

B. Storage and Handling

Support pipe stored at the work site on wooden blocks, and place it in a location that does not interfere with traffic or work being performed in the area. Handle pipe with double strap leather, canvas, or nylon slings.

1.6 Site Conditions

A. Existing Conditions

1. Typical installations are below and within right-of-ways of operating roadways, or in close proximity to active utility lines. Contractor is responsible for verifying existing conditions prior to commencing work.
2. Soils information for the site can be found in Geotechnical Report No. [] by [].

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B. Environmental Requirements

1. Surplus water resulting from the execution of the work shall be disposed of by to an existing surface drainage facility in a manner that poses no hazard to surrounding properties.
2. Upon completion of the work, areas affected shall be cleaned and restored to original condition to the satisfaction of Construction Manager.

C. Sequencing and Scheduling

1. Work within street right-of-ways shall be performed in a manner that does not interfere with surrounding traffic or operations.
2. Work that crosses or lies within a right-of-way shall be coordinated with the appropriate governing authority and be subject to the inspection and direction of such authority. Approval shall be obtained prior to crossing or working within existing right-of-ways.

2.0 PRODUCTS

2.1 General

- A. Contractor shall be responsible for satisfying all requirements set forth by each individual highway department concerning installations within their right-of-way.
- B. Timber lagging or timber falsework is not acceptable in installations within SDHPT (State Department of Highway and Public Transportation) right-of-ways. Instead, steel casing shall be used for installations SDHPT right-of-ways. Steel casings shall extend completely across the right-of-way.

2.2 Materials

- A. Casing material shall be smooth wall welded steel pipe casing, ASTM A139 Grade B, shall be designed to meet or exceed the loading requirements of the particular installation.
- B. Casing insulators shall be equipped with rubber inner liners. Assemblies shall be designed to carry the carrier pipe so that the carrier joints at any rotation point, shall have a minimum 1 1/4" +/- 1/8" clearance from the casing pipe.
- C. Material required to fill the annular ring shall meet the requirements specified in the below NY DOT Subsections or be approved by the Engineer:
 - Portland Cement 701-01
 - Fine Aggregate 703-01
 - Screened Gravel 703-0202
 - Mortar Sand 703-03

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2.3 Equipment

- A. No gasoline powered equipment shall be permitted in the underground works or construction shafts.
- B. Provide equipment to adequately ventilate the entire underground works at all times during construction.
- C. Provide adequate lighting of entire work area.
- D. Provide portable equipment to test for carbon monoxide gas, hydrogen sulfide gas, and oxygen deficiency.

3.0 EXECUTION

3.1 Preparation

- A. Baselines and benchmarks are indicated on the drawings. Check these baselines and benchmarks at the beginning of the contract, and report any errors or discrepancies to the Owner's Representative.
- B. Use the baselines and benchmarks to maintain reference lines and grades for the construction. Use these lines to establish the exact location of the bore and existing utilities or structures.
- C. Ground surface settlement that may occur during construction may affect the accuracy of the temporary benchmarks. Advise the Owner's Representative of any settlement affecting the permanent monumentation benchmarks.

3.2 Installation

The excavation by the cutting head shall not exceed the outside diameter of the pipe by more than 1/2 inch, except in rock. The face of the cutting head shall not exceed the outside diameter of the pipe by more than 1/2 inch. The face of the cutting head shall be arranged to provide reasonable obstruction to the free flow of soft or loose material.

A. Boring

- 1. Obtain approval from the Owner's Representative for the location of any pits for boring equipment and workmen.
- 2. A pilot hole may be bored to check for line and grade and to determine if the larger diameter hole complies with the tolerances previously stated.
- 3. Bore the large diameter hole using mechanical means. Jetting is not permitted. Place excavated material away from the top of the working pit, and dispose of in accordance with the Owner's Representative directions.

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B. Jacking

1. Obtain approval from the Owner's Representative for any required pit locations.
2. Provide heavy duty jacks suitable for forcing the pipe through the embankment. Apply even jacking pressure.
3. Excavate material just ahead of or within the pipe, and remove it through the pipe. Then force the pipe through the embankment with the jacks into the space thus provided. Dispose of excavated material in accordance with the directions of the Owner's Representative.

C. Insulators

1. A crossing insulator shall be installed approximately two feet from the ends of each length of carrier pipe with intermediate insulators spaced at a maximum of 8 feet apart. There shall be an insulator each extremity of the casing pipe.

3.3 Dewatering

- A. Some or all of the boring and jacking operations may be below the groundwater table, and in conditions which may require a dewatering system to prevent flow of water and materials into the bore and pits. The dewatering method used shall not cause damage to adjacent structures or property due to lowering of the water table and subsequent ground settlement.
- B. If well points are used, provide spacing adequate for necessary dewatering, and use sandpacking or other means to prevent pumping of fine sands or silts from the subsurface. Continually ensure that the subsurface soil is not being removed by the dewatering operation.

3.4 Field Quality Control

- A. Before installation, inspect each pipe for straightness, roundness, and other essential characteristics. Any pipe with defects shall not be used.
- B. If braces are used, to maintain circularity of pipe during installation and grouting, do not remove cross braces until entire void around pipe has been filled with grout and grout has attained its final set.
- C. Pipe shall be installed to the tolerances previously specified in Section 1.4. Any variation in line and grade of the pipe as installed shall not cause a reversal of the planned slope at any location.

3.5 Adjustment And Cleaning

Before installation, thoroughly clean the interior of the casing or carrier pipe to remove any foreign matter, and keep the interior clean until the work has been inspected and accepted. Keep joint contact surfaces clean until jointing is completed.

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3.6 Protection

When installation is not in progress, keep the ends of the pipe closed by means of a suitable plug or bulkhead. Adequately barricade and cover open pits when not in use prior to backfilling.

4.0 ATTACHMENTS

Not applicable.

End of Specification

PRECAST CONCRETE

1.0 GENERAL

1.1 Summary

A. Scope of Specification

This specification prescribes requirements for the fabrication and erection of precast concrete including:

1. Inline cleanout manholes
2. Furnishing manhole steps, frames, lids and grates and other hardware as shown on drawings.
3. Erection of complete precast system.
5. Grouting and caulking of precast components as required.

B. Related Specifications

The following specifications prescribe items of related work:

02200	Earthwork
02725	Underground Piping Systems
03300	Cast-In-Place Concrete

Coordinate work prescribed by this specification with work prescribed by the above listed specifications.

1.2 References

The publications listed below form part of this specification to the extent referenced in this specification. Each publication shall be the latest revision and addendum in effect on the date this specification is issued for construction unless noted otherwise. If there is a discrepancy between the references and the specifications, the specifications shall govern.

A. ACI (American Concrete Institute)

1. ACI 211.1-91 Standard Practice for Selecting Properties for Normal, Heavyweight, and Mass Concrete
2. ACI 301-89 Specification for Structural Concrete for Buildings
3. ACI 315-92 Details and Detailing of Concrete Reinforcement
4. ACI 318/318R-92 Building Code Requirements for Reinforced Concrete

B. ASTM (American Society for Testing and Materials)

1. ASTM A36/A36M Standard Specification for Structural Steel

PRECAST CONCRETE

- | | | |
|-----|--------------|---|
| 2. | ASTM A82 | Standard Specification for Steel Wire, Plain; for Concrete Reinforcement |
| 3. | ASTM A325-93 | Standard Specification for Structural Bolts, Steel, and Heat-Treated |
| 4. | ASTM A615 | Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement |
| 5. | ASTM C33 | Standard Specification for Concrete Aggregates |
| 6. | ASTM C150 | Standard Specification for Portland Cement |
| 7. | ASTM C260 | Standard Specification for Air-Entraining Admixtures for Concrete |
| 8. | ASTM C443 | Specification for Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets |
| 9. | ASTM C478 | Specification for Precast Reinforced Concrete Manhole Sections. |
| 10. | ASTM C494 | Standard Specification for Chemical Admixtures for Concrete |

1.3 System Description

In summary, the Supplier shall prepare shop drawings, fabricate precast concrete components, and deliver and erect the precast concrete items as shown on the drawings and specified herein.

1.4 Product Delivery And Handling

A. Delivery

Deliver precast units to the Project site in quantities and times as shall ensure the continuity of installation.

B. Storage and Handling

Store and transport units to ensure against cracking, distortion, staining, or other physical damage, and so that identification marks are visible. Lift and support units at the designated lift points only.

1.6 Site Conditions

Examine the site, existing facility and the conditions under which the work is to be performed, and notify the Owner's Site Representative in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in an acceptable manner.

1.7 Design Requirements

Design modifications may be made only as necessary to meet field conditions and to ensure

PRECAST CONCRETE

proper fitting of the work, and as acceptable to Owner. Maintain the general design concept as shown.

2.0 PRODUCTS

2.1 Materials

A. Reinforcing Materials

Provide the following as may be required for the design of precast units:

1. Reinforcing bars: ASTM A615, grade as required.
2. Steel wire: ASTM A82, plain, cold-drawn steel.
3. Welded wire fabric: ASTM A185.
4. Supports for Reinforcement: Devices for supporting, spacing, and fastening reinforcement shall comply with CRSI recommendations. Devices shall be concealed in the fabricated work to the greatest extent possible and, where exposed, shall be corrosion protected, stainless steel, or have at least 1/8 of an inch plastic sheathing.

B. Concrete Materials

1. Cement

Portland Cement shall be Type I conforming to ASTM C150, unless otherwise specified. Cement for exposed surfaces shall be 1 type and obtained from one source throughout the entire Project to maintain uniform color and to establish undivided responsibility.

2. Aggregates

- a. Fine Aggregate shall be sand conforming to ASTM C33 (normal weight) and shall be composed of clean, uncoated grains of sound materials free from clay, mineral dust, organic impurities, and particles containing iron oxide.
- b. Coarse aggregates shall be clean, crushed stone or gravel conforming to ASTM C33 (normal weight).

3. Water

Mixing water shall be potable, clean, fresh, and free from oil, acids, alkalis, organic materials, or other impurities.

4. Admixtures

Admixtures, except air entraining, water reducing and retarding admixtures, shall not be used without the approval of the Owner. Calcium chloride or admixtures containing calcium chloride shall not be used. Air entraining admixtures shall conform to ASTM C260 and water reducing and retarding admixtures shall conform to ASTM C494.

PRECAST CONCRETE

5. Grout

Grout shall be nonmetallic, nonshrinking, nongas forming, noncorrosive, and moisture resistant such as Five Star, as manufactured by U.S. Grout Corporation or equal.

C. Manhole Steps

Neenah R-1982W Aluminum or approved equal.

D. Castings

Castings shall be free from cracks, holes, swells, cold shuts, and patches.

E. Gasket Materials

Gaskets shall be Rubber O-ring gaskets conforming to ASTM C443.

F. Precast Structures

Conform with ASTM C478. Openings shall be preformed. Walls shall have a minimum thickness of 5 inches. 4000 psi concrete.

2.2 Fabrication And Manufacture

- A. All precast concrete shall be cast in watertight forms of metal, wood, hardboard, oncrete or other suitable materials to provide a finish with a dense texture, free of honeycombing and excess air holes. Surface texture shall be uniform and shall be standard finish of concrete placed against steel or other dense surface.
- B. Any precast members where the reinforcement protrudes through the surface or where shadow lines caused by reinforcement too near the surface shall be rejected. Final product shall be watertight. No leakage through joints will be acceptable.

PRECAST CONCRETE

3.0 EXECUTION

3.1 Inline Cleanout Manholes

- A. Place where shown on Drawings and in accordance with details.
- B. Excavate, backfill, and compact in accordance with Section 02200.
- C. Pipe Connections
 - 1. Annular space shall be uniform around pipe and gasket material evenly distributed.
 - 2. Ensure watertight connection.
- D. Provide rubber O-ring gasket material between manhole or inline cleanout sections as necessary for watertight joint.
- E. Place succeeding manhole sections so steps remain in true vertical alignment.
- F. Place appropriate top section, cone or flat top, as indicated on Drawing.
- G. Place brick on manhole top. Bring completed manhole to finished grade.
- H. Install frame and cover. Use a Bilco door with ladder-up.

3.2 Field Quality Control

- A. Precast reinforced concrete bases, risers, and tops shall be subject to rejection for failure to conform to Specifications.
- B. Individual sections of bases, risers, tops, and cribwall members may be rejected for following.
 - 1. Fractures or cracks passing through bell, except for single end crack not exceeding joint depth.
 - 2. Excessive patching.
 - 3. Grouted pipe openings.
 - 4. Defects indicating imperfect proportioning, mixing, and molding.
 - 5. Surface defects indicating honeycombed or open texture.
 - 6. Damaged ends, where such damage prevents making satisfactory joint.
 - 7. Manhole steps out of line, not properly spaced or damaged.
 - 8. Continuous crack having surface width of 0.01 in. or more and extending for length of 12 in. or more, regardless of position.

PRECAST CONCRETE

- C. Installation may be rejected for following.
1. Use of individual components subject to rejection.
 2. Failure to conform to installation requirements.
 3. Visible infiltration
 4. Variation from true vertical alignment by more than 2% of depth.
 5. Variations in pipe and rim elevations greater than 0.5 in. from elevations shown on drawings.

4.0 ATTACHMENTS

Not applicable.

End of Specification

HDPE LINING REPAIR

1.0 GENERAL

1.1 Summary

A. Scope of Specification

This specification prescribes the requirements for the work of supply and repair of high density polyethylene (HDPE) geomembrane.

B. Related Specifications

Coordinate Work prescribed by this specification with Work prescribed by Specification 02200 - Earthwork.

C. Terminology

Where used in this specification, the following term shall have the meaning indicated below, unless clearly indicated otherwise by the context of their use.

1. Geomembrane: A flexible, synthetic polyethylene liner to be installed on a prepared surface to restrict the flow of surface water infiltration into the underlying landfill.

1.2 References

The publications listed below form part of this specification. Each publication shall be the latest revision and addendum in effect on the date this specification is issued for construction unless noted otherwise. Except as modified by the requirements specified herein or the details of the drawings, work included in this specification shall conform to the applicable provisions of these publications.

A. American Society for Testing and Materials (ASTM):

1. ASTM D638 Standard Test Method for Tensile Properties of Plastics
2. ASTM D746 Standard Test Method for Brittleness Temperature of Plastics and Elastomers by Impacts
3. ASTM D792 Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement
4. ASTM D1004 Standard Test Method for Initial Tear Resistance of Plastic Film and Sheeting
5. ASTM D1204 Standard Test Method for Linear Dimensional Changes of Nonrigid Thermoplastic Sheeting or Film at Elevated Temperature
6. ASTM D1238 Standard Test Method for Flow Rates of Thermoplastics by Extrusion Plastometer

HDPE LINING REPAIR

7. ASTM D1505 Test Method for Density of Plastics by the Density-Gradient Technique
8. ASTM D1621 Standard Test Method for Compressive Properties of Rigid Cellular Plastics
9. ASTM D1693 Test Method for Environmental Stress-Cracking of Ethylene Plastics
10. ASTM D3083 Specification for Flexible Poly (Vinyl Chloride) Plastic Sheeting for Pond, Canal and Reservoir Lining
11. ASTM D5199 Standard Test Method for Measuring Nominal Thickness of Geotextiles and Geomembranes
12. ASTM E96 Test Method for Water Vapor Transmission of Materials

B. OSHA (Occupational Safety and Health Administration)

1. OSHA Construction Industry Standards, Title 29, Code of Federal Regulations, Part 1920.120, Construction Health and Safety Plan, and Construction Contingency Plan
2. OSHA Construction Industry Standards, Title 29, Code of Federal Regulations, Part 1926, Safety and Health Regulations for Construction.

1.3 Submittals

- A. The manufacturer shall submit a sample of each of the HDPE repair lining system materials and the minimum specifications of the materials. The specification shall fully cover the details of minimum physical properties and test methods used, methods to be used for making field seams, and certifications that the material complies with the minimum specifications.

1.4 Product Delivery And Handling

The Contractor shall receive, inspect, and properly store all materials received on site until the installation of the liner. All such materials shall be inspected to verify their conformance to the requirements of this specification and to verify that they are free from defects. Any nonconforming or defective materials shall be removed from the jobsite.

2.0 PRODUCTS

Materials shall be one of the following types unless otherwise shown on the drawings. If the material shown on the drawing is different from that covered in this specification, the manufacturer's literature and directions shall be used for the properties of material, types of field joints, inspection, and any other item required for satisfactory liner installation.

HDPE LINING REPAIR

2.1 HDPE

HDPE geomembrane shall be manufactured from new, firm-quality HDPE resin and shall meet the specification values according to the specification sheet for HDPE. The liner material shall be free from holes, blisters, undispersed raw materials, or any sign of contamination by foreign matter. The lining material shall have no seams and shall be supplied in rolls. Each roll shall be labeled to identify thickness, length, and roll numbers. The material shall have a minimum thickness of 40 mils; Gundline HDPE, National Seal Company HDPE, or approved equal.

3.0 EXECUTION

3.1 Repair Procedures on Seams

Repair Procedures on Seams: Defective seams shall be repaired by reseaming or applying a capstrip. Tears or holes shall be repaired by seaming or patching. Blisters, larger holes, undispersed raw materials, and contamination by foreign matter shall be repaired by patches. Each patch shall be numbered. Patches shall be round or oval in shape, made of the same generic geomembrane, and extend a minimum of six inches beyond the edge of defects.

1. Weld sheeting together by means of integration of the extrudate bead with the lining material. The composition of the extrudate shall be identical to the lining material, or all sheeting shall be welded together using the hot wedge welding system. The welding equipment used shall be capable of continuously monitoring and controlling the temperatures in the zone of contact where the machine is actually fusing the lining material so as to ensure that changes in weather conditions will not affect the integrity of the weld.
2. No fish mouths shall be allowed within the seam area. Where fish mouths occur, cut and overlap the material; apply an overlap extrusion weld. Seal inlets, outlets, and other projections through the lining following the manufacturer's recommendation.

3.2 Thermal Expansion/Contraction

During repair, take appropriate measures, as recommended by the geomembrane manufacturer, to provide sufficient slack in the HDPE liner, to avoid excessive stresses being generated in the geomembrane due to temperature changes.

3.3 Field Quality Control

A. Non-Destructive Field Seam Testing

1. All field seams shall be non-destructively tested over their full length using a vacuum test unit or other approved method. Each seam shall be numbered or otherwise designated. The location, date, test unit, name of tester, and outcome of all non-destructive testing shall be recorded by the Owner's Representative.

HDPE LINING REPAIR

2. The Owner's Representative will observe all testing. Testing shall be done as the seaming work progresses, not at the completion of all field seaming. All defects found during testing shall be numbered and marked immediately after detection. All defects found shall be repaired, retested and remarked to indicate completion of the repair and acceptability. The test unit shall be a vacuum test unit.
3. The tests mentioned above shall be supplemented by a visual inspection. Any areas that appear suspect shall be probed utilizing a flat, thin, round edged metal probe to check the seams for continuity of the sheets and extruded bead.
4. The following procedures shall apply to locations where seams cannot be nondestructively tested:
 - a. All such seams shall be cap-stripped with the same geomembrane;
 - b. If the seam is accessible to testing equipment prior to final installation, the seam shall be nondestructively tested prior to final installation.
 - c. If the seam can not be tested prior to final installation, the seaming and cap-stripping operations shall be observed by the geosynthetic quality assurance technician for uniformity and completeness.

5. Vacuum Box Testing

The equipment shall be comprised of the following:

- a. A vacuum box assembly consisting of rigid housing, a transparent viewing window, a soft neoprene gasket attached to the bottom, port hole or valve assembly, and a vacuum gauge;
- b. A steel vacuum tank and pump assembly equipped with a pressure controller and pipe connections;
- c. A rubber pressure/vacuum hose with fittings and connection;
- d. A bucket and wide paint brush, and a soapy solution.

The following procedures shall be followed:

- a. Energize the vacuum pump and reduce the tank pressure to approximately 10 inches of mercury, i.e., 5 psi gauge (35kPa).
- b. Wet a strip of geomembrane approximately 12 inches by 48 inches (0.3m by 1.2m) with the soapy solution.
- c. Place the box over the wetted area.
- d. Close bleed valve and open the vacuum valve.

Ensure that the leak tight seal is created.

HDPE LINING REPAIR

For a period of not less than 30 seconds, examine the geomembrane through the viewing window for presence of soap bubbles.

If no bubbles appear after 30 seconds, close the vacuum valve and open the bleed valve, move the box over the next adjoining area with a minimum of 3 inches overlap and repeat the process.

All areas where soap bubbles appear shall be marked and repaired.

B. Identification of Defects

1. All seams and non-seam areas of the geomembranes shall be inspected for identification of defects, holes, blisters, undispersed raw materials and any sign of contamination by foreign matter.
2. The surface of the geomembrane shall be clean at the time of inspection. Brooming and/or washing of the geomembrane surface shall be required if the amount of surface dust or mud inhibits inspection.

C. Evaluation of Defects: Each suspect location both in seam and non-seam areas shall be non-destructively tested using the methods described herein. Each location which fails the non-destructive testing shall be marked and repaired.

D. Defective seams shall be repaired by reseaming or applying a capstrip. Tears or holes shall be repaired by seaming or patching. Blisters, larger holes, undispersed raw materials, and contamination by foreign matter shall be repaired by patches. Each patch shall be numbered. Patches shall be round or oval in shape, made of the same generic geomembrane, and extend a minimum of six inches beyond the edge of defects.

E. Verification of Repairs on Seams: Each repair shall be non-destructively tested using the methods described herein. Tests which pass the non-destructive test shall be taken as an indication of an adequate repair. Failed tests shall be reseamed and retested until a passing test results. The Construction Manager will observe all non-destructive testing of repairs. The Geomembrane Installer shall record the number of each patch, date, location, patcher and test outcome.

F. Daily Field Installation Reports: The Geomembrane Installer shall provide the QA Engineer with daily report of: the total amount and location of geomembrane placed; total amount and location of seams completed and names of individuals doing seaming and units used; changes in drawings; results of test seams; location and results of non-destructive testing; and location and results of repairs.

3.4 Liner Repair Acceptance

A. The geomembrane liner will be accepted when: the installation is finished; all documentation of installation is completed; and verification of the adequacy of all field seams and repairs, and associated testing is complete.

HDPE LINING REPAIR

- B.** A passing non-destructive test of field seams and repairs shall be considered to indicate the adequacy of field seams and repairs.

3.5 Disposal of Scrap Materials

On completion of installation, the contractor shall be responsible for disposal of all trash and scrap material generated by his activities, remove equipment used in connection with the work herein, and shall leave the premises in neat and acceptable manner.

End of Specification

GENERAL REQUIREMENTS - INSTRUMENT INSTALLATION

1.0 GENERAL

This specification prescribes practice to be followed for the installation of field mounted instruments.

1.1 Scope of Specification

This specification covers procedures for location, support and piping of instruments which are not an integral part of a piping system or packaged unit.

1.2 References

The publications listed below form part of this specification. Each publication shall be the latest revision and addendum in effect on the date this specification is issued for construction unless noted otherwise. Except as modified by the requirements specified herein or the details of the drawings, Work included in this specification shall conform to the applicable provisions of these publications.

A. ISA (Instrument Society of America)

1. ISA RP12.1 Electrical Instruments in Hazardous Locations
2. ISA S12.4 Instrument Purging for Reduction of Hazardous Area Classification

B. NEMA (National Electrical Manufacturers Association)

C. UL (Underwriters' Laboratories)

D. ASME (American Society of Mechanical Engineers)

1.3 Description

Instrument installations include the following:

- All instrument impulse piping, except the valved connection on pipelines or equipment.
- All supports for instruments and impulse or pneumatic tubing.

1.4 Safety

Contractor shall be responsible for performing all work activities in a safe, professional manner and shall strictly adhere to all OSHA safety requirements as well as Owner specified safety regulations. As a minimum, Contractor shall be responsible for the following:

- Safety indoctrination of all personnel
 - Implementation of required safety procedures
 - Conducting regularly scheduled safety meetings
 - Inspection and maintenance of work area for safety hazards
 - Maintaining tools and machinery in safe operating condition
 - Provision of safety equipment for all personnel
 - Safe work permits as required by Owner
-

GENERAL REQUIREMENTS - INSTRUMENT INSTALLATION

In addition, Contractor shall be responsible for all related safe working requirements as specified in the installation contract and as required by Owner during performance of the work.

2.0 PRODUCTS

2.1 Material

A. General

Minimum pipe or tubing size shall be 1/4 of an inch, except for connections at instruments, which shall be manufacturer's standard.

B. Tag Numbers:

Each Supplier provided instrument shall have the following identifying information stamped on a stainless steel nameplate permanently fastened to the instrument. The only acceptable language is English.

1. Manufacturer's name, model, and serial number.
2. As applicable, nameplates shall also carry information in English units relating to the following:
 - Pressure rating of pressure holding parts
 - Operating range
 - Voltage
 - Frequency
 - Power requirements
 - Material of parts exposed to process fluids
 - Spring range
 - Type of plug
 - Packing materials
 - Lubricant and set pressure

Size of body and inner valve shall be in inches.

C. Electrical

1. Enclosures for electrical instruments shall comply with requirements of the electrical area classification in which they are installed. In the event that the manufacturer of certain instruments cannot provide enclosures suitable for the area, purging of the enclosure with inert, dry air or gas, according to ISA RP12.4, shall be given consideration. Cases for locally mounted instruments and devices shall be weatherproof, conforming to NEMA 3 requirements as a minimum.
2. Terminals for electrical interconnections wire shall be clearly identified as required to indicate polarity, electrical ground where applicable, and test connection.

GENERAL REQUIREMENTS - INSTRUMENT INSTALLATION

2.2 Submittals

Contractor shall submit the following documents for approval:

- Dimensional Outline Drawing.
- Elementary Wiring Diagrams for Circuits.
- Piping Connections.
- Recommended Spare Parts List and Pricing.
- Installation and Operation Instructions.

3.0 EXECUTION

3.1 Instrument Installation

- A. All instruments shall be installed according to the Manufacturer's instructions in addition to the requirements stated herein.
- B. All instruments shall be installed so that accuracy or reliability shall not be impaired due to vibration, pulsation, temperature, or contamination.
- C. All instruments shall be installed so that they are easily accessible for maintenance and inspection. They shall not be located under grating or in any place or manner that would make it difficult or dangerous for personnel to inspect or work on them during operation or shutdown.
- D. Supports
 - 1. Supports shall be as indicated on DWG. 594010-30K-08A.
 - 2. Supports shall be sufficient to maintain the piping in a neat manner.

E. Instrument Piping

Instrument piping shall be routed in a manner so as to provide for its protection during operation and maintenance.

3.2 Checkout

A. General

- 1. Field checkout shall consist of a thorough inspection of components to ensure that they are according to specification, installed correctly, calibrated, and functional. To ensure this status is achieved, the following shall be performed:

Calibration: This should have been completed before start of final checkout. Records should be available to verify that calibration is satisfactory. Calibration

GENERAL REQUIREMENTS - INSTRUMENT INSTALLATION

shall consist of the application of a precision input signal and measurement of the output signal by a precision digital meter or gage. Specifically, the calibration shall verify that the accuracy (input versus output), range linearity, and hysteresis meet the specification and are within the manufacturer's guarantees.

B. Functional Loop Check

1. Competent personnel shall be provided to supervise a function check of instrument systems to ensure a correct installation. This will include local control elements, inputs, outputs, and control room devices including Distributed Control System consoles and accessories.
 - a. Functional testing shall be done by simulation of process conditions at the instrument input.
 - b. The loop shall be functionally checked as needed to verify that every component, mechanical and electrical, is undamaged and functional, verify loop integrity with respect to signal ranges and directions, and direction of action of final control elements. This should be done by simulation of process inputs and outputs by a pressure or electronic source at 0-50-100 percent.
 - c. Continuity Testing, Resistance Testing, and Meggering: These should have been completed before checkout. Records should be available to verify these functions.

4.0 ATTACHMENTS

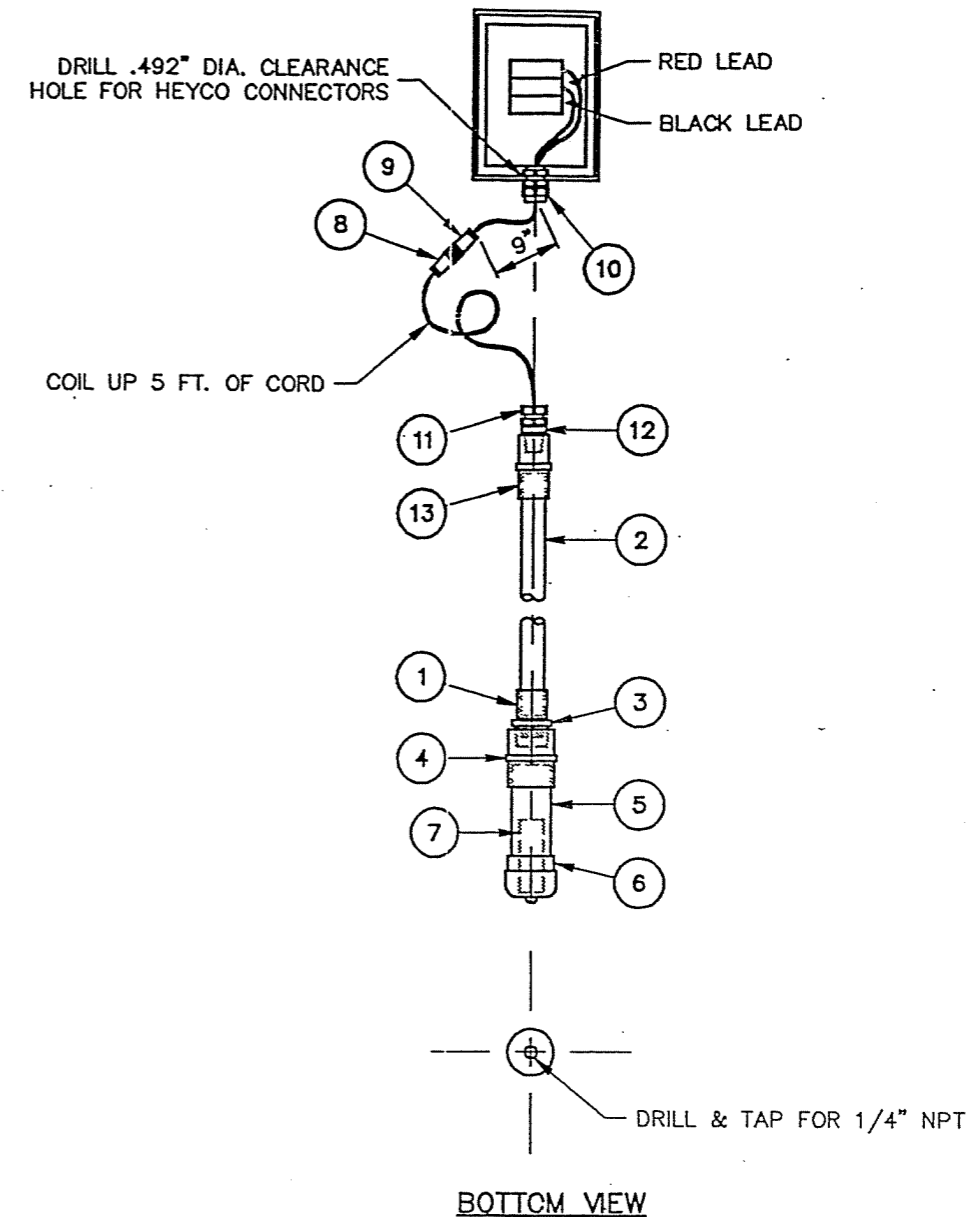
Not Applicable.

END OF SPECIFICATION

ITEM	QTY.	DESCRIPTION	MANUFACTURER	PART/MODEL NUMBER
1	1	3/4" PVC MALE ADAPTER MIPTxSLIP	AMERICAN PIPE	GL No. 34P4OSMA PART No. 436-007
2	AS REQ'D	3/4" SCH. 40 PVC PIPE	AMERICAN PIPE	GL No. 34P40P
3	1	1 1/4"x3/4" PVC THREADED BUSHING, MIPTxFIPT	AMERICAN PIPE	439-167
4	1	1 1/4" PVC FEMALE ADAPTER, SLIPxFIPT	AMERICAN PIPE	435-012
5	4 IN.	1 1/4" SCH. 40 PVC PIPE	AMERICAN PIPE	GL No. 114P40P
6	1	1 1/4" PVC CAP	AMERICAN PIPE	GL No. 114P40SCA
7	1	DISCRIMINATING LIQUID SENSOR WITH 25 FT. OF CABLE	GEMS	156616
8	1	3 PIN MALE CONNECTOR	LUMBERG	RSC3U/7
9	1	3 PIN FEMALE CONNECTOR	LUMBERG	RKC3U/7
10	1	CORD GRIP FITTING STRAIGHT THRU	HEYCO	3444
11	1	CORD GRIP FITTING 1/2" NPT	HEYCO	3800
12	1	3/4"x1/2" PVC THREADED BUSHING MIPTxFIPT	AMERICAN PIPE	439-101
13	1	3/4" PVC FEMALE ADAPTER, SLIPxFIPT	AMERICAN PIPE	435-007

* SUPPLIED BY OCCIDENTAL CHEMICAL CORPORATION (OXY)

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LEAK DETECTION ASSEMBLY DETAIL

N.T.S.

FEB 26 1997

-			-			-			1069ED02.DWG		
Plan Location			Flow Sheet			Equipment No.			File Name		
No.	Revisions	Drwn.	App.	Date	Treatek - CRA™ COMPANY			Drwn. By	Z.M.	Date	01/97
								Dsgn. By	RJS	Date	01/97
								App. By		Date	
						OXY: HYDE PARK PLANT NIAGARA FALLS, NEW YORK					
						BLDG. No.		DWG.		SHT.	
						-		C-11-61334		-	
PROCESS: HYDE PARK REMEDIAL PROGRAM											
ELECTRICAL: LEAK DETECTION ASSEMBLY											

ITEM	QTY.	DESCRIPTION	MANUFACTURER	PART/MODEL NUMBER
1	10 FT	1 1/2" MEDIUM DUTY SLOTTED FIBERGLASS CHANNEL	AICKINSTRUT	20P-1700
2	3	3/4" GLASS REINFORCED POLYURETHANE CHANNEL NUT	AICKINSTRUT	750PU-CNHD
3	3	1/4"x1" REINFORCED POLYURETHANE HEX HEAD BOLT	AICKINSTRUT	250PU-100
4	1	2 1/2" REINFORCED POLYURETHANE 2 HOLE PIPE STRAP	AICKINSTRUT	PS250
5	3	3/8" REINFORCED POLYURETHANE SADDLE CLIP	AICKINSTRUT	200-4226
6	1	CLIC CONDUIT CLAMP	LITCHFIELD INT	NO. 25
7				
8				

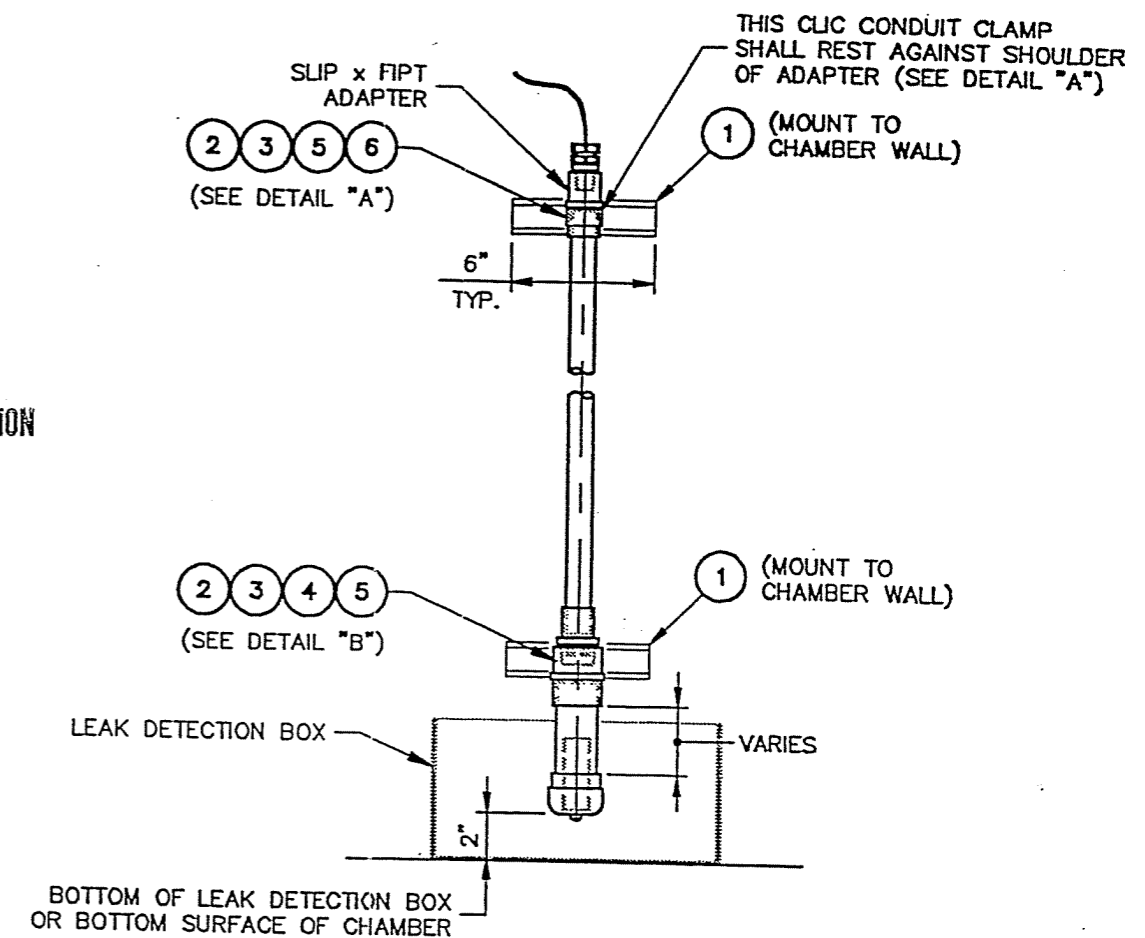
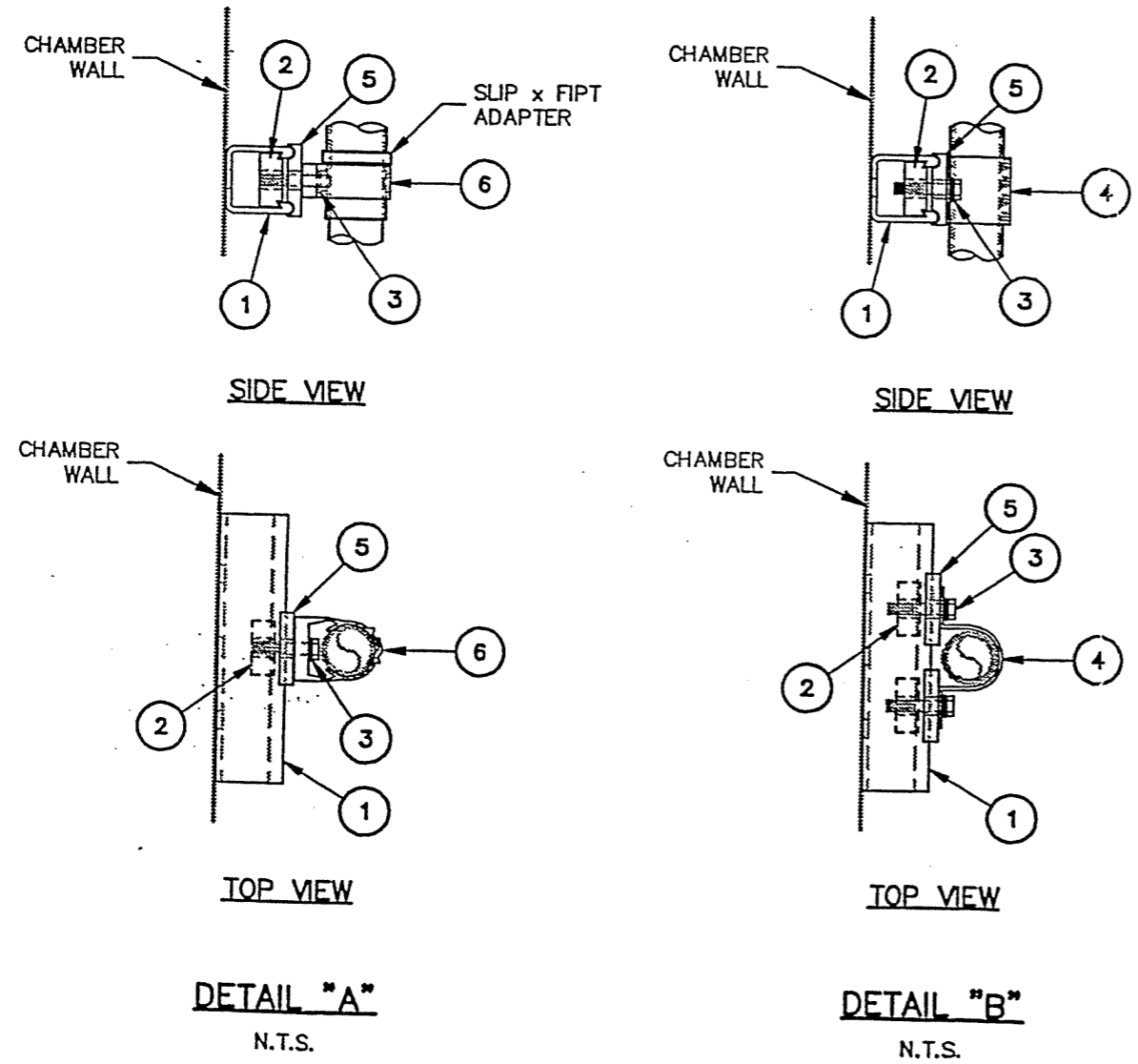
* SUPPLIED BY GLENN SPRINGS HOLDINGS, INC.
 Δ CUT TO LENGTH

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CERTIFIED FOR CONSTRUCTION

MAY 05 1997

TREATEK-CRA



LEAK DETECTION ASSEMBLY MOUNTING

N.T.S.

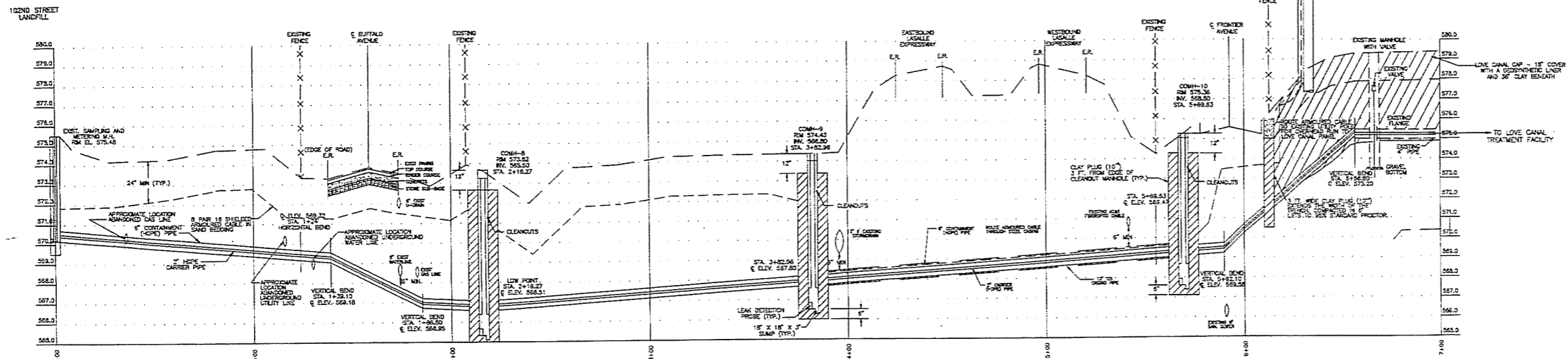
REFERENCE DRAWINGS:

DWG. No. C-11-61334, LEAK DETECTION ASSEMBLY

Plan Location		Flow Sheet		Equipment No.	1069ED03.DWG
No.	Revisions	Drwn.	App.	Date	File Name
Treatek - CRA™ COMPANY					Drwn. By <u>Z.M.</u> Date <u>04/95</u>
					Dsgn. By <u>RJS</u> Date <u>04/95</u>
					App. By <u>TIT</u> Date <u>5/95</u>
OCCIDENTAL PETROLEUM CORPORATION					
NIAGARA FALLS, NEW YORK					
BLDG. No.		DWG.		SHT.	
-		C-11-61339			

PROCESS: HYDE PARK REMEDIAL PROGRAM
 ELECTRICAL: LEAK DETECTION ASSEMBLY MOUNTING DETAIL

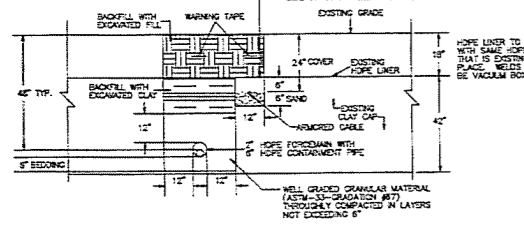
THIS DRAWING INCLUDING THE INFORMATION, DATA AND DESIGN IS THE PROPERTY OF TREATEK - CRA. IT IS NOT TO BE REPRODUCED OR ITS CONTENTS DIVULGED WITHOUT WRITTEN PERMISSION OF TREATEK - CRA



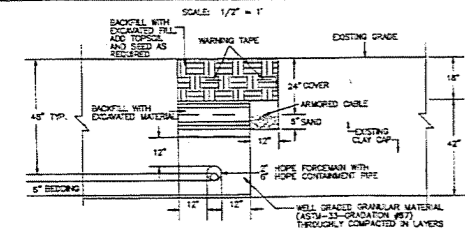
PROFILE - FORCEMAIN FROM METERING AND SAMPLING MH TO LOVE CANAL FACILITY

STA. 0+00 TO STA. 7+00

SCALE: 1" = 20' HORIZONTAL
1" = 2' VERTICAL



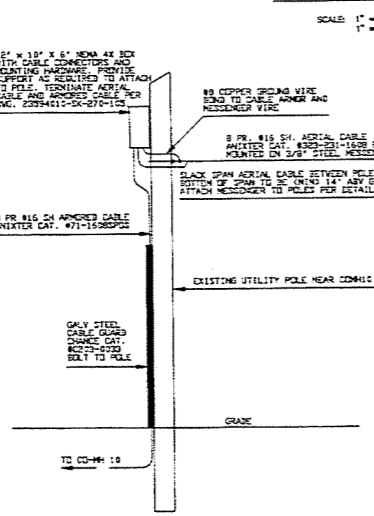
CROSS SECTION OF NEW FORCEMAIN AT LOVE CANAL



CROSS SECTION OF NEW FORCEMAIN

SCALE: 1/2" = 1'

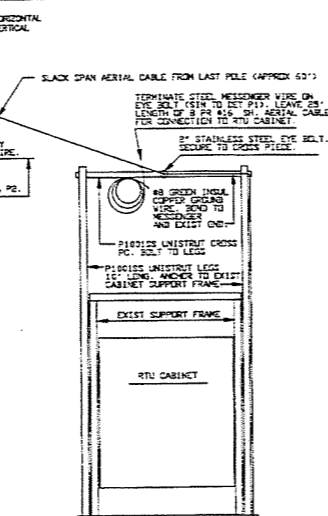
NOTE: FOR TRENCHING ACROSS BUFFALO AVENUE AND FRONTIER AVENUE
SEE PAVING RESTORATION DETAIL ON 30K-05A FOR REPLACEMENT.



ARMORED TO AERIAL CABLE DETAIL

SEE NOTE 1

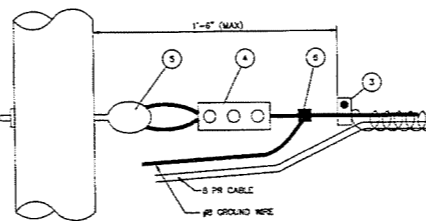
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AERIAL CABLE TO EXISTING RTU

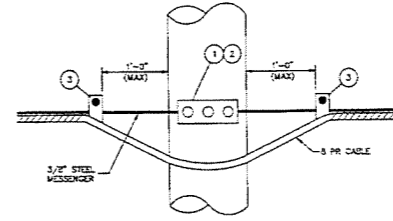
SEE NOTE 1

SCALE: NONE



DETAIL P1

SCALE: NONE



DETAIL P2

SCALE: NONE

BILL OF MATERIAL (DETAILS P1 & P2)	
ITEM	DESCRIPTION
1	3 BOLT STRAIGHT SUSPENSION CLAMP W/ BOLTS AND NUTS CHANGE CAT #7003 OR EQUAL
2	THROUGH BOLT 5/8" DIA W/NUT, WASHER & SPACER LENGTH TO SUIT CHANGE CAT #8004 (LENGTH) OR EQUAL
3	LASING WIRE CLAMP W/ BOLTS, NUTS AND WASHERS CHANGE CAT #8000 OR EQUAL
4	3 BOLT GUY CLAMP W/ BOLTS AND NUTS CHANGE CAT #8001 OR EQUAL
5	THIMBLE BOLT 5/8" DIA W/ NUT AND WASHER LENGTH TO SUIT CHANGE CAT #8004 (LENGTH) OR EQUAL
6	BURNETT UNIVERSAL PARALLEL CLAMP CAT #A0000-1 OR EQUAL

NOTES

- ALL ELECTRICAL WORK SHALL COMPLY WITH THE LATEST EDITIONS OF THE NATIONAL ELECTRICAL CODE, THE NATIONAL ELECTRICAL SAFETY CODE AND LOCAL ORDINANCES HAVING JURISDICTION.



REV	DATE	REVISION DESCRIPTION	DESIGNER	CHECKED	DATE	REVISION DESCRIPTION	DESIGNER	CHECKED	DATE
1	1/18/98	ISSUED FOR CIVIL PACKAGE CONSTRUCTION							
2	1/18/98	ADDED ELECTRICAL DETAILS							
3	1/18/98	REVISED PER AGENCIES COMMENTS							

FLUOR DANIEL

DESIGNED BY: C. J. PAN
 CHECKED BY: C. BARR
 DRAWN BY: C. BARR
 DATE: 1/18/98

PROJECT: 594000-102PROF

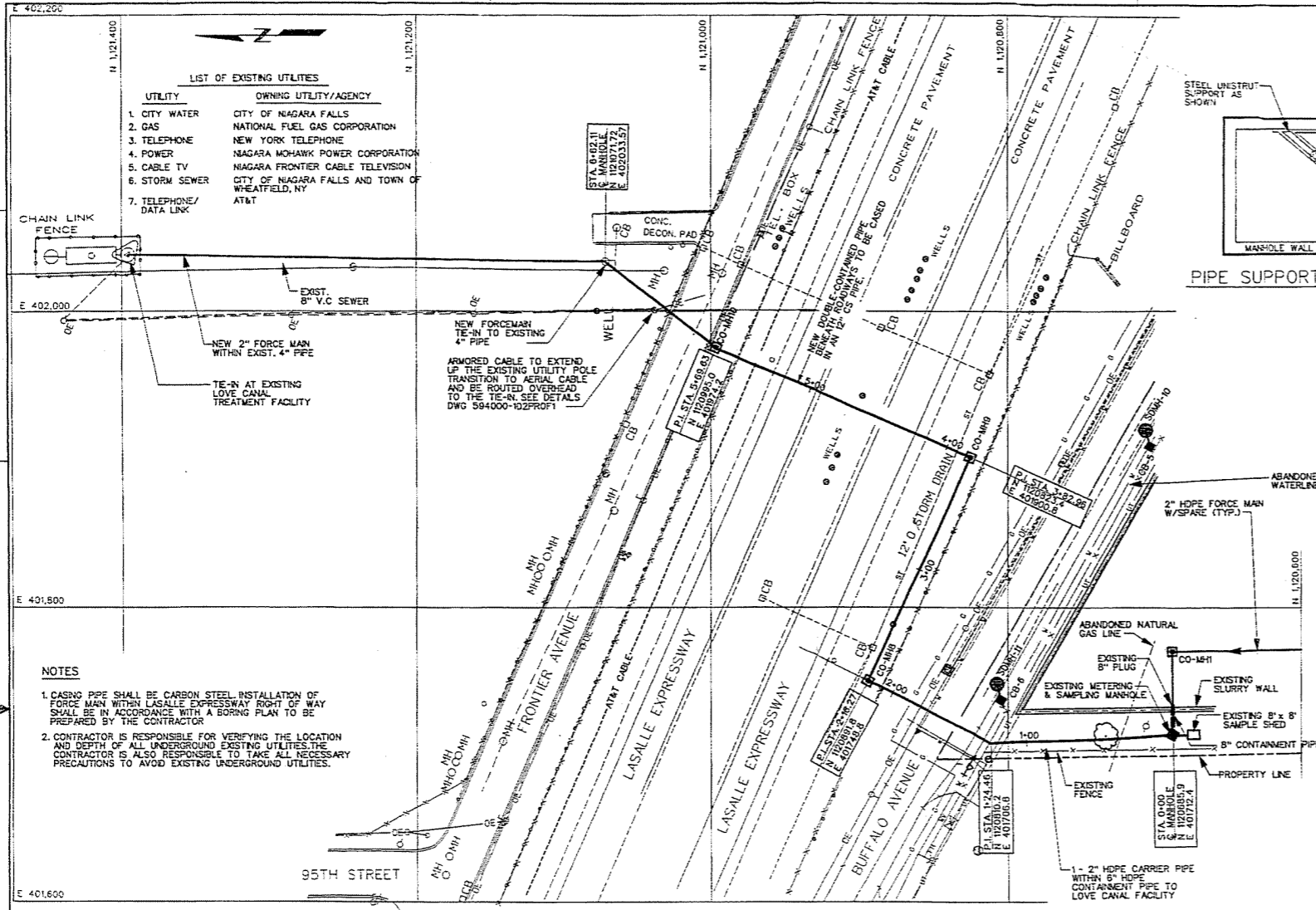
DATE: 12/17/97

SCALE: AS NOTED

NO. 3

LIST OF EXISTING UTILITIES

UTILITY	OWNING UTILITY/AGENCY
1. CITY WATER	CITY OF NIAGARA FALLS
2. GAS	NATIONAL FUEL GAS CORPORATION
3. TELEPHONE	NEW YORK TELEPHONE
4. POWER	NIAGARA MOHAWK POWER CORPORATION
5. CABLE TV	NIAGARA FRONTIER CABLE TELEVISION
6. STORM SEWER	CITY OF NIAGARA FALLS AND TOWN OF WHEATFIELD, NY
7. TELEPHONE/ DATA LNK	AT&T

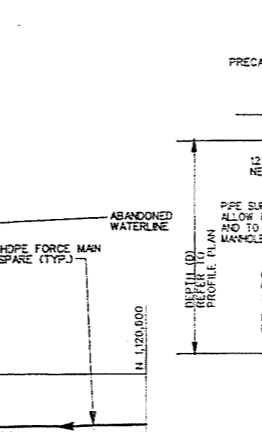


NOTES:

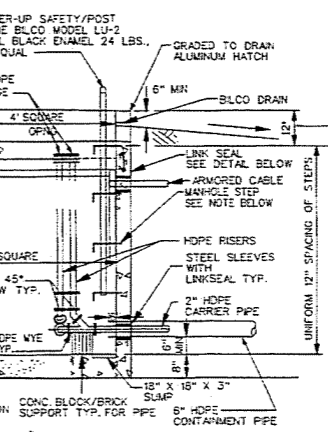
- CASING PIPE SHALL BE CARBON STEEL. INSTALLATION OF FORCE MAIN WITHIN LASALLE EXPRESSWAY RIGHT OF WAY SHALL BE IN ACCORDANCE WITH A BORING PLAN TO BE PREPARED BY THE CONTRACTOR.
- CONTRACTOR IS RESPONSIBLE FOR VERIFYING THE LOCATION AND DEPTH OF ALL UNDERGROUND EXISTING UTILITIES. THE CONTRACTOR IS ALSO RESPONSIBLE TO TAKE ALL NECESSARY PRECAUTIONS TO AVOID EXISTING UNDERGROUND UTILITIES.

FORCE MAIN TO LOVE CANAL ROUTING PLAN
SCALE: NONE

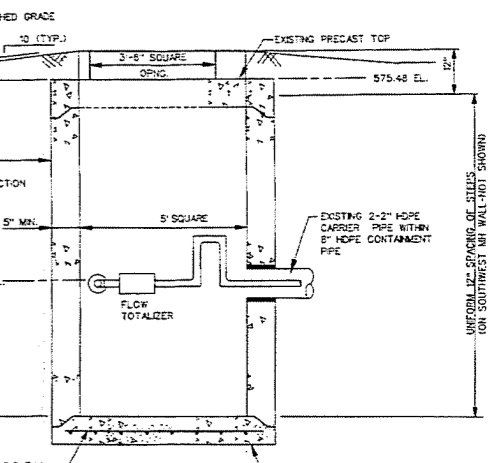
PIPE SUPPORT DETAIL



PLAN VIEW



PLAN



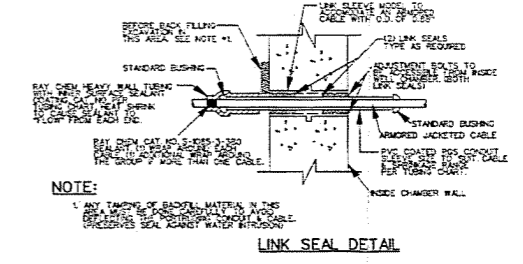
EXISTING METER AND SAMPLING MANHOLE DETAIL
(L&K, NORTHEAST)
N.T.S.

NOTES:

- OPENINGS FOR PIPE IN PRECAST MANHOLE SHALL BE PERFORMED BY THE CONTRACTOR. THE CONTRACTOR SHALL FURNISH THE FABRICATOR WITH ANGLES BETWEEN CENTER LINES, THE INVERT ELEVATIONS AND SIZE OF ALL PIPES. HOLES SHALL BE SIZED TO ACCOMMODATE LINK SEALS.
- MANHOLE STEPS SHALL BE NEENAH R-1982W, ALUMINUM OR APPROVED EQUAL.
- PRECAST REINFORCED CONCRETE CHAMBER SHALL CONFORM TO ASTM C478.
- CAST STEEL SLEEVES INTO MANHOLE WALLS.
- CLEANOUT MANHOLES SHALL BE PRECAST IN ONE PIECE, COATED WITH WATERPROOF SEAL.

SECTION
SCALE: NONE
(REF. DWG. 10U-07)

INLINE CLEANOUT MANHOLE DETAIL
COMH-8 COMH-9 COMH-10



NOTE:

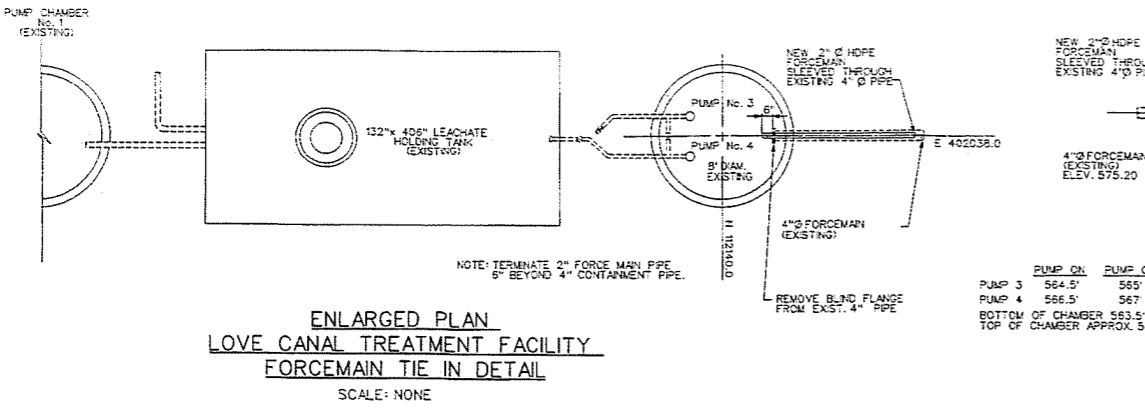
1. ANY TRACING OF BASED MATERIAL IN THIS DETAIL SHALL BE REMOVED TO EXPOSE ALL SURFACES. PRESERVE SEAL AGAINST WATER INGRESS.

RAY CHEM TUBING CHART

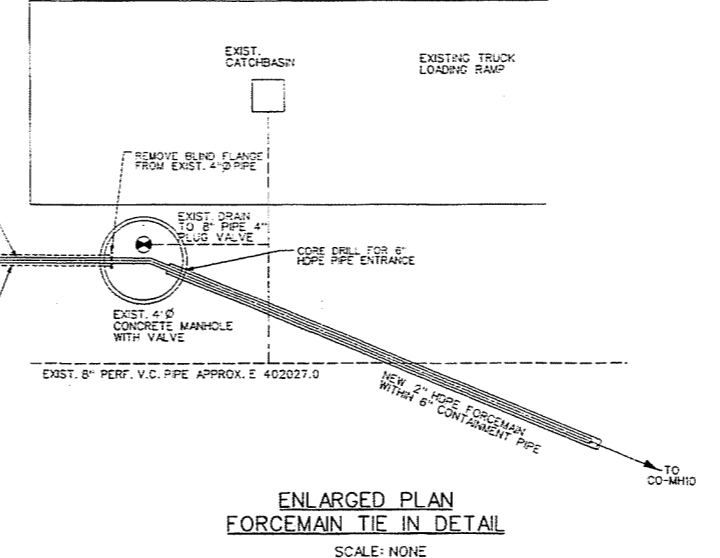
DETAIL NUMBER	SIZE	LENGTH
COMH-8	6" DIA	10'-0"
COMH-9	6" DIA	10'-0"
COMH-10	6" DIA	10'-0"
COMH-11	6" DIA	10'-0"
COMH-12	6" DIA	10'-0"
COMH-13	6" DIA	10'-0"
COMH-14	6" DIA	10'-0"
COMH-15	6" DIA	10'-0"
COMH-16	6" DIA	10'-0"
COMH-17	6" DIA	10'-0"
COMH-18	6" DIA	10'-0"
COMH-19	6" DIA	10'-0"
COMH-20	6" DIA	10'-0"
COMH-21	6" DIA	10'-0"
COMH-22	6" DIA	10'-0"
COMH-23	6" DIA	10'-0"
COMH-24	6" DIA	10'-0"
COMH-25	6" DIA	10'-0"
COMH-26	6" DIA	10'-0"
COMH-27	6" DIA	10'-0"
COMH-28	6" DIA	10'-0"
COMH-29	6" DIA	10'-0"
COMH-30	6" DIA	10'-0"

PAVEMENT RESTORATION DETAIL
(BUFFALO AVENUE & FRONTIER AVENUE)

- NOTES:** TAKEN FROM CITY OF NIAGARA FALLS PAVEMENT RESTORATION STANDARD SPECIFICATIONS.
- SAW-CUT ALL EDGES OF PAVEMENT & BASE TO FULL DEPTH IN ONE PASS.
 - CRACKS EXPOSED TO ALL EXPOSED MATERIAL SHALL BE REPAIRED WITH A REPAIR MIXTURE APPLICABLE TO THE TYPE OF PAVEMENT AND DEPTH OF CRACKS.
 - CRACKS IN PAVEMENT SHALL BE REPAIRED WITH A REPAIR MIXTURE APPLICABLE TO THE TYPE OF PAVEMENT AND DEPTH OF CRACKS.



ENLARGED PLAN LOVE CANAL TREATMENT FACILITY FORCEMAIN TIE IN DETAIL
SCALE: NONE



ENLARGED PLAN FORCEMAIN TIE IN DETAIL
SCALE: NONE

REV.	DATE	REVISION DESCRIPTION	DES. OR.	APPROVED	REV. DATE	REVISION DESCRIPTION	DES. OR.	APPROVED	DWG. NO.	REFERENCE DRAWINGS	DWG. NO.	REFERENCE DRAWINGS
0	02/20/00	ISSUED FOR APPROVAL	GZK						594010-10U-07	FORCE MAIN ROUTING PLAN		
1	02/20/00	REVISED PER OXYS 12/1/97 COMMENTS							594000-30K-08	APL COLLECTION SYSTEM SECTIONS AND DETAILS		
2	4/15/98	ISSUED FOR CIVIL PACKAGE CONSTRUCTION										
3	01/13/98	REVISED PER AGENCIES COMMENTS										

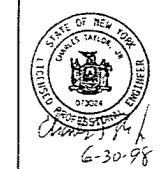


OXYCHEM/OLIN REMEDIAL DESIGN
102nd STREET LANDFILL SITE
NIAGARA FALLS, NEW YORK

FORCE MAIN FROM MET/SAMP MH TO L.C. FACILITY PLAN & DETAILS

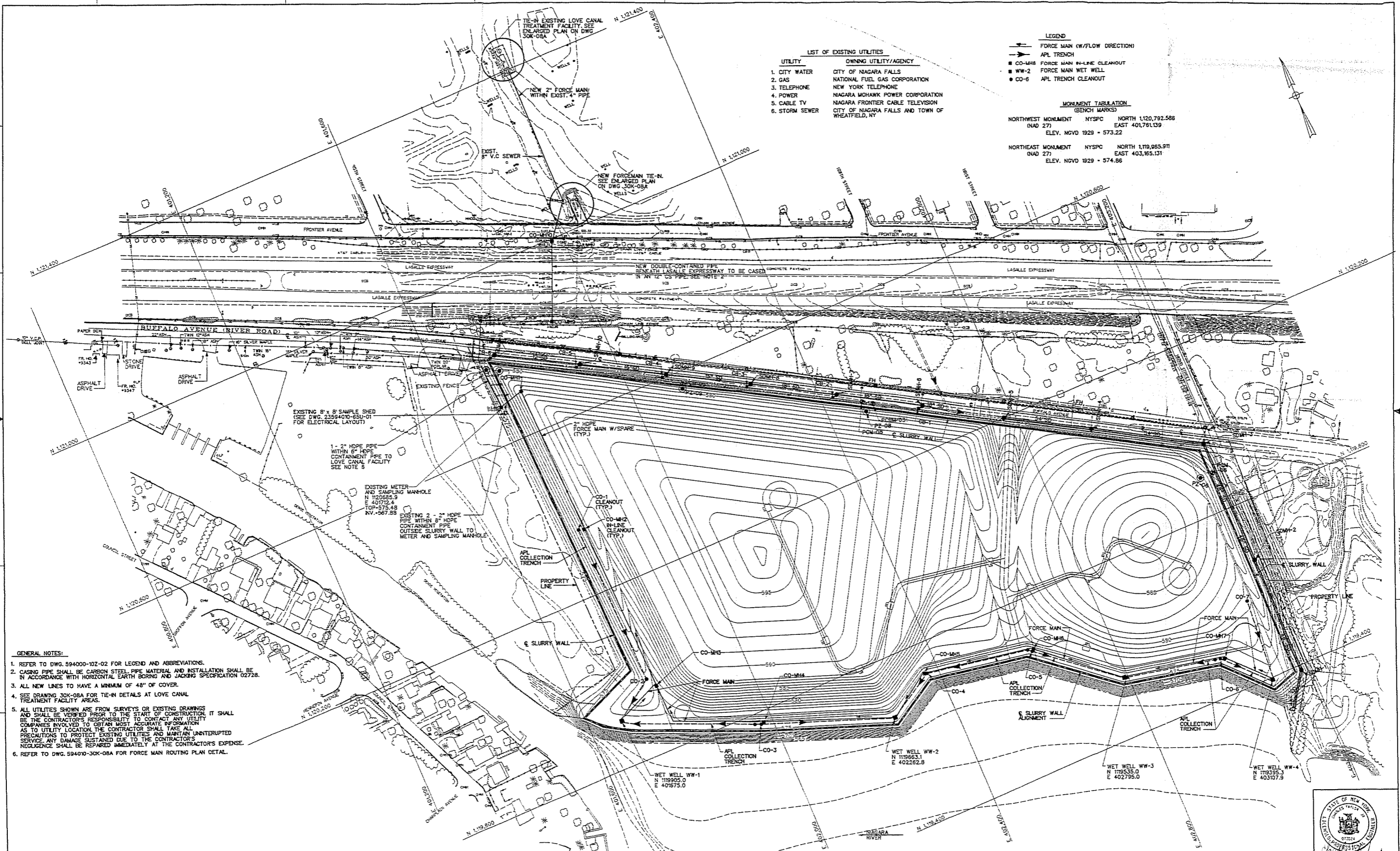
594010-30K-08A

DATE: 6-30-98



DESIGNED BY	G. KURTLE	CHECKED BY	C. MARS
DATE		DATE	
PROJECT	OXYCHEM/OLIN	DATE	
SCALE	AS NOTED	DATE	

SUB-CONTRACT PING. WORK PKG. DIST. CODE. 10



- LIST OF EXISTING UTILITIES**
- | UTILITY | OWNING UTILITY/AGENCY |
|----------------|--|
| 1. CITY WATER | CITY OF NIAGARA FALLS |
| 2. GAS | NATIONAL FUEL GAS CORPORATION |
| 3. TELEPHONE | NEW YORK TELEPHONE |
| 4. POWER | NIAGARA MOHAWK POWER CORPORATION |
| 5. CABLE TV | NIAGARA FRONTIER CABLE TELEVISION |
| 6. STORM SEWER | CITY OF NIAGARA FALLS AND TOWN OF WHEATFIELD, NY |

- LEGEND**
- > FORCE MAIN (W/FLOW DIRECTION)
 - APL TRENCH
 - CO-1/4/8 FORCE MAIN IN-LINE CLEANOUT
 - WW-2 FORCE MAIN WET WELL
 - CO-6 APL TRENCH CLEANOUT

MONUMENT TABULATION (BENCH MARKS)

NORTHWEST MONUMENT (NAD 27)	NYSFC	NORTH 1,120,792.586	EAST 401,761.139	ELEV. NGVD 1929 = 573.22
NORTHEAST MONUMENT (NAD 27)	NYSFC	NORTH 1,119,955.911	EAST 403,653.131	ELEV. NGVD 1929 = 574.86

- GENERAL NOTES:**
- REFER TO DWG. 594000-102-02 FOR LEGEND AND ABBREVIATIONS.
 - CASING PIPE SHALL BE CARBON STEEL PIPE MATERIAL AND INSTALLATION SHALL BE IN ACCORDANCE WITH HORIZONTAL EARTH BORING AND JACKING SPECIFICATION 02728.
 - ALL NEW LINES TO HAVE A MINIMUM OF 48" OF COVER.
 - SEE DRAWING 30K-08A FOR TIE-IN DETAILS AT LOVE CANAL TREATMENT FACILITY AREAS.
 - ALL UTILITIES SHOWN ARE FROM SURVEYS OR EXISTING DRAWINGS. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO CONTACT ANY UTILITY COMPANIES INVOLVED TO OBTAIN MOST ACCURATE INFORMATION AS TO UTILITY LOCATION. THE CONTRACTOR SHALL TAKE ALL PRECAUTIONS TO PROTECT EXISTING UTILITIES AND MAINTAIN UNINTERRUPTED SERVICE. ANY DAMAGE SUSTAINED DUE TO THE CONTRACTOR'S NEGLIGENCE SHALL BE REPAIRED IMMEDIATELY AT THE CONTRACTOR'S EXPENSE.
 - REFER TO DWG. 594010-30K-08A FOR FORCE MAIN ROUTING PLAN DETAIL.



REV.	DATE	REVISION DESCRIPTION	DES. CHK.	APPROVED	REV.	DATE	REVISION DESCRIPTION	DES. CHK.	APPROVED	DWG NO.	REFERENCE DRAWINGS	DWG NO.	REFERENCE DRAWINGS
A	10/20/07	ISSUED FOR REVIEW	GZK		4	10/19/07	ISSUED FOR CIVIL PACKAGE CONSTRUCTION			594000-30K-08C	APL WELL DETAILS		
B	10/20/07	REVISED SANITARY SEWER GRAVITY LINE AND APL FORCE MAIN	GZK		5	10/24/07	REVISED PER AGENCIES COMMENTS			594000-30K-08	APL COLLECTION SYSTEM SECTIONS AND DETAILS		
D	10/20/07	ISSUED FOR APPROVAL	GZK							594010-30K-08A	FORCE MAIN DETAILS		
1	10/20/07	ISSUED FOR CLIENT REVIEW	MCC										
2	10/25/07	NEW LINE REROUTED TO LOVE CANAL TREATMENT FACILITY	MCC										
3	10/27/07	NEW LAYOUT OF FORCE MAIN											

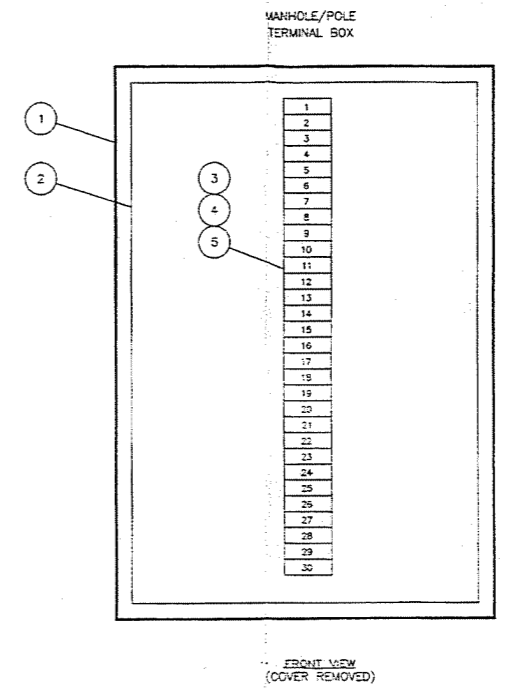
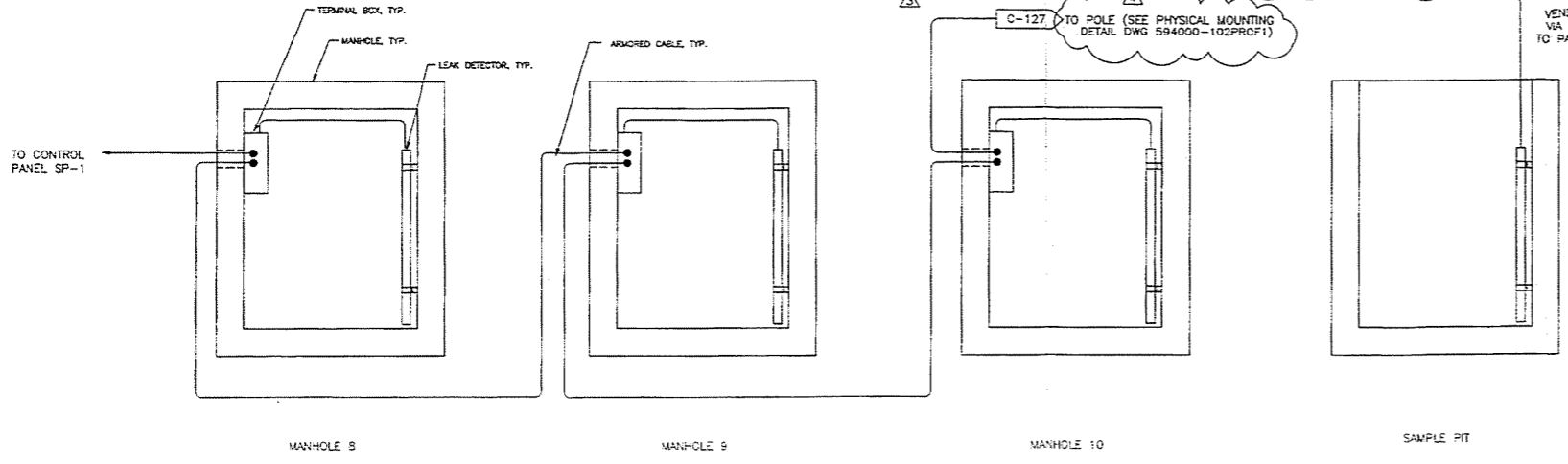


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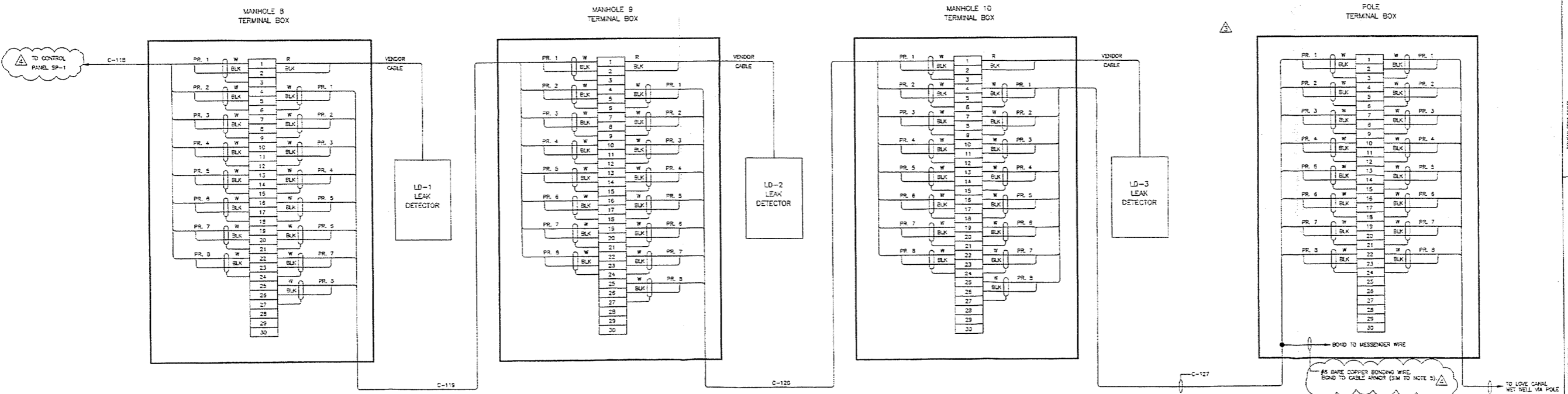
DESIGNED BY	G. KURYLLEC
CHECKED BY	C. WARS
SUPERVISOR	C. WARS
LEAD ENGINEER	C. TAYLOR
PROJECT	C. WARS
CLIENT	OXYCHEM/OLIN

OXYCHEM/OLIN REMEDIAL DESIGN 102nd STREET LANDFILL SITE NIAGARA FALLS, NEW YORK	
FORCE MAIN ROUTING PLAN	
SCALE	1"=80'
DWG NO.	594010-10U-07
SHEET NO.	5

ITEM	QUANTITY	DESCRIPTION	MANUFACTURER	MODEL NO.
1	3	FIBERGLASS ENCLOSURE, NEMA 4X 12" X 10" X 6"	HOFFMAN	A-1210BCHORFG
2	3	SUB-PANEL 10.75' X 8.88'	HOFFMAN	A-12P10
3	120	TERMINAL BLOCK	ALLEN-BRADLEY	1492-W6
4	5	MOUNTING RAIL	ALLEN-BRADLEY	199-DR1
5	10	END BARRIERS	ALLEN-BRADLEY	1492-EB6



- NOTES:**
1. WHEN INSTALLED, TIP OF PROBE SHALL BE 1/4" FROM BOTTOM OF MANHOLE.
 2. SEE ATTACHMENTS 1 & 2 IN SPECIFICATION 70002 FOR ASSEMBLY AND MOUNTING DETAILS FOR LEAK DETECTOR INSTALLATION.
 3. CORE BORE A SUFFICIENT SIZE OPENING IN MANHOLE WALL FOR ARMORED CABLE INSTALLATION.
 4. TO COMPLETE CABLE INSTALLATION, SEAL BORE OPENING AROUND CABLE(S) WITH A COMMERCIAL WATERPROOF SEALANT.
 5. ARMORED CABLES ENTERING TERMINAL BOXES SHALL BE BONDED WITH #12 GROUND WIRE USING CROUSE-HENDS TYPE "TMC" CONNECTORS WITH GROUND BUSHINGS OF ENGINEERING APPROVED EQUAL. THIS WILL PERMIT A CONTINUOUS GROUND UTILIZING THE CABLE ARMORED JACKET.



REV	DATE	REVISION DESCRIPTION	DESIGNER	APPROVED	CHK	DATE	REVISION DESCRIPTION	DESIGNER	APPROVED	CHK	DATE
0	1/24/97	ISSUED FOR APPROVAL									
1	1/27/97	GENERAL SCOPE CHANGE									
2	1/27/97	ISSUED FOR CONSTRUCTION									
3	3/1/98	REVISED CABLE TO WET WELL									
4	6/24/98	REVISED PER AGENCY COMMENTS									

FLUOR DANIEL

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OXYCHEM/QUIN - REMEDIAL DESIGN
102nd STREET LANDFILL SITE
NIAGARA FALLS, NEW YORK

MANHOLES 8, 9 & 10 & SAMPLE PIT WR.DIAG.