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**OPERABLE UNIT 4 CERTIFIED FOR CONSTRUCTION REMEDIAL DESIGN  
PACKAGE - SITE PREPARATION/UNDERGROUND UTILITIES FOR  
FERNALD RESIDUES VITRIFICATION PLANT**

11/22/95

DOE-0232-96  
DOE-FN EPAS  
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DESIGN



Department of Energy  
Fernald Environmental Management Project  
P. O. Box 398705  
Cincinnati, Ohio 45239-8705  
(513) 648-3155

NOV 22 1995  
DOE-0232-96

Mr. James A. Saric, Remedial Project Director  
U.S. Environmental Protection Agency  
Region V - 5HSF-5J  
77 W. Jackson Boulevard  
Chicago, Illinois 60604-3590

Mr. Tom Schneider, Project Manager  
Ohio Environmental Protection Agency  
401 East 5th Street  
Dayton, Ohio 45402-2911

Dear Mr. Saric and Mr. Schneider:

**OPERABLE UNIT 4 CERTIFIED FOR CONSTRUCTION REMEDIAL DESIGN PACKAGE - SITE PREPARATION/UNDERGROUND UTILITIES FOR FERNALD RESIDUES VITRIFICATION PLANT**

- References:
1. Letter, James A. Saric to Jack R. Crag, "Approval of the OU4 Pre-Final Remedial Design Package for Site Preparation/Underground Utilities for Fernald Residues Vitrification Plant," dated October 12, 1995.
  2. Letter, Thomas A. Schneider to Johnny Reising, "Approval - OU4 Pre-Final Design Site Preparation/Underground Utilities," dated October 10, 1995.

In accordance with the requirements of the "Final Work Plan for the Operable Unit 4 Remedial Design," Revision 0, dated May 1995, enclosed is the "uncontrolled" copy of the subject Certified For Construction (CFC) Design Package which consists of the design drawings and specifications.

Note, while the Site Preparation/Underground Utilities Pre-Final Design Package was under review at the U.S. Environmental Protection Agency (U.S. EPA) and the Ohio Environmental Protection Agency (OEPA), the construction planning effort was initiated. Several modifications to the approved Pre-Final Design Package have since resulted and are incorporated into this CFC package. These modifications are primarily related to providing the necessary support facilities to accommodate Fernald Residues Vitrification Plant construction. A summary of these changes is provided in the enclosure.

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If you should have any questions concerning this transmittal or require additional information, please contact Randi Allen at (513) 648-3102, or Nina Akgunduz at (513) 648-3110.

Sincerely,

  
Johnny W. Reising  
Fernald Remedial Action  
Project Manager

FN:Allen

Enclosure: As Stated

cc w/enc:

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EXPLANATION OF SP/PU PRE-FINAL TO CFC MODIFICATIONS

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ITEM	PRE-FINAL PACKAGE	CERTIFIED FOR CONSTRUCTION	EXPLANATION OF MODIFICATIONS
1. Process Water (TW)	DWG. 94X-5900-G-00898 R.I.V. B: TW pipeline was north of the FRVP footprint tying into existing 3" TW within K-65 trench.	TW pipeline relocated parallel with SN-4" and FOI-8" southeast of FRVP footprint. TW pipeline ties into existing 4" TW located northeast of Building 51.	<ol style="list-style-type: none"> <li>1. Establishes a Centralized Utility Corridor to the FRVP.</li> <li>2. Avoids possible schedule delays due to construction in and around the potentially contaminated K-65 trench.</li> </ol>
2. Electrical Duct Bank	DWG. 94X-5900-G-00898 REV B: Duct Bank was north of the FRVP footprint tying into existing Elect. Manhole 247.	Duct Bank relocated parallel with SN-4" and FOI-8" southeast of FRVP footprint.	<ol style="list-style-type: none"> <li>1. Establishes a Centralized Utility Corridor to the FRVP.</li> <li>2. Allows the decision of future tie-in to existing site electrical source (as shown in drawings) OR a future FEMF substation to be located southwest of Building 51 to be made at a later date. Present design allows for the greatest flexibility in the decision-making process for the future source of FRVP electric.</li> </ol>
3. Survey Monuments #101 and #102	DWG. 94X-5900-G-00899 REV B: #101 was northwest and #102 was northeast of FRVP footprint at the K-65 trench.	#101 relocated south of Silo 1. #102 relocated south of High Nitrate Storage Tank 18M.	<ol style="list-style-type: none"> <li>1. Avoids the installation of monuments within the potentially contaminated soils in the proximity of the K-65 trench.</li> <li>2. Locations of monuments are within areas that will not be disturbed during construction activities.</li> </ol>
4. Temporary Trailer Complex w/ Assoc. Utilities	Not Present	DWG. 94X-5900-G-00899: Trailer Complex and support utilities located south of High Nitrate Storage Tank 18M.	<ol style="list-style-type: none"> <li>1. Added due to Construction Planning. Provides trailers to replace existing Verification Pilot Plant (VITPP) trailers presently located within the FRVP footprint and new trailers to support FRVP construction and VITPP operation.</li> <li>2. Utilities to the Trailer Complex including potable water, fire protection, electric, communications, sanitary sewer, storm sewer.</li> </ol>
5. Sanitary Lift Station	DWG. 94X-5900-G-00898 REV B: Point No. 33, Wet well was to be installed and Lift Station to be installed at later date.	Lift Station to be installed under this package to support Trailer Complex.	<ol style="list-style-type: none"> <li>1. Added to accommodate the Toilet Trailer within the Trailer Complex.</li> </ol>
6. Construction Access Roadway	Not Present	DWG. 94X-5900-G-00899: Roadway to provide access to Trailer Complex and construction laydown areas to support future silo superstructure and FRVP construction.	<ol style="list-style-type: none"> <li>1. Added to provide access to the Trailer Complex and future construction laydown areas to support silo superstructure and FRVP construction.</li> <li>2. Two TW tees, valves, and blind flanges are provided for possible future design of decontamination washdown pads on either side of the OU2 Haul Road to be constructed during the OU2 Haul Road construction.</li> </ol>
7. Walkway over future OU2 Haul Road	Not Present	DWG. 94X-5900-G-00899: Future pedestrian walkway located for OU4 access.	<ol style="list-style-type: none"> <li>1. Proposed future walkway located for installation during the OU2 Haul Road construction.</li> </ol>

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**Site Preparation/Underground Utilities  
Fernald Residues Vitrification Plant  
Performance Specifications**

**Operable Unit 4  
Project Order 146  
WBS No. 1.1.1.1.4.3  
November 1995  
Revision 0**

**Environmental Remedial Action Project  
Fernald Environmental Management Project  
Fernald, Ohio  
FERMCO Subcontract No. 2-21487**

**CDC/UNCONTROLLED**



**Fairfield Executive Center  
6120 South Gilmore Road  
Fairfield, Ohio 45014**

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**Site Preparation/Underground Utilities  
Fernald Residues Vitrification Plant  
Performance Specifications**

**Operable Unit 4  
Project Order 146  
WBS No. 1.1.1.1.4.3  
November 1995  
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Fernald Environmental Management Project  
Fernald, Ohio  
FERMCO Subcontract No. 2-21487**



**Fairfield Executive Center  
6120 South Gilmore Road  
Fairfield, Ohio 45014**

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## U.S. DEPARTMENT OF ENERGY

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT  
FERMCO SUBCONTRACT NO. 2-21487PROJECT ORDER 146  
WBS NO. 1.1.1.1.4.3  
PERFORMANCE SPECIFICATIONS  
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## DIVISION 1 - (NOT USED)

## DIVISION 2 - SITE WORK

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02300	BORING AND JACKING	0	11/22/95
02511	ASPHALTIC CONCRETE PAVING	0	11/22/95
02600	STORM DRAINAGE	0	11/22/95
02667	WATER LINES	0	11/22/95
02675	DISINFECTION OF WATER DISTRIBUTION SYSTEMS	0	11/22/95
02700	SANITARY	0	11/22/95
02730	DUPLEX FACTORY-BUILT SEWAGE LIFT STATION	0	11/22/95
02770	STORMWATER MANAGEMENT (SWM) BASIN	0	11/22/95
02830	CHAIN LINK FENCES	0	11/22/95
02900	SEEDING	0	11/22/95

## DIVISION 3 - CONCRETE

03001	CONCRETE	0	11/22/95
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16118	UNDERGROUND DUCTBANKS, DUCT, AND MANHOLES	0	11/22/95
16170	GROUNDING AND BONDING	0	11/22/95
16370	OVERHEAD POWER DISTRIBUTION	0	11/22/95
16720	FIRE AND EVACUATION ALARM SYSTEMS	0	11/22/95
16855	HEATING CABLES	0	11/22/95

**END OF SECTION**

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**SECTION 02200  
EARTHWORK**

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Site grading.
- B. Excavating.
- C. Backfilling and compacting.
- D. Landscape grading.
- E. Redistribution of topsoil.
- F. Sampling and testing.
- G. Trenching for utilities.
- H. Soil and aggregate materials.
- I. Remove surface debris and paving.
- J. Clear and grub site affected by construction.
- K. Dust control.

**1.2 RELATED SECTIONS**

- A. Section 02300 - Boring and Jacking.
- B. Section 02600 - Storm Drainage.
- C. Section 02667 - Water Lines.
- D. Section 02700 - Sanitary.
- E. Section 02720 - Stormwater Management Basin.
- F. Section 02830 - Chain Link Fences.

- G. Section 02900 - Seeding.
- H. Section 16118 - Underground Ductbanks, Ducts, and Manholes.

**1.3 REFERENCE DRAWINGS**

- A. See Section 01011 for the Schedule of Drawings.

**1.4 REFERENCES**

- A. American Society for Testing and Materials (ASTM):
  1. ASTM C136-92 Standard Method for Sieve Analysis of Fine and Coarse Aggregates.
  2. ASTM D422-63 Standard Test Method for Particle-Size Analysis of Soils (reapproved 1990).
  3. ASTM D698-91 Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup>) (600 kN-m/m<sup>3</sup>).
  4. ASTM D1556-90 Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
  5. ASTM D2487-92 Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System).
  6. ASTM D2922-91 Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
  7. ASTM D3017-88 Standard Test Methods for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).
- B. State of Ohio, Department of Transportation (ODOT), Construction and Materials Specifications, January 1, 1995.
  1. ODOT 200 Earthwork.
  2. ODOT 203 Roadway Excavation and Embankment.
  3. ODOT 207 Temporary Soil Erosion and Sediment Control.
  4. ODOT 304 Aggregate Base.

- C. Fernald Environmental Restoration Management Corporation (FERMCO) Procedures:
1. EP-0003 Unexpected Discovery of Cultural Resources.

## 1.5 SUBMITTALS

- A. Provide submittals as required by Section 01010.
- B. Material suppliers shall be required to certify that supplied materials meet specifications prior to use.
- C. Submit name and address of soil testing laboratory for approval.
- D. Dewatering plan, if needed, shall be submitted for review prior to dewatering activities.
- E. Traffic control plan with details of the type of barricades, signs, and other material to be used.

## 1.6 QUALITY ASSURANCE

- A. Unless noted otherwise, all work shall be done in accordance with ODOT Section 200.

## PART 2 PRODUCTS

### 2.1 MATERIALS

- A. Every effort shall be made to re-use surplus materials generated by the project before importing material from off site.
- B. Subsoil Type S1: Excavated and re-used material; graded; free of lumps larger than 3 inches, rocks larger than 2 inches, and debris; conforming to ASTM D2487 Group Symbol CL, ML, CH.
- C. Subsoil Type S2: Imported material; graded; free of lumps larger than 3 inches, rocks larger than 2 inches, and debris; conforming to ASTM D2487 Group Symbol CL, ML, SC.

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- D. Topsoil Type S3: Excavated and re-used material; graded; free of roots, rocks larger than 1/2 inch, subsoil, debris, weeds, and foreign matter not suitable for subsequent seeding operations and maintenance; conforming to ASTM D2487 Group Symbol OH.
- E. Coarse Aggregate Type A2: Conforming to ODOT Item 304:
1. The aggregate shall be crushed carbonate, crushed gravel, crushed air-cooled slag, granulated slag, admixture of crushed and granulated slag, or other types of suitable materials meeting the requirements of this item. Crushed carbonate stone or mixtures of crushed and granulated slags shall meet the following gradation requirements:

Sieve Size	Percent Passing
2 inches	100
1 inch	70-100
3/4 inch	50-90
No. 4	30-60
No. 30	7-30
No. 200	0-13

- F. Fine Aggregate Type A3: Sand - natural river or bank sand; washed; free of silt, clay, loam, friable or soluble materials, and organic matter; graded in accordance with ASTM C136 and D2487; within the following limits:

Sieve Size	Percent Passing
No. 4	90-100
No. 50	7-40
No. 200	0-10

- G. Dust control materials shall be nonhazardous. Water shall be potable.

**PART 3 EXECUTION****3.1 PREPARATION**

- A. The Subcontractor is responsible for all earthwork layout.
  - 1. FERMC0 will provide two horizontal and vertical control points, which shall be verified by the Subcontractor prior to starting work.
  - 2. The Subcontractor shall take necessary precautions to protect control points during the construction.
- B. No backfill shall be placed around or upon any structure/foundation until it is shown that the concrete has attained satisfactory strength.
- C. Install erosion and sediment control measures in accordance with Section 02900.
- D. Install traffic control measures according to the traffic control plan.
- E. Subcontractor shall clear only areas required for site access and execution of work.
- F. Removal
  - 1. Remove debris, rock, and extracted plant life.
  - 2. Saw cut and remove existing pavement as indicated on the drawings.
  - 3. Remove and stockpile existing fencing as indicated in Section 02830.

**3.2 ERECTION/INSTALLATION/APPLICATION**

- A. Excavation:
  - 1. Excavate subsoil required to accommodate foundations, slabs on grade, site structures, and construction operations.
  - 2. Correct unauthorized excavation at no extra cost to FERMC0.
  - 3. Hand-trim excavation for structural footers on grade. Remove loose material.

4. Do not interfere with 45-degree bearing splay of foundations.
5. Stockpile excess soil in the area designated on the contract drawings.
6. Perform grading and other operations to maintain site drainage. No water shall be permitted to accumulate in excavations under paving areas or equipment pads. Control water by means of ditches, dams, temporary pumps and piping, plastic coverings, tarps, or other methods. Construct stormwater basin first.
7. Areas that are disturbed or that lose firmness before concrete is poured shall be undercut, backfilled, and compacted as specified in Article 3.3, Paragraph E. At the Subcontractor's option, a lean concrete (2,500 psi at 28 days) may be installed.
8. If, during excavation, unknown debris, lumped subsoil, boulders, and rock up to 1/3 yd<sup>3</sup> is encountered, it shall be removed and placed as directed by FERMC0.

B. Topsoil Excavation:

1. Excavate topsoil from area to be excavated or to receive fill and stockpile clean topsoil to a height not exceeding 8 feet in the area designated on the contract drawings.
2. Protect stockpile from erosion. Refer to Section 02600 for erosion control measures.

C. Trenching:

1. Cut trenches sufficiently wide to enable installation of utilities and allow inspection.
2. Hand-trim excavation and leave free of loose matter.
3. Support pipe during placement and compaction of bedding fill.
4. Backfill trenches to required contours and elevations.
5. Install trace wire as indicated in Section 02667.

D. Filling and Backfilling for all Excavations:

1. Prepare subgrade as follows:
  - a. Compact exposed subgrade to density requirements for subsequent backfill materials.
  - b. Cut out soft areas of subgrade not capable of in situ compaction. Backfill with Type A3 fill and compact to density equal to or greater than requirements for subsequent fill material.
2. Backfill areas to contours and elevations shown. Use unfrozen and unsaturated materials.
3. Do not backfill over porous, wet, frozen, or spongy subgrade surfaces.
4. Unsatisfactory subgrade:
  - a. Where unsatisfactory subsurface conditions (e.g., wet subgrade, organic material, debris) in an area of backfill are observed, excavate unsatisfactory material to satisfactory subgrade as approved by FERMC0.
  - b. Backfill with fill material required for specific area. Compact to density required for the area.
5. Unless noted otherwise, place and compact fill materials in continuous layers not exceeding 8 inches loose depth.
6. Employ a placement method so as not to disturb or damage foundations or utilities in trenches.
7. Maintain moisture content within  $\pm 3$  percent of optimum moisture as determined by ASTM D698.
8. Backfill against foundations and pads as specified in Article 3.3, Paragraph E.
9. Slope grade away from foundations and pads a minimum 1/4 inch per foot, unless noted otherwise.
10. Backfill simultaneously on each side of unsupported foundation walls.
11. No organic fill is to be placed below the top foot in any fill or embankment.

E. Backfill Over Underground Utilities:

1. Initial backfill from top of bedding to 1 foot, minimum above pipe, Type A3 material compacted in

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6-inch layers, minimum density 95 percent Standard Proctor (ASTM D698).

2. Final backfill Type S1 or S2, A2, or A3 from top of initial backfill to subgrade, compacted to 95 percent Standard Proctor (ASTM D698).

F. Placing Topsoil:

1. Clean up and restore areas disturbed by and during construction operations and/or occupied by the Contractor's temporary facilities. Place a minimum of 4 inches to a maximum of 12 inches of compacted topsoil on all such areas prior to final acceptance of the project by FERMCO.
2. Prepare subsoil to eliminate uneven areas and low spots. Maintain lines, levels, profiles, and contours. Make changes in grade gradual. Blend slope into level areas.
3. Remove large stones, roots, grass, weeds, debris, and foreign material while spreading.
4. Roll placed topsoil.
5. Leave stockpile area and site clean, raked, and with positive drainage, ready to be seeded.

G. Material Stockpiles:

1. Separate differing materials with dividers, or stockpile apart to prevent mixing.
2. Direct surface water away from stockpile site to prevent erosion or deterioration of materials. Prevent silt migration at the stockpile perimeter.
3. Provide stormwater runoff controls at pile to prevent sediment from leaving stockpile area.

H. Dust Control: Provide dust control using potable water or other materials.

I. Dewatering:

1. Should dewatering be required, a written plan of drainage procedures shall be submitted for review.
2. Dewatering shall be achieved by gravity or by pumps. All methods shall be of sufficient capacity to keep excavations/trenches sufficiently dewatered.

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J. Except as supplemented or otherwise modified herein and/or shown on the construction drawings, the entire work under this section shall be in compliance with the provisions of ODOT Items 203 and 207.

**3.3 FIELD QUALITY ASSURANCE**

- A. Proof Rolling: The existing subgrade shall be proof rolled to identify soft areas. Proof rolling shall be by a pneumatic-tired vehicle with a minimum loaded weight of 20 tons.
- B. Compaction testing will be performed in accordance with ASTM D698, ASTM D1556, ASTM D2922, and ASTM D3017.
- C. Grain size analysis shall be performed in accordance with ASTM D422.
- D. Frequency of Tests:
  - 1. Frequency of in-place density testing shall be whichever of the following requires the greatest number of tests:
    - a. Once each day of work filling.
    - b. Once every layer of fill.
    - c. Once every 100 cubic yards of fill.
    - d. Every 2,000 square feet under paving, slab on grade.
    - e. Under each foundation at subgrade.
- E. Minimum Compaction Requirements:

Location	Required Compaction
Under Slabs and Buildings (Fill Type A3)	100 percent Standard Proctor (ASTM D698)
Trenches	95 percent Standard Proctor (ASTM D698)
All other fill (Fill Type S1 or S2)	95 percent Standard Proctor (ASTM D698)

**3.4 ADJUSTING**

- A. Grading and Filling: In accordance with the following table:

Structural subgrade	±1 inch
Pavement repair	±1/2 inch
General site	±3 inches*

\* Graded to drain

- B. Top of Topsoil: Plus or minus 3 inches of required elevation or plane.

**3.5 CLEANING**

- A. Leave the area in a clean and neat condition. Grade and stabilize site surface to prevent freestanding surface water.

**3.6 PROTECTION**

- A. Grade excavation top perimeter to prevent surface water runoff from entering into excavation or to adjacent properties.
- B. Protect finished work and existing features, and landscaping which will remain.
- C. Reshape and recompact fills subjected to vehicular traffic to final grade and to compaction requirements given in Article 3.3.
- D. Protect excavations by methods required to prevent cave-in or loose soil from falling into excavation.
- E. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.

F. Provide erosion and sediment control in accordance with Section 02600.

END OF SECTION

SECTION 02300  
BORING AND JACKING

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Materials and installation of fire protection (FQ) line, and potable water line (DW) under the K-65 slurry trench.
- B. Excavation: The removal and disposal of the excavated material in conformance with the lines, grades, and dimensions shown on the drawings.
- C. Backfill: Backfill with Type S1 material as specified in Section 02200. Backfilling of pits shall be brought to the lines and grade existing before excavation.
- D. Shoring: Sheet piling or timber shoring system which supports the sides of the excavation.

**1.2 RELATED SECTIONS**

- A. Section 02200 - Earthwork.
- B. Section 02600 - Storm Drainage.
- C. Section 02667 - Water Lines.
- D. Section 02900 - Seeding.

**1.3 REFERENCE DRAWINGS**

- A. See Section 01011 for the Schedule of Drawings.

**1.4 REFERENCES**

- A. American Society for Testing and Materials (ASTM), Annual Book of Standards:
  - 1. ASTM A139-90 Standard Specifications for Electric-Fusion (Arc)-Welded Steel Pipe (NPS 4 and Over).

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- B. American Water Works Association (AWWA), AWWA Standards:
  - 1. ANSI/AWWA C203-91 AWWA Standard for Coal-Tar Protective Coatings and Linings for Steel Water Pipelines - Enamel and Tape - Hot-Applied.

**1.5 SYSTEM DESCRIPTION**

- A. This section involves work which requires earthwork, excavation, stockpiling, backfilling, and compaction relating to the boring and jacking for fire protection line and potable water line.
- B. Definitions:
  - 1. Utility: Any buried pipe or conduit.

**1.6 SUBMITTALS**

- A. Provide submittals as required by Section 01010.

**PART 2 PRODUCTS**

**2.1 MATERIALS**

- A. Boring and Jacking:
  - 1. Steel casing pipe shall have diameter sufficient to accommodate pipes as specified on the construction drawings. Steel casing pipe shall be spiral or straight seam welded steel pipe conforming to ASTM A139, Grade B, Schedule 40.
  - 2. Steel casing shall be coated on the outside with Type II coal-tar enamel in accordance with AWWA C203.

**PART 3 EXECUTION**

**3.1 INSTALLATION/APPLICATION/ERECTION**

- A. Before excavation begins, provide erosion and sediment control to minimize erosion and the transport of sediment beyond the limits of the Contractor's work area. Methods of control shall conform to Section 02900.

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- B. Excavate boring and receiving pits to the width, length, and depth necessary for boring and jacking operations.
- C. Bored installations shall be a bored-hole diameter essentially the same as the outside diameter of the casing pipe to be installed.
- D. Casing pipe shall be jacked into boring as soon as possible after boring is made. Lengths of casing pipe as long as practical shall be used. Joints between sections of casing pipe shall be welded as recommended for joining the particular type of pipe. There shall be a minimum of 12 inches between adjacent casing pipes.
- E. Care shall be taken to ensure that casing pipe installed by boring and jacking is at the proper alignment and grade.
- F. Boring, jacking, or driving casing pipe under K-65 slurry trench shall be accomplished without jetting, sluicing, or wetboring.
- G. After casing pipe is installed, the carrier pipes shall be installed in such a manner as to protect coating, lining, and joint integrity. Each carrier pipe shall be placed in proper horizontal and vertical alignment using wooden blocking/wedges or prefabricated pipe collars spaced radially around pipe and secured firmly in place. Blocking or collars shall be installed around the pipes such that joints do not touch. Spacing of blocking or collars shall be no greater than 10 feet on center longitudinally in casing pipe.
- H. Close ends of casing pipe with concrete brick and mortar.
- I. Backfill materials shall be placed in 6-inch layers and tamped. Backfilling of pits shall be brought to the lines and grade existing before excavation in accordance with Section 02200.

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**3.2 CLEANING**

- A. Leave the site in a condition suitable for final grading, surfacing, or stabilization.

**END OF SECTION**



**1.4 SYSTEM DESCRIPTION**

- A. Paving: Designed for AASHTO H-20 vehicle load.

**1.5 SUBMITTALS**

- A. Provide submittals as required by Section 01010.
- B. Provide all test reports as required by ODOT Section 401.

**1.6 QUALITY ASSURANCE**

- A. Perform work in accordance with ODOT Standard Specifications, except as modified specifically otherwise herein.
  - 1. Maintain a copy of the ODOT Standard Specifications in the Field Office of the Contractor for use by the FERMCO Construction Manager, as well as by the Contractor and the Contractor's employees. Do not remove from the Field Office.
- B. Mixing Plant and Construction Equipment: Conforming to requirements of Section 401 of ODOT Standard Specifications.

**1.7 ENVIRONMENTAL REQUIREMENTS**

- A. Do not place asphalt mixture when base surface temperature is less than 40 degrees F, air temperature is below 45 degrees F, surface is wet or frozen, or when weather conditions are otherwise unfavorable.

**PART 2 PRODUCTS**

**2.1 MATERIALS**

- A. Geotextile: See Section 02600.
- B. Bituminous Base Course: Hot-laid asphalt-concrete base course in accordance with Section 301 of ODOT Standard Specifications.

- C. Prime Coat: Cut-back asphalt (Medium Curing Type) in accordance with Section 408 of ODOT Standard Specifications.
- D. Bituminous Binder Course: Hot-laid asphalt concrete surface course Type 2, in accordance with Section 402 of ODOT Standard Specifications.
- E. Bituminous Surface Course: Hot-laid asphalt concrete surface course in accordance with Section 404 of ODOT Standard Specifications.

### **PART 3 EXECUTION**

#### **3.1 PREPARATION OF SUBGRADE**

- A. Subgrade shall be compacted to 95 percent Standard Proctor per ASTM D698.

#### **3.2 INSTALLATION OF GEOTEXTILE**

- A. Geotextile rolls shall be overlapped a minimum of 18 inches or sewn per manufacturer's recommendations.

#### **3.3 INSTALLATION OF BITUMINOUS BASE COURSE**

- A. Placing and construction of the bituminous base course shall comply with the requirements of Section 301 of ODOT Standard Specifications.

#### **3.4 INSTALLATION OF BITUMINOUS BINDER COURSE**

- A. Placing and construction of the bituminous binder course shall comply with the requirements of Section 402 of ODOT Standard Specifications.
- B. Apply prime coat over bituminous base course prior to installation of binder course.

**3.5           INSTALLATION OF BITUMINOUS SURFACE COURSE**

- A.     Placing and construction of the bituminous surface course shall comply with the requirements of Section 404 of ODOT Standard Specifications.

**3.6           TOLERANCES**

- A.     Flatness:   Maximum variation of 1/4 inch measured with a 10-foot straight edge.
- B.     Compacted Scheduled Thickness:   Within 1/4 inch of design thickness.

**END OF SECTION**

SECTION 02600  
STORM DRAINAGE

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. High-density polyethylene (HDPE) pipe.
- B. Concrete manholes and cover.
- C. Concrete Wet Well.
- D. Concrete catch basins, frames, and covers.
- E. Riprap ditch and channel protection.
- F. Corrugated steel pipe and fittings.
- G. Maintenance of erosion control measures within the Subcontractor's work area.
- H. Soil erosion and sedimentation control for areas of the Subcontractor's work area which are graded or disturbed as a part of the contract work.
- I. Maintenance and removal of temporary erosion control facilities.

**1.2 RELATED SECTIONS**

- A. Section 02200 - Earthwork.
- B. Section 02667 - Water Lines.
- C. Section 02700 - Sanitary.
- D. Section 02900 - Seeding.

### 1.3

#### REFERENCES

- A. American Society for Testing and Materials (ASTM):
1. ASTM C478-93 Standard Specification for Precast Reinforced Concrete Manhole Sections.
  2. ASTM D698-91 Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup>) (600 kN-m/m<sup>3</sup>).
  3. ASTM D3035-93 Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter.
- B. American Water Works Association (AWWA):
1. AWWA C906-90 Polyethylene (PE) Pressure Pipe and Fittings, 4-Inch through 63-Inch, for Water Distribution.
- C. State of Ohio, Department of Transportation, Construction and Material Specification, January 1, 1995 (ODOT):
1. ODOT 499 Concrete - General.
  2. ODOT 604 Manholes, Catch Basins, Inlets, Inspection Wells, Junction Chamber, or Monuments.
  3. ODOT 706 Concrete and Clay Pipe.
  4. ODOT 707.01 Metallic Coated Corrugated Steel Conduit.
  5. ODOT 707.02 Metallic Coated Corrugated Steel Conduits.
  6. ODOT 707.05 Bituminous Coated Corrugated Steel Pipe and Pipe Arches with Paved Invert.

### 1.4

#### SUBMITTALS

- A. Provide submittals as required by Section 01010.
- B. Product Data: Provide data on all pipe materials, pipe fittings, accessories, manholes, trenches, catch basins, holding tank, and the methods for installation.

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- C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- D. Project Record Documents:
  - 1. Accurately record actual locations by NAD83 coordinates of all underground culverts and headwalls; invert elevations, size, and type; and show on as-built drawings.
- E. Redline drawings.

## 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect, and handle products to construction site.

## PART 2 PRODUCTS

### 2.1 MATERIALS

- A. Pipe:
  - 1. HDPE Pipe: AWWA C906 (PE 3408), ASTM D3035, SDR 32.5:
    - a. Fitting: AWWA C906, molded, butt fusion weld to pipe.
    - b. Joints: Butt fusion.
  - 2. Culvert Pipe and Fittings:
    - a. The pipe and fittings shall be bituminous coated corrugated steel pipe and pipe arches with paved invert conforming to ODOT Items 707.01, 707.02, and 707.05, with a wall thickness of 0.064 inches.
    - b. The nominal size for the pipe and fittings is based on the nominal inside diameter of the pipe.
    - c. End sections shall have sides tapered to blend with the contour of the slope.
- B. Bedding Materials:
  - 1. Bedding: Fill Type A3 as specified in Section 02200.
- C. Manholes and Catch Basins:
  - 1. The manholes and catch basins shall conform to precast reinforced concrete manhole riser sections.

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and catch basins in ODOT Section 706 and ASTM C478.

- D. Manhole and catch basin frames and lids shall be heavy-duty (H-20 load) cast iron as noted on the drawings.

**2.2 ACCESSORIES**

A. Concrete:

1. Concrete shall meet the requirements of ODOT Item 499, Class F, 3,000 psi average compressive strength at 28 days or Class C, 4,000 psi as noted.

Minimum Physical Properties (Minimum Average Roll Values)			
Property	Test Method	Units	Material
Unit weight	ASTM D-3776	oz/yd <sup>2</sup>	7.1
Grab tensile	ASTM D-4632	lbs	210
Grab elongation	ASTM D-4632	percent	60
Mullen burst	ASTM D-3786	psi	360
Puncture	ASTM D-4833	lbs	95
Trapezoid tear	ASTM D-4533	lbs	75
Apparent opening size	ASTM D-4751	US sieve number	70
Permittivity	ASTM D-4491	sec <sup>-1</sup>	110
Water flow rate	ASTM D-4491	gal/min/ft <sup>2</sup> /	1.47
Permeability	ASTM D-4491	cm/sec	.35
Thickness	ASTM D-1777	mils	95

**PART 3 EXECUTION**

**3.1 EXAMINATION**

- A. Verify that excavations are ready to receive work.
- B. Construct protective devices as specified herein and as required on the construction drawings.

3.2 PREPARATION

- A. Hand trim excavations. Correct over-excavation according to the requirements of Section 02200 of this specification package.
- B. Prepare subsoil to eliminate uneven areas and low spots. Maintain lines, levels, profiles, and contours. Make changes in grade gradual. Blend slopes into level areas.
- C. Remove debris, weeds, and undesirable plants and their roots. Remove contaminated subsoil.
- D. Scarify subsoil to a depth of 3 inches where topsoil is to be placed.
- E. Repeat cultivation in areas where equipment used for hauling and spreading of topsoil has compacted subsoil.

3.3 ERECTION/INSTALLATION/APPLICATION

- A. Installation:
  - 1. Excavate soil to a depth and width as shown on drawings.
  - 2. Place corrugated steel pipe in properly excavated trench with bedding in place, as shown on the drawings, and properly compact backfill around pipe.
- B. Bedding:
  - 1. Place pipe on sand bedding material, Type A3 (per Section 02200), as indicated on drawings.
  - 2. Backfill shall be placed in 6-inch layers and compacted to 95 percent Standard Proctor per ASTM D698. Puddling of backfill will not be allowed.
  - 3. Maintain moisture content at optimum ( $\pm 3$  percent).
- C. Backfill:
  - 1. See Section 02667 for installation of backfill materials.
- D. Placing Topsoil:
  - 1. Spread topsoil to a depth of 4 inches ( $\pm 1$  inch) over areas to be seeded. Rake until smooth.

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2. Place topsoil on unsaturated, unfrozen subgrade.
  3. Remove vegetative matter and foreign non-organic material from topsoil while spreading.
  4. Grade topsoil to eliminate rough, low, or soft areas and to ensure positive drainage.
- E. Straw Bales: Install straw bales in accordance with drawings.
- F. Protection:
1. Berms and Diversion Ditches: Miscellaneous berms and diversion ditches shall be provided to protect sloping area from erosion.
    - a. Locate to direct runoff as required. Size to prevent overflowing.
    - b. Use hay bale check dams to filter out the suspended matter, as required.
    - c. Filter fabric shall be placed under all riprap.
  2. Protect pipe from damage or displacement until backfilling operation is complete. Pipe outfalls shall be protected from erosion by riprap ditches and channel protection as shown on the drawings.
  3. Excavation shall proceed in a manner to locate and protect existing underground utilities in the vicinity of construction.
  4. Protect storm drains and ditches from siltation during construction as specified. Storm drains and ditches shall be free of sediment and erosion problems at project completion.
- G. Manholes, Catch Basins, and Inlets:
1. Install in accordance with ODOT Item 604.

**END OF SECTION**

SECTION 02667  
WATER LINES

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Pipe and fittings for underground:
1. Fire water lines (FQ1).
  2. Potable water lines (DW).
  3. Process water lines (TW).
  4. Thrust blocks.
- B. Valves, hydrants, fittings, and connections.

**1.2 RELATED SECTIONS**

- A. Section 02200 - Earthwork.
- B. Section 02300 - Boring and Jacking.
- C. Section 02675 - Disinfection of Water Distribution Systems.
- D. Section 03001 - Concrete.

**1.3 REFERENCES**

- A. American Society for Testing and Materials (ASTM):
1. ASTM D698-91 Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lb/ft<sup>3</sup>) (600 kN-m/m<sup>3</sup>).
  2. ASTM D2321-89 Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.
  3. ASTM D2922-91 Standard Test Methods for Density of Soil and Soil-Aggregate in Place by

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- Nuclear Methods (Shallow Depth).
4. ASTM D3017-88 Standard Test Methods for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).
  5. ASTM D3035-93 Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter.

B. American Water Works Association (AWWA):

1. AWWA C105-88 Polyethylene Encasement for Ductile-Iron Piping for Water and Other Liquids.
2. AWWA C110/  
A21.10-93 Ductile-Iron and Gray-Iron Fittings, 3-Inch through 48-Inch, for Water and Other Liquids.
3. AWWA C111/  
A21.11-90 Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
4. AWWA C151/  
A21.51-91 Ductile-Iron Pipe, Centrifugally Cast, for Water or Other Liquids.
5. AWWA C500-93 Metal-Seated Gate Valves for Water Supply Service.
6. AWWA C502-85 Dry Barrel Fire Hydrant.
7. AWWA C600-93 Installation of Ductile-Iron Water Mains and Their Appurtenances.
8. AWWA C906-90 Polyethylene (PE) Pressure Pipe and Fittings, 3-inch through 63-Inch, for Water Distribution.

C. Underwriters Laboratories, Inc. (UL):

1. UL 246 UL Standard for Safety Hydrants for Fire Protection Service, Seventh Edition.

- D. National Fire Protection Association (NFPA):
  - 1. NFPA 24-92 Standard for the Installation of Private Fire Service Mains and Their Appurtenances.
  
- E. State of Ohio, Department of Transportation, Construction and Material Specifications, January 1, 1995 (ODOT):
  - 1. ODOT 499 Concrete - General.

#### 1.4 SUBMITTALS

- A. Provide submittals as required by Section 01010.
  
- B. Product Data: Provide data on all pipe materials, pipe fittings, valves, accessories, and the methods and equipment for High-Density Polyethylene (HDPE) fusion welding.
  
- C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
  
- D. Project Record Documents:
  - 1. Accurately record actual locations by NAD83 coordinates of all underground utilities, piping mains, valves, connections, and invert elevations, and show on as-built drawings.
  - 2. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.
  
- E. Redline drawings.

#### 1.5 QUALITY ASSURANCE

- A. Piping and Valves: Manufacturer's name and pressure rating marked on valve body.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect, and handle products to construction site.

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- B. Deliver and store valves and hydrants in shipping containers or pallets with labeling in place.

1.7 PROJECT PREPARATION

- A. Drain lines into tanks or to trench.
- B. Isolate lines prior to disconnect.

PART 2 PRODUCTS

2.1 MATERIALS

A. Pipe:

1. Ductile-Iron Pipe: AWWA C151, Class 55:
  - a. Fittings: AWWA C110, ductile-iron, cement-lined, standard thickness. All fittings and pipe at valves shall be flanged.
  - b. Joints: AWWA C111, push-on, rubber gasket.
  - c. Jackets: AWWA C105, PE encasement.
2. HDPE Pipe: AWWA C906 (PE 3408), ASTM D3035, SDR 11 for 160 psi pressure rating.
  - a. Fittings: AWWA C906, molded, butt fusion weld to pipe.
  - b. Joints: Butt fusion, flanged gasket joints, and molded adapter pipe at interface connections with ductile-iron pipe and valves.
  - c. Trace Wire: Magnetic detectable conductor, brightly colored plastic covering, imprinted with "water service" in large letters.

B. Gate Valves:

1. AWWA C500, iron body, bronze trim, nonrising stem with square nut, single wedge, Class 125 flanged ends, control rod, post indicator or extension box, and valve key.

C. Fire Hydrant:

1. Hydrant: AWWA C502, UL 246, dry barrel type, inside dimension of 7 inches minimum, with minimum 5-1/4-inch diameter valve seat opening; 6-inch

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flanged joint inlet connection with accessories, gland bolts, and gaskets to match pipe.

- 2. Hydrant Extensions: Fabricate in multiples of 6 inches with rod and coupling to increase barrel length.
- 3. Hose and Streamer Connection: Match sizes with FERMCO standard, two hose nozzles, one pumper nozzle.
- 4. Finish: Primer and two coats of enamel. Color to be orange body with green cap and top.

D. Bedding and Backfill Materials:

- 1. Bedding: Fill Type A3 as specified in Section 02200.
- 2. Backfill: Fill types S1, S2, A2, and A3 as specified in Section 02200.

2.2 ACCESSORIES

- A. Concrete for Thrust Blocks: ODOT Item 499, Class F, 3,000 psi average compressive strength at 28 days. Poured against undisturbed soil or compacted fill.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify existing conditions.
- B. Verify that building service connection and site utility water main size, location, and invert are as indicated.

3.2 PREPARATION

- A. Ream pipe and tube ends and remove burrs.
- B. Remove scale and dirt on inside and outside before assembly.
- C. Prepare pipe connections to equipment by using flanges or unions.

- D. Excavate pipe trench in accordance with Section 02200. Hand-trim excavation for accurate placement of pipe to elevations required.

### 3.3 ERECTION/INSTALLATION/APPLICATION

#### A. Installation - Pipe: Ductile-Iron Pipe

1. Maintain separation of water main from sewer piping (10-foot horizontal minimum, 18-inch vertical minimum), or sewer encased in concrete.
2. Install pipe to indicated elevation to within tolerance of  $\pm 1$  inch at structures.
3. Install ductile-iron piping and fittings to AWWA C600.
4. Route pipe in straight line except as shown on drawing.
5. Install pipe to allow for expansion and contraction without stressing pipe or joints, as per manufacturer's recommendations.
6. Form and place concrete for thrust blocks at each elbow or change of direction of pipe main.
7. Establish elevations of buried piping to ensure cover of not less than 3 feet for process water, 3.5 feet for potable water, and 4 feet for fire protection piping.
8. Pipe bedding and backfill trench in accordance with Section 02200.

#### B. Installation - Pipe: HDPE

1. Maintain separation of potable water main from sewer piping (10-foot horizontal minimum, 18-inch vertical minimum).
2. Install pipe to indicated elevation to within tolerance of  $\pm 1$  inch at structures.
3. Install HDPE piping and fittings to AWWA C906 (by butt weld fusion method).
4. Route pipe in line as shown on drawing.
5. Install pipe to allow for expansion and contraction without stressing pipe or joints, as per manufacturer's recommendation.
6. Form and place concrete for thrust blocks at each elbow, tee, or wye, as shown on the drawings.

7. Establish elevations of buried piping to ensure not less than 3 feet for process water, 3.5 feet for potable water, and 4 feet for fire protection piping.
8. Install trace wire continuous over top of pipe, buried 6 inches below finish grade, above pipe line; coordinate with Section 02200.

C. Bedding:

1. Trench bedding shall be in conformance with ASTM D2321. Sand bedding material shall be Type A3, as indicated on drawings.
2. Place bedding material (Type A3) in maximum 6-inch lifts. Thoroughly tamp bedding using vibrating equipment or hand tamping.

D. Backfill:

1. Common trench:
  - a. Place initial backfill (Type A3) in 6-inch layers to 1 foot above pipe and compact to 95 percent Standard Proctor per ASTM D698.
  - b. Backfill Type S1 or S2 to top of trench and compact to 95 percent Standard Proctor per ASTM D698.
  - c. Maintain optimum moisture content of initial backfill material to  $\pm 3$  percent.
  - d. Trench initial backfilling shall be in conformance with ASTM D2321.
2. Trench under pavement:
  - a. Place initial backfill (Type A3) in 6-inch layers to 1 foot above pipe and compact to 95 percent Standard Proctor per ASTM D698.
  - b. Place backfill (Type A2) coarse aggregate in 6-inch layers to within 2 feet of the pavement subgrade and compact to 95 percent Standard Proctor per ASTM D698.
  - c. Backfill (Type S1 or S2) fill material in 6-inch layers to subgrade and compact to 95 percent Standard Proctor per ASTM D698.
  - d. Maintain moisture content of initial backfill material to optimum  $\pm 3$  percent.
  - e. Trench initial backfilling shall be in conformance with ASTM D2321.

- E. Installation - Valves, Hydrants, and Post Indicator Valves:
1. Set valves, including post indicator valves, on solid bearing of concrete.
  2. Center and plumb valve box over valve. Set box cover flush with finished grade with a tolerance of +2 inches to -1 inch.
  3. Center and plumb indicator post over valve. Indicator post to extend above grade as shown on the drawings to plate window reading open and shut position.
  4. Set hydrants plumb and locate pumper nozzle perpendicular to roadway.
  5. Set hydrants to grade, with nozzles at least 18 inches aboveground.
  6. Locate control valve 12 inches away from hydrant.
- F. Disinfection of Potable Water Piping System:
1. Flush and disinfect system in accordance with Section 02675.
- G. Excess Debris and Waste:
1. Excess debris and waste generated as a result of the work shall be containerized by the Subcontractor as described in Part 6, Statement of Work, of the Invitation for Bid.

### 3.4 FIELD QUALITY ASSURANCE

- A. Compaction testing shall be performed in accordance with ASTM D698, ASTM D2922, and ASTM D3017.
- B. If tests indicate work does not meet specified requirements, remove and replace at no cost to owner.
- C. Perform hydrostatic tests on all water piping.

D. Testing for fire protection line shall be in accordance with NFPA 24. Testing for potable water and process water lines shall be in accordance with AWWA C600. Test pressures shall be 160 psi for potable water and process water, and 200 psi for fire water.

**END OF SECTION**

SECTION 02675  
DISINFECTION OF WATER DISTRIBUTION SYSTEMS

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Disinfection of potable water lines.
- B. Testing and reporting results.

**1.2 RELATED SECTIONS**

- A. Section 02667 - Water Lines.

**1.3 REFERENCES**

- A. American Water Works Association (AWWA):
  - 1. AWWA B300-92 Standard for Hypochlorites.
  - 2. AWWA B301-92 Standard for Liquid Chlorine.
  - 3. AWWA B302-90 Standard for Ammonium Sulfate.
  - 4. AWWA B303-88 Standard for Sodium Chlorite.
  - 5. AWWA C651-92 Standards for Disinfecting Water Mains.
  - 6. AWWA M12-75 Simplified Procedure for Water Examination.
- B. Ohio Revised Code (ORC):
  - 1. ORC 3745-83 Operational Requirements.

**1.4 SYSTEM DESCRIPTION**

- A. Regulatory Requirements:
  - 1. Conform to applicable code or regulation for performing the work of this section, to include US Public Health Service Drinking Water Standards identified in AWWA M12 as well as ORC 3745-83.

**1.5 SUBMITTALS**

- A. Provide submittals as required by Section 01010.

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- B. Certificate: Certify that cleanliness of water lines meets or exceeds specified requirements.
- C. Project Record Documents:
  - 1. Disinfection report; record:
    - a. Type and form of disinfectant used.
    - b. Date and time of disinfectant injection start and time of completion.
    - c. Test locations.
    - d. Initial and 24-hour disinfectant residuals (quantity in treated water), in ppm, for each outlet sampled.
    - e. Date and time of flushing start and completion.
    - f. Disinfectant residual after flushing, in ppm, for each outlet sampled.
  - 2. Bacteriological report: by FERMCO.

**1.6 QUALITY ASSURANCE**

- A. Perform work in accordance with AWWA C651.

**PART 2 PRODUCTS**

**2.1 MATERIALS**

- A. Disinfection Chemicals:
  - 1. Chemicals: AWWA B300, Hypochlorite; AWWA B301, Liquid Chlorine; AWWA B302, Ammonium Sulfate; and AWWA B303, Sodium Chlorite.

**PART 3 EXECUTION**

**3.1 EXAMINATION**

- A. Verify that piping system has been cleaned, inspected, and pressure tested prior to starting disinfection of the system.
- B. Perform disinfection activity.

**3.2 ERECTION/INSTALLATION/APPLICATION**

- A. Introduce treatment into piping system.
- B. Maintain disinfectant in system for 24 hours.
- C. Flush, circulate, and clean until required cleanliness is achieved; use potable water.
- D. Replace permanent system devices removed for disinfection.
- E. Seal the piping system immediately after disinfection to ensure that contaminants do not enter the system.

**3.3 FIELD QUALITY ASSURANCE**

- A. Provide analysis and testing of treated water.
- B. Test samples in accordance with AWWA C651.

**END OF SECTION**

SECTION 02700  
SANITARY

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Pipe and fittings for gravity sanitary sewer.
- B. Pipe and fitting for sanitary force main.
- C. Connection to existing 4-inch (SN) force main.
- D. Lift station wet well.
- E. Connections to wet well.
- F. Thrust blocks.
- G. Manholes.

**1.2 RELATED SECTIONS**

- A. Section 02200 - Earthwork.
- B. Section 02600 - Storm Drainage.
- C. Section 02667 - Water Lines.

**1.3 REFERENCES**

- A. American Society for Testing and Materials (ASTM):
  - 1. ASTM A126-93 Standard Specification for Gray Iron Casings for Valves, Flanges, and Pipe Fittings.
  - 2. ASTM C969-94 Standard Practice for Infiltration and Exfiltration Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines.
  - 3. ASTM D698-91 Test Method for Laboratory Compaction Characteristics of

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- Soil Using Standard Effort  
(12,400 ft-lbf/ft<sup>3</sup>) (600 kN-  
m/m<sup>3</sup>).
4. ASTM D2922-91 Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
  5. ASTM D3017-88 Standard Test Methods for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).
  6. ASTM D3035-93 Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter.

B. American Water Works Association (AWWA):

1. AWWA C105-88 Polyethylene Encasement for Ductile-Iron Piping for Water and Other Liquids.
2. AWWA C110/  
A21.10-93 Ductile-Iron and Gray-Iron Fittings, 3-Inch through 48-Inch, for Water and Other Liquids.
3. AWWA C111/  
A21.11-90 Rubber-Gasket Joints for Ductile Iron Pressure Pipe and Fittings.
4. AWWA C151/  
A21.51-91 Ductile-Iron Pipe, Centrifugally Cast, for Water or Other Liquids.
5. AWWA C600-93 Installation of Ductile-Iron Water Mains and Their Appurtenances.
6. AWWA C606-87 Grooved and Shouldered Joints.
7. AWWA C906-90 Polyethylene (PE) Pressure Pipe and Fittings, 4-Inch through 63-Inch, for Water Distribution.



**PART 2 PRODUCTS**

**2.1 MATERIALS**

**A. Pipe:**

1. HDPE Pipe: AWWA C906 (PE 3408), ASTM D3035, SDR 17 for 100 psi pressure rating.
  - a. Fitting: AWWA C906, molded, butt fusion weld to pipe.
  - b. Joints: Butt fusion, flanged gasket joints, and molded adapter pipe at interface connections with ductile iron pipe and valves.
  - c. Trace Wire: Magnetic detectable conductor, brightly colored plastic covering, imprinted with "sanitary sewer" in large letters.
2. Ductile Iron Pipe: AWWA C151, Class 55:
  - a. Fittings: AWWA C110, ductile iron cement lined, standard thickness. All fittings and pipe at valves shall be flanged.
  - b. Joints: AWWA C111, push-on, rubber gasket.
  - c. Jackets: AWWA C105, PE encasement.

**B. Plug Valves:**

1. Valves shall be of the nonlubricated eccentric type with resilient faced plugs and shall be furnished with end connections as shown on the plans. Mechanical joint ends shall conform to AWWA C111, grooved ends per AWWA C606.
2. Valve bodies shall be of ASTM A126, Class B cast iron. Bodies in 4-inch and larger valves shall be furnished with a 1/8-inch welded overlay seat of not less than 90 percent pure nickel. Seat area shall be raised, with raised surface completely covered with weld to ensure that the plug face contacts only nickel. Screwed-in seats shall not be acceptable.
3. Plugs shall be of ASTM A126, Class B cast iron. The plug shall have a cylindrical seating surface eccentrically offset from the center of the plug shaft. The interface between the plug face and body seat, with the plug in the closed position, shall be externally adjustable in the field with

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- the valve in the line under pressure. The plug shall be resilient faced with neoprene or hycar, suitable for use with sewage.
4. Valves shall have sleeve type metal bearings and shall be sintered, oil impregnated, and permanently lubricated.
  5. Valve shaft seals shall be of the multiple V-ring type and shall be externally adjustable and replaceable without removing the bonnet or actuator from the valve under pressure. Valves utilizing O-ring seals or non-adjustable packing shall not be acceptable.
  6. Valve pressure ratings shall be 175 psi. Each valve shall be given a hydrostatic and seat test, with test results being certified when required by the specifications.
  7. Manual valves shall have gear actuators and tee wrenches, extension stems, extension box, etc., as indicated on the plans. All gearing shall be enclosed in a semi-steel housing and be suitable for running in a lubricant with seals provided on all shafts to prevent entry of dirt and water into the actuator. The actuator shaft and the quadrant shall be supported on permanently lubricated bronze bearings. Actuators shall clearly indicate valve position, and an adjustable stop shall be provided to set closing torque and to provide seat adjustment to compensate for change in pressure differential or flow direction change.
  8. Valves and gear actuators for buried service shall have seals on all shafts and gaskets on the valve and actuator covers to prevent the entry of water. Actuator mounting brackets for buried or submerged service shall be totally enclosed and shall have gasket seals. All exposed nuts, bolts, springs, and washers shall be stainless steel. Actuators shall be equipped with an operating nut, control rod, extension box, and valve key.
  9. Valves and actuators shall be as manufactured by Dezurik or approved equal.

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C. Bedding Materials:

1. Bedding and Initial Backfill: Fill Type A3 as specified in Section 02200.

D. Lift Station Wet Well and Manholes:

1. Precast concrete specified in ODOT Item 604 and 706.13.

**2.2 ACCESSORIES**

- A. Concrete: 3,000 psi, ODOT Item 499, Class F, average compressive strength at 28 days, poured against undisturbed soil or compacted fill.

**PART 3 EXECUTION**

**3.1 PREPARATION**

- A. Ream pipe and tube ends and remove burrs.
- B. Remove scale and dirt on inside and outside before assembly.
- C. Excavate pipe trench in accordance with Section 02200 for work of this section. Hand-trim excavation for accurate placement of pipe to elevations indicated. Locate all existing utilities in the area and determine whether they will interfere with the proposed utility. Notify FERMCO if there is an interference.

**3.2 ERECTION/INSTALLATION/APPLICATION**

- A. Installation - Pipe: Ductile Iron Pipe
1. Maintain separation of water main from sewer piping (10-foot horizontal minimum, 18-inch vertical minimum), or sewer encased in concrete.
  2. Install pipe to indicated elevation to within tolerance of 5/8 inches.
  3. Install ductile iron piping and fittings to AWWA C600.
  4. Route pipe in straight line except as shown on drawing.

5. Install pipe to allow for expansion and contraction without stressing pipe or joints, as per manufacturer's recommendations.
6. Form and place concrete for thrust blocks at each elbow or change of direction of pipe main.
7. Establish elevations of buried piping to ensure not less than 3.5 feet of cover.
8. Backfill trench in accordance with Section 02200.

B. Installation - Pipe: HDPE

1. Maintain separation of water main from sewer piping (10-foot horizontal minimum, 18-inch vertical minimum).
2. Install pipe to indicated elevation to within tolerance of 5/8 inch at structures.
3. Install HDPE piping and fittings to AWWA C906 (by butt weld fusion method).
4. Route pipe in line as shown on drawing.
5. Install pipe to allow for expansion and contraction without stressing pipe or joints, as per manufacturer's recommendation.
6. Install access fittings to permit cleanout.
7. Form and place concrete for thrust blocks at each elbow, wye, or tee on the force main.
8. Establish elevations of buried force main piping to ensure not less than 3.5 feet of cover.
9. Install trace wire continuously over top of pipe, buried 6 inches below finish grade, above pipe line; coordinate with Section 02200.
10. Backfill trench in accordance with Section 02200.

C. Bedding:

1. See Section 02667, Article 3.3, Paragraph C, for bedding installation.

D. Backfill:

1. See Section 02667, Article 3.3, Paragraph D, for installation of backfill materials.

E. Installation - Valves:

1. Set valves on solid bearing of concrete.
2. Center and plumb valve box over valve. Set box cover flush with finished grade.

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3.3 FIELD QUALITY ASSURANCE

- A. Compaction testing will be performed in accordance with ASTM D698, ASTM D2922, and ASTM D3017.
- B. Perform hydrostatic tests on sanitary force main in accordance with AWWA C600. Test pressure shall be 100 psi.
- C. Perform exfiltration testing for gravity sanitary sewer lines following the exfiltration testing procedure in ASTM C969, regardless of pipe material. Use the leakage criteria of 200 gal/(inch of internal diameter)\*(mile of sewer)\*(24 hours). Minimum test time shall be 15 minutes.

END OF SECTION

SECTION 02730  
DUPLEX FACTORY-BUILT SEWAGE LIFT STATION

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. One automatically controlled duplex pumping unit capable of handling raw unscreened sewage or similar liquids. The pumps and mechanical accessories shall be installed in the wet well as shown on the drawings. The pump control panel, liquid level control, and system valving shall be installed in a factory-built fiberglass station enclosure to provide for a complete working system.

**1.2 RELATED SECTIONS**

- A. Section 02200 - Earthwork.  
B. Section 02700 - Sanitary.

**1.3 REFERENCE DRAWINGS AND ATTACHMENTS**

- A. Pump Data Sheet.

**1.4 REFERENCES**

- A. Underwriters Laboratories, Inc. (UL):  
1. UL 67-93 UL Standard for Safety Panelboards, Eleventh Edition.  
2. Electrical Construction Materials Directories, 1995.
- B. National Fire Protection Association (NFPA):  
1. NFPA 70-96 National Electric Code.
- C. American National Standards Institute (ANSI):  
1. ANSI 16.1-89 Cast Iron Pipe Flanges and Flanged Fittings.  
2. ANSI 360-86 Liquid-Tight Flexible Steel Conduit.

- D. American Water Works Association (AWWA):
  - 1. AWWA C115/ Flanged Ductile Iron Pipe with  
A21.15-88 Threaded Flanges.
  
- E. National Electric Manufacturers Association (NEMA):
  - 1. NEMA ICS 2-93 Industrial Control and Systems  
Controllers, Contactors, and  
Overload Relays Rated Not More  
Than 2000 Volts AC or 750  
Volts DC.
  - 2. NEMA ICS 6-88 Enclosures for Industrial  
Controls and Systems.
  - 3. NEMA MG 1-93 Motors and Generators.
  
- F. Hydraulics Institute Standards.

**1.5 SUBMITTALS**

- A. Manufacturer's Support Literature: Submit manufacturer's support literature, including operating instructions, installation instructions, maintenance and repair data, parts listing, start-up instructions, and dimensions of manufacturer's products.
  
- B. Certificates of Conformance: Manufacturer shall certify and provide data which indicate that all supplied products meet or exceed the requirements of this specification.
  
- C. Submit details of fiberglass enclosure heater, piping, valves, guide rails, pump anchor assembly, pumps, electrical controls and wiring, pump level controls, access door, structural connections, and wet well for approval.

**1.6 QUALITY ASSURANCE**

- A. Products Requiring Electrical Connection: Shall be listed and classified by Underwriters Laboratories, Inc., Electrical Construction Materials Directories, 1995, as suitable for the purpose specified and indicated.

**1.7 WARRANTY**

- A. Material and Workmanship:
1. The supplier shall warrant equipment supplied to be of quality construction, free of defects in material and workmanship. The written warranty shall indicate specific parts and labor covered, on a prorated basis, for a period of 5 years.

**PART 2 PRODUCTS**

Any equipment suppliers identified in this section in no way preclude the offerer from proposing alternate suppliers of any of the equipment to be furnished within the scope of this specification. This list of suppliers is intended to identify the type of equipment and general quality of that equipment that will be included in the offerer's proposal. It is the offerer's responsibility to propose equipment that is best suited for this project in combined terms of quality and price.

**2.1 MANUFACTURERS**

- A. The Gorman-Rupp Co.
- B. ITT Flygt Corp.
- C. ABS Pumps, Inc.
- D. Smith & Loveless, Inc.

**2.2 PUMPS**

- A. Operating Conditions: Each submersible pump shall have the necessary characteristics and be properly selected to deliver 100 gpm at a design dynamic discharge head of 25 feet and have other necessary characteristics as listed below.
- B. Hydraulic Components and Solids Handling:
  1. All pump openings and passages shall be of adequate size to pass 3-inch-diameter spheres (minimum) and any trash or stringy material which

can pass through a sanitary sewage system. The impeller shall be recessed into the pump casing and shall not require flow of liquid through the impeller. The impeller and seal housing shall incorporate auxiliary vanes to hydraulically reduce pressure on the primary seal and force fibrous materials and solids away from the close axial clearance on the backside of the impeller. No impeller clearance adjustment or wear rings shall be required.

2. The impeller shall be a multivane vortex type with integral winglets on each vane. The winglet shall form an L-shaped cross section at the face of the vane for improved hydrodynamic efficiency. Impeller shall be of ductile iron and precision balanced. Balancing shall not deform or weaken the impeller. The impeller shall have a tapered locking fit onto the shaft and be further secured by a key and locking bolt. Impeller fasteners shall be noncorroding.

C. Hoisting Bail: A hoisting bail shall provide for proper balance of pump and guide shoe from the discharge connection while using a single lift cable.

D. Components: All other major pump components such as stator housing, seal housing, and bearing brackets shall be of structural grade steel or gray iron - Class 30. All external surfaces coming into contact with sewage shall be protected by a coal tar-based epoxy coating of 8 mils minimum thickness. All exposed fasteners and lock washers shall be of 304 stainless steel.

E. Shaft Seal:

1. The pump shaft shall be sealed against leakage by a mechanical-double faced seal with combined spring system for the upper and lower portion. The lower wearing faces shall be silicon carbide. The upper faces shall be carbon and hardened stainless steel. Elastomers shall be viton.
2. The rotating seal faces shall be lubricated from an oil-filled reservoir between pump and motor,

the oil serving as both lubricating and cooling media. The reservoir shall have separate oil fill and drain plugs to ensure accuracy when measuring lubricant level, and for ease of maintenance.

3. Seal shall require no special maintenance or routine adjustment. However, it shall be easily inspected or replaced. No seal damage shall result from operating the pump for short periods without liquid.

## 2.3 PUMP MOTORS

A. Electrical Power: The electrical power to be furnished to the site will be 480 volts  $\pm$  10 percent, three phase, 60 Hertz, three wire. Control voltage shall not exceed 132 volts.

B. Motor Description:

1. The submersible pump motor shall be 5.0 hp (maximum). The motor and pump must be connected to form an integral unit. Motor shall be a squirrel-cage, induction type in an air-filled, watertight enclosure. The motor shall conform to NEMA MG 1 design Class B, and incorporate NEMA MG 1 Class F insulation materials to withstand a continuous operating temperature of 155 degrees C (311 degrees F).
2. Motor shall be capable of sustaining a minimum of 10 starts per hour. Factory test and provide documentation with equipment.
3. Motor housing shall be of cast iron. The stator shall consist of copper windings with copper connectors applied to high-grade electrical steel laminations.

C. Watertight Integrity:

1. All static seals at watertight mating surfaces shall be of nitrile "O" ring type. Use of auxiliary sealing compounds will not be required. The power and control cables shall enter the motor through a terminal housing.

2. The pump and electrical cables shall be capable of continuous submergence to a depth of 65 feet without loss of waterproof integrity.
3. The watertight integrity of the motor housing and shaft seal shall be tested during manufacture by pressurizing the motor cavity and submerging in water with motor operating. A separate performance test shall also be conducted on each fully assembled pump to verify published head/capacity and power input. The Vendor shall provide written verification of compliance with these requirements.

D. Motor Protection: The motor shall be protected from thermal and moisture damage. Thermal protection shall consist of three separate thermostatic switches embedded into the stator windings. Each switch shall open independently and terminate motor operation if temperature of the protected winding reaches the high temperature setpoint. Any moisture in the motor housing shall be detected by a mechanically activated, moisture-sensing micro-switch. The switch shall be sensitive enough to detect airborne moisture and terminate operation of motor before liquid enters the cavity. Use of probes or floats that rely on the presence of liquid to initiate signal shall not be considered acceptable. The thermal and moisture-sensing devices shall be connected to the pump control panel by the contractor.

#### 2.4 VALVES AND PIPING

A. Check Valves: Each pump shall be equipped with a full-flow type check valve, capable of passing a 3-inch spherical solid with flanged ends, and be fitted with an external lever and spring. The valve seat shall be constructed of stainless steel and shall be replaceable. The valve body shall be cast iron and shall incorporate a 3-inch cleanout port. Valve clapper shall have a molded neoprene seating surface incorporating low-pressure sealing rings. Valve hinge pin and internal hinge arm shall be stainless steel supported on each end in brass bushings; sealing

bushing shall have double O-rings. O-rings shall be easily replaceable without requiring access to interior of valve body. Valve shall be rated at 175 psi water working pressure, 350 psi hydrostatic test pressure. Valves other than full-flow type or valves mounted in a manner that prevents the passage of a 3-inch spherical solid shall not be acceptable.

B. Isolation Valves: Each discharge line shall be equipped with a plug valve to permit isolation of the pumps from the common discharge header. The plug valve shall be either the nonlubricated, tapered type or the eccentric plug type. Valve body shall be semisteel with flanged end connections drilled to 125-pound standard. Valve shall be furnished with a drip-tight shutoff plug mounted in stainless steel or teflon over phenolic bearings, and shall have a resilient facing bonded to the sealing surface. Valves shall have ports designed to pass 3-inch spherical solids.

C. Piping:

1. Flanged header pipe shall be centrifugally cast, ductile iron, complying with AWWA C115/A21.15 and Class 53 thickness.
2. Flanges shall be cast iron Class 125 and shall comply with ANSI 16.1.
3. Pipe and flanges shall be threaded with suitable thread sealant, applied before assembling flange to pipe.

D. Supports: All pipes connected to the pump station shall be supported according to good commercial practice.

## 2.5 AUTOMATIC DISCHARGE CONNECTION

A. Description: Each pump shall be furnished with a submersible discharge connection system to permit removal and installation of the pump without the necessity of an operator entering the wet well. The design shall ensure an automatic and firm connection of the pump to the discharge piping when lowered into place.

B. Baseplate: A gray iron cast base with integral guide rail pilots shall be provided along with all hardware and anchor bolts required for permanent installation to the wet well floor. The base shall be designed with an integral 90-degree elbow, or adapt to a commercially available elbow for connection to the vertical discharge piping utilizing standard ANSI 125-lb flanges. The base shall be coated with coal tar epoxy for corrosion resistance. The manufacturer shall provide all necessary drawings to ensure proper installation and alignment of baseplate within the sump.

C. Discharge Connection:

1. Each pump shall be provided with a replaceable ductile iron slide rail guide shoe attached to the pump discharge flange. A replaceable neoprene seal shall be provided as an integral part of the guide shoe to form a seal with the baseplate connection and eliminate the possibility of leakage and erosive wear during operation. The seal shall contact mating faces in a static position and shall have adequate flexibility to flex under pumping pressure to increase seal efficiency. Metal-to-metal contact at the discharge connection shall not be acceptable.
2. Schedule 40 stainless steel guide rail pipe shall be provided for each pump.
3. Upper guide rail pilots and a lifting cable shall be furnished for each pump. Bottom pilots shall be an integral part of the baseplate for ease of installation and proper alignment.

D. Guide Rail System and Method of Operation:

1. The guide shoe shall direct the pump down two vertical guide rails and onto the discharge connection in a simple linear movement. The design shall ensure that the buildup of sludge and grease on guide rails will not present problems during the lifting operation. The guide shoe shall be designed with integral hooks at the top to transmit the full weight of the pump to the baseplate flange. No portion of the pump shall be

supported directly on the bottom of the wet well, guide rails, or lifting cable.

2. The lifting cable shall consist of a stainless steel braided wire cable attached to the pump lifting bail. An eyelet shall be provided at the upper end of this cable for attaching to the wet well access frame.
3. All bolts, machine screws, nuts, washers, and lockwashers for complete assembly of access cover, guide rails, and discharge elbow shall be 304 stainless steel.

## 2.6 WET WELL ACCESS

- A. Description: The wet well access shall be fabricated from welded aluminum sections. A hinged aluminum door shall be provided for each pump. The hinged door shall be fabricated from 1/4-inch-thick aluminum with nonskid diamond tread on upper surface. All hardware on access assembly shall be stainless steel with a flush upper surface without protrusions. For safety, the door shall have a 300 lbs/ft<sup>2</sup> rating and be fitted with a recessed staple for padlock. Door shall be furnished with a flush aluminum drop handle and automatic hold-open arm with vinyl grip on release handle.

## 2.7 ELECTRICAL CONTROL COMPONENTS

- A. Controls:
1. The pump control panel shall have a UL label for "Enclosed Industrial Control Panels."
  2. Panel Enclosure:
    - a. The electrical control equipment shall be mounted within a NEMA 12 stainless steel, dead front type control enclosure. It shall include a removable steel back panel on which control components shall be mounted. Operator controls shall be mounted on a steel inner swing panel. The control panel shall be equipped with vapor emission type corrosion inhibitors. Enclosure shall be suitable for wall mounting of panel enclosure within the station enclosure.

- b. Control panel shall be in accordance with UL 67 and NEMA ICS 6.

2.8 MOTOR BRANCH COMPONENTS

- A. All operating controls and instruments shall be securely mounted and shall be clearly labeled to indicate function.
- B. Main Connections: A main terminal block and ground bar shall be furnished for field connection of the electrical supply.
- C. Combination Motor Starters: An open-frame, across-the-line, NEMA ICS 2 rated magnetic motor starter (size 1 or larger) shall be furnished for each pump motor. All motor starters shall be equipped to provide undervoltage release and overload protection on all three phases.
- D. Overload Relays: Overload relays shall be of block type, utilizing melting alloy type spindles, and shall have visual trip indication with trip-free operation. Overload relays shall be of manual reset only. Heater elements shall provide Class 10 trip times per NEMA ICS 2 and shall be selected in accordance with the actual motor nameplate data. An overload reset pushbutton shall be mounted through the door of the control panel in such a manner as to permit resetting the overload relays without opening the control panel door.
- E. Pump Motor Protection: The pump control panel shall be equipped to terminate pump operation due to high motor winding temperature or moisture in the motor housing and shall utilize the contacts in the pump motor. If either event should occur, the motor starter will drop out and a mechanical indicator, visible on the inner door, shall indicate that the pump motor has been shut down. The pump motor shall remain locked out until the condition has been corrected and then shall be manually reset.

2.9 OTHER CONTROL COMPONENTS

- A. Control Circuit: The control circuit shall be protected by a normal duty thermal-magnetic air circuit breaker, which shall be connected in such a manner as to allow control power to be disconnected from all control circuits.
- B. Pump Mode Selection: Pump mode selector switches shall be connected to permit manual start and manual stop for each pump individually, and to select automatic operation of each pump under control of the liquid level control system.
- C. Alternator Relay: Pump alternator relay contacts shall operate after pump shutdown.
- D. Pump Run Indicators: Control panel shall be equipped with one oil-tight pilot light for each pump motor. Light shall be wired in parallel with the related pump motor starter to indicate that the motor is on or should be running. Run lights shall be equipped with lamps providing a minimum of 15,000 hours.
- E. Elapsed Time Indicators: Six-digit elapsed time indicators (non-reset type) shall be connected to each motor starter to indicate the total running time of each pump in "hours" and "tenths of hours."
- F. Sequence Selector Switch: A switch shall be provided to permit the station operator to select automatic alternation of the pumps, to select lead lag pumps.
- G. Dry Contacts: The control panel manufacturer shall supply dry contacts, single pole, double throw (SPDT), wired to terminal blocks for field connection to a remote status indication system:

1. <u>FUNCTION</u>	<u>CONTACT</u>
Motor #1 Trip (Moisture/Thermal...	(1) S.P.D.T.
Motor #2 Trip (Moisture/Thermal) ..	(1) S.P.D.T.
2. High Water Alarm.....	(1) S.P.D.T.
Low Water Alarm.....	(1) S.P.D.T.

In addition to above output contacts, provide a indicator light on panel cover to indicate alarm condition with proper label.

- H. Receptacle: A duplex ground fault indicating utility receptacle providing 115 VAC, 60 Hertz, single phase current shall be mounted through the inner swing panel of the control enclosure. Receptacle circuit shall be protected by a 15-ampere thermal-magnetic circuit breaker.
- I. Panel Heater: The control panel shall be equipped with a panel heater and thermostat to minimize the effects of humidity and condensation.
- J. Auxiliary Power Transformer: The lift station shall be equipped with a 2 kVA stepdown transformer to supply 115 volt, AC, single phase for the control and auxiliary. A mechanical operating mechanism shall be installed on the circuit breaker to provide a means of disconnecting power to the transformer. The operator handle for the mechanism shall be located on the exterior of the control panel, with interlocks which permit the door to be opened only when the circuit breaker is in the "OFF" position.
- K. Wiring:
  - 1. The control panel, as furnished by the manufacturer, shall be completely wired. The contractor shall field connect the power feeder lines to the main terminal block, final connections to the remote alarm devices, and the connections between the pump and the pump motor control. All wiring, workmanship, and schematic wiring diagrams shall be in compliance with applicable standards and specifications set forth by NFPA 70.
  - 2. All user serviceable wiring shall be type MTW or THW, 600 volts, and shall be color coded as follows:
    - a. Line and Load Circuits, AC or DC power . . . . . Black
    - b. AC Control Circuit Less Than



- Line Voltage . . . . . Red
- c. DC Control Circuit . . . . . Blue
- d. Interlock Control Circuit, from  
External Source . . . . . Yellow
- e. Equipment Grounding Conductor . . . . . Green
- f. Current Carrying Ground . . . . . White
- g. Hot With Circuit Breaker Open . . . . . Orange

L. Wire Identification and Sizing:

1. Control circuit wiring inside the panel, with the exception of internal wiring of individual components, shall be 12 gage minimum, type MTW or THW, 600 volts. Power wiring shall be 12 gage minimum.
2. The ampacity of motor branch conductors and other power conductors shall not exceed the temperature rating of the connecting terminals. Wires shall be clearly numbered at each end in accordance with the electrical diagrams.

M. Wire Bundles: Wires connected to components mounted on the enclosure door shall be bundled and tied in accordance with good commercial practice.

N. Conduit

1. Conduit requirements:
  - a. All conduit and fittings shall be UL listed.
  - b. Liquid-tight flexible metal conduit shall be constructed of smooth, flexible galvanized steel core with smooth, abrasion-resistant, liquid-tight polyvinyl chloride cover in accordance with ANSI 360.
  - c. Conduit shall be supported in accordance with Articles 346, 347, and 350 of NFPA 70.
  - d. Conduit shall be sized according to NFPA 70.
2. Grounding:
  - a. The pump control manufacturer shall provide a common ground bar mounted on the enclosure back plate. The mounting surface of the ground bar shall have any paint removed before making final connections.

- b. The contractor shall make the field connections to the main ground lug and each pump motor in accordance with NFPA 70.
- 3. Equipment Marking:
  - a. Permanent, corrosion-resistant nameplate(s) shall be attached to the equipment.
  - b. Control components shall be permanently marked using the same identification shown on the electrical diagram. Identification label shall be mounted adjacent to the device.
  - c. Switches, indicators, and instruments shall be plainly marked to indicate function, position, etc. Marking shall be mounted adjacent to and above the device.

## 2.10 LIQUID LEVEL CONTROL

- A. Functional Description: The level control system shall start and stop the pump motors in response to changes in wet well level, as set forth herein.
- B. Type: The level control system shall be the air bubbler type, containing air bubbler piping which extends into the wet well. A pressure sensor contained within the electronic pressure switch shall sense the air pressure in this piping to provide wet well level signals for the remainder of the level control system.
- C. Sequence of Operation: The electronic pressure switch shall continuously monitor the wet well level, permitting the operator to read wet well level at any time. Upon operator selection of automatic operation, the electronic pressure switch shall start the motor for one pump when the liquid level in the wet well rises to the "lead pump start level." When the liquid is lowered to the "lead pump stop level," the electronic pressure switch shall stop this pump. These actions shall constitute one pumping cycle. Should the wet well level continue to rise, the electronic pressure switch shall start the second pump when the liquid reaches the "lag pump start level" so that both pumps are operating. These levels shall be adjustable as described below.

- D. Automatic Pump Alternation: The level control system shall utilize the alternator relay to select first one pump, then the second pump, to run as lead pump for a pumping cycle. Alternation shall occur at the end of a pumping cycle.
- E. Electronic Pressure Switch:
1. The electronic pressure switch shall include integral components to perform all pressure sensing, signal conditioning, EMI and RFI suppression, DC power supply, and 120 volt outputs. Comparators shall be solid state, and shall be integrated with other components to perform as described below.
  2. The electronic pressure switch shall be capable of operating in an ambient temperature range of -18 degrees C (0 degrees F) through +55 degrees C (131 degrees F). Control range shall be 0 to 12.0 feet of water with an overall repeat accuracy of  $\pm 0.1$  feet of water.
  3. The electronic pressure switch shall consist of the following integral components: Pressure sensor, display, electronic comparators, and output relays.
- F. Pressure Sensor: The pressure sensor shall be a strain gauge transducer and shall receive an input pressure from the air bubbler system. The transducer shall convert the input to a proportional electrical signal for distribution to the display and electronic comparators. The transducer output shall be filtered to prevent control response to level pulsations or surges. The transducer range shall be 0-15 psi, temperature compensated from -40 degrees C (-40 degrees F) through +85 degrees C (+185 degrees F), with a repeat accuracy of  $\pm 0.25$  percent full scale about a fixed temperature. Transducer overpressure rating shall be three times full scale.
- G. Display: The electronic pressure switch shall incorporate a digital panel meter which, upon operator selection, shall display liquid level in the wet well, and the preset start and stop level for both lead and

lag pump. The meter shall be a 3-1/2-inch digit display calibrated to read out directly in feet of water, accurate to within 1/10 foot (0.1 foot), with a full-scale indication of not less than 12 feet.

- H. Electronic Comparators: Level adjustments shall be electronic comparator setpoints to control the levels at which the lead and lag pumps start and stop. Each of the level settings shall be adjustable and accessible to the operator without opening the electronic pressure switch or any cover panel on the electronic pressure switch. Controls shall be provided to permit the operator to read the selected levels on the display. Such adjustments shall not require hard wiring, the use of electronic test equipment, artificial level simulation, or introduction of pressure to the electronic pressure switch.
- I. Output Relays: Each output relay in the electronic pressure switch shall be solid state.
- J. Serviceability: The electronic pressure switch shall be equipped with replaceable plug-in integrated circuits, output relays, and fuses.
- K. High Water Alarm: The electronic pressure switch shall be equipped with an additional electronic comparator and solid state output relay to alert maintenance personnel to a high liquid level in the wet well. An electrical or mechanical indicator, visible on the front of the control panel, shall indicate that a high wet well level exists. The magnetic switch shall maintain the alarm signal until the wet well level has been lowered and the circuit has been manually reset.
- L. Low Water Alarm: The electronic pressure switch shall be equipped with an additional electronic comparator and solid state output relay to alert maintenance personnel to a low liquid level in the wet well. A mechanical indicator, visible on the front of the control panel, shall indicate that a low wet well level exists. The magnetic switch shall maintain the alarm signal until the cause for the low wet well level has

been corrected and the circuit has been manually reset. A low liquid level condition shall disable both pump motors. When the wet well rises above the low level point, both pump motors shall be automatically enabled.

- M. Spare Parts: The manufacturer shall supply one of each type integrated circuit and one output relay as spare parts.

## 2.11 ALARMS

- A. Alarm Light (External): A 115 volt AC alarm light with a red globe, conduit box, and mounting fixtures shall be provided. The light shall be shipped loose for field mounting by the contractor.
- B. Alarm Horn (External): A 115 volt AC weatherproof alarm horn with a conduit box and mounting fixtures shall be provided. The components shall be designed in such a manner as to permit mounting without water collecting in the horn. The horn shall be shipped loose for field mounting by the contractor.
- C. Alarm Flasher: The alarm light circuit shall be equipped with a repeat cycle timer that causes the alarm light to flash. Flash rate shall be approximately 1 second (1/2 second on and off).
- D. Alarm Silence: An alarm silence pushbutton and relay shall be provided.

## 2.12 AIR BUBBLER SYSTEM AND PIPING

- A. Air Pumps:
1. Two vibrating reed, industrial rated air pumps shall be furnished to deliver free air at a rate of approximately 5 cubic feet per hour and a pressure not to exceed 7 psi. Liquid level control systems utilizing air compressors will not be acceptable.
  2. A selector switch shall be furnished to provide manual alternation of the air pumps.

- B. Air Bell: An air bell constructed of PVC 3 inches in diameter shall be provided for installation at the outlet of the air bubbler line in the wet well. The air bell shall have a 3/8-inch NPT tapped fitting for connection to the bubbler line.
- C. Air Flow Indicator: An air flow indicator gauge shall be provided and connected to the air bubbler piping to provide a visual indication of rate of flow in standard cubic feet per hour.

**2.13 STATION ENCLOSURE**

- A. Description: The station enclosure shall contain and enclose all valves and associated controls, and shall be constructed to enhance serviceability. Minimal requirements include the following:
  1. Two access panels shall be provided. Panels shall be sized and placed to permit routine maintenance operations through the panel openings of the enclosure. For these purposes, routine maintenance shall include frequently performed adjustments and inspections of the electrical components, controls, and valves.
  2. The access panels shall be provided with a hinge and latch. Hinge shall be the continuous type. Latch shall engage the enclosure at not fewer than two places, and shall be protected by a keyed lock.
  3. One access panel shall contain a screened vent to maximize air flow for enclosure ventilation.
  4. Station enclosure, less base, shall be completely removable or able to be disassembled following the removal of re-usable tamper-proof hardware. After removal or disassembly, no portion of the enclosure shall project above the surface of the base to interfere with maintenance operations or endanger personnel.
  5. Removal or disassembly of the enclosure shall be accomplished by not more than two maintenance personnel and without the use of lifting equipment.

B. Materials:

1. The station enclosure shall be manufactured of fiberglass suitable for use in a sewage lift station environment.
2. All interior surfaces of the housing shall be coated with a polyester resin-rich finish.
3. The outside of the enclosure shall be coated with a suitable pigmented resin, compounded to ensure long, maintenance-free life.

C. Enclosure Base:

1. Station base shall be constructed of precast, reinforced concrete bonded inside a fiberglass form covering top and sides, and shall be designed to ensure strength adequate to resist deformation of the structure during shipping, lifting, or handling. The enclosure base shall function at the wet well top and incorporate a duplex access lid, sized for the installation and removal of the specified pumps, and shall be of sufficient size to permit access to the wet well.
2. Color used shall de-emphasize the presence of dirt, grease, etc., and shall be provided with a nonskid surface.

D. Ventilation Blower: An exhaust blower shall be mounted in the roof of the enclosure. Blower capacity shall be sufficient to change station air a minimum of once every 2 minutes. Blower motor shall be operated automatically and shall be turned on at approximately 70 degrees F and shall be turned off at 55 degrees F. Blower motor and control circuit shall be protected by a thermal-magnetic air circuit breaker to provide overcurrent and overload protection. Blower exhaust outlet shall be designed to prevent the entrance of rain, snow, rocks, and foreign material.

E. Static Wet Well Vent: A static wet well vent shall be mounted in the station base and housed in the station enclosure. The station enclosure shall provide a transition area between the wet well and the vent outlet. The vent shall terminate through the station wall with a screened opening which shall be designed to

prevent the entrance of rain, snow, rocks, and foreign material.

- F. Cable Transition Adapter: The station base shall incorporate a cable transition adapter for the pump cables, level controls, and associated wiring. The adapter shall provide for a vapor-tight transition between the wet well and the lift station enclosure. The adapter shall incorporate cable grips for each cable and be provided with a gasket between the adapter and the station for a positive seal. Junction boxes shall not be considered for cable transition.
- G. Station Heater: Pump station shall be provided with a 1300/1500 watt, 115 volt, thermostatically controlled, grounded electric heater.
- H. Insulation Package: The pump station shall be equipped with a 1-inch-thick closed cell foam insulation, which shall be applied to the roof, walls, doors, and corner panels.
- I. Hand Lamp: Pump station shall be provided with a 100-watt, 115-volt AC vapor-tight hand lamp with 25 feet of cord and grounding plug. Hand lamp shall be constructed of corrosion-resistant materials and shall be equipped with a guard and a clear globe. Ungrounded hand lamps may be supplied if provided with an effective means of double insulation.

**2.14 WET WELL**

- A. The wet well shall be in accordance with Section 02700.

**2.15 FINISH**

- A. Station Finish: All aboveground station piping and exposed steel framework shall be cleaned with industrial grade chemical cleaner. The prime coat shall be a zinc-based synthetic primer. The finish coat shall be an automotive grade white acrylic enamel.

**2.16 MANUFACTURERS' RESPONSIBILITIES**

- A. **System Responsibility:** To ensure system compatibility, all pumps, pump bases, station enclosure, station valving, pump controls, and level system shall be furnished by the pump manufacturer. The pump manufacturer shall assume complete responsibility for system compatibility.
- B. **Operational Test:**
1. The pumps, motors, and controls will each be given an independent operational test in accordance with the standards of the Hydraulics Institute. Recordings of the test shall constitute the correct performance of the equipment at the design head, capacity, and rated speed and horsepower as specified herein.
  2. Upon request from FERMCO, a FERMCO representative and/or a representative designated by FERMCO shall be invited to witness the operational test at the manufacturer's facility or other location designated by the manufacturer.
- C. **Support Literature:**
1. The subcontractor shall submit support literature from the pump manufacturer for the pump and all related equipment specified herein.
  2. **Installation Instructions:** Pumping units shall be installed in accordance with written instructions provided by the manufacturer.
  3. **Operation and Maintenance Instructions:**
    - a. The pump manufacturer shall supply a complete set of comprehensive written instructions to enable an operator to properly operate and maintain the equipment supplied. Content of the instructions shall assume the operator is familiar with pumps, motors, piping, and valves, but that the operator has not previously operated and/or maintained the exact equipment supplied.
    - b. The instructions shall be prepared as a system manual applicable solely to the pump

equipment and related devices supplied by the manufacturer, as specified herein.

c. The instructions shall include, but not be limited to, the following:

- (1) Descriptions of, and operating instructions for, each major component of the complete pump package as supplied.
- (2) Instructions on operation of the pump and pump controls in all intended modes of operation.
- (3) Instruction for all adjustments which must be performed at initial start-up of pump equipment, adjustments required after the replacement of liquid level control system components, and adjustments as required in the course of preventative maintenance as specified by the manufacturer.
- (4) Service instructions for major components not manufactured by the pump package manufacturer, but supplied by the manufacturer in accordance with the specifications. In such case, the literature supplied by the actual manufacturer shall be incorporated as appendices.
- (5) Electrical schematic diagram of the pump and control package. Schematics shall illustrate, to the extent of authorized repair, pump motor branch, control and alarm system circuits, and interconnections among these circuits. Wire numbers shall be shown on the schematic. Schematic diagrams for individual components, not normally repairable by the station operator, need not be included, and details for such parts shall not be substituted for an overall system schematic. Partial schematics, block diagrams, and simplified schematics shall not be

provided in lieu of an overall system diagram.

- (6) Layout drawing of the pump package as supplied, prepared in accordance with good commercial practice, showing the location of all submersible pumps, baseplates, and guide rail assemblies.
- 4. Operation and maintenance instructions which are limited to a collection of component manufacturer's literature without overall pump station continuity will not be acceptable.
- 5. Operation and maintenance instructions shall be specific to the equipment supplied in accordance with these specifications. Instruction manuals applicable to many different configurations of pump stations, and which require the operator to selectively read portions of the manual, will not be acceptable.

### **PART 3 EXECUTION**

#### **3.1 EXAMINATION**

- A. Verify that proper power supply is available.
- B. Verify that all piping is in place and all leak testing has been satisfactorily performed.

#### **3.2 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Install in accordance with the requirements of NFPA 70.
- C. All earthwork shall be performed in accordance with Section 02200.
- D. All exterior gravity and force main piping shall be installed in accordance with Section 02700.

**3.3 MANUFACTURER ASSISTANCE**

- A. The manufacturer shall provide installation supervision and start-up assistance. Service assistance shall be in accordance with the manufacturer's warranty.

**END OF SECTION**

SECTION 02770  
STORMWATER MANAGEMENT (SWM) BASIN

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Outlet standpipe structure and accessories.
- B. Concrete base.
- C. Excavation.
- D. Backfilling and compacting.
- E. Soil and aggregate.
- F. Riprap ends of culverts.
- G. Erosion control.

**1.2 RELATED SECTIONS**

- A. Section 02200 - Earthwork.
- B. Section 02600 - Storm Drainage.
- C. Section 02830 - Chain Link Fences.
- D. Section 02900 - Seeding.
- E. Section 03001 - Concrete.

**1.3 REFERENCES**

- A. American Society for Testing and Materials (ASTM):
  - 1. ASTM A36-94 Standard Specification for Carbon Structural Steel.
  - 2. ASTM D698-91 Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort.

(12,400 ft-lbf/ft/[600 kN-  
m/m<sup>3</sup>).

- B. State of Ohio, Department of Transportation,  
Construction and Material Specification,  
January 1, 1995 (ODOT):
1. ODOT 499 Concrete - General.
  2. ODOT 703.01 Aggregate - General.
  3. ODOT 707.02 Metallic-Coated Steel  
Conduits.
  4. ODOT 707.05 Bituminous Coated Corrugated  
Steel Pipe and Pipe Arches  
with Paved Invert.

#### 1.4 SUBMITTALS

- A. Provide submittals as required by Section 01010.
- B. Product Data: Provide data on all pipe materials, pipe fittings, accessories, and methods for installation.
- C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- D. Project Record Documents:
1. Accurately record actual locations by NAD83 coordinates of all underground culverts and headwalls; invert and top elevations, size, and type; and show on redline drawings.
  2. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

### PART 2 PRODUCTS

#### 2.1 FABRICATION

- A. Pipe and Fittings:
1. The pipe and fittings shall conform to ODOT 707.02.
  2. The pipe and fittings shall conform to ODOT 707.05.

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3. End sections shall have sides tapered to blend with the contour of the slope.
4. The nominal size for the pipe and fittings is based on the nominal inside diameter of the pipe.

B. Anti-vortex vane - ASTM A36 steel.

## 2.2 ACCESSORIES

- A. Concrete: ODOT Item 499, Class F, 3,000 psi average compressive strength at 28 days, poured against undisturbed soil or compacted fill.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Verify that excavations are ready to receive work.

### 3.2 PREPARATION

- A. Hand-trim excavations. Correct overexcavation according to the requirements of Section 02200.

### 3.3 ERECTION/INSTALLATION/APPLICATION

A. Installation:

1. Excavate soil to depth and width required.
2. Place corrugated steel pipe in properly excavated trench with bedding in place, as shown on the drawings, and properly compact backfill around pipe. Riser to be set upright with its top level.

B. Bedding:

1. Place pipe on sand bedding material, Type A3 (per Section 02200), as indicated on drawings.
2. Backfill shall be placed in 6-inch layers and compacted to 95 percent as determined by ASTM D698. Puddling of backfill will not be allowed.
3. Maintain moisture content within  $\pm 3$  percent of optimum moisture.

- C. Backfill:
  - 1. See Section 02667 for installation of backfill materials.
- D. Aggregate:
  - 1. ODOT Item 703.01, Size Number 57 as shown on the drawings.
  - 2. ODOT 703.01 - Size Number 3 as shown on the drawings.
- E. Riprap: As specified in Section 02600.

### 3.4 FIELD QUALITY ASSURANCE

- A. Testing of backfill compaction shall be as specified in Section 02200.

### 3.5 PROTECTION

- A. Protect pipe from damage or displacement until backfilling operation is complete.
- B. Excavation shall proceed in a manner to locate and protect existing underground utilities in the vicinity of construction.
- C. Berms and Diversion Ditches: Miscellaneous berms and diversion ditches shall be provided to protect sloping areas from erosion:
  - 1. Locate to direct runoff as required to prevent overflowing.
  - 2. Use hay bale check dams to filter out the suspended matter, as required.
  - 3. Filter fabric shall be placed under all riprap.
- D. Protect storm drains and ditches from siltation during construction as specified in Section 02900. Storm drains and ditches shall be free of sediment and erosion problems at project completion. Riprap at the pipe ends and the emergency spillway shall be done according to Section 02600.

- E. Placing Topsoil:
1. Spread topsoil to a depth of 4 inches ( $\pm 1$  inch) over areas to be seeded. Rake until smooth.
  2. Place topsoil on unsaturated, unfrozen subgrade.
  3. Remove vegetation matter and foreign, non-organic material from topsoil while spreading.
  4. Grade topsoil to eliminate rough, low, or soft areas and to ensure positive drainage.
- F. Seeding: Seed and mulch areas to be vegetatively stabilized according to Section 02900.

**END OF SECTION**

SECTION 02830  
CHAIN LINK FENCES

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Fence framework, fabric, and accessories.
- B. Excavation for post bases and concrete foundation for posts.
- C. Fence repair needed as a result of subcontractor's construction or demolition activities.
- D. Installation of a temporary gate.
- E. Removal and salvage of existing fence.

**1.2 RELATED SECTIONS**

- A. Section 02200 - Earthwork.
- B. Section 16170 - Grounding and Bonding.

**1.3 REFERENCES**

- A. American Society for Testing and Materials (ASTM):
  - 1. ASTM A121-86 Standard Specification for Zinc-Coated (Galvanized Steel Barbed Wire.
  - 2. ASTM A123 Standard Specification for Zinc (Hot Dip Galvanized) Coatings on Iron and Steel Products.  
Rev. A-89
  - 3. ASTM A153-82 Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
  - 4. ASTM A392 Standard Specification for Zinc-Coated Steel Chain-Link Fence Fabric.  
Rev. B-91

5. ASTM A569/A569M Standard Specification for  
Rev. A-91 Steel, Carbon (0.15 Maximum  
Percent), Hot-Rolled Sheet and  
Strip Commercial Quality.

## 1.5 SYSTEM DESCRIPTION

- A. Fence Height: 7 feet nominal with barbed wire 1 foot high on extension arms as indicated on drawings.
- B. Line Post Spacing: At intervals not exceeding 10 feet.
- C. Gate shall be a manual double swing type.

## 1.6 SUBMITTALS

- A. Provide submittals as required by Section 01010.
- B. Shop Drawings: Indicate plan layout, spacing of components, post foundation dimensions, hardware anchorage, and schedule of components.
- C. Product Data: Provide data on fabric, posts, accessories, fittings, and hardware.
- D. Certificate of Conformance: Manufacturer certifies that supplied products meet or exceed specification requirements.
- E. As-built Drawings: Indicate plan layout, size, and type.

## PART 2 PRODUCTS

### 2.1 MATERIALS

- A. Re-use post and wire fabric salvaged during site preparation work. New material is as follows:
1. Framing (Steel): ASTM A569 hot rolled steel strip, cold formed to pipe configuration, longitudinally welded construction, minimum yield strength of 50 ksi.

2. Fabric Wire (Steel): ASTM A392 zinc-coated, 9-gage, wire fabric.
3. Barbed Wire: ASTM A121 galvanized steel; 12-gage wire, three strands, four points at 5 inches on center.
4. Fittings: Galvanized steel sleeves, bands, clips, rail ends, tension bars, fasteners, and fittings.
5. Drive Anchor: Two angles, 36-inch length, 1-1/4 inch by 1-1/4 inch by 1/4 inch.

## 2.2 COMPONENTS

- A. Line Posts: 2-3/8 inch outside diameter.
- B. Corner and Terminal Posts: 2-7/8-inch, OD.
- C. Top and Brace Rail: 1-5/8-inch OD, plain end, sleeve coupled.
- D. Fabric: 2-inch diamond mesh interwoven wire, No. 9 gage, top selvage twisted tight, bottom selvage knuckle end closed.
- E. Tension Wire: No. 6 gage steel, single strand, galvanized.
- F. Tie Wire: No. 6 gage galvanized steel.
- G. Caps: Cast steel galvanized; sized to post diameter, set screw retainer.

## 2.3 FABRICATION

- A. Finishes on new items
  1. Components and Fabric: Galvanized to ASTM A123, 2.0 ounces/ft<sup>2</sup> coating.
  2. Hardware: Galvanized to ASTM A153, 2.0 ounces/ft<sup>2</sup> coating.
  3. Accessories: Same finish as framing.

**PART 3 EXECUTION**

**3.1 ERECTION/INSTALLATION/APPLICATION**

- A. Install framework, fabric, accessories, and gates in accordance with manufacturer's instructions.
- B. Set all posts plumb. All corner and pull posts are to be set in concrete footings with top of footing 2 inches above finish grade. Slope top of concrete for water runoff. All line posts shall be set using steel drive anchors. The post shall be driven into solid ground and then anchored into position by two angles driven diagonally through metal shoes bolted to the post below ground level. Set angles perpendicular to the fence line.
- C. All Post Footing Depth Below Finish Grade: 3 feet, 6 inches as shown on construction drawings.
- D. Brace corner post to adjacent line post with horizontal center brace rail and diagonal truss rods. Install brace rail, one bay from end and gate posts.
- E. Provide top rail through line post tops and splice with 6-inch-long rail sleeves.
- F. Stretch fabric between terminal posts.
- G. Position bottom of fabric 2 inches above finished grade.
- H. Fasten fabric to top rail, line posts, braces, and bottom tension wire with tie wire at maximum 15 inches on centers.
- I. Attach fabric to end and corner posts with tension bars and tension bar clips.
- J. Install bottom tension wire stretched taut between terminal posts.

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- K. Make adaptations of existing fence to new fence as required at places where existing and new fences meet.
- L. Install grounding as noted on the details.
- M. During initial site preparation work, remove and salvage existing fence fabric, post, and hardware for re-use.

### 3.2 FIELD QUALITY ASSURANCE

- A. Construction shall be accomplished in a manner that will provide a rigid, taut fence, closely conforming to the surface of the ground.

### 3.3 ADJUSTING

- A. Erection Tolerances
  - 1. Maximum Variation from Plumb: 1/4 inch.
  - 2. Maximum Offset from True Position: 1 inch.
- B. Patch, repair, or replace any material damaged by the Subcontractor to match undamaged material.

**END OF SECTION**

SECTION 02900  
SEEDING

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Seed and mulch to stabilize disturbed areas.
- B. Maintenance of seeded areas until final acceptance of contract work.

**1.2 RELATED SECTIONS**

- A. Section 02100 - Site Clearing and Demolition.
- B. Section 02200 - Earthwork.
- C. Section 02600 - Storm Drainage.

**1.3 REFERENCE DRAWINGS**

- A. See Section 01011 for the Schedule of Drawings.

**1.4 REFERENCES**

- A. American Society for Testing and Materials (ASTM):
  - 1. ASTM D977-91 Standard Specification for Emulsified Asphalt.
- B. State of Ohio, Department of Transportation (ODOT), Construction and Material Specifications, January 1, 1995.
  - 1. ODOT 207 Temporary Soil Erosion and Sediment Control.
  - 2. ODOT 659 Seeding and Mulching.
  - 3. ODOT 659.02 Agricultural Liming Materials.
  - 4. ODOT 659.06 Mulching Material.
  - 5. ODOT 659.08 Fertilizing and Liming.
  - 6. ODOT 601 Slope and Channel Protection.
  - 7. ODOT 667 Seeding and Jute Matting.
  - 8. ODOT 668 Seeding Excelsior Matting.
  - 9. ODOT 670 Erosion Protection.

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**1.5 SUBMITTALS**

- A. Provide submittals as required by Section 01010.
- B. Maintenance Data: Submit maintenance instructions for seeded areas including:
  - 1. Grass Seed: Types, application, cutting method, and maximum grass height.
  - 2. Soil Nutrients: Types, frequency, and recommended coverage.
  - 3. Soil Conditioners: Type and recommended coverage.
- C. Certificates: Provide written certification from supplier of seed to state that the seed delivered to the project complies with the following:
  - 1. Seed varieties and mixture comply with requirements of the specifications.
  - 2. Purity and germination rate comply with the requirements of the specifications.
- D. Product Data:
  - 1. Filter fabric catalog data and sample.
  - 2. Mulch for seeding.

**1.6 GENERAL**

- A. Except as supplemented or otherwise modified herein and/or shown on the construction drawings, the entire work under this section shall be in compliance with the provisions of ODOT Items 659 and 670.

**1.7 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver grass seed mixture in original, sealed containers. Seed in damaged packaging will not be accepted. Containers shall show:
  - 1. Names and percentage of each seed variety.
  - 2. Year of production, percentage of purity, minimum germination rate, and date of packaging.
  - 3. Net weight.

- B. Deliver plant nutrients and soil conditioners in waterproof bags showing weight, chemical analysis, and name of manufacturer.
- C. Store materials in a dry area, free from wetting and physical damage.

**1.8 MAINTENANCE**

- A. Seed Areas:
  - 1. Apply plant nutrients as required in recommendations of agricultural authority such as the Soil Conservation Service.
  - 2. Water to prevent grass and soil from drying out.
  - 3. Immediately re-seed areas that show bare spots. Fill in washed-out areas with topsoil and re-seed.
- B. Removal of Sedimentation Accumulation:
  - 1. Remove accumulated sediments when sediment is greater than one-half the height of the control measure, and at project completion.

**PART 2 PRODUCTS**

**2.1 MATERIALS**

- A. Seed
  - 1. Seed Mixture: Permanent seeding
    - a. Forty percent Kentucky Bluegrass (POA Pratensis).
    - b. Forty percent Kentucky Fescue (Festuca Rubra).
    - c. Twenty percent Annual Ryegrass (Lolium Multiflorum).
  - 2. Mixture shall be clean, guaranteed 95 percent pure, and have a minimum germination rate of 85 percent within 1 year of test.
- B. Soil Conditioners
  - 1. Lime:
    - a. Lime shall meet the requirements of ODOT Item 659.02.

- b. Agricultural ground limestone, with a minimum total neutralizing power (TNP) of 90 percent, at least 40 percent passing a No. 100 sieve, and at least 35 percent passing a No. 8 sieve, is considered to be standard grade. This grade is applied at a 100 percent standard application rate of 2,000 pounds per acre subject to the approval of FERMC0. Other grades of agricultural liming materials may be used. Apply substitute material at rates which are dependent on the TNP and sample fineness.

C. Plant Nutrients

1. Fertilizer:

- a. Fertilizer shall meet the requirements of ODOT Item 659.08.
- b. The standard application of fertilizer shall be at the rate of 20 pounds per 1,000 square feet of 12-12-12. Another analysis, in the same ration, may be used by varying the application rate to produce the same values specified. Either dry or liquid fertilizer may be used and shall be distributed in an even pattern over the specified area, then thoroughly disked, harrowed, or raked into the soil to a depth between 2 and 4 inches.

2.2 ACCESSORIES

A. Mulch:

- 1. Mulch shall meet the requirements of ODOT Item 659.06.
- 2. Materials used for mulching shall be straw or hay. They shall be reasonably free of weed seed and such foreign materials as may detract from their effectiveness as a mulch or injure desired plant growth.

B. Matting:

- 1. Matting shall meet the requirements of ODOT Items 667 or 668.

2. Matting shall be of a uniform open plain weave of undyed and unbleached single jute yarn or excelsior. The yarn shall be of loosely twisted construction and shall not vary in thickness by more than half its normal diameter. Matting shall be furnished in rolled strips as follows:
- a. Length: Minimum 50 yards.
  - b. Width: 48 inches plus or minus 1 inch.
  - c. Warp Ends Width: 81 plus or minus 3.
  - d. Weft Ends per Yard: 41 plus or minus 3.
  - e. Average Weight: 1.22 pounds per linear yard plus or minus 10 percent.

Staples used to fasten the matting shall be made from 12-inch lengths of No. 11 gage steel wire bent into narrow "U" shape with the ends of the staple approximately 1 inch apart. For clay, shale, and other heavy soils, a 3-inch steel staple, at least 9 gage with points approximately 1 inch apart will be used.

3. Excelsior matting shall consist of a machine-produced mat of wood excelsior, 80 percent of which is at least 8 inches in length. The wood from which the excelsior is cut shall be properly cured to achieve adequately curled and barbed fibers.

The matting shall be of consistent thickness, with the fiber evenly distributed over the entire area of the mat. The matting shall be covered on the top side with netting having a maximum 3-inch by 1-inch weave, twisted kraft paper yarn having a high wet strength, or biodegradable plastic, and entwined with the excelsior for maximum strength and ease of handling.

The matting may be 24, 36, or 48 inches in width, plus or minus 1 inch, and in rolls of more than 100 feet in length. The weight of the material shall be not less than 0.72 pounds per square yard, constant weight, air dry.

- C. Bales: Hay or straw bales shall be reasonably free of weed seed and such foreign materials as may detract from their effectiveness or be injurious to desired plant growth.

- D. Emulsified Asphalt: Conforming to requirements of ASTM D977 for slow-setting type SS-1.
- E. String: Jute twine.
- F. Stakes: Stakes shall be wooden (2 inches by 2 inches), reinforcing bars, or fence posts.
- G. Water: Clean, fresh (not salt water), and free of substances or matter which could inhibit vigorous growth of grass.
- H. Non-woven geotechnical fabric per the following table and similar to Trevira No. 011/250 as manufactured by Hoechst Celanese Corp.:
- I. Riprap: Materials as indicated in ODOT Item 601 and the drawings.

**PART 3 EXECUTION**

**3.1 PREPARATION**

- A. Remove debris, weeds, and undesirable plants and their roots. Remove contaminated subsoil.
- B. Repeat cultivation in areas where equipment used for hauling and spreading of topsoil has compacted subsoil.

**3.2 ERECTION/INSTALLATION/APPLICATION**

- A. Application of Soil Conditioners:
  - 1. Apply lime conditioners at the rate specified in Article 2.1, Paragraph B, Subparagraph 1.b., or as determined by soil test.
  - 2. Mix thoroughly into the top 2 inches of the topsoil.
- B. Application of Plant Nutrients:
  - 1. Apply fertilizer at the rate specified in Article 2.1, Paragraph C, Subparagraph 1.b.
  - 2. Apply after smooth raking of topsoil, and prior to roller compaction.

3. Mix thoroughly into upper 2 inches of topsoil.
4. Lightly water to aid the distribution of fertilizer.

C. Seeding:

1. The seed may be sown dry or hydraulically. When applying seed with a mechanical spreader, apply evenly in two intersecting directions. Rake in lightly. Apply at a minimum rate of 3 pounds per 1,000 square feet.
2. Do not seed areas in excess of that which can be mulched on same day.
3. Apply seed mixture as follows:
  - a. All seeding performed between October 15 and March 15 shall be temporary seeding in accordance with ODOT Item 207.
  - b. Permanent seeding may be performed at any time with permission of FERMCO.
4. Lightly roll seeded area.
5. Immediately following seeding and compacting, apply mulch.
6. Apply water with a fine spray immediately after each area has been mulched. Saturate soil to approximately 4 inches deep.

**3.3 FIELD QUALITY ASSURANCE**

- A. To qualify for acceptance, an area shall have a good, clean stand of perennial grass.
- B. Coverage shall be at least 95 percent of the area, and no bare spots shall exceed 3 square feet.
- C. Areas that fail to meet requirements of the specifications shall be repaired or re-seeded as necessary to produce an acceptable stand of grass.

**3.4 PROTECTION**

- A. Seed Protection:
  1. Apply protection as necessary to retain soil and plant material.

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2. Cover seeded slope area with mulch. Cover ditch lines with matting.
3. Where slope is steeper than 3 horizontal to 1 vertical, replace mulch with matting.
4. Mulch:
  - a. Mulch seeded area with straw mulch. Spread mulch at a rate of not less than 2 tons per acre.
  - b. Apply by hand, by mechanical spreaders, or by blowers.
5. Matting:
  - a. Roll matting onto slopes or along ditch lines without stretching or pulling.
  - b. Lay matting smoothly on surface, and bury top end of each section in 6-inch-deep excavated topsoil trench.
  - c. Provide 12-inch overlap of adjacent rolls.
  - d. Rake smooth, level with adjacent soil.
  - e. Secure outside edges and overlap with staples at a maximum interval of 36 inches. Intermediate staples shall be spaced at a maximum interval of 5 feet.
  - f. Lightly dress slopes with topsoil to ensure close contact between matting and soil.
  - g. At sides of ditches, lay matting laps in direction of water flow.

END OF SECTION

SECTION 03001  
CONCRETE

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Concrete work for slabs, electric ductbanks, head walls, manholes, equipment pads, catch basins, pipe encasement, thrust blocks, and other miscellaneous concrete.
- B. Formwork and accessories.
- C. Reinforcement and accessories.
- D. Cast-in-place concrete and accessories.
- E. Finishing and curing.
- F. Sampling and testing of concrete work.

**1.2 REFERENCES**

- A. American Concrete Institute (ACI):
  - 1. ACI 301-89 Specifications for Structural Concrete for Buildings.
  - 2. ACI 305R-91 Hot Weather Concreting.
  - 3. ACI 306R-88 Cold Weather Concreting.
  - 4. ACI 318/318R-Rev 92 Building Code Requirements for Reinforced Concrete.
  - 5. ACI SP-66-94 ACI Detailing Manual.
- B. American Society for Testing and Materials (ASTM):
  - 1. ASTM A185-94 Steel Welded Wire Fabric, Plain, for Concrete Reinforcement.
  - 2. ASTM A615-A615M-94 Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.

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- 3. ASTM C31-91 Standard Practice for Making and Curing Concrete Test Specimens in the Field.
- 4. ASTM C33-93 Concrete Aggregates.
- 5. ASTM C39-94 Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
- 6. ASTM C94-94 Ready Mixed Concrete.
- 7. ASTM C143-Rev. A-90 Standard Test Method for Slump of Hydraulic Cement Concrete.
- 8. ASTM C150-Rev B-94 Portland Cement.
- 9. ASTM C231-Rev. B-91 Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
- 10. ASTM C260-94 Air-Entraining Admixtures for Concrete.
- 11. ASTM C309-94 Liquid Membrane-Forming Compounds for Curing Concrete.
- 12. ASTM C494-92 Chemical Admixtures for Concrete.

C. U. S. Department Of Commerce, Voluntary Products Standards (PS):

- 1. PS 1-83 Plywood.

**1.3 SUBMITTALS**

- A. Provide submittals as required by Section 01010.
- B. Shop Drawings: Indicating reinforcing bar sizes, spacings, locations, quantities, bending and cutting schedules, placing drawings, and supporting and spacing devices.
- C. Product Data: Concrete mix designs, including documentation of aggregate sources and most recent sieve analysis. Sieve analyses must not be older than 1 year.

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- D. Concrete Supplier: Name and address of the transit-mix concrete supplier. Supply typical batch ticket and history per ASTM C94.
- E. Material Safety Data Sheets (MSDSs): MSDSs shall be submitted for any chemical compound or material to be used on the project.
- F. Test Reports: Test reports for all tests required under Article 3.3.

#### 1.4 QUALITY ASSURANCE

- A. ACI 301: References are made to ACI 301 to abbreviate text of this section. Only those portions of ACI 301 referred to specifically in this section shall apply.
- B. In ACI 301, any mention of Architect/Engineer or Owner refers to the FERMCO Construction Manager.
- C. Formwork shall be in accordance with Chapter 4 of ACI 301 unless specified otherwise in this section.
- D. Perform concrete reinforcing work in accordance with Chapter 5 of ACI 301, unless specified otherwise in this section.
- E. Perform cast-in-place concrete work in accordance with Chapters 7, 8, 10, 11, and 12 of ACI 301, unless specified otherwise in this section.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Tags: Reinforcing bar tags shall be made of durable material and marked in a legible manner with waterproof markings; not less than one tag per bundle, attached by wire. Identification tags shall show the grade, number of pieces, size, and mark or length of bars.

#### PART 2 PRODUCTS

The listing of materials suppliers below in no way precludes the Subcontractor from proposing alternate suppliers of any of

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the materials to be furnished within the scope of this specification. This list of suppliers is intended to identify the type of materials and general quality of those materials that will be included in the Subcontractor's proposal. It is the Subcontractor's responsibility to propose materials that are best suited for this project in combined terms of quality and price.

## 2.1 MATERIALS

- A. Plywood Forms: Not less than 5/8-inch-thick, 5-ply Douglas fir plywood conforming to PS 1, and as manufactured by a member of the American Plywood Association; B-B Plyform, Class I, Exterior-APA, with plyform faces sanded and oiled.
- B. Prefabricated Type Forms: Matched, tight fitting, stiffened to support weight of concrete.
- C. Form Release Agent: Colorless mineral oil which will not stain concrete or impair natural bonding characteristics of subsequent coatings.
- D. Reinforcing Steel: ASTM A615, 60 ksi yield grade; deformed billet steel bars; plain finish.
- E. Welded Steel, Wire Fabric: ASTM A185, plain type welded wire fabric.
- F. Tie Wire: Minimum 16-gage annealed type wire.
- G. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for strength and support of reinforcement during concrete placement conditions.
- H. Fabrication: Fabricate concrete reinforcing in accordance with ACI SP-66 and Chapter 7 and 12 of ACI 318.
- I. Cement:
  - 1. Normal, Portland cement, conforming to requirements of ASTM C150, Type I.

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## J. Admixtures:

1. Air Entrainment: Conforming to ASTM C260.
2. Water Reducing and Retarding: Conforming to requirements of ASTM C494.

## K. Aggregates:

1. Normal Weight Concrete: Conforming to requirements of ASTM C33.
2. Maximum aggregate size: 1 inch.

**2.2 ACCESSORIES**

- A. Chamfer Strips: Chamfered, wood strip type; 3/4-by-3/4-inch size.
- B. Nails, Spikes, and Anchorages: Sized as required and of sufficient strength and character to maintain formwork in place while placing concrete.
- C. Form Ties: Removable or snap-off type; designed to prevent form deflection; of adjustable length, cone type, with waterproofing washer; and free of defects that could leave holes larger than 1 inch in concrete surface.
- D. Curing Compound: Conforming to the requirements of ASTM C309, clear; must not impair natural bonding characteristics of subsequent coatings.

**2.3 FABRICATION**

- A. General: All concrete used in work shall be composed of Portland cement, fine and coarse aggregate, and the specified admixtures. Concrete for every part of the work shall be of homogeneous structure which, when hardened, will have the required strength and resistance to weathering. The proportions for all concrete shall be such as to produce a mixture which will work readily into the forms and around reinforcement with the method of placing employed on the work, but without permitting the materials to segregate.

B. Mix Proportions:

1. The following mix designs shall be used for cast-in-place concrete.

a. Slabs

Specified Strength (28 days) 4,000 psi  
Total Air Content: 5 ± 1-1/2 percent  
Specified Slump: 4 inches ± 1 inch  
Maximum Aggregate Size: 1 inch  
Maximum Water/Cement Ratio: 0.35 (per ACI 318, Section 5.4)

Water Reducing and retarding admixtures as required per ASTM C494.

b. Ductbank

Specified Strength (28 days) 2,500 psi  
Specified Slump: 6 inches ± 1-1/2  
Max. Aggregate Size 3/8 inch  
Max. Water/Cement Ratio 0.80

c. Walls and Foundations

Specified Strength (28 days): 3,000 psi  
Total Air Content: 5 ± 1-1/2 percent  
Specified Slump: 4 inches ± 1 inch  
Maximum Aggregate Size: 1 inch  
Maximum Water/Cement Ratio: 0.46 (per ACI 318, Section 5.4)

Water reducing and retarding admixtures as required per ASTM C494.

d. Fence posts, guard posts, and other miscellaneous concrete

Specified Strength (28 days) 3,000 psi  
Specified Slump: 3 inches ± 1-1/2  
Maximum Aggregate Size: 1-1/2 inches  
Maximum Water/Cement Ratio: 0.55

2. The work has been designed for concrete having a minimum compressive strength at 28 days as determined by ASTM C39. The water/cement ratio

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shall be determined by consideration of the specified strength, the water-reducing admixtures, the slump required for proper placement, air entraining requirements, the maximum allowable aggregate size and its specific gravity, the fineness modulus of the fine aggregate and its specific gravity, and the amount of water carried on the aggregates. The mix designs shall be proportioned in accordance with ACI 318, Section 5.3 or Section 5.4.

3. The Subcontractor shall provide all plant and equipment necessary to determine and control the actual proportions of materials entering the batch. Slumps shall be recorded for each trial batch.
- C. Water Content: In calculating the total water content in any mix, the amount of water carried on the aggregate shall be included. The water on the aggregate shall be determined periodically by test, and the amount of free water on the aggregate shall be subtracted from the water allowed in the mix. In all cases, the amount of water to be used shall be the minimum amount required to produce a plastic mixture of the specified strength and slump.
- D. Mixing and Delivery: Mixing and delivery of concrete shall be scheduled so that all concrete placing operations can be completed within 1-1/2 hours or before the drum has revolved 300 revolutions, whichever comes first, after introduction of mixing water to cement and aggregates, in accordance with Section 11 of ASTM C94. When air temperature has fallen to or is expected to fall below 40 degrees F, the recommendations for cold weather concreting contained in ACI 306R shall be followed. When the air temperature exceeds 90 degrees F, the recommendations for hot weather concreting contained in ACI 305R shall be followed.

**PART 3 EXECUTION**

**3.1 PREPARATION**

- A. Erect formwork and bracing to achieve design requirements in accordance with requirements of Chapter 4 of ACI 301.
1. Provide bracing to ensure stability of formwork.
  2. Align joints and make watertight. Keep number of form joints to a minimum.
  3. Provide chamfer strips on external corners of permanently exposed edges.
  4. Shore or strengthen formwork subject to overstressing by construction loads.
- B. Application - Form Release Agent: Apply form release agent on formwork in accordance with manufacturer's instructions.
1. Apply prior to placement of reinforcing steel, anchoring devices, and embedded items.
  2. Keep surfaces coated prior to placement of concrete.
- C. Form Cleaning: Clean and remove foreign matter within forms as erection proceeds.
1. Clean formed cavities of debris prior to placing concrete.
  2. Flush with water or vacuum to remove remaining foreign matter.
  3. Ensure that water and debris drain to exterior.
  4. During cold weather, remove ice and snow from within forms. Do not use de-icing salts or water to clean out forms.
- D. Tolerances: Construct formwork to maintain tolerances required by ACI 301, Section 4.3.
- E. Form Removal: Forms or bracing shall not be removed until concrete has gained sufficient strength to carry its own weight and imposed loads.
1. Loosen forms carefully.
  2. Do not wedge with pry bars, hammers, or tools against finished concrete surfaces.

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### 3.2 ERECTION/INSTALLATION/APPLICATION

- A. Place, support, and secure reinforcement against displacement. Do not deviate from required position.
- B. Maintain concrete cover around reinforcing according to the requirements of Chapter 5 of ACI 301, Chapter 7 of ACI 318, and as shown on construction drawings.
- C. Provide formed openings where required for work to be embedded in concrete members.
- D. Coordinate work of other sections in forming and setting openings, slots, recesses, sleeves, bolts, anchors, and other inserts.
- E. Install concrete accessories straight, level, and plumb, or as called out on the construction drawings.
- F. Place concrete continuously between forms or other limits indicated on the construction drawings.
  - 1. Place concrete in accordance with Chapter 8 of ACI 301 and Chapter 5 of ACI 318.
  - 2. Ensure that reinforcement and forms are not disturbed during concrete placement.
- G. FERMC0 is to maintain records of concrete placement, record date, location, quantity, air temperature, and test samples taken.

### 3.3 FIELD QUALITY ASSURANCE

- A. Testing: The Subcontractor shall deliver test specimens to the testing agency. The agency shall perform field tests (take slumps, air, and cylinders) and shall perform laboratory tests on the specimens. Concrete testing shall be performed in accordance with Chapter 16 of ACI 301 for each 50 cubic yards, or fraction thereof, of each mix design placed in any 1 day.
  - 1. Slump Tests: ASTM C143. One sample for each strength test.

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2. Air Content Tests: ASTM C231. One sample for each strength test.
3. Test Cylinders: ASTM C31. One set of three cylinders for above quantities.
4. Compressive Strength: ASTM C39. One specimen tested at 7 days and two specimens tested at 28 days.

**3.4 PROTECTION**

- A. Provide concrete curing and protection in accordance with Chapter 12 of ACI 301.
  1. Apply slab curing compound, where used, in accordance with the approved manufacturer's recommendations.
- B. Provide finishes for formed concrete surfaces as defined in Chapter 10 of ACI 301.
- C. Provide finishes and tolerances for slabs in accordance with Chapter 11 of ACI 301.
  1. Provide troweled finish with Class A tolerance on all exposed slabs.

**END OF SECTION**

SECTION 16050  
BASIC ELECTRICAL MATERIALS AND METHODS

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Conduit.
- B. Building wire and cable (600 volt).
- C. Nameplates.
- D. Wire markers and cable tags.
- E. Splicing and termination components.
- F. Panelboards.

**1.2 REFERENCES**

- A. National Fire Protection Association (NFPA):
  - 1. NFPA 70-96 National Electrical Code.
- B. American National Standards Institute (ANSI):
  - 1. ANSI C80.1-90 Rigid Steel Conduit - Zinc Coated.
- C. Underwriters Laboratories, Inc. (UL):
  - 1. UL 486A-91 UL Standard for Safety Wire Connectors and Soldering Lugs for Use with Copper Conductors.
  - 2. UL 486B-91 UL Standard for Safety Wire Connectors and Soldering Lugs for Use with Copper Conductors.
  - 3. UL 510-94 UL Standard for Safety Polyvinyl Chloride, Polyethylene and Rubber Insulating Tape.
  - 4. Electrical Construction Materials Directories, 1994.

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- D. National Electrical Manufacturers Association (NEMA):
1. NEMA AB 1-93 Molded Case Circuit Breakers and Molded Case Switches.
  2. NEMA PB 1-90 Panelboards.
  3. NEMA PB 1.1-91 General Instructions for Proper Installation, Operation, and Maintenance of Panelboards Rated 600 Volts or Less.
  4. NEMA 250-91 Enclosures for Electrical Equipment (1000 Volts Maximum).

### 1.3 SUBMITTALS

- A. Submittals shall be in accordance with Section 01011.

### 1.4 QUALITY ASSURANCE

- A. All work shall conform to the requirements of NFPA 70.
- B. All products shall be listed and classified by Underwriters Laboratories, Inc. Electrical Construction Materials Directories, as suitable for the purpose specified and shown.

## PART 2 PRODUCTS

### 2.1 MATERIALS

- A. Conduit
1. Rigid steel conduit and fittings conforming to ANSI C80.1. Conduit shall be 1/2 inch minimum in diameter.
  2. All conduit connections shall be NPT.
- B. Wire and Cable
1. Single conductor, 600-volt insulated copper conductor. Conductors for power and lighting branch circuits shall be sized as required by NFPA 70.
    - a. Conductors No. 12 AWG and larger shall be stranded.

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- b. Conductors for control shall not be smaller than No. 14 AWG stranded.
- c. Conductors for Class 1 remote-control and signal circuits shall be enclosed in cable and shall comply with NFPA 70.
- d. Power and lighting conductor insulation shall be Type THW, XHHW, or THWN. Conductors required to be rated 90 degrees C in accordance with NFPA 70 shall be Type XHHW-2 or THW-2.

C. Nameplates

- 1. Nameplates shall be engraved, three-layer laminated plastic, 5/16-inch bold style, black letters on white background. Provide for all items 6 inches by 6 inches or larger.

D. Wire Markers and Cable Tags

- 1. Wire markers shall be single-conductor, slip-on, heat-shrinkable sleeve with typed or printed black letters on a white background. Wire markers shall be W. H. Brady Co. computer-printable "Bradysleeve" or approved equal.
- 2. Cable tags shall be rectangular, flat, non-heat-shrinkable tags with 1/8-inch-high letters. Cable markers shall be Raychem-type TMS or approved equal.

E. Splicing and Termination Components

- 1. Wire connectors, UL 486A or UL 486B, as applicable.
- 2. Insulation tape, UL 510.
- 3. Provide solderless terminal lugs on stranded conductors.

2.2 EQUIPMENT

A. Circuit Breaker Panelboards

- 1. Circuit Breaker Panelboards: NEMA PB 1, circuit breaker type, circuits as indicated.
- 2. Panelboard Bus: Copper, ratings as indicated. Provide copper ground bus in each panelboard.

3. Minimum Integrated Short Circuit Rating: 42,000 amperes rms symmetrical or as indicated on drawings.
4. Molded Case Circuit Breakers: NEMA AB 1, bolt-on type, thermal magnetic trip circuit breakers with common trip handle for all poles. Provide UL-listed circuit breakers with lockout capability. Provide UL Class A ground fault interrupter circuit breakers where scheduled. Provide main circuit breaker with amperage equal to bus rating, where indicated. Breaker terminals shall be rated 75 degrees C, minimum.
5. Enclosure: NEMA 250, Type 12.
6. Cabinet Box: Manufacturer's standard.
7. Sized and equipped as shown on single-line diagram of design drawings.

B. Acceptable Manufacturers: The listing of equipment suppliers below in no way precludes the offerer from proposing alternate suppliers of any of the equipment to be furnished within the scope of this specification. This list of suppliers is intended to identify the type of equipment and general quality of that equipment that will be included in the offerer's proposal.

1. Siemens.
2. Westinghouse.
3. Square D.

### **PART 3 EXECUTION**

#### **3.1 ERECTION/INSTALLATION/APPLICATION**

##### **A. Conduit**

1. Route conduit parallel or at right angles to building lines. Provide conduit supports as required by NFPA 70.
2. Cut conduit square using saw or pipecutter. All cut ends of conduit shall be reamed smooth.
3. Install no more than the equivalent of three 90-degree bends between junction boxes. Use factory elbows for conduit diameter larger than 1-1/2 inches.

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4. Use Form 8 conduit bodies to make sharp changes in direction. Avoid moisture traps; provide junction box with weep hole.
5. Provide 1/8-inch nylon pull cord in empty conduits. Cap empty conduits to prevent moisture and entry of foreign objects.
6. Size conduit as required by NFPA 70.

#### B. Wire and Cable

1. Swab conduit before installing cable. Remove burrs, dirt, or other debris. For existing conduit, pull a mandrel through before pulling cable to verify roundness and bending radii.
2. When pulling cable into conduit, use wire pulling compound.
3. Splices shall be made only in outlet or junction boxes.
4. Provide equipment grounding conductor along with phase conductors in all conduits.
5. Multiconductor cables shall contain an integral ground conductor.
6. Grounding conductors shall be connected to equipment with compression lugs. Grounding connections shall be made to clean, dry surfaces. Scale, rust, grease, and dirt shall be removed from surfaces to which grounding connections are to be made.
7. Conductors shall be color coded. Conductors No. 6 AWG and larger shall be identified using colored tape at terminals and splice points. Conductors No. 8 AWG and smaller shall be identified using colored insulation or jacket. Color coding shall be as follows:

480Y/277V Phase A	Yellow
Phase B	Orange
Phase C	Brown
Neutral (grounded)	Gray
Ground	Green
Plant Fire	Red and Yellow
Alarm System	Brown and Yellow

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C. Nameplates

1. Degrease and clean surfaces to receive nameplates.
2. Install nameplates parallel to equipment lines. Secure nameplates to equipment fronts using self-tapping screws.

D. Wire and Cable Markers

1. Provide wire markers on each conductor in pull boxes and junction boxes, and at each load connection. Provide cable tags in pull boxes for multiconductor cables.
2. Wire and cable tags shall identify panel and circuit number or control wire number, as required.

E. Panelboards

1. Install panelboards in accordance with NEMA PB 1.1.
2. Install panelboards plumb. Install in accordance with manufacturer's instructions.
3. Provide working clearance in accordance with NFPA 70, minimum 36 inches from front.
4. Provide filler plates for unused spaces in panelboards.
5. Provide typed circuit directory for each panelboard. Revise directory to reflect circuiting changes required to balance phase loads.
6. Provide engraved plastic nameplates for each circuit breaker.

**3.2 FIELD QUALITY ASSURANCE**

A. Power and Control Wire

1. All wires shall be tested for continuity. Wire insulation for conductors No. 6 AWG and larger shall be megger tested between each conductor and ground. A 1000-volt megger shall be used for insulation rated 600 volts. Minimum resistance shall be 100 megohms. Provide written test report. Inspection and testing shall be by subcontractor and may be observed by FERMCO.

**B. Utilization Equipment**

1. Make electrical connections to utilization equipment in accordance with manufacturer's instructions.
2. Installation shall conform to the requirements of NFPA 70.

**C. Panelboards**

1. Measure steady-state load currents at each panelboard feeder. Rearrange circuits in the panelboard to balance the phase loads to within 20 percent of each other. Maintain proper phasing for multiwire branch circuits.
2. Visual and Mechanical Inspection: Inspect for physical damage, proper alignment, anchorage, and grounding. Check proper installation and tightness of connections for circuit breakers.

**END OF SECTION**

SECTION 16118  
UNDERGROUND DUCTBANKS, DUCTS, AND MANHOLES

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Conduit.
- B. Non-metallic duct.
- C. Manholes.

**1.2 RELATED SECTIONS**

- A. Section 02200 - Earthwork.
- B. Section 03001 - Concrete.

**1.3 REFERENCES**

- A. American National Standards Institute (ANSI):
  - 1. ANSI C80.1-90 Rigid Steel Conduit - Zinc-Coated.
- B. Institute of Electrical and Electronic Engineers (IEEE):
  - 1. IEEE C2-93 National Electrical Safety Code.
- C. National Fire Protection Association (NFPA):
  - 1. NFPA 70-96 National Electrical Code.
- D. American Association of State Highway and Transportation Officials (AASHTO):
  - 1. AASHTO-92 Standard Specification for Highway Bridges.
- E. National Electrical Manufacturers Association (NEMA):
  - 1. NEMA TC 3-90 PVC Fittings for Use with Rigid PVC Conduit and Tubing.

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2. NEMA TC 6-90 PVC and ABS Plastic Utilities  
Duct for Underground  
Installation.

- F. Underwriters Laboratories, Inc. (UL):  
1. Electrical Construction Materials Directories,  
1994.

**1.4 SUBMITTALS**

- A. Submittals shall be in accordance with Section 01011.

**1.5 PROJECT CONDITIONS**

- A. Accurately record actual locations of exact routing of ductbank by field survey.  
B. Accurately record actual locations of each manhole and conduit stub-up by field survey.

**1.6 QUALITY ASSURANCE**

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum 3 years experience.  
B. Conform to requirements of NFPA 70 and IEEE C2.  
C. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and indicated.

**1.7 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver, store, protect, and handle products to site.  
B. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.

**1.8 PROJECT CONDITIONS**

- A. Verify routing and termination locations of ductbank prior to excavation for rough-in.

- B. Verify locations of manholes and conduit stub-ups prior to excavating for installation.

## 1.9 DEFINITION

- A. In the text of this section, the words conduit and duct are used interchangeably.

## PART 2 PRODUCTS

### 2.1 MATERIALS

- A. Rigid Steel Conduit: ANSI C80.1.
- B. Plastic Utilities Duct: NEMA TC 6; PVC.
- C. Plastic Utility Duct Fittings: NEMA TC 3.
- D. Precast Concrete Manholes:
  1. Material: Reinforced precast concrete.
  2. Construction: Modular sections with tongue-and-groove joints.
  3. Reinforcing: AASHTO loading H-20, according to AASHTO-92.
  4. Shape: Rectangular with truncated corners.
  5. Nominal Inside Dimensions: 7 feet by 5 feet.
  6. Inside Depth: 6-1/2 feet or as indicated on design drawings.
  7. Wall Thickness: 8 inches or as indicated on design drawings.
  8. Base Section: Include sump, with cast sleeve, and two 1-inch ground rod openings.
  9. Top Section: Include grooved opening for frame and cover.
  10. Riser Casting: 6-inch, with manhole step cast into frame.
  11. Duct Entry Provisions: Window knockouts.
  12. Duct Entry Locations: As indicated.
  13. Duct Entry Size: For 5-inch, nominal conduit/end bells.

## 2.2 ACCESSORIES

- A. Underground Warning Tape: 4-inch-wide plastic tape, colored yellow with suitable warning legend describing buried electrical lines.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Verify that excavation, base material installation, and compaction are completed.

### 3.2 PREPARATION

- A. Prepare excavation for manholes in accordance with manhole manufacturer's instructions.

### 3.3 ERECTION/INSTALLATION/APPLICATION

- A. Underground Duct:
  1. Install power ductbank 30 inches (minimum) to top of ductbank below finished grade.
  2. Install duct with minimum slope of 4 inches per 100 feet. Slope duct to manholes.
  3. Cut duct square using saw or pipe cutter; de-burr cut ends.
  4. Insert duct to shoulder of fittings; fasten securely.
  5. Join nonmetallic duct using adhesive as recommended by manufacturer.
  6. Wipe nonmetallic duct dry and clean before joining. Apply full even coat of adhesive to entire area inserted in fitting. Allow joint to cure for 20 minutes, minimum.
  7. Install no more than equivalent of three 90-degree bends between pull points.
  8. Provide suitable fittings to accommodate expansion and deflection where required.
  9. Terminate duct at manhole entries using end bell.
  10. Stagger duct joints vertically in concrete encasement 6 inches minimum.

11. Use suitable separators and chairs installed not greater than 4 feet on centers.
12. Band ducts together before placing concrete.
13. Securely anchor duct to prevent movement during concrete placement.
14. Place concrete under provisions of Section 03001. Use mineral pigment to color concrete red. Concrete shall have a 28-day compressive strength of 3,000 psi.
15. Provide minimum 3-inch concrete cover at bottom, top, and sides of ductbank.
16. Connect to manhole wall using dowels.
17. Provide pull rope in each duct except sleeves and nipples. Minimum 1/2-inch, 4,000 psi tensile strength polypropylene.
18. Swab duct. Use suitable caps to protect installed duct against entrance of dirt and moisture.
19. Perform excavations and backfill trenches under provisions of Section 02200 of this specification package.
20. Interface installation of underground warning tape with backfilling. Install tape below finished surface as indicated on drawings.
21. All duct end bells shall be rigid steel.

**B. Precast Manhole Installation:**

1. Install and seal precast sections in accordance with manufacturer's instructions.
2. Install manholes plumb.
3. Use precast neck and shaft sections to bring manhole cover to finished elevation.
4. Attach cable racks to inserts after manhole installation is complete.

**END OF SECTION**

SECTION 16170  
GROUNDING AND BONDING

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Grounding electrodes and conductors.
- B. Equipment grounding conductors.
- C. Bonding.

**1.2 REFERENCES**

- A. National Fire Protection Association (NFPA):
  - 1. NFPA 70-96 National Electrical Code.
- B. Underwriters Laboratories, Inc. (UL):
  - 1. Electrical Construction Materials Directories, 1994.

**1.3 SYSTEM DESCRIPTION**

- A. Periphery grounding conductor.
- B. Concrete-encased grounding conductor.
- C. Rod electrode.
- D. Grounding System Resistance: 5 ohms maximum.

**1.4 SUBMITTALS**

- A. Submittals shall be in accordance with Section 01011.

**1.5 QUALITY ASSURANCE**

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum 3 years experience.

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- B. Conform to requirements of NFPA 70.
- C. Furnish products listed and classified by Underwriters Laboratories, Inc., as suitable for purpose specified and shown.

**1.6 PROJECT CONDITIONS**

- A. Accurately record actual locations of grounding electrodes.

**PART 2 PRODUCTS**

The listing of equipment suppliers below in no way precludes the offerer from proposing alternate suppliers of any of the equipment to be furnished within the scope of this specification. This list of suppliers is intended to identify the type of equipment and general quality of that equipment that will be included in the offerer's proposal. It is the offerer's responsibility to propose equipment that is best suited for this project in combined terms of quality and price.

**2.1 MANUFACTURERS**

- A. Mechanical Connectors
  - 1. Burndy.
  - 2. Ideal.
  - 3. Ilsco.

**2.2 MATERIALS**

- A. Mechanical Connectors
  - 1. Bronze.
- B. Wire
  - 1. Stranded copper.
    - a. Periphery Grounding Conductor: #4/0 AWG.
    - b. Grounding Conductor: Size to meet NFPA 70 requirements.

**PART 3 EXECUTION****3.1 EXAMINATION**

- A. Verify that final backfill and compaction have been completed before driving rod electrodes.

**3.2 ERECTION/INSTALLATION/APPLICATION**

- A. Install products in accordance with manufacturer's instructions.
- B. Install rod electrodes at locations indicated. Install additional rod electrodes as required to achieve specified resistance to ground.
- C. Provide bonding to meet NFPA 70 requirements.

**3.3 FIELD QUALITY ASSURANCE**

- A. Inspect grounding and bonding system conductors and connections for tightness and proper installation as defined by contract documents and manufacturer's instructions.
- B. Use a suitable test instrument to measure the system's resistance to the ground. Perform testing in accordance with instrument manufacturer's recommendations using the fall-of-potential method.

**END OF SECTION**

SECTION 16370  
OVERHEAD POWER DISTRIBUTION

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Poles.
- B. Pole hardware and anchors.
- C. Overhead line conductors.
- D. Surge arresters.

**1.2 REFERENCES**

- A. National Fire Protection Association (NFPA):
  - 1. NFPA 70-96 National Electrical Code.
- B. American National Standards Institute (ANSI):
  - 1. ANSI C2-93 National Electrical Safety Code.
  - 2. ANSI C135.1-79 Galvanized Steel Bolts and Nuts for Overhead Line Construction.
  - 3. ANSI O5.1-92 Wood Poles Specifications and Dimensions.
- C. American Society for Testing and Materials (ASTM):
  - 1. ASTM A36/A36M-94 Standard Specification for Carbon Structural Steel.
  - 2. ASTM A475-89 Standard Specification for Zinc-Coated Steel Wire Strand.
  - 3. ASTM D698-91 Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft).
- D. American Wood-Preservers Association (AWPA):
  - 1. AWPA C4-89 Poles - Pressure Process.

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- E. National Electrical Manufacturers Association (NEMA):
  - 1. NEMA LA 1-92 Surge Arresters.
  
- F. Underwriters Laboratories, Inc. (UL):
  - 1. UL 96-94 UL Standard for Lightning Protection Components.
  - 2. UL Electrical Construction Materials Directories, 1994.
  
- G. Fernald Environmental Restoration Management Corporation (FERMCO):
  - 1. SSOP-0044 Management of Soil, Debris, and Waste from a Project.

**1.3 SYSTEM DESCRIPTION**

- A. Overhead distribution consisting of power and alarm circuits as indicated on drawings.

**1.4 SUBMITTALS**

- A. Submittals shall be in accordance with Section 01011.

**1.5 QUALITY ASSURANCE**

- A. Manufacturer: Company specializing in manufacturing products specified in this section with a minimum of 3 years experience.
- B. Conform to requirements of NFPA 70 and ANSI C2.
- C. Furnish products, where available, listed and classified by UL Electrical Construction Materials Directories as suitable for the purpose specified and shown.
- D. Installation shall comply with ANSI C2, heavy loading district, Grade B construction.

**1.6 DELIVERY, STORAGE, AND HANDLING**

- A. Protect poles from damage and decay by stacking to provide free circulation of air. Maintain 1 foot (300

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mm) minimum spacing between bottom pole and ground or ground vegetation. Do not store poles above decayed or decaying wood.

- B. Stack poles stored for more than 2 weeks on decay-resistant skids arranged to support poles without noticeable pole distortion.
- C. Handle treated poles with tools which will not produce an indentation greater than 1 inch (25 mm) deep. Do not drag treated poles along ground. Do not apply tools to that section of treated poles between 1 foot (300 mm) above and 2 feet (600 mm) below ground line.

## PART 2 PRODUCTS

### 2.1 MATERIALS

#### A. Poles

1. Wood Poles: ANSI O5.1; treated southern pine poles of length and class indicated.
2. Select poles for straightness, minimum sweeps, and short crooks.
3. Preservative: ANSI O5.1 and AWPA C4, Pentachlorophenol.
4. Apply preservative to AWPA C4 with minimum net retention of 12 lbs/ft<sup>3</sup> (285 kg/m<sup>3</sup>). Obtain complete sapwood penetration.

#### B. Pole Hardware

1. Miscellaneous Pole Hardware: Hot-dipped galvanized after fabrication.
2. Bolts and Nuts: ANSI C135.1.
3. Butt Plate: Copper.
4. Guy Strand: High strength, seven-strand steel cable galvanized to ASTM A475, Class A or B.
5. Guy Termination: Three-bolt clamp type.
6. Guy Guards: 8-foot (2 m) long plastic, colored yellow.
7. Ground Wire: Soft drawn copper conductors, 6 AWG minimum size.
8. Air Terminal: UL 96; 18-inch copper air terminal.
9. Guy Adapter: Triple Eye.

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- C. Line Conductors
  - 1. Secondary Conductors: Copper or aluminum, as shown on drawings, quadruplex or triplex cable with 600 volt cross-linked polyethylene insulation for phase conductors.
  - 2. All cable shall be ultraviolet resistant.
  - 3. Insulation shall be NFPA 70 Type XHHW-2 or THW-2.
  
- D. Arresters
  - 1. Surge Arresters: NEMA LA 1; valve type, arranged for pole mounting, and rated 3 kV.
  - 2. Mechanical Connectors: Bronze.
  - 3. Wire: Stranded copper.
    - a. Grounding Conductor: Size to meet NFPA 70 requirements.
  
- E. Anchors
  - 1. Helical Screw Anchors: Galvanized steel, ASTM A36/A36M.

**PART 3 EXECUTION**

**3.1 EXAMINATION**

- A. Verify that field measurements are as shown on drawings.

**3.2 ERECTION/INSTALLATION/APPLICATION**

- A. Install products in accordance with manufacturer's instructions.
  
- B. Plug unused holes in poles using treated wood dowel pins. Treat field-cut gains and field-bored holes with preservative.
  
- C. Shorten poles when required by cutting from top end. Apply hot preservative to shortened end of pole.
  
- D. Set poles in straight line. Place curved poles with curvature in line with lead pole. Maintain an even grade.

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- E. Dig setting holes large enough to permit use of power tampers to full depth. Place earth in maximum 6-inch (150 mm) layers and pack to 95 percent density per ASTM D698.
- F. Rake poles located at corners, angles, and dead ends so that poles are vertical after line installation.
- G. Do not install poles along the edge of cuts and embankments or where soil may be washed out.
- H. Identify each pole using aluminum marker stamped with characters 2-1/2 inches (60 mm) high, minimum. Locate to provide maximum visibility from roadway and fasten with aluminum nails. Obtain identifying numbers from FERMCO.
- I. Dispose of excess soil (from drilling activities) in accordance with SSOP-0044.
- J. Minimum depths in normal firm ground, measured from lower side of pole:

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OVERALL LENGTH	DEPTH FOR STRAIGHT LINES	DEPTH AT CURVES, CORNERS, AND POINTS OF EXTRA STRAIN
30'	5'-6"	5'-6"
35'	6'-0"	6'-0"
40'	6'-6"	6'-6"
45'	7'-0"	7'-6"
50'	7'-6"	8'-0"
60'	8'-0"	8'-6"

- K. Install guys and anchors according to ANSI C2 requirements and as shown on drawings.
- L. Use small diameter steel probe to verify area is free of underground obstructions prior to installation of anchors.

**END OF SECTION**

SECTION 16720  
FIRE AND EVACUATION ALARM SYSTEMS

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Fire alarm initiating devices.
- B. Fire alarm signaling appliances.
- C. Fire alarm and evacuation speaker wire and cable.
- D. Lightning protectors.

**1.2 RELATED SECTIONS**

- A. Section 16050 - Basic Electrical Materials and Methods.

**1.3 REFERENCES**

- A. National Fire Protection Association (NFPA):
  - 1. NFPA 70-96 National Electrical Code.
  - 2. NFPA 72-96 National Fire Alarm Code.
  - 3. NFPA 101-94 Code for Safety to Life from Fire in Buildings and Structures.

**1.4 SYSTEM DESCRIPTION**

- A. Fire Alarm System: NFPA 72, manual and automatic local fire alarm system with connections via dedicated telephone cable to the central fire alarm equipment located in the Communications Center basement of Building No. 53. Install and tie in as indicated on drawings. Provide spacing as required by NFPA 72.
- B. Evacuation System: Provide at least one evacuation speaker in each trailer. Tap into evacuation loop at Vitrification Pilot Plant as shown on drawings.
- C. The Subcontractor shall provide and install all equipment specified herein and indicated on the

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drawings. Honeywell, the FEMP alarm systems subcontractor, shall perform all final terminations of cables.

**1.5 SUBMITTALS**

- A. Submittals shall be in accordance with Section 01011.

**1.6 QUALITY ASSURANCE**

- A. Installer: Company specializing in installing the products specified in this section with minimum 3 years experience and certified by the State of Ohio as a fire alarm installer.
- B. Products and execution shall conform to NFPA 70 and NFPA 101.

**1.7 MAINTENANCE**

- A. Furnish service maintenance of fire alarm system for 1 year from completion date of construction acceptance testing.

**PART 2 PRODUCTS**

**2.1 MANUFACTURER**

- A. Honeywell (Existing FEMP fire alarm and evacuation systems are by Honeywell).

**2.2 EQUIPMENT**

- A. Fire Alarm Initiating Devices
1. Manual Station: Honeywell #S464.
  2. Smoke Detector: Honeywell TC805C, ionization type smoke detector.
- B. Fire Alarm Signaling Appliance
1. Fire Alarm Horn Strobe: Honeywell #SC716B1001.

- C. Fire Alarm Wire and Cable
1. Fire Alarm Power Branch Circuits: Wire as specified in Section 16050 of this specification package.
  2. Initiating Device and Indicating Appliance Circuits: Honeywell AK3702R, 2/C #18, solid.
  3. Signal Device Circuits: Honeywell AK3702B, 2/C #18, solid.
  4. Provide fire alarm circuit conductors with insulation color coded as follows:
    - a. Initiating Device Circuit: Red and yellow.
    - b. Signal Device Circuit: Brown and yellow.
- D. Lightning Protectors
1. Lightning protectors shall be used on fire alarm branch circuits when leaving a building.
  2. Install lightning protectors as shown on drawings.
  3. Lightning protectors shall be Honeywell No. 14502412-XXX (to be determined by Honeywell).
- E. Evacuation Signaling Device
1. Speaker: Atlas AP15TUC or Honeywell #SC811A1015.
- F. Evacuation Wire and Cable
1. Cable: 2/C #16, stranded and twisted, non-jacketed.
  2. Black and white.

### **PART 3 EXECUTION**

#### **3.1 PREPARATION**

- A. Equipment connections and other necessary work within existing Data Gathering Panels (DGPs) shall be coordinated with the Owner's Agent's fire alarm service company at the direction of FERMCO. FERMCO shall arrange and pay for the services of the Owner's Agent's fire alarm service company for performing necessary DGP work.

**3.2 ERECTION/INSTALLATION/APPLICATION**

- A. Install products in accordance with manufacturer's instructions.
- B. Install manual station with operating handle 42 inches above floor. Install audible signal devices 8 feet above the floor or just below the ceiling if less than 8 feet.
- C. For circuits installed inside, install fire alarm detection and signal circuit conductors in rigid steel conduit.
- D. Mount end-of-line device with last device (1.91 k ohms).

**3.3 FIELD QUALITY ASSURANCE**

- A. Test systems in accordance with NFPA 72 and local fire department codes. FERMCO may choose to observe tests.

**3.4 ADJUSTING**

- A. Include services of manufacturer's certified technician to supervise installation, adjustments, final connections, and system testing.

**3.5 DEMONSTRATION**

- A. Demonstrate normal and abnormal modes of operation and required responses to each.

**END OF SECTION**

SECTION 16855  
HEATING CABLES

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Heating cable and accessories.

**1.2 REFERENCES**

- A. National Fire Protection Association (NFPA):  
1. NFPA 70-96 National Electrical Code.
- B. National Electrical Manufacturers Association (NEMA):  
1. NEMA ICS 6-93 Industrial Controls and  
Systems Enclosures.

**1.3 SUBMITTALS**

- A. Submittals shall be in accordance with Section 01011.

**1.4 SYSTEM DESCRIPTION**

- A. Heat tracing for pipe and any other outdoor equipment requiring freeze protection with outside temperature at -10 degrees F.

**1.5 QUALITY ASSURANCE**

- A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum 3 years experience.

**1.6 SEQUENCING AND SCHEDULING**

- A. Coordinate installation of heating cable with installation of piping and piping insulation.

**PART 2 PRODUCTS**

**2.1 MANUFACTURERS**

A. Acceptable Manufacturers:

1. Raychem.
2. Chromalox.
3. Thermon.

**2.2 MATERIALS**

A. Heating Cable

1. Self-limiting, parallel resistance electric tracing cable with grounding shield around conductors. Maximum output temperature 150 degrees F.
2. Rating: 120V or as required.

**2.3 ACCESSORIES**

- A. Thermostat: Type 4X according to NEMA ICS 6, adjustable setpoint, suitable for -30 degrees F to 140 degrees F.
- B. Pilot light.
- C. Power termination kits, splice kits, tee kits, and end seals shall be utilized.
- D. Provide stainless steel identification tags for all devices. Include assembly and circuit numbers.

**PART 3 EXECUTION**

**3.1 EXAMINATION**

- A. Verify that the piping system is complete, tested, and ready for heating equipment.
- B. Verify field measurements.
- C. Verify required utilities are available, in proper locations, and ready for use.

**3.2 ERECTION/INSTALLATION/APPLICATION**

- A. Install heat trace material on piping systems as required. Install to allow for heat trace cable to be moved aside during maintenance of piping system.
- B. Install in accordance with manufacturer's instructions and NFPA 70.
- C. Avoid pinching and making sharp bends in cable.
- D. Prevent damage by sharp objects during installation.
- E. Do not install electric tracing cables across expansion joints.
- F. All electric heat trace cables shall be installed in the 7 and 8 o'clock positions or in the 4 and 5 o'clock positions on horizontal runs of pipes.
- G. Accurately record actual locations of heating cable, thermostats, and branch circuit connections.

**3.3 FIELD QUALITY ASSURANCE**

- A. Test continuity of heating cable.
- B. Measure insulation resistance to manufacturer's recommended values. Use test instruments in accordance with manufacturer's instructions.
- C. Perform continuity and insulation resistance test on completed cable installation prior to installation of thermal insulation.
- D. Measure voltage and current at each unit.

3.4

**DEMONSTRATION**

- A. Demonstrate operation of heating cable controls.

**END OF SECTION**

- SEE DRAWING 94X-5900-E-00954 FOR SINGLE LINE DIAGRAM.
- INSTALL SOIL ANCHORS ACCORDING TO MANUFACTURER'S INSTRUCTIONS. DEPTH CALCULATION BASED ON SOIL DATA FOR MINIMUM BLOW COUNT OF SEVEN. IF BLOW COUNT IS LESS THAN 7 THEN CONTACT FERMCO CONSTRUCTION MANAGER.
- PRIOR TO INSTALLATION OF EARTH ANCHORS, VERIFY LOCATION OF NEARBY UNDERGROUND UTILITIES AND PUSH SMALL DIAMETER STEEL SOIL PROBE THROUGH AREA TO VERIFY THAT NO UNDERGROUND OBSTRUCTIONS ARE PRESENT.
- SAFETY SWITCHES, SHOWN ON THIS DRAWING TO BE 600 VOLT, 3 POLE, 200 AMPS WITH NEMA 3R ENCLOSURE, MINIMUM.
- SEE DRAWING 94X-5900-X-00926 FOR DRAWING INDEX.
- SEE DRAWING 94X-5900-X-00952 FOR MATERIAL IDENTIFICATION MARK NUMBERS.

LEGEND

- MS MANUAL PULL STATION
- H FIRE ALARM HORN
- EAH EVACUATION SPEAKER

REF DWG NO.	DRAWING TITLE
94X-5900-X-00926	INDEX SHEET
94X-5900-E-00954	SINGLE LINE DIAGRAM
94X-5900-E-00938	SITE PLAN - UNDERGROUND DUCTBANK ROUTING
94X-5900-E-00948	SITE PLAN - TRAILER AREA
94X-5900-E-00952	POWER POLE DETAILS - SHEET 1

11 28 95 1688

CDC/UNCONTROLLED

APPROVED FOR CONSTRUCTION		<i>JL Cooper</i>	
REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	DATE

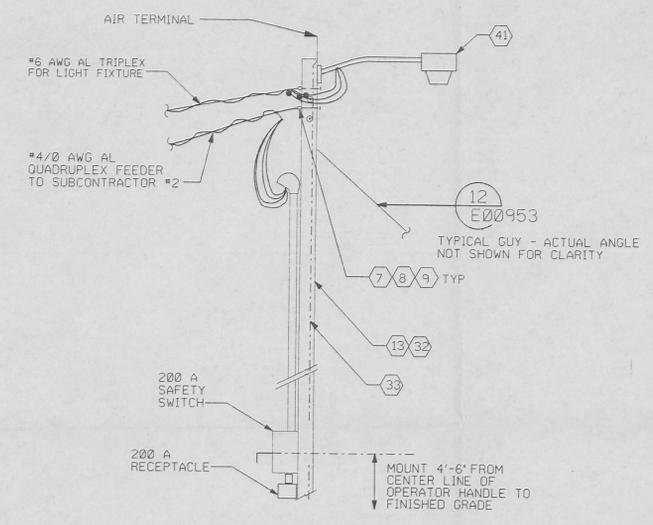
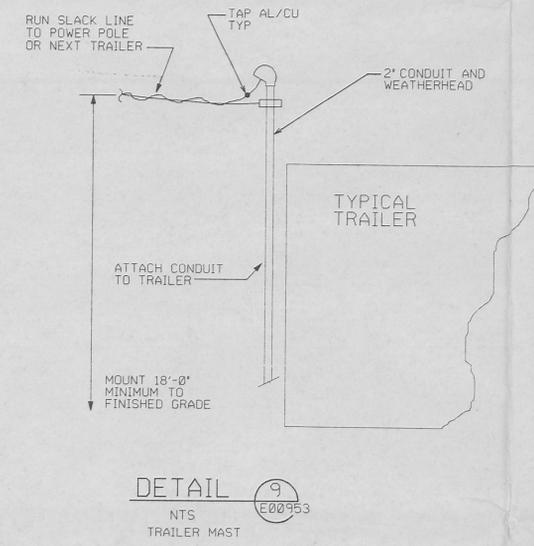
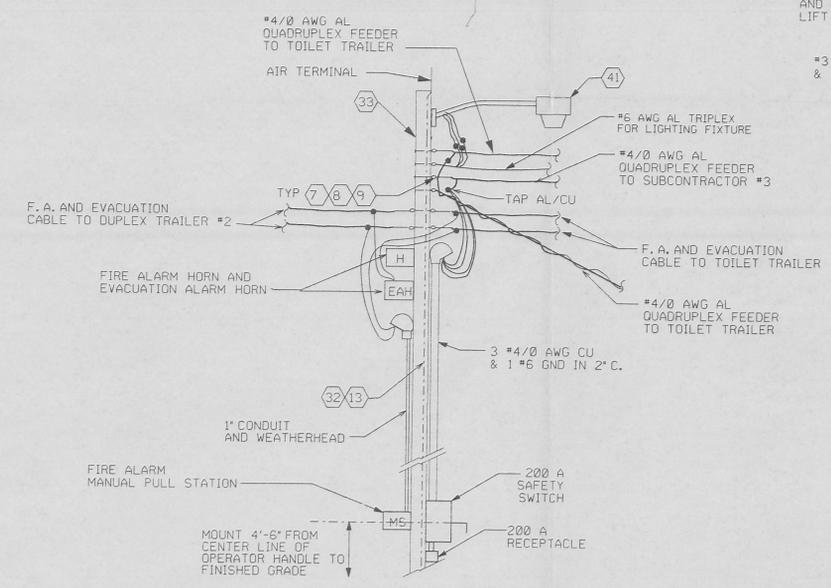
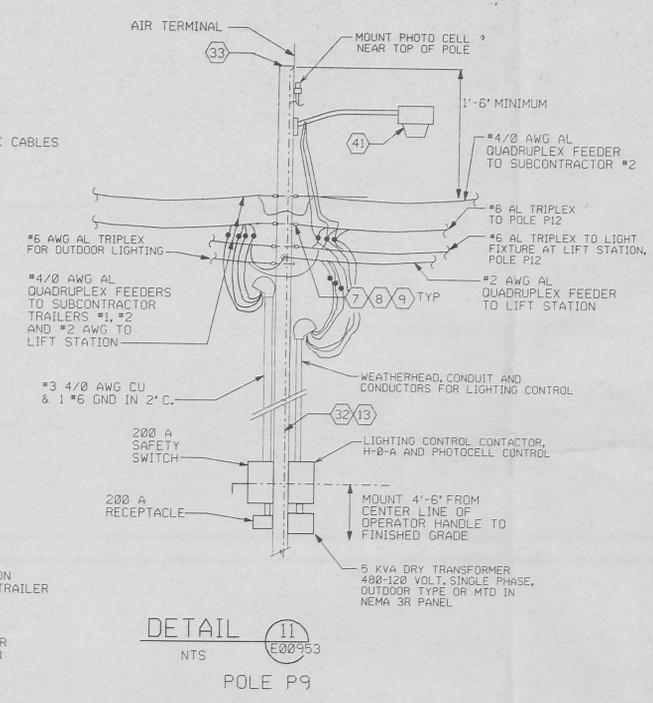
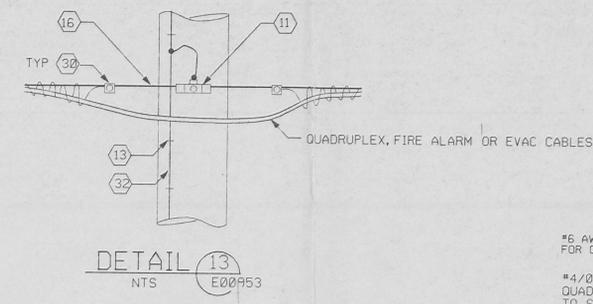
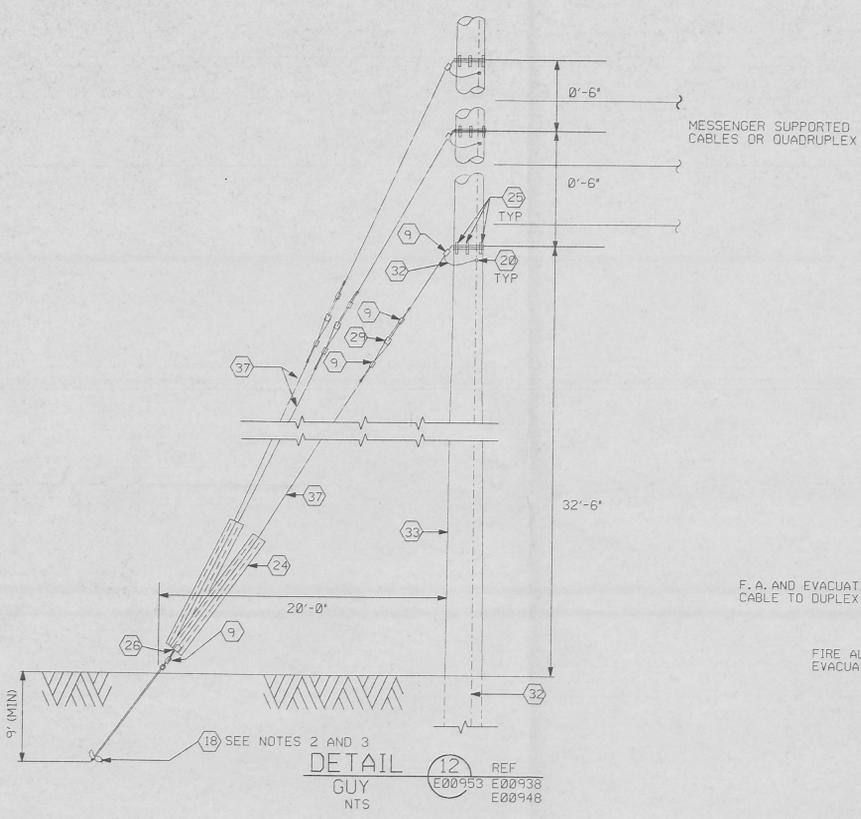
**UNITED STATES DEPARTMENT OF ENERGY**  
**FERNALD ENVIRONMENTAL MANAGEMENT PROJECT**

THIS DRAWING PREPARED BY  
**PARSONS**  
 THE RALPH M. PARSONS CO. - PARSONS MAIN, INC. - ENGINEERING-SCIENCE, INC.  
 CINCINNATI, OHIO

PROJECT NAME  
**SITE PREPARATION / UNDERGROUND UTILITIES**  
 FERNALD RESIDUES VITRIFICATION PLANT

DRAWING TITLE <b>ELECTRICAL POWER POLE DETAILS SHEET 2 OF 2</b>			
DRAWN BY R. PROSKI	DATE 11-03-95	LEAD ENGINEER J. L. COOPER	CHECKED BY J. L. COOPER
PLANT/BLDG. NO.	FLOOR	SCALE NONE	CLASS
SUBMITTED FOR APPROVAL <i>JL Cooper</i> 11/21/95		FERMCO CRU APPROVAL N/A	N/A

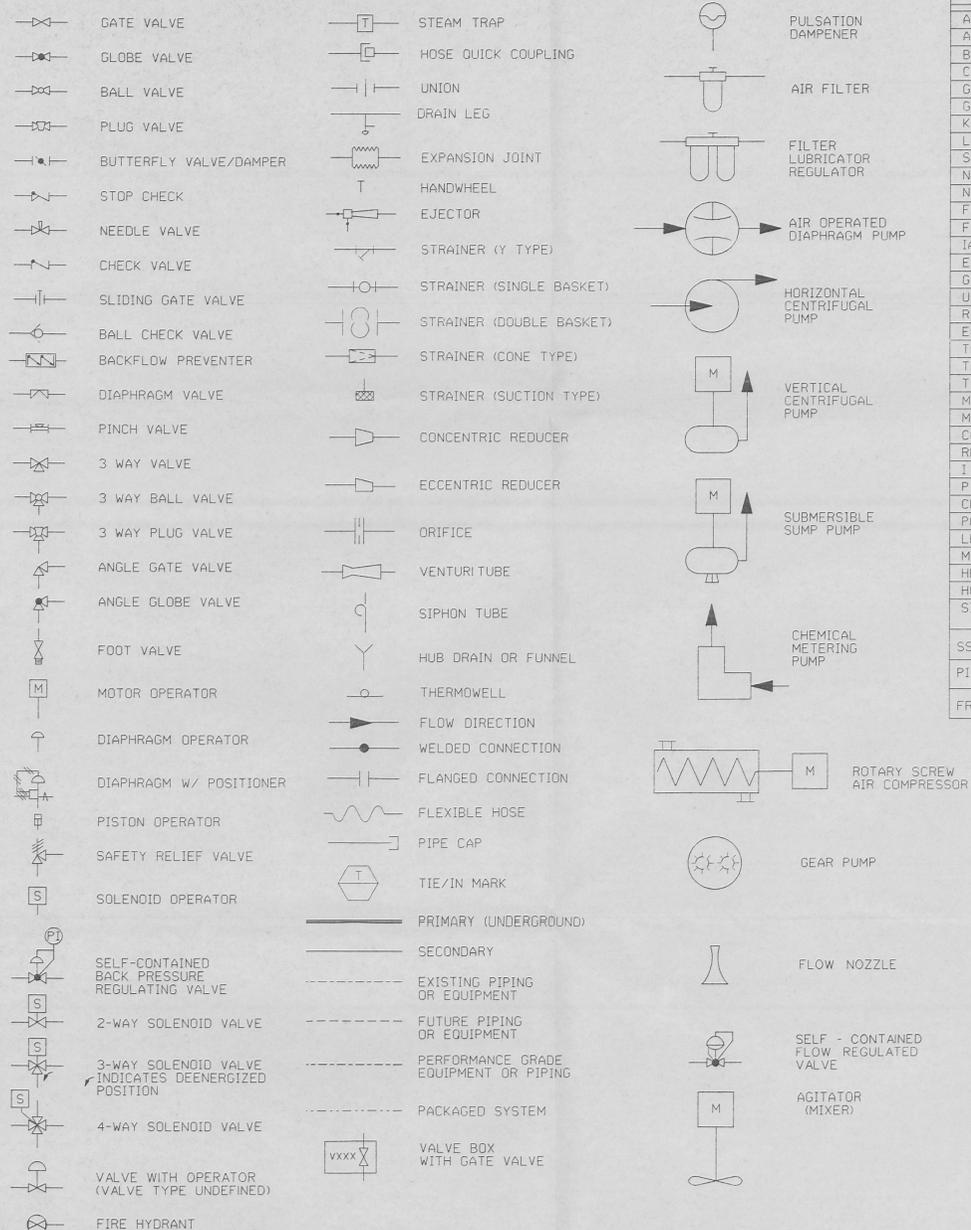
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A  
B  
C  
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A  
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PIPING SYMBOLS



ABBREVIATIONS

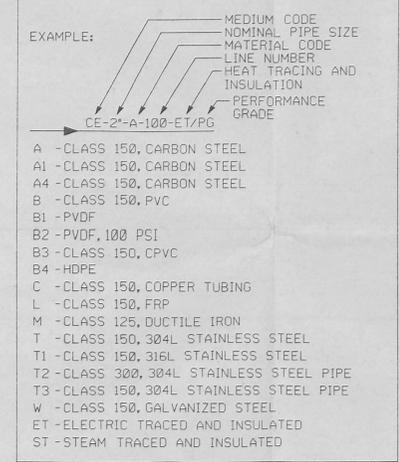
AD	AIR TO OPEN
AC	AIR TO CLOSE
BTU	BRITISH THERMAL UNIT
CU FT	CUBIC FEET
GPH	GALLONS PER HOUR
GPM	GALLONS PER MINUTE
KW	KILOWATT
LB/HR	POUNDS PER HOUR
SCFM	STD. CUBIC FT/MINUTE
NO	NORMALLY OPEN
NC	NORMALLY CLOSED
FO	FAIL OPEN
FC	FAIL CLOSED
IA	INSTRUMENT AIR
EF	EXHAUST FAN
GV	GRAVITY VENTILATOR
UH	UNIT HEATER
RED	REDUCER
ECC	ECCENTRIC
TBD	TO BE DETERMINED
TF	TOP FLAT
TYP	TYPICAL
MATL	MATERIAL
MED	MEDIUM
CO	CARBON MONOXIDE
RH	RELATIVE HUMIDITY
I	INSULATION ONLY
P	PERSONNEL PROTECTION
CFM	CUBIC FEET/MINUTE
PG	PERFORMANCE GRADE
LH	LOW HAZARD
MH	MANHOLE
HH	HIGH HAZARD
HC	HAZARD CLASSIFICATION
SIH	STANDARD INDUSTRIAL HAZARD
SSC	STRUCTURES, SYSTEMS OR COMPONENTS
PIV	POST INDICATOR VALVE
FRVP	FERNALD RESIDUES VITRIFICATION PLANT

INSTRUMENTATION SPECIAL DESIGNATIONS

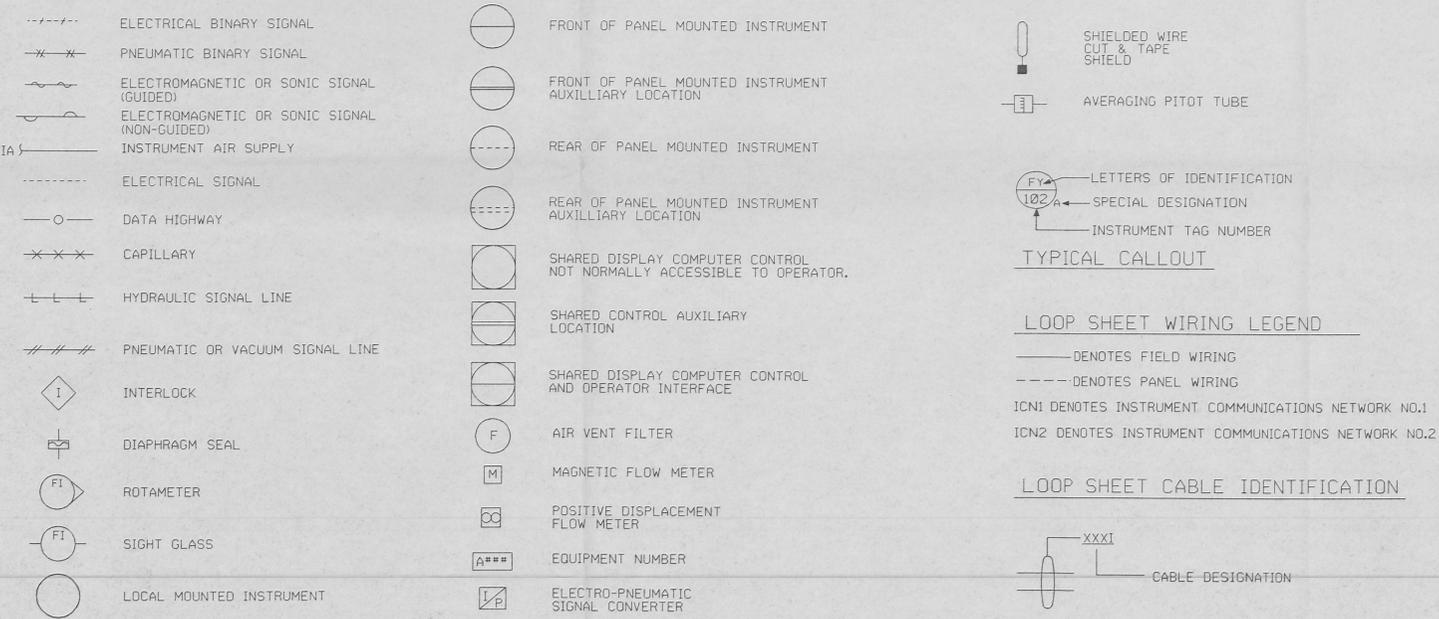
DESIGNATION	FUNCTION/ABBREVIATION
Z/N OR AVG	AVERAGING
± OR BI	BIAS
1:1, 3:2, 1 (TYP)	BOOST, GAIN OR ATTENUATE (INPUT:OUTPUT)
Δ OR DIF	DIFFERENTIAL
± OR DIV	DIVIDE
√ OR SQ.RT.	EXTRACT SQUARE ROOT
X OR MUL	MULTIPLY
N	RAISE TO POWER
REV	REVERSING
Σ OR SUM	SUMMING
L	LOW
LL	LOW LOW
H	HIGH
HH	HIGH HIGH
HL	HIGH LOW
∫	INTEGRATE (TIME INTEGRAL)
∝	PROPORTIONAL
Y	UNDETERMINED COMPUTING RELAY
HOA	HAND-OFF-AUTO
SS	START-STOP
≠	EXISTING INSTRUMENT TO BE RELOCATED
I/P	CURRENT TO PNEUMATIC TRANSDUCER
RUN	RUNNING
OA	OFF-AUTO
OCA	OPEN-CLOSE-AUTO
I/O	INPUT / OUTPUT
O	OPEN
C	CLOSE
*	INSTRUMENT PROVIDED WITH ASSOCIATED EQUIPMENT
R/L	RAISE / LOWER

PIPING SPECIFICATIONS

FLOWING MEDIUM	MED CODE	MATL CODE
BOILER FEEDWATER	BF	A4
BACK WASH	BW	T
BRINE	BR	T
CHLORINE	CL	B1
CONDENSATE	CN	A4
POTABLE WATER	DW	B4
CHEMICAL FEED	CF	T
COOLING WATER	WS, WR	A
DRAIN	DR	A4
THICKENER OVERFLOW	TO	A
NATURAL GAS	FG	A4
FIRE PROTECTION	FQI	B4, M
FLUSH WATER	FW	A
FORCE MAIN	FM	B4, M
INSTRUMENT AIR	IA	W
MELTER OFF-GAS	OG	T, A
METAL OXIDE	MO	A
NITROGEN	NG	A4
PERCHED GND WATER	PGW	B
PHOSPHORIC ACID	PAPH	T1
PLANT AIR	PA	W
POLISHED WATER	PW	A
TREATED WATER	TW	B4
PROCESS WASTEWATER	CE	B4
RAW WATER	RW	A
RECYCLE WATER	RC	A, A2
STEAM	LS	A4
SOFTENER WATER	TW	A4
SANITARY SEWER	SN	B4, M
SODIUM HYDROXIDE	NA	A
SODIUM SILICATE	SS	A
STORM WATER	ST	A
SULFURIC ACID	SB	T1
SUMP DISCHARGE	SU	A
VACUUM	V	A
VENT	VE	A4
WASTE WATER	WW	A



INSTRUMENT SYMBOLS



LETTERS OF INSTRUMENT IDENTIFICATION

LETTER	FIRST LETTER	2ND LETTER	3RD OR 4TH LETTER
A	MEASURED OR INITIATING VARIABLE	ALARM	ALARM
B	BURNER FLAME	----	----
C	CAMERA	CONTROLLER	CONTROLLER
D	DENSITY	DIFFERENTIAL	----
E	VOLTAGE	ELEMENT	ELEMENT
F	FLOW RATE	RATIO (FRACTION)	----
G	----	VIEWING DEVICE	GLASS
H	HAND (MANUAL)	----	HIGH
I	CURRENT (ELECT)	INDICATE	INDICATE
J	POWER	SCAN	----
K	TIME	----	----
L	LEVEL	LIGHT	LOW
M	MOIST OR HUMIDITY	----	----
N	----	----	----
O	OBSERVATION	----	ORIFICE
P	PRESSURE OR VACUUM	----	POINT (TEST)
Q	QUANTITY OR EVENT	TOTALIZER	----
R	RADIATION	RECORDER	RECORDER
S	SPEED OR FREQUENCY	SAFETY/SWITCH	SWITCH
T	TEMPERATURE	TRANSMITTER	TRANSMITTER
U	USER'S GUIDE	----	MULTIFUNCTION
V	VIBRATION	VALVE	VALVE
W	WEIGHT OR FORCE	WELL	----
X	CONTROL	----	UNCLASSIFIED
Y	RELAY	----	----
Z	POSITION	----	----

NOTES

REF DWG NO.	DRAWING TITLE
94X-5900-X-00926	DRAWING INDEX

11 28 95 1688  
CDC/UNCONTROLLED

0	APPROVED FOR CONSTRUCTION		N/A
REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	INITIALS AND DATE	A-E PERMID DATE

**UNITED STATES DEPARTMENT OF ENERGY**  
**FERNALD ENVIRONMENTAL MANAGEMENT PROJECT**  
THIS DRAWING PREPARED BY  
**PARSONS**  
THE RALPH M. PARSONS CO. - PARSONS MAIN, INC. - ENGINEERING-SCIENCE, INC.  
CINCINNATI, OHIO

PROJECT NAME  
**SITE PREPARATION/UNDERGROUND UTILITIES**  
**FERNALD RESIDUES VITRIFICATION PLANT**

DRAWING TITLE  
**MECHANICAL PROCESS**  
**PIPING AND INSTRUMENTATION DIAGRAM**  
**SYMBOLS AND LEGEND SHEET**

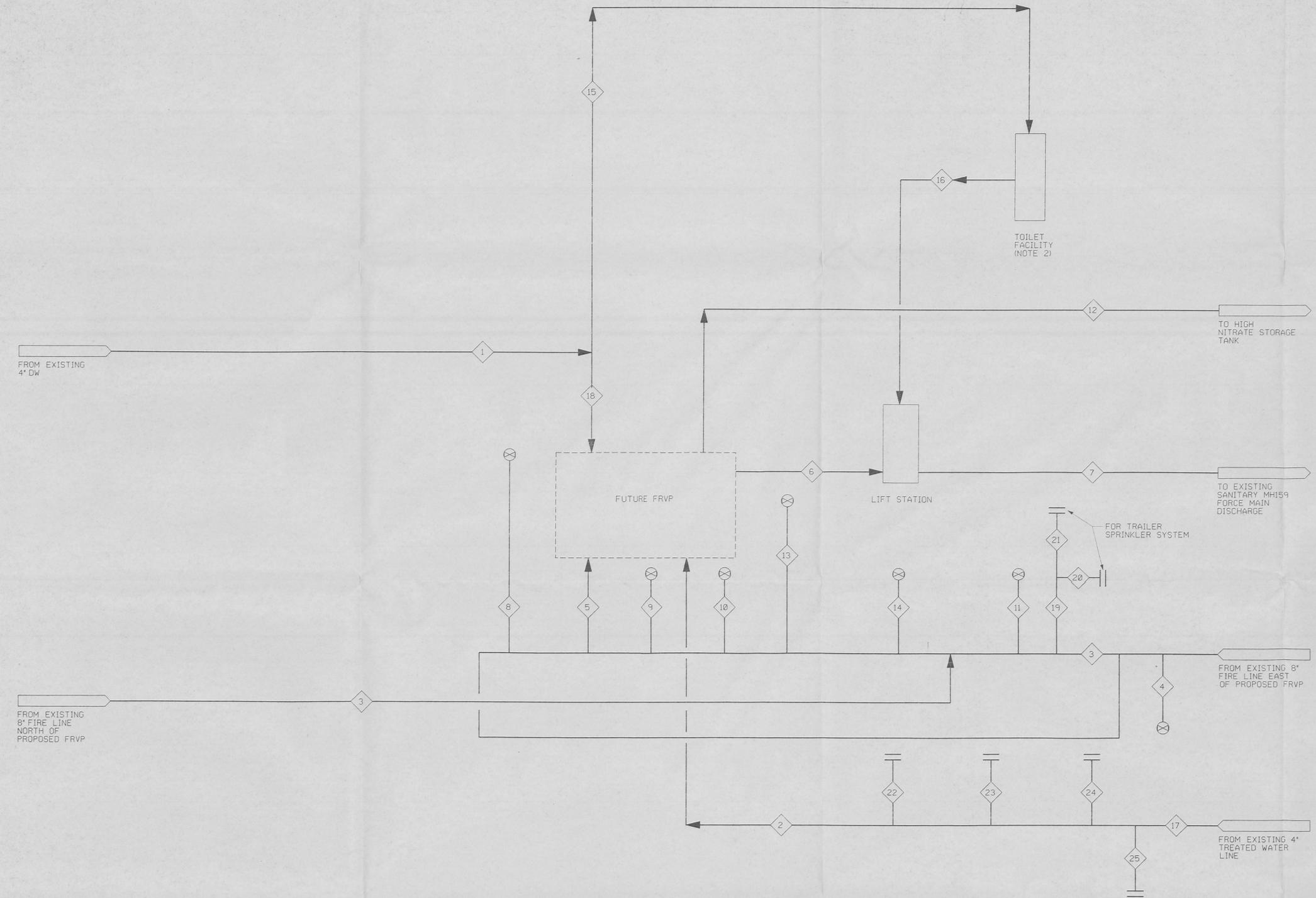
DRAWN BY P. A. WILSON	DATE 6/22/95	LEAD ENGINEER [Signature]	DATE 11/21/95	CHECKED BY D. CARLSON	DATE 6/26/95
PLANT/BLDG. NO.	FLOOR	SCALE	CLASS		
SUBMITTED FOR APPROVAL [Signature]	DATE 11/21/95	FERMCO CRU APPROVAL N/A		N/A	

PREPARED UNDER PARSONS PROJECT ORDER NUMBER CRU4/P0146	DOE PROJECT NO. WBS 1.1.1.4.3.2	TEMP PROJECT NO. 00-90701	DRAWING INDEX CODE NO. 94X-5900-N-00921	SHEET NO. N0001	REV. NO. 0
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JTM LAWSON Jan. 2, 1992, 13:50:14

NOTES

1. FLOWS SHALL BE DETERMINED WHEN THE THROUGHPUT OF THE PROPOSED FRVP IS KNOWN.
2. ONLY THE TOILET TRAILER IS SHOWN FOR CLARITY. IT IS THE ONLY TRAILER OF THE SEVEN REQUIRING WATER & SANITARY SERVICES.
3. FUTURE YARD HYDRANT CONNECTIONS FOR DECONTAMINATION PAD WASHDOWN.
4. STREAMS 15 AND 16 ARE FOR USE DURING CONSTRUCTION OF FRVP. AFTER CONSTRUCTION STREAMS 6 AND 18 WILL BE USED AND 15 AND 16 ELIMINATED.
5. FOR CLEANOUTS AND MANHOLES ON SANITARY SEWER LINE SEE CIVIL DRAWING 94X-5900-G-00898.



11 29 95 1688  
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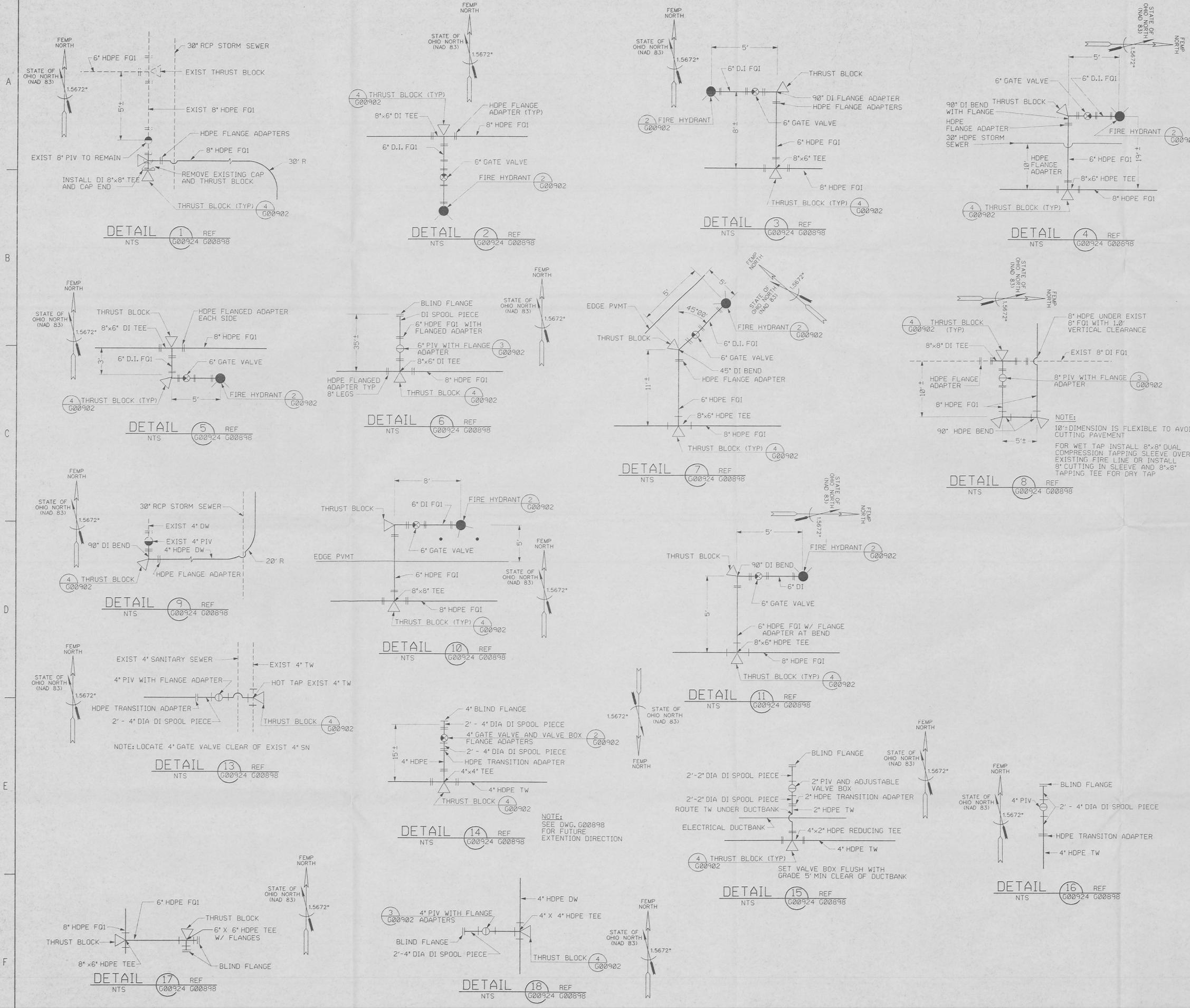
REF DWG NO.	DRAWING TITLE			
94X-5900-X-00926	DRAWING INDEX			
0 APPROVED FOR CONSTRUCTION INITIALS AND DATE: <i>RAF</i> N/A				
REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	PERMCO	DATE

**UNITED STATES DEPARTMENT OF ENERGY**  
**FERNALD ENVIRONMENTAL MANAGEMENT PROJECT**  
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 CINCINNATI, OHIO

PROJECT NAME  
**SITE PREPARATION/UNDERGROUND UTILITIES**  
 FERNALD RESIDUES VITRIFICATION PLANT

DRAWING TITLE <b>MECHANICAL PROCESS UTILITY FLOW DIAGRAM UNDERGROUND UTILITIES</b>			
DRAWN BY P. A. WILSON	DATE 6/22/95	LEAD ENGINEER <i>sd</i>	DATE 11/21/95
PLANT/BLDG. NO.	FLOOR	CHECKED BY G. CARLSON	DATE 6/26/95
SUBMITTED FOR APPROVAL		PERMCO CRU APPROVAL N/A	CERTIFIED FOR CONSTRUCTION N/A

STREAM NO.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	
COMPONENT	DOMESTIC WATER	PROCESS WATER	FIRE PROTECT. (TOTAL)	HYDRANT FLOW	FIRE PROTECT. TO FRVP	SANITARY GRAVITY FLOW	SANITARY FORCE MAIN	HYDRANT FLOW	HYDRANT FLOW	HYDRANT FLOW	HYDRANT FLOW	PROCESS WASTE WATER	HYDRANT FLOW	HYDRANT FLOW	DOMESTIC WATER TOILETS	SANITARY GRAVITY TOILETS	PROCESS WATER TOTAL	DOMESTIC WATER FRVP	SPRINK'R SUPPLY WATER	SPRINK'R FUTURE	SPRINK'R FUTURE	FUTURE	FUTURE	TO CRU-1 (FUTURE)	AWWT TIE (FUTURE)	
OPERATING HR/DAY	24	24	INTERMIT	INTERMIT	INTERMIT	24	24	INTERMIT	INTERMIT	INTERMIT	INTERMIT	24	INTERMIT	INTERMIT	24	24	24	24	INTERMIT	INTERMIT	INTERMIT					
SOLIDS (LBS/HR)																										
WATER (LBS/HR)																										
AIR (GAS) (LBS/HR)																										
ADDITIVES (LBS/HR)																										
TOTAL (LBS/HR)																										
SPECIFIC GRAVITY - DRY SOLIDS																										
SPECIFIC GRAVITY - SLURRIES																										
RADON (uCi/L)																										
SOLIDS FLOW (CFM)																										
LIQUID FLOW (GPM)	55 (MAX)	150	TBD	1000	TBD	55 (MAX)	55 (MAX)	1000	1000	1000	1000	150	1000	1000	35 (MAX)	35 (MAX)	TBD	55	TBD	TBD	TBD	TBD	TBD	TBD	TBD	
GAS FLOW (SCFM)																										
TEMPERATURE (DEG F)																										
PRESSURE (PSIG)	60	60	20 (MIN)	20 (MIN)	20 (MIN)			20 (MIN)	20 (MIN)	20 (MIN)	20 (MIN)		20 (MIN)	20 (MIN)			60	60	20 (MIN)	20 (MIN)	20 (MIN)					
NOTES	4		1		1	4.5	5			3					4	4.5			4				3	3		



REF DWG NO.	DRAWING TITLE
94X-5900-X-00926	INDEX SHEET
94X-5900-X-00927	LEGEND AND SYMBOLS
94X-5900-G-00898	UTILITY PLAN (MASTER PLAN)
94X-5900-G-00902	CIVIL - DETAILS - SHEET 1 OF 2

11 28 95 1688

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0	APPROVED FOR CONSTRUCTION		
REV NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	DATE

**UNITED STATES  
DEPARTMENT OF ENERGY  
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT**

THIS DRAWING PREPARED BY  
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CINCINNATI, OHIO

PROJECT NAME  
**SITE PREPARATION/UNDERGROUND UTILITIES  
FERNALD RESIDUES VITRIFICATION PLANT**

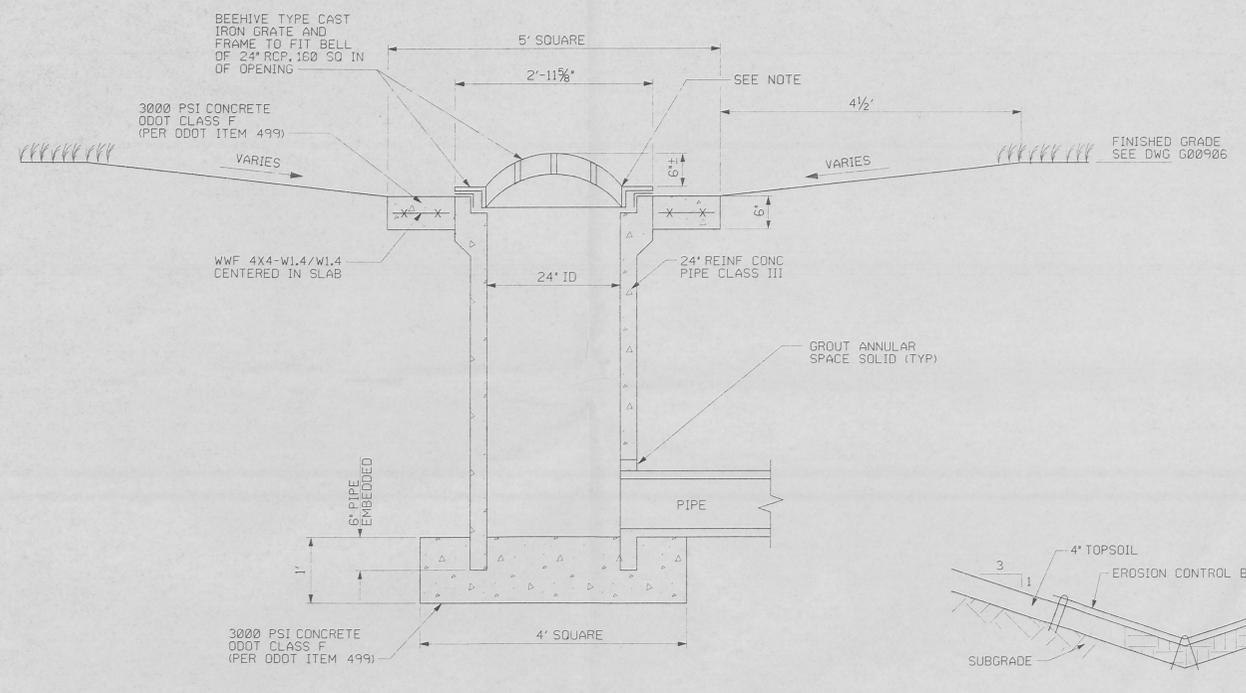
DRAWING TITLE  
**CIVIL  
WATER LINE DETAILS**

DRAWN BY D. BABAYAN	DATE 07-11-95	LEAD ENGINEER	DATE	CHECKED BY K. GERARD	DATE 11-10-95
PLANT/BLDG. NO.	FLOOR	SCALE NONE	CLASS		
SUBMITTED FOR APPROVAL		FERMCO CRU APPROVAL N/A		N/A	

PREPARED UNDER PARSONS PROJECT ORDER NUMBER CRU4/P0146	PROJECT NO. WBS 1.1.1.4.3 00-90701	FEMP PROJECT NO. 94X-5900-G-00924	DRAWING INDEX CODE NO.	SHEET NO. G0012	REV. NO. 0
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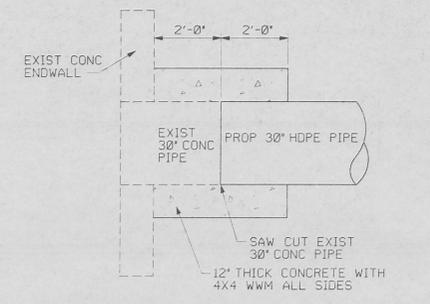
NOTES

- UNLESS OTHERWISE NOTED ALL MATERIALS SHALL CONFORM TO THE STATE OF OHIO DEPARTMENT OF TRANSPORTATION (ODOT) CONSTRUCTION AND MATERIAL SPECIFICATIONS DATED JANUARY 1, 1995.
- UNLESS OTHERWISE NOTED, ALL CONCRETE SHALL BE ODOT CLASS F, 3000 PSI COMPRESSIVE STRENGTH AT 28 DAYS.

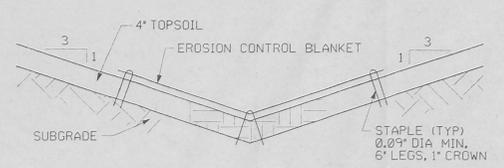


NOTE: REFER TO PIPE PROFILES FOR INVERT AND TOP OF GRATE ELEVATIONS.

DETAIL 1 REF 000912 000906  
CATCH BASIN INLET  
NTS

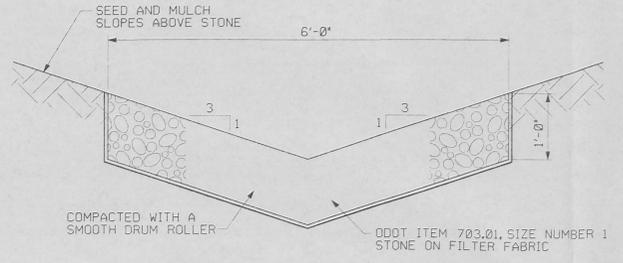


DETAIL 3 REF 000912 000906  
ENDWALL CONNECTION  
NTS

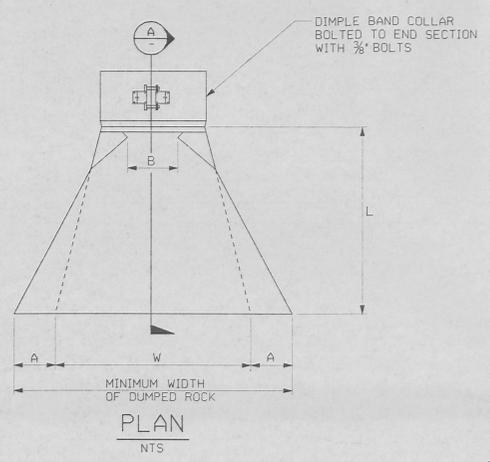


- NOTES:
- FERTILIZE AND SEED PRIOR TO APPLYING EROSION CONTROL BLANKET AND MULCH.
  - INSTALL 4' WIDE EROSION CONTROL BLANKET SIMILAR TO CURLEX-II AT CHANNEL BOTTOM, STAPLE AT FLOWLINE AND TOP AT 4' INTERVALS. MULCH AREA ABOVE BLANKET.

DETAIL 4 REF 000912 000906  
DRAINAGE DITCH  
NTS

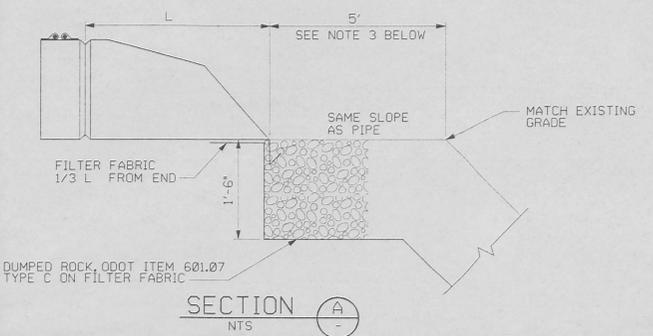


DETAIL 5 REF 000912 000906  
STONE LINED DITCH  
NTS

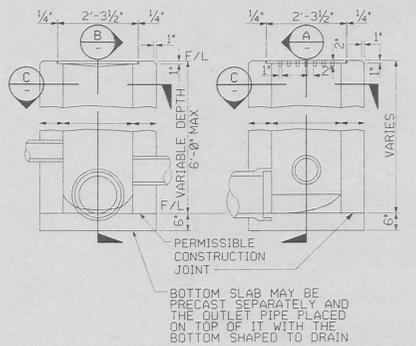


DETAIL 2 REF 000912 000906  
STANDARD FLARED END SECTION  
NTS

- INSTALL PER MANUFACTURER'S INSTRUCTIONS.
  - MATERIAL TO BE GALVANIZED STEEL.
  - LENGTH OF DUMPED ROCK IS 5' UNLESS NOTED OTHERWISE ON SITE/GRADING/UTILITY PLAN
  - DIMENSIONS, IN INCHES, ARE AS FOLLOWS:
- |              |              |
|--------------|--------------|
| 15" DIA      | 18" DIA      |
| A=7.5 (1"±)  | A=8 (1"±)    |
| L=26 (1.5"±) | L=31 (1.5"±) |
| W=30 (2"±)   | W=36 (2"±)   |
| B=8 MAX      | B=8 MAX      |



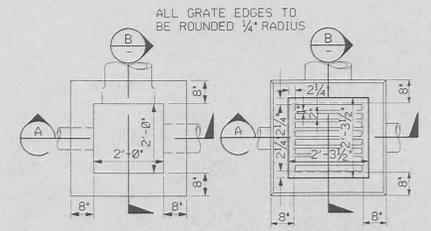
SECTION A  
NTS



SECTION B  
NTS

SECTION C  
NTS

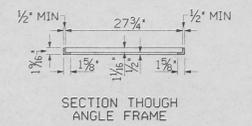
- NOTES:
- LOCATION AND ELEVATION WHEN GIVEN ON THE PLANS IS TOP CENTER OF THE GRATE.
  - GRATING AND FRAME - THE DESIGN SHALL BE ESSENTIALLY THE SAME AND EQUALLY AS STRONG AS THE ONE SHOWN HEREIN. WEIGHT OF GRATE, 20 LBS MINIMUM. WEIGHT OF FRAME, 40 LBS.
  - CAST-IN-PLACE CONCRETE WALLS HAVE A NOMINAL THICKNESS OF 8 INCHES. PRECAST WALLS SHALL HAVE A MINIMUM THICKNESS OF 6 INCHES AND BE REINFORCED SUFFICIENTLY TO PERMIT SHIPPING AND HANDLING WITHOUT DAMAGE.
  - CONCRETE, CAST-IN-PLACE TO BE ODOT CLASS C. ALL PRECAST CONCRETE SHALL MEET THE REQUIREMENTS OF ODOT 706.13 WITH 6% ± 2% AIR VOID CONTENT IN THE HARDENED CONCRETE AND BE MARKED WITH CATCH BASIN NUMBER.
  - OPENINGS FOR PIPES SHALL BE O.D. ±2" WHEN FABRICATED OR FIELD CUT.



SECTION C  
NTS

PLAN  
NTS

DETAIL 6 REF 000912 000906  
STANDARD 2-2-B  
CATCH BASIN  
NTS



SECTION THROUGH ANGLE FRAME

REF DWG NO.	DRAWING TITLE
94X-5900-X-00926	DRAWING INDEX
94X-5900-X-00927	LEGEND AND SYMBOLS
94X-5900-G-00906	GRADING AND DRAINAGE PLAN

11 28 95 1688  
CDC/UNCONTROLLED

0	APPROVED FOR CONSTRUCTION		
REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	FERMCO DATE

**UNITED STATES DEPARTMENT OF ENERGY**  
**FERNALD ENVIRONMENTAL MANAGEMENT PROJECT**  
 THIS DRAWING PREPARED BY  
**PARSONS**  
 THE RALPH M. PARSONS CO. - PARSONS MAIN, INC. - ENGINEERING-SCIENCE, INC.  
 CINCINNATI, OHIO

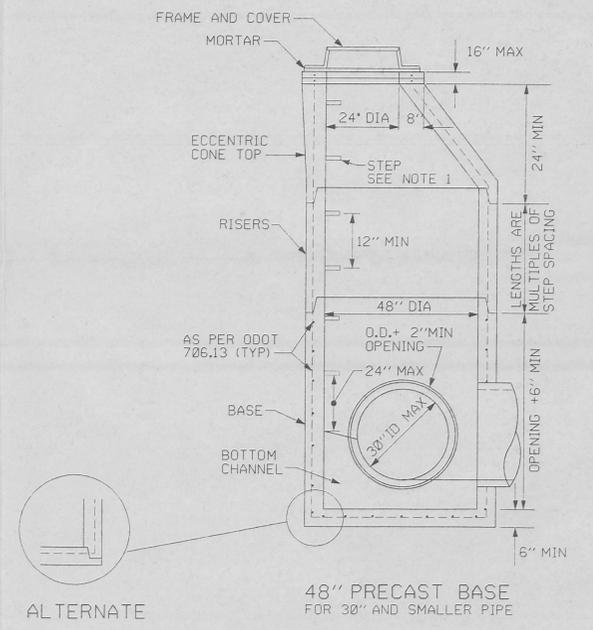
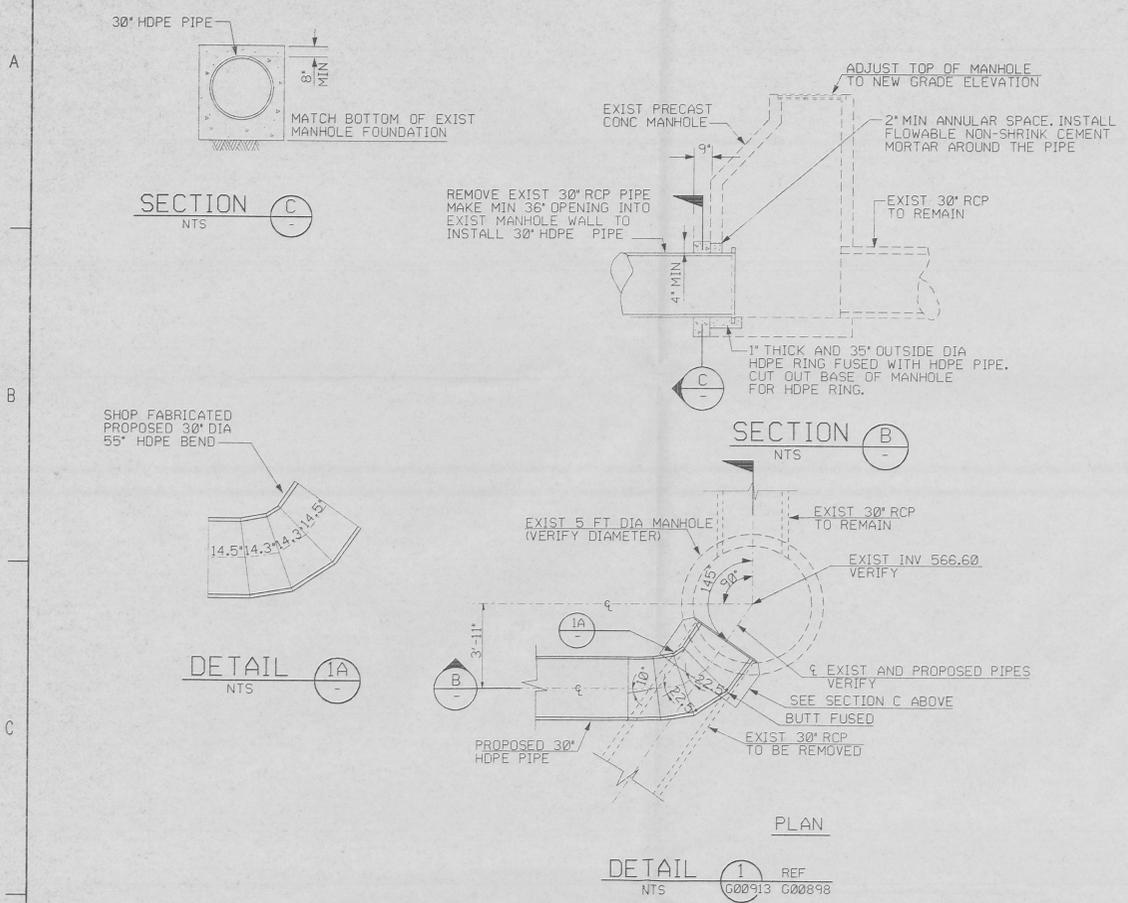
PROJECT NAME  
**SITE PREPARATION/UNDERGROUND UTILITIES**  
**FERNALD RESIDUES VITRIFICATION PLANT**

DRAWING TITLE  
**CIVIL**  
**STORMWATER MANAGEMENT DETAILS**  
**SHEET 2 OF 2**

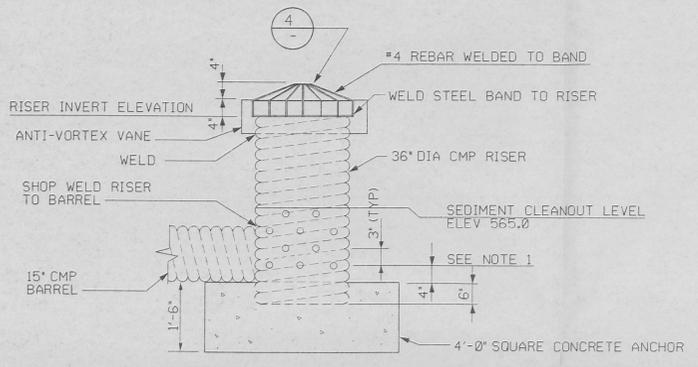
DRAWN BY D. THOMPSON	DATE 06-16-95	LEAD ENGINEER	DATE	CHECKED BY K. GERARD	DATE 08-15-95
PLANT/BLDG. NO.	FLOOR	SCALE NONE	CLASS		
SUBMITTED FOR APPROVAL	FERMCO CRU APPROVAL N/A			N/A	

PREPARED UNDER PARSONS PROJECT ORDER NUMBER CRU4/P0146	DATE 00-90701	TEMP PROJECT NO. WBS 11.1.1.4.3	DRAWING INDEX CODE NO. 94X-5900-G-00912	SHEET NO. G0011	REV. NO. 0
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- UNLESS OTHERWISE NOTED ALL MATERIALS SHALL CONFORM TO THE STATE OF OHIO DEPARTMENT OF TRANSPORTATION (ODOT) CONSTRUCTION AND MATERIAL SPECIFICATIONS DATED JANUARY 1, 1995.
- UNLESS OTHERWISE NOTED, ALL CONCRETE SHALL BE ODOT CLASS F, 3000 PSI COMPRESSIVE STRENGTH AT 28 DAYS.



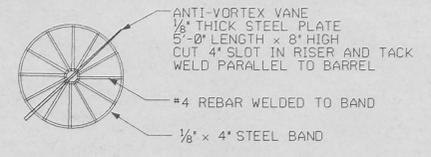
DETAIL 2 PRECAST MANHOLE NTS REF G00913 G00898



SIDE VIEW

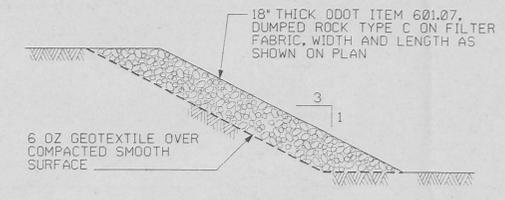
- NOTES:
- 4 ROWS OF 1" DIA HOLES AT 3" O.C., 16 HOLES PER ROW.
  - DURING CONSTRUCTION, SEDIMENT TO BE REMOVED FROM BASIN WHEN SEDIMENT ELEVATION REACHES THE SEDIMENT CLEANOUT ELEVATION. AT THE CONCLUSION OF THE PROJECT, ALL ACCUMULATED SEDIMENT SHALL BE REMOVED, AND ALL GRADES RESTORED TO THE DESIGN ELEVATIONS.
  - AGGREGATE AND DUMPED ROCK NOT SHOWN, SEE SECTION A.
  - ALL CUTS AND WELDS TO BE PAINTED WITH A GALVANIZED COATING COMPOUND.

DETAIL 3 RISER NTS REF G00913 G00898 G00906

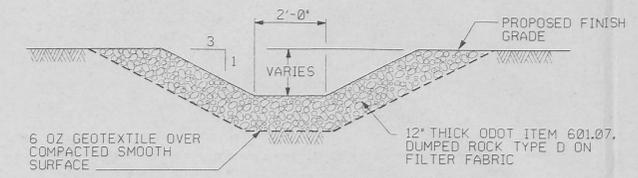


TOP VIEW OF TRASH RACK

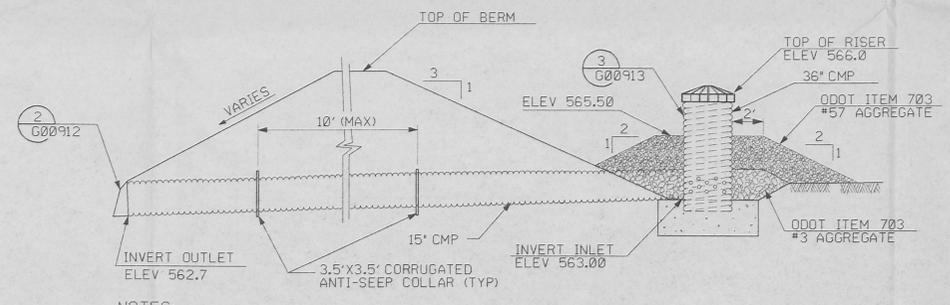
DETAIL 4 NTS



DETAIL 5 NTS REF G00913 G00906



CHANNEL SECTION DETAIL 6 NTS REF G00913 G00906



- NOTES:
- ANTI-SEEP COLLAR TO CONNECT TO PIPE WITH WATERTIGHT JOINT.
  - ANTI-SEEP COLLAR TO BE SAME GAUGE AS PIPE MATERIAL.

SECTION A NTS REF G00913 G00908

REF DWG NO.	DRAWING TITLE
94X-5900-X-00926	DRAWING INDEX
94X-5900-X-00927	LEGEND AND SYMBOLS
94X-5900-G-00898	UTILITY PLAN
94X-5900-G-00906	GRADING AND DRAINAGE PLAN
94X-5900-G-00908	STORM DRAIN PROFILES
94X-5900-G-00912	STORMWATER MANAGEMENT DETAILS - SHEET 2 OF 2

11 28 95 1688

CDC/UNCONTROLLED

0	APPROVED FOR CONSTRUCTION			
REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	FERMCO	DATE
				INITIALS AND DATE

**UNITED STATES DEPARTMENT OF ENERGY**  
**FERNALD ENVIRONMENTAL MANAGEMENT PROJECT**

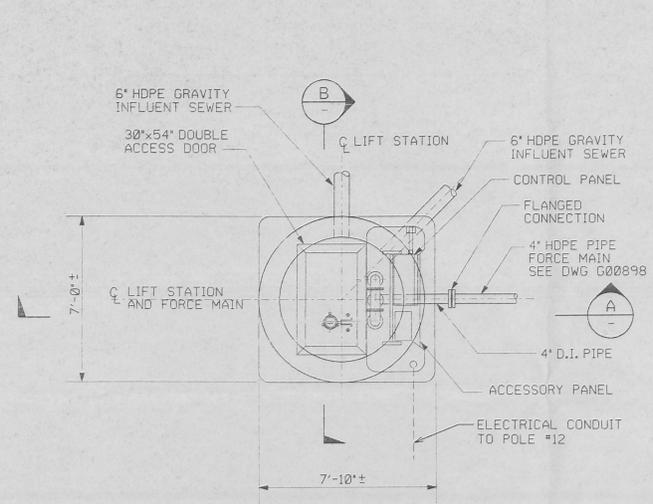
THIS DRAWING PREPARED BY  
**PARSONS**  
 THE RALPH M. PARSONS CO. - PARSONS MAIN, INC. - ENGINEERING-SCIENCE, INC.  
 CINCINNATI, OHIO

PROJECT NAME  
**SITE PREPARATION/UNDERGROUND UTILITIES**  
**FERNALD RESIDUES VITRIFICATION PLANT**

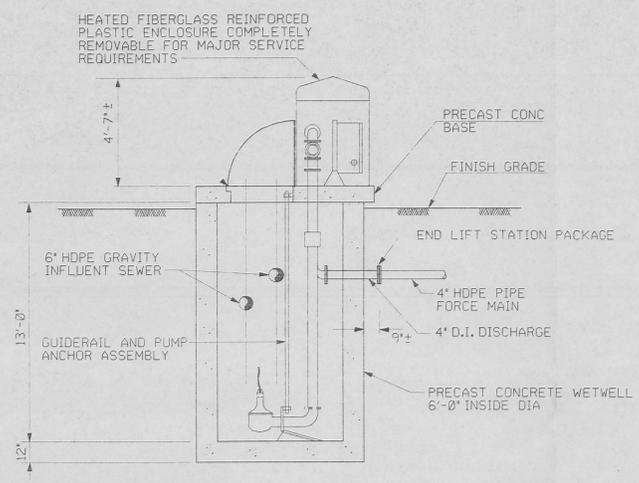
DRAWING TITLE  
**CIVIL STORMWATER MANAGEMENT DETAILS**  
 SHEET 1 OF 2

DRAWN BY O. BABAYAN	DATE 7/14/95	LEAD ENGINEER	DATE	CHECKED BY K. GERARD	DATE 8/15/95
PLANT/BLDG. NO.	FLOOR	SCALE	NONE	CLASS	
SUBMITTED FOR APPROVAL	FERMCO CRU APPROVAL	N/A	N/A		

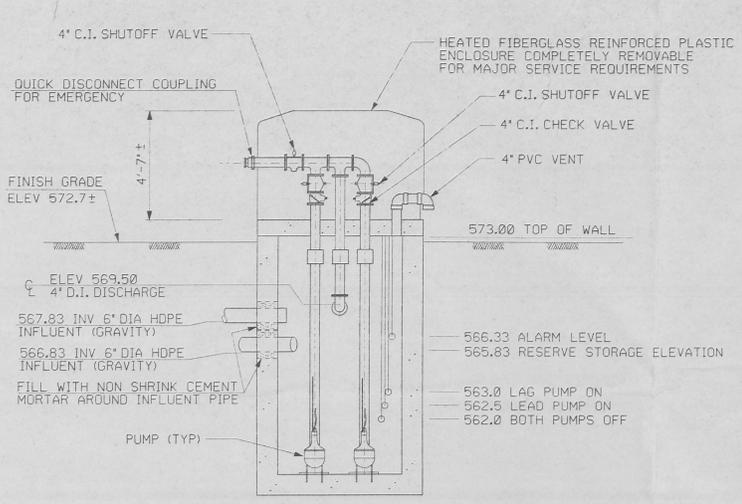
PREPARED UNDER PARSONS PROJECT ORDER NUMBER CRU4/P0146	DATE 11/24/95	PROJECT NO. WBS 1.1.1.4.3 00-90701	DRAWING INDEX CODE NO. 94X-5900-G-00913	SHEET NO. G0010	REV. NO. 0
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TOP VIEW



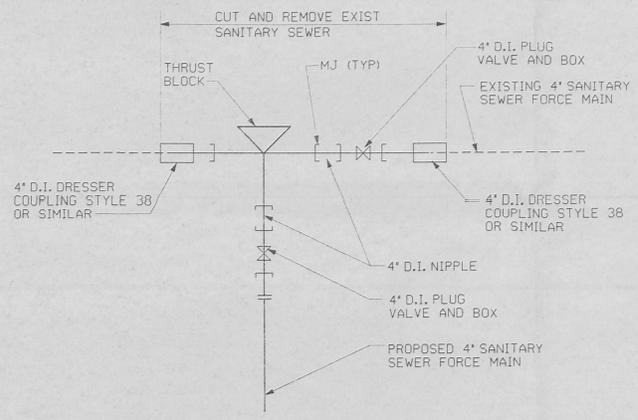
SECTION A



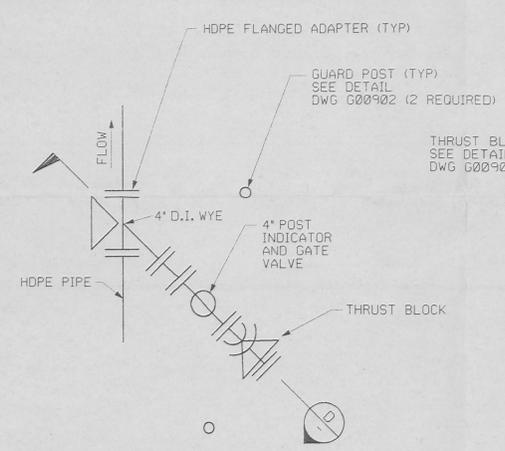
SECTION B

NOTE: LIFT STATION SHOWN IS A GORMAN-RUPP J-SERIES. OTHER UNITS MAY BE CONSIDERED AS PROVIDED FOR IN THE SPECIFICATIONS

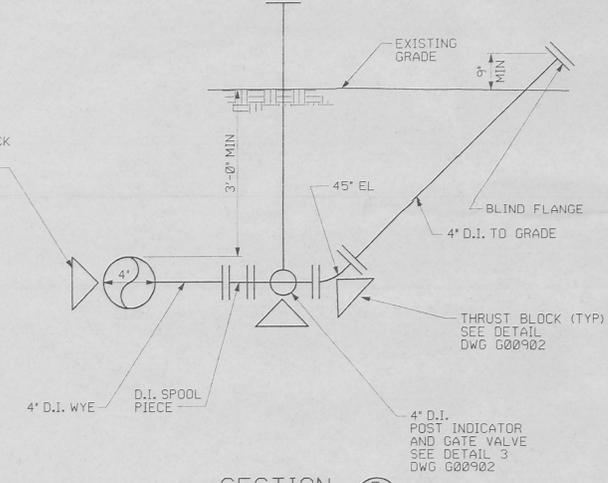
LIFT STATION DETAIL 1 REF G00911 G00898



DETAIL 2 REF G00911 G00898

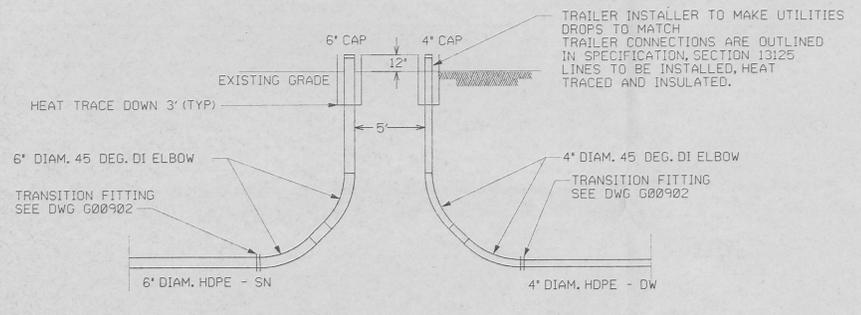


PLAN



SECTION D

CLEANOUT DETAIL 3 REF G00911 G00898



DETAIL 4 REF G00911 G00898

REF DWG NO.	DRAWING TITLE
94X-5900-X-00926	INDEX SHEET
94X-5900-X-00927	LEGEND AND SYMBOLS
94X-5900-G-00898	UTILITY PLAN (MASTER PLAN)
94X-5900-G-00902	DETAILS - SHEET 1 OF 2

11 28 95 1688

CDC/UNCONTROLLED

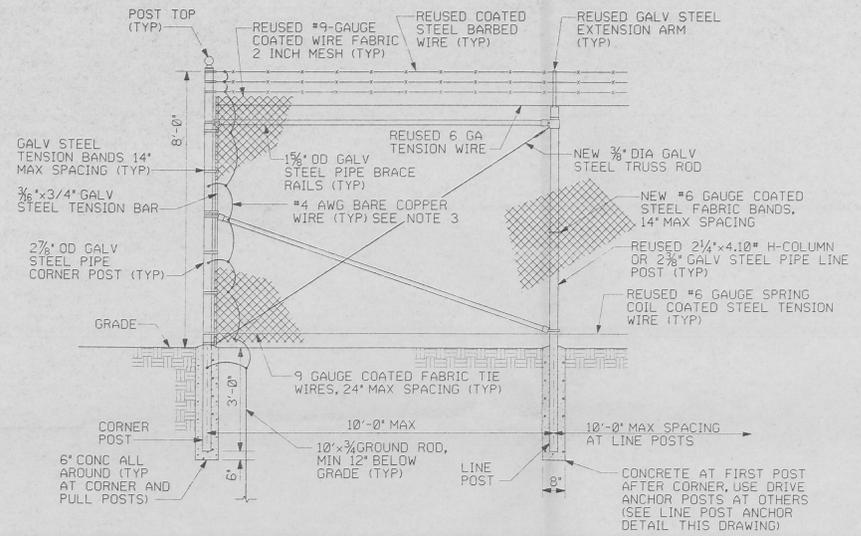
0	APPROVED FOR CONSTRUCTION	APB	N/A
REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	FERMCO DATE

**UNITED STATES DEPARTMENT OF ENERGY**  
**FERNALD ENVIRONMENTAL MANAGEMENT PROJECT**  
 THIS DRAWING PREPARED BY  
**PARSONS**  
 THE RALPH M. PARSONS CO. - PARSONS MAIN, INC. - ENGINEERING-SCIENCE, INC.  
 CINCINNATI, OHIO  
 PROJECT NAME  
**SITE PREPARATION/UNDERGROUND UTILITIES**  
**FERNALD RESIDUES VITRIFICATION PLANT**  
 DRAWING TITLE  
**CIVIL**  
**UTILITY DETAILS**

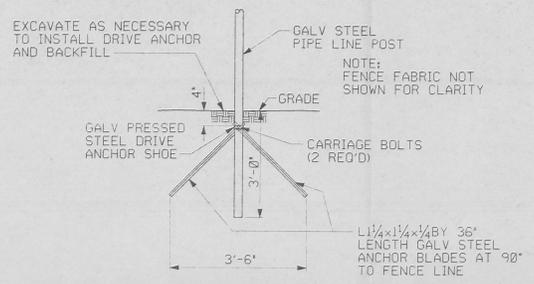
DRAWN BY R. LINDGREN	DATE 8/01/95	LEAD ENGINEER	DATE	CHECKED BY Y. AFSHAR	DATE 8/15/95
PLANT/BLDG. NO.	FLOOR	SCALE	NONE	CLASS	
SUBMITTED FOR APPROVAL		FERMCO CRU APPROVAL		N/A	

PREPARED UNDER PARSONS PROJECT ORDER NUMBER CRU4/P0146	PROJECT NO. WBS 1.1.1.4.3 00-90701	PROJECT NO. 94X-5900-G-00911	DRAWING INDEX CODE NO. G0009 0	SHEET NO. 000148	REV. NO.
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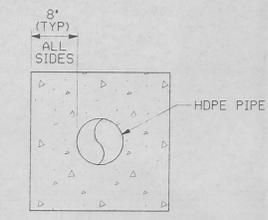
- UNLESS OTHERWISE NOTED ALL MATERIALS SHALL CONFORM TO THE STATE OF OHIO DEPARTMENT OF TRANSPORTATION (ODOT) CONSTRUCTION AND MATERIAL SPECIFICATIONS DATED JANUARY 1, 1995.
- UNLESS OTHERWISE NOTED, ALL CONCRETE SHALL BE ODOT CLASS F, 3000 PSI COMPRESSIVE STRENGTH AT 28 DAYS.



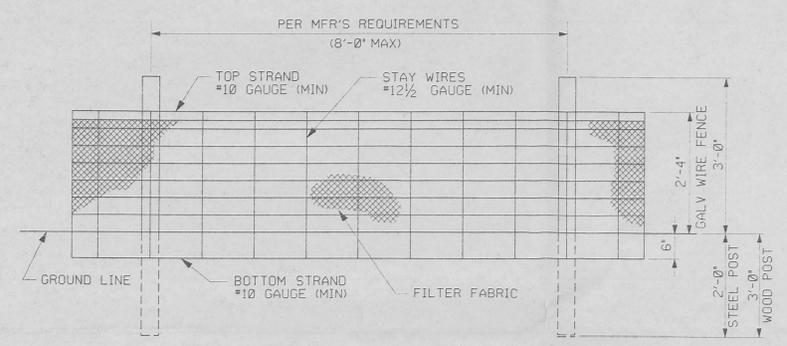
DETAIL 1 REF G00909 G00899 NTS



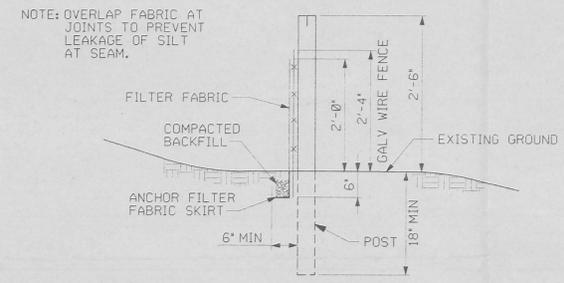
LINE POST DRIVE ANCHOR DETAIL NTS



DETAIL 2 REF G00909 G00900 G00906 G00910 NTS



ELEVATION

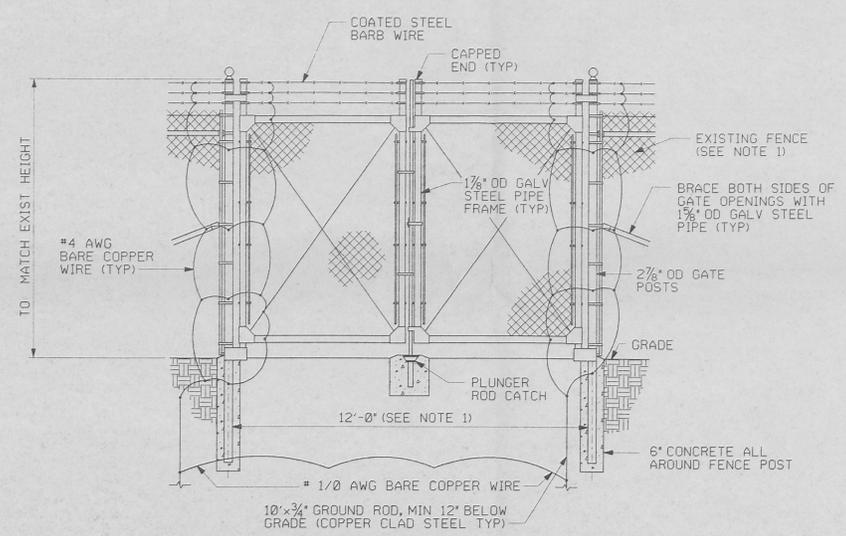


SECTION

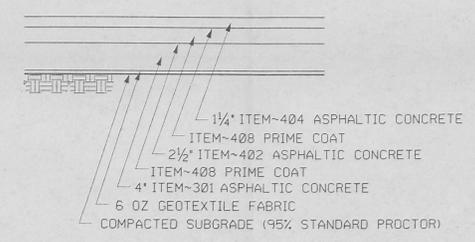
NOTES FOR SILT FENCE

- FENCE CAN BE FIELD CONSTRUCTED AND INSTALLED, OR A PREMANUFACTURED FENCE MAY BE USED.
- PREMANUFACTURED FENCE SHALL BE MIRAFI, INC. ENVIROFENCE OR EQUAL.
- FOR FIELD CONSTRUCTED FENCE:
  - WIRE SHALL BE A MINIMUM OF 32 INCHES IN WIDTH AND SHALL HAVE A MINIMUM OF 6 LINE WIRES WITH 12 INCH STAY SPACING.
  - FILTER FABRIC SHALL BE EITHER TREVIRA 1125, AMOCO CONSTRUCTION FABRIC SILT STOPPER, OR EQUAL.
  - FILTER FABRIC SHALL BE A MINIMUM OF 36 INCHES WIDE AND SHALL BE FASTENED ADEQUATELY TO THE WIRE AT 8' ON CENTER.
  - STEEL POSTS SHALL BE 5'-0" IN HEIGHT AND BE OF THE SELF-FASTENER ANGLE STEEL TYPE.
  - WOOD POSTS SHALL BE A MINIMUM OF 6'-0" IN HEIGHT AND 3" OR MORE IN DIAMETER. WIRE FABRIC SHALL BE FASTENED TO POST WITH NOT LESS THAN #9 WIRE STAPLES, 1 1/2' LONG.

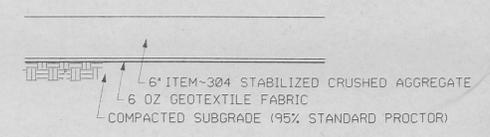
DETAIL 3 REF G00909 G00906 NTS



DETAIL 4 REF G00909 G00899 NTS



DETAIL 5 REF G00909 G00899 NTS



DETAIL 6 REF G00909 G00899 NTS

11 28 95 1688

CDC/UNCONTROLLED

REF DWG NO.	DRAWING TITLE
94X-5900-X-00926	DRAWING INDEX
94X-5900-X-00927	LEGEND AND SYMBOLS
94X-5900-G-00900	WATER LINE PROFILES
94X-5900-G-00906	GRADING AND DRAINAGE PLAN
94X-5900-G-00910	SANITARY SEWER AND UTILITY PROFILES
94X-5900-G-00899	SITE PLAN

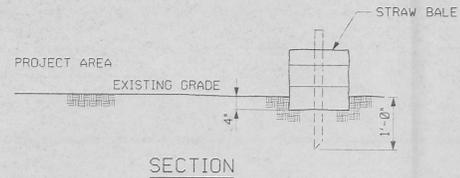
0	APPROVED FOR CONSTRUCTION		
REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	DATE
		INITIALS AND DATE	

**UNITED STATES DEPARTMENT OF ENERGY**  
**FERNALD ENVIRONMENTAL MANAGEMENT PROJECT**  
 THIS DRAWING PREPARED BY  
**PARSONS**  
 THE RALPH M. PARSONS CO. - PARSONS MAIN, INC. - ENGINEERING-SCIENCE, INC.  
 CINCINNATI, OHIO  
 PROJECT NAME  
**SITE PREPARATION/UNDERGROUND UTILITIES**  
**FERNALD RESIDUES VITRIFICATION PLANT**

DRAWING TITLE <b>CIVIL DETAILS</b> <b>SHEET 2 OF 2</b>			
DRAWN BY D. THOMPSON	DATE 06-16-95	LEAD ENGINEER DATE	CHECKED BY K. GERARD DATE 8/15/95
PLANT/BLDG. NO.	FLOOR	SCALE NONE	CLASS
SUBMITTED FOR APPROVAL DATE 11/24/95	FERMCO CRU APPROVAL N/A	N/A	

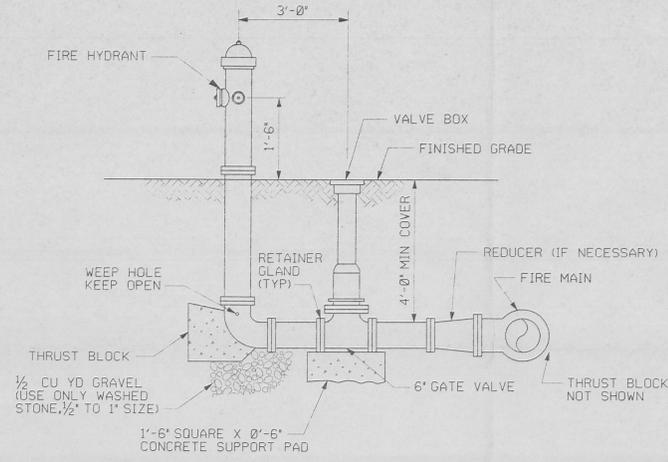
PREPARED UNDER PARSONS PROJECT ORDER NUMBER CRU4/P0146	DOE PROJECT NO. WBS 1.1.1.4.3 00-90701	FEMP PROJECT NO. 94X-5900-G-00909	DRAWING INDEX CODE NO. G0008	SHEET NO. 0	REV. NO.
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- 1. UNLESS OTHERWISE NOTED ALL MATERIALS SHALL CONFORM TO THE STATE OF OHIO DEPARTMENT OF TRANSPORTATION (ODOT) CONSTRUCTION AND MATERIAL SPECIFICATIONS DATED JANUARY 1, 1995.
- 2. UNLESS OTHERWISE NOTED, ALL CONCRETE SHALL BE ODOT CLASS F, 3000 PSI COMPRESSIVE STRENGTH AT 28 DAYS, AS PER ODOT ITEM 499 SPECIFICATION.



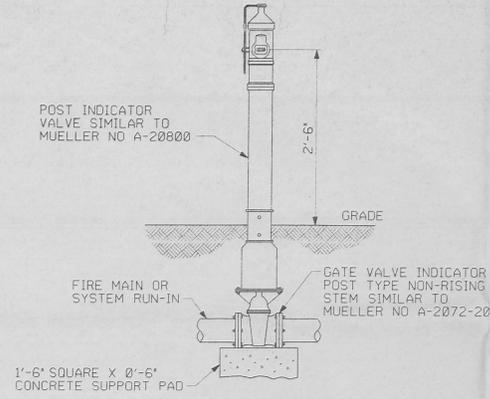
- NOTES:
1. STRAW BALES TO BE USED WHEN NATURAL GROUND IS LEVEL OR SLOPING AWAY FROM PROJECT.
  2. PLACE STRAW BALES APPROXIMATELY PARALLEL TO BOTTOM OF FILL SLOPE.
  3. STAKES SHALL BE PER SPECIFICATION 02270.
  4. STRAW BALES SHALL BE STANDARD SIZE 18" x 18" x 48".
  5. FOR EROSION CONTROL MAINTENANCE SEE SPECIFICATIONS.

DETAIL 1 REF 600902 600906  
 STRAW BALE EROSION CONTROL  
 NTS

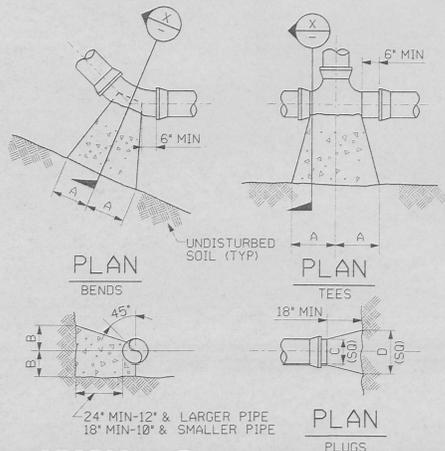


NOTE: FLANGE ADAPTOR'S AND DI SPOOL PIPE SHALL BE USED AT ALL TRANSITIONS OF UNLIKE PIPING MATERIAL.

DETAIL 2 REF 600902 600898  
 FIRE HYDRANT WITH CONTROL VALVE  
 NTS

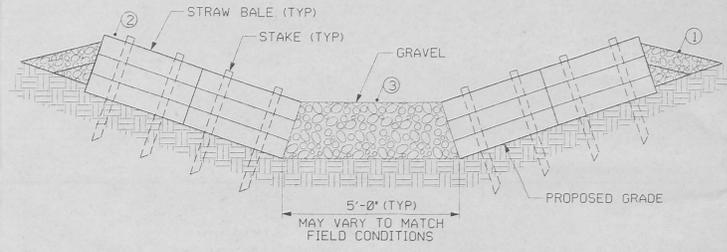


DETAIL 3 REF 600902 600898  
 POST INDICATOR VALVE  
 NTS



TYPE	SIZE	1/4 BENDS		1/8 BENDS		TEES		PLUGS	
		A	B	A	B	A	B	C	D
2000 PSF SOIL	6"	16"	10"	9"	10"	6"	8"	10"	21"
	8"	22"	13"	12"	13"	8"	10"	12"	29"
	10"	26"	17"	14"	17"	10"	13"	16"	36"
	12"	29"	21"	16"	21"	11"	16"	18"	41"

NOTE: BASED ON 100 PSI STATIC PRESSURE PLUS A.W.W.A. WATER HAMMER. ALL BEARING SURFACES TO BE CARRIED TO UNDISTURBED GROUND.



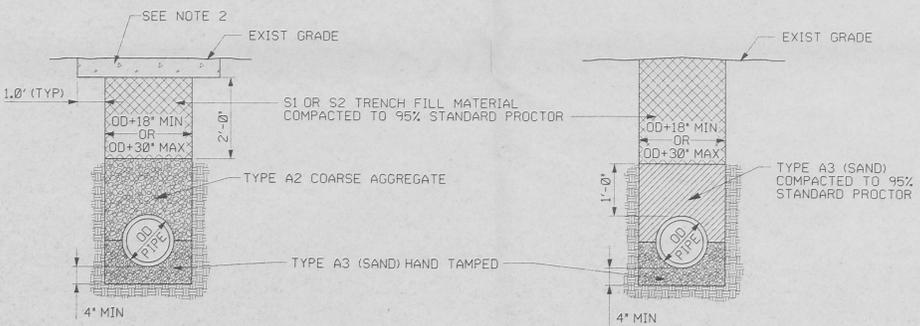
- 1 ODOT ITEM 304 STABILIZED CRUSHED AGGREGATE (2-6" COURSES) ON FILTER FABRIC, ODOT ITEM 712, TYPE D.
- 2 INSTALL STRAW BALE AS SHOWN IN DETAIL 1.
- 3 GRAVEL TO BE ODOT ITEM 601.07, TYPE C TOP WIDTH TO BE SAME AS STRAW BALES.

DETAIL 5 REF 600902 600906  
 CHECK DAM  
 NTS

SECTION X  
 BENDS & TEES

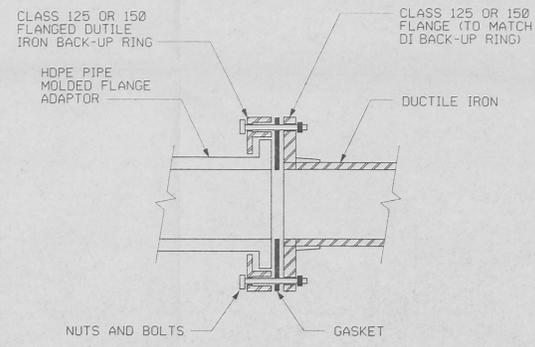
- NOTES:
1. ALL FIRE PROTECTION WORK, MATERIALS, AND LABOR SHALL MEET THE REQUIREMENTS OF NFPA 24.
  2. ALL FIRE PROTECTION PIPING SHALL HAVE A MINIMUM COVER OF 4'-0".
  3. IF PIPE DIAMETER IS LESS THAN 6", USE 6" DESIGN CRITERIA.
  4. DETAIL APPLIES TO DUCTILE IRON AND HDPE PIPE.

DETAIL 4 REF 600902 600924  
 THRUST BLOCKS  
 NTS

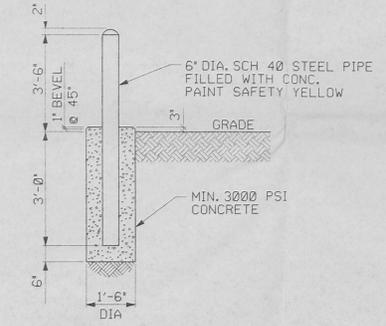


TYPICAL PIPE BEDDING DETAIL  
 NTS

- NOTE:
- 1) SEE SPECIFICATIONS SECTION 02200 EARTHWORK FOR MATERIAL DESCRIPTIONS.
  - 2) PAVING SECTION FOR PAVEMENT REPAIR USE 6" CONCRETE. PAVING SECTION THROUGH NEW PAVEMENT SEE DETAIL 5, DWG. 600909.



TRANSITION FITTING DETAIL  
 NTS



TYPICAL EXTERIOR GUARD POST DETAIL  
 NTS

REF DWG NO.	DRAWING TITLE
94X-5900-X-00926	DRAWING INDEX
94X-5900-X-00927	LEGEND AND SYMBOLS
94X-5900-G-00898	UTILITY PLAN
94X-5900-G-00906	GRADING AND DRAINAGE PLAN
94X-5900-G-00909	DETAILS-SHEET 2 OF 2
94X-5900-G-00924	WATER LINE DETAILS

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0	APPROVED FOR CONSTRUCTION		
REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	FERMCO DATE

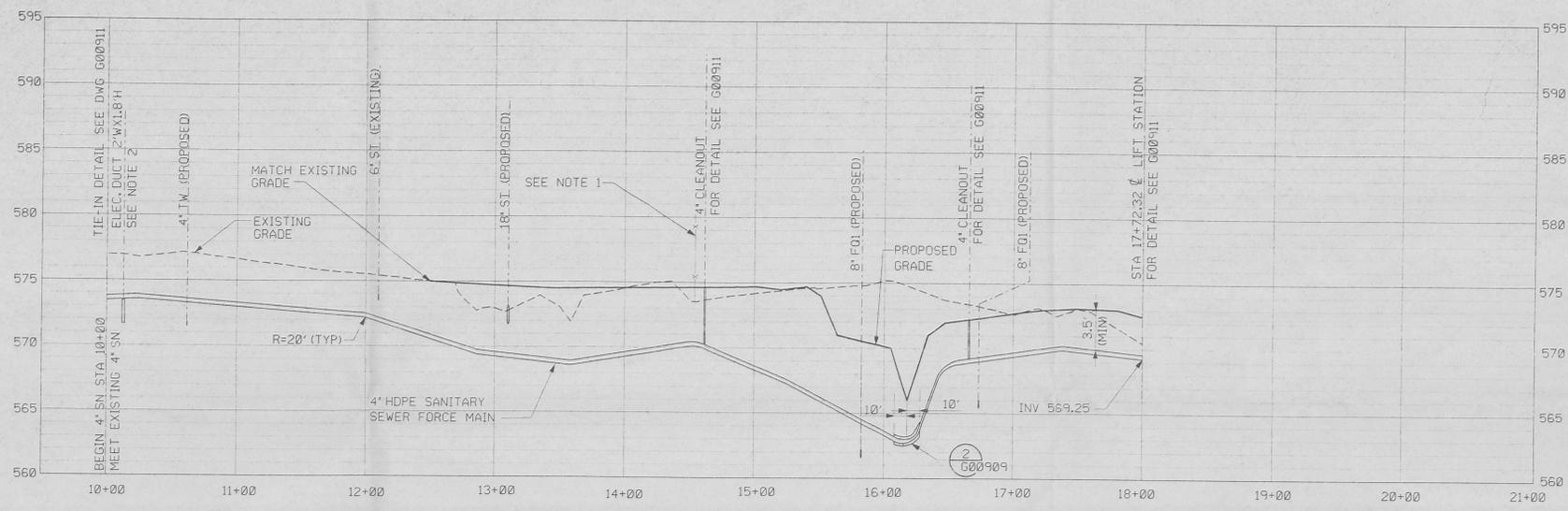
**UNITED STATES DEPARTMENT OF ENERGY**  
**FERNALD ENVIRONMENTAL MANAGEMENT PROJECT**  
 THIS DRAWING PREPARED BY  
**PARSONS**  
 THE RALPH M. PARSONS CO. - PARSONS MAIN, INC. - ENGINEERING-SCIENCE, INC.  
 CINCINNATI, OHIO

PROJECT NAME  
**SITE PREPARATION/UNDERGROUND UTILITIES**  
**FERNALD RESIDUES VITRIFICATION PLANT**

DRAWING TITLE <b>CIVIL DETAILS SHEET 1 OF 2</b>			
DRAWN BY D. THOMPSON	DATE 6/16/95	LEAD ENGINEER	DATE
PLANT/BLDG. NO.	FLOOR	CHECKED BY K. GERRARD	DATE 8/15/95
SUBMITTED FOR APPROVAL		FERMCO CRU APPROVAL	NONE
DATE 11/21/95		N/A	N/A

PREPARED UNDER PARSONS PROJECT ORDER NUMBER CRU4/PO146	ODE PROJECT NO. WBS 1.1.1.4.3 00-90701	FEMP PROJECT NO. 94X-5900-G-00902	DRAWING INDEX CODE NO. 60007 0	SHEET NO. 0	REV. NO.
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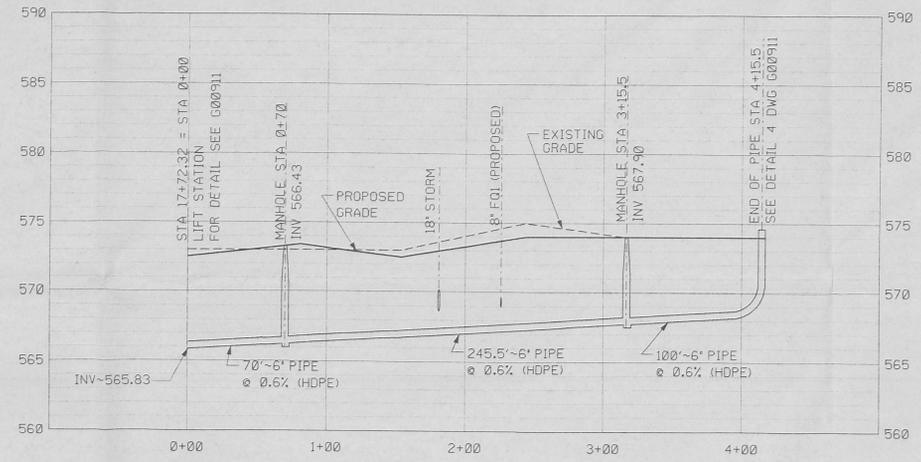
- EXISTING FENCE TO BE REINSTALLED AT THE COMPLETION OF SANITARY LINE CONSTRUCTION.
- MINIMUM COVER OVER 4" HDPE FORCE MAIN IS 3'-6". IT SHALL ALSO HAVE A MINIMUM OF 6" CLEARANCE FROM THE ELECTRIC DUCT.



SN - 4" SANITARY SEWER PROFILE

SCALE: HOR 1"=50'  
VER 1"=5'

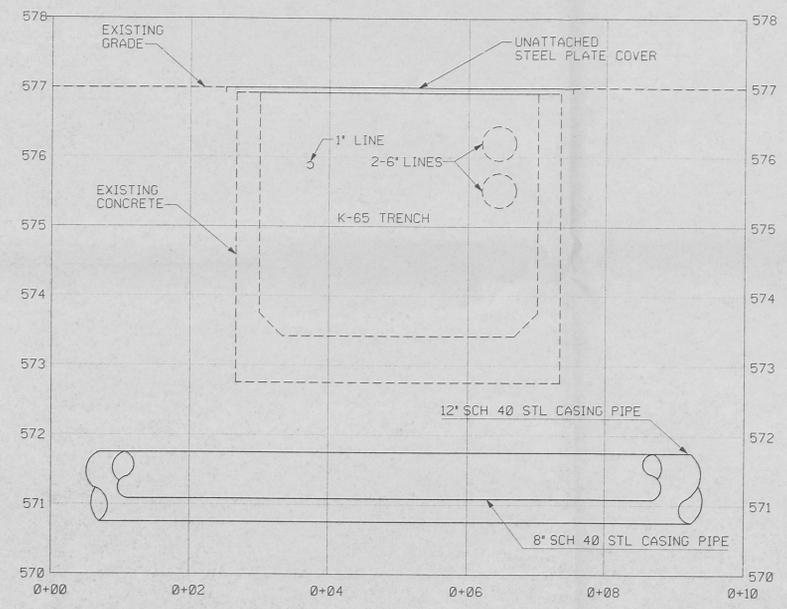
REF G00898  
G00911



SN - 6" SANITARY SEWER PROFILE

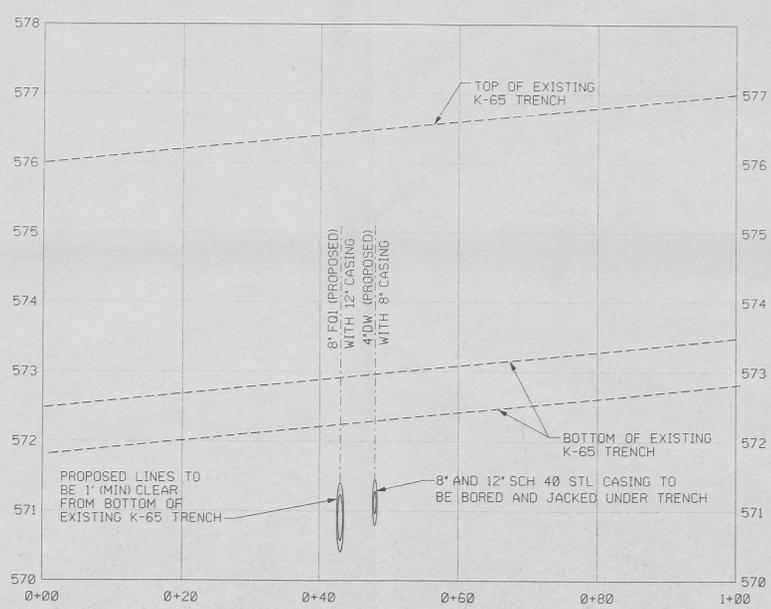
SCALE: HOR 1"=50'  
VER 1"=5'

REF G00898  
G00911



SECTION A  
SCALE: HOR 1"=2'  
VER 1"=1'

REF G00910  
G00898



SECTION B  
SCALE: HOR 1"=10'  
VER 1"=1'

REF G00910  
G00898

REF DWG NO.	DRAWING TITLE
94X-5900-X-00926	DRAWING INDEX
94X-5900-X-00927	LEGEND AND SYMBOLS
94X-5900-G-00898	UTILITY PLAN
95X-5900-G-00909	DETAILS-SHEET 2 OF 2
94X-5900-G-00911	UTILITY DETAILS

11 28 95 1688

CDC/UNCONTROLLED

0	APPROVED FOR CONSTRUCTION			
REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	FERMCO	DATE
				INITIALS AND DATE

**UNITED STATES DEPARTMENT OF ENERGY**  
**FERNALD ENVIRONMENTAL MANAGEMENT PROJECT**

THIS DRAWING PREPARED BY  
**PARSONS**  
 THE RALPH M. PARSONS CO. - PARSONS MAIN, INC. - ENGINEERING-SCIENCE, INC.  
 CINCINNATI, OHIO

PROJECT NAME  
**SITE PREPARATION/UNDERGROUND UTILITIES**  
**FERNALD RESIDUES VITRIFICATION PLANT**

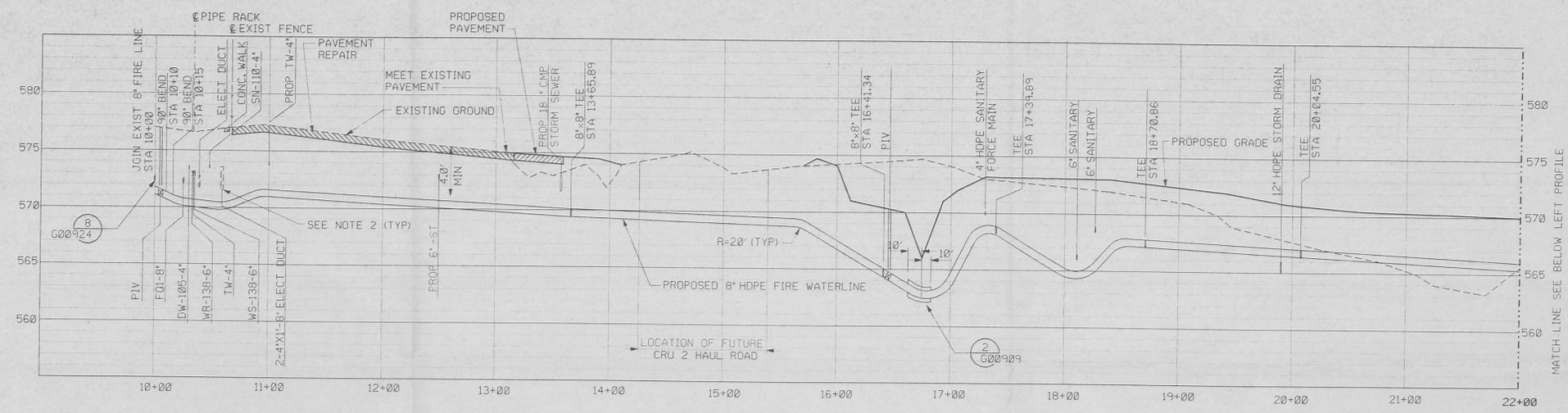
DRAWING TITLE  
**CIVIL**  
**SANITARY SEWER AND UTILITY PROFILES**

DRAWN BY D. BABAYAN	DATE 6/31/95	LEAD ENGINEER	DATE	CHECKED BY K. GERARD	DATE 11/10/95
PLANT/BLDG. NO.	FLOOR	SCALE AS SHOWN	CLASS		
SUBMITTED FOR APPROVAL	DATE 11/24/95	FERMCO CRU APPROVAL N/A	N/A		

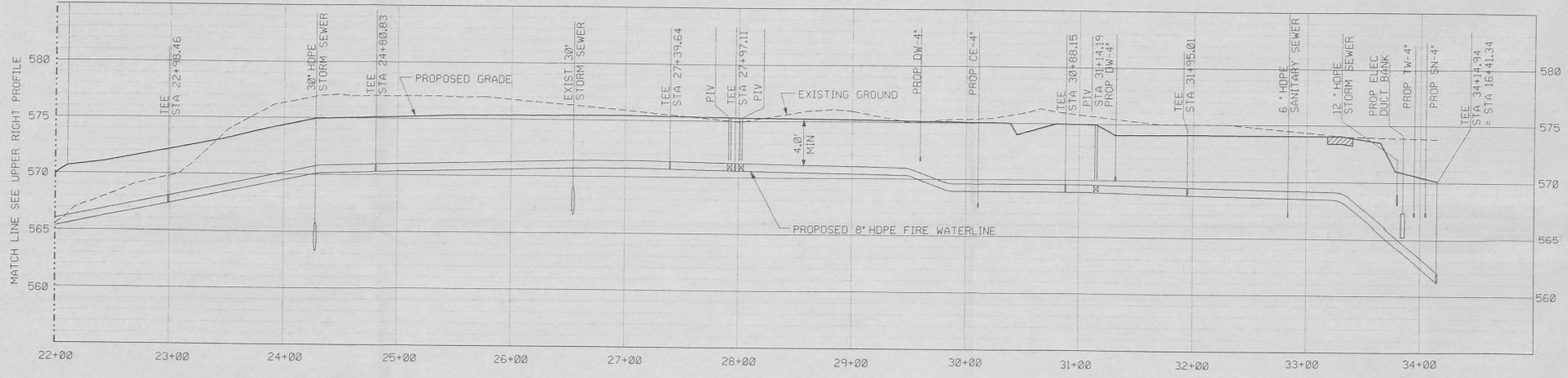
PREPARED UNDER PARSONS PROJECT ORDER NUMBER CRU4/P0146	DATE PROJECT NO. WBS 1.1.1.4.3	DATE 00-90701	DRAWING INDEX CODE NO. 94X-5900-G-00910	SHEET NO. G0006	REV. NO. 0
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NOTES

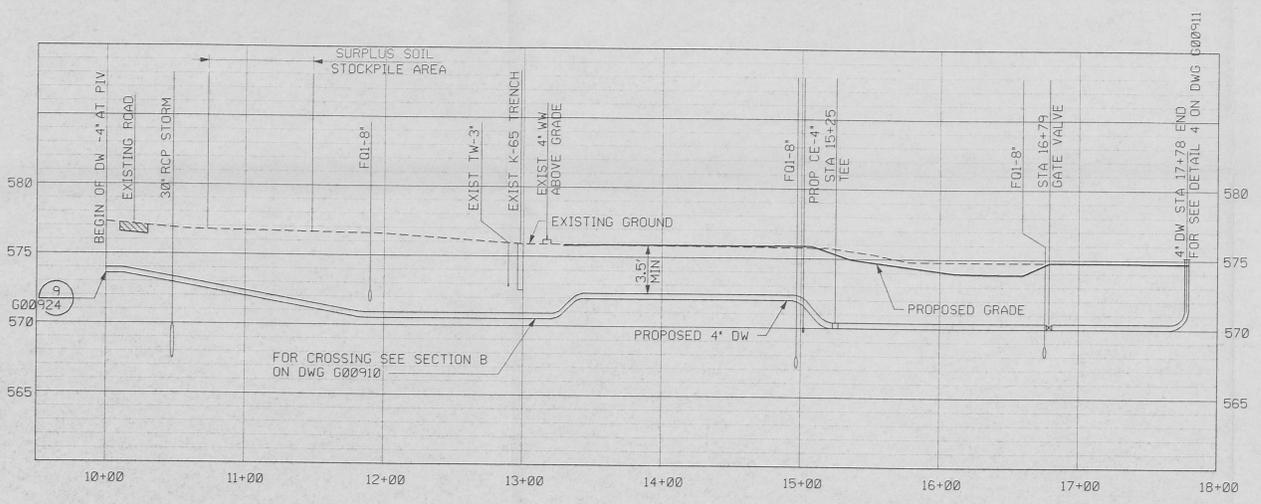
- SANITARY, TREATED WATER, AND ELECTRICAL DUCT BANK PROFILES SIMILAR TO 8" FIRE LINE PROFILE BETWEEN STA 10+00 TO STA 18+00.
- MAINTAIN 12" CLEARANCE MINIMUM BETWEEN FIRE LINE AND OTHER UTILITIES OR OTHER INTERFERENCES.



FQ1 - 8" FIRE WATER LINE PROFILE (SEE NOTE 1)  
 SCALES: HORIZ 1"=50'-0"  
 VERT 1"=5'-0"  
 REF G00898



FQ1 - 8" FIRE WATER LINE PROFILE  
 SCALES: HORIZ 1"=50'-0"  
 VERT 1"=5'-0"  
 REF G00898



DW - 4" DRINKING WATER LINE PROFILE  
 SCALES: HORIZ 1"=50'-0"  
 VERT 1"=5'-0"  
 REF G00898

REF DWG NO.	DRAWING TITLE
94X-5900-X-00926	DRAWING INDEX
94X-5900-X-00927	LEGEND AND SYMBOLS
94X-5900-G-00898	UTILITY PLAN
94X-5900-G-00924	WATER LINE DETAILS
94X-5900-G-00909	DETAILS - SHEET 2 OF 2
94X-5900-G-00911	UTILITY DETAILS
94X-5900-G-00910	SANITARY SEWER AND UTILITY PROFILES

11 28 95 1688  
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0	APPROVED FOR CONSTRUCTION	NA	NA
REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	FERMCO DATE
		INITIALS AND DATE	

**UNITED STATES DEPARTMENT OF ENERGY**  
**FERNALD ENVIRONMENTAL MANAGEMENT PROJECT**  
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**PARSONS**  
 THE RALPH M. PARSONS CO. - PARSONS MAIN, INC. - ENGINEERING-SCIENCE, INC.  
 CINCINNATI, OHIO  
 PROJECT NAME  
**SITE PREPARATION/UNDERGROUND UTILITIES**  
**FERNALD RESIDUES VITRIFICATION PLANT**

DRAWING TITLE <b>CIVIL WATER LINE PROFILES</b>	
DRAWN BY D. BABAYAN	DATE 7/24/95
LEAD ENGINEER K. GERARD	DATE 11/15/95
CHECKED BY K. GERARD	DATE 11/15/95
SCALE 1"=50'	CLASS
SUBMITTED FOR APPROVAL G. P. [Signature] 11/24/95	FERMCO CRU APPROVAL N/A
DATE 11/24/95	DATE N/A

PREPARED UNDER PARSONS PROJECT ORDER NUMBER CRU4/PO146	PROJECT NO. WBS 1.1.1.1.4.3 00-90701	PROJECT INDEX CODE NO. 94X-5900-G-00900	SHEET NO. G0005	REV. NO. 0
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MATERIAL LIST

- 1 MULTIPLE TAP CONNECTOR, UL LISTED, ILSCO # PTA-4-750-500-W/C OR EQUAL.
- 2 GROUND WIRE CLAMP, USED TO ATTACH STATIC WIRE TO BAYONET.
- 3 INSULATED SECONDARY & DEADEND CLEVIS, HOT DIP GALVANIZED WITH 3/8" DIAMETER POST.
- 4 PORCELAIN SPOOL INSULATOR, WET PROCESS PORCELAIN ANSI CLASS 53-3, 3/8" BOLT SIZE.
- 5 STATIC WIRE SUPPORT, STRAIGHT BAYONET TYPE.
- 6 STATIC WIRE SUPPORT, CORNER BAYONET TYPE.
- 7 THIMBLE, FOR STATIC WIRE OR MESSENGER WIRE DEAD-END.
- 8 EYE BOLT, OVAL EYE TYPE, FOR DEAD-END, 3/8" DIA., WITH ONE SQUARE NUT, ADDITIONAL NUTS, WASHERS, AND LENGTH AS REQUIRED.
- 9 GUY GRIP, FOR STATIC WIRE, PREFORMED WIRE TYPE.
- 10 WEATHERHEAD, 3" CONDUIT, OUTDOOR, WEATHERTIGHT.
- 11 CLAMP, SUSPENSION, FOR 3/8" MESSENGER.
- 12 EYENUT, 3/8" BOLT DIAMETER.
- 13 STAPLE, COPPERCLAD, 1 1/2" LONG.
- 14 GROUND ROD, 3/4" DIAMETER X 10' LONG, COPPERWELD.
- 15 BOLTS, DOUBLE ARMING, SQUARE NUTS, 3/8" DIA X LENGTH AS REQUIRED.
- 16 3/8" DIAMETER, 7X8, STANDARD CONSTRUCTION, GALVANIZED STEEL STRAND.
- 17 1/2" DIAMETER, 7 STRAND, HIGH STRENGTH, GALVANIZED STEEL STRAND.
- 18 1 1/4" DIAMETER HELICAL SCREW TYPE GUY ANCHOR WITH MIN. PULLOUT CAPACITY OF 28,000 LBS.
- 19 COMPRESSION GROUND FITTING.
- 20 SPLIT-BOLT CONNECTOR, FOR OUTDOOR OVERHEAD CONDUCTOR INSTALLATIONS.
- 21 COMPRESSION GROUND FITTING, TO SECURE #4 AWG BARE COPPER CONDUCTOR TO 3/4" GROUND ROD.
- 22 FOR GUY INSTALLATION, SEE DETAIL 12 ON DWG. 94X-5900-E-00767
- 23 J-HOOK BOLT AND CLAMP, 1/2" DIAMETER BOLT.
- 24 GUY WIRE MARKER, HALF ROUND, 2" WIDE, 84" LONG, UV RESISTANT W/ HARDWARE.
- 25 GUY AND LOAD PLATE, W/ ANGLE THIMBLE EYE BOLT.
- 26 TRIPLEYE, GALVANIZED ANCHOR ROD, 1" DIA., LENGTH AS REQ'D.
- 27 1/2" EYENUT, GALVANIZED.
- 28 1/2" STEEL THREADED ROD WITH NUTS, LENGTH AS REQ'D.
- 29 GUY STRAIN INSULATOR, ANSI CLASS 54-4, FOR 1/2" GUY WIRE.
- 30 LASHING WIRE CLIP, SIZE AS REQ'D.
- 31 CROSSARM, 3 1/2" X 4 1/2" X 12' PRESSURE TREATED DOUGLAS FIR
- 32 #4 AWG, BARE SOLID COPPER GROUND CONDUCTOR.
- 33 POLE, 45 FT. CLASS 2, PRESSURE TREATED, SOUTHERN YELLOW PINE.
- 34 PANELBOARD, 600 AMP, 600 VOLT, THREE PHASE, SUITABLE FOR USE AS SERVICE ENTRANCE, NEMA 3R ENCLOSURE, RACK MOUNTED.
- 35 DOUBLE-EYE, GALVANIZED ANCHOR ROD, 1" DIA., LENGTH AS REQ'D.
- 36 SINGLE-EYE, GALVANIZED ANCHOR ROD, 1" DIA., LENGTH AS REQ'D.
- 37 3/8" DIAMETER, 7 STRAND, HIGH STRENGTH, GALVANIZED STEEL STRAND.
- 38 SIDEWALK TYPE GUY BRACE, 3" DIA. PIPE, GALVANIZED, 9' LONG, W/REQ'D HARDWARE.
- 39 SIDEWALK TYPE GUY BRACE, 3" DIA. PIPE, GALVANIZED, 13' LONG, W/REQ'D HARDWARE.
- 40 3/4" DIAMETER, 19 STRAND, HIGH STRENGTH, GALVANIZED STEEL STRAND.
- 41 250 WATT, HPS, 120 VOLT, 1 PHASE, FUSED, HIGH EFFICIENCY BALLAST, WITH POLE MOUNTING HARDWARE
- 42 POLE, 50 FT. CLASS 2, PRESSURE TREATED, SOUTHERN YELLOW PINE.

NOTES

1. SEE DRAWING 94X-5900-E-00954 FOR SINGLE LINE DIAGRAM.
2. (1) - SYMBOL INDICATES ITEM #1 ON MATERIAL LIST.
3. ATTACH CONDUIT AND WEATHERHEADS TO BUILDING STEEL AT VPP, (BLDG 94).
4. USE 50 FOOT WOODEN POLE AT POLE P6 AND POLE P7. INSTALL 12'-6" IN GROUND DUE TO EXCAVATION FOR CONDUITS AT BASE OF POLES.

LEGEND

- MS MANUAL PULL STATION
- H FIRE ALARM HORN
- EAH EVACUATION SPEAKER

REF DWG NO.	DRAWING TITLE
94X-5900-X-00926	INDEX SHEET
94X-5900-E-00954	SINGLE LINE DIAGRAM
94X-5900-E-00938	ELECTRICAL SITE PLAN UNDERGROUND DUCTBANK ROUTING
94X-5900-E-00948	ELECTRICAL SITE PLAN TRAILER AREA

11 28 95 1488  
CDC/UNCONTROLLED

0	APPROVED FOR CONSTRUCTION	APR	1/14	
REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	PERMID	DATE
			INITIALS AND DATE	

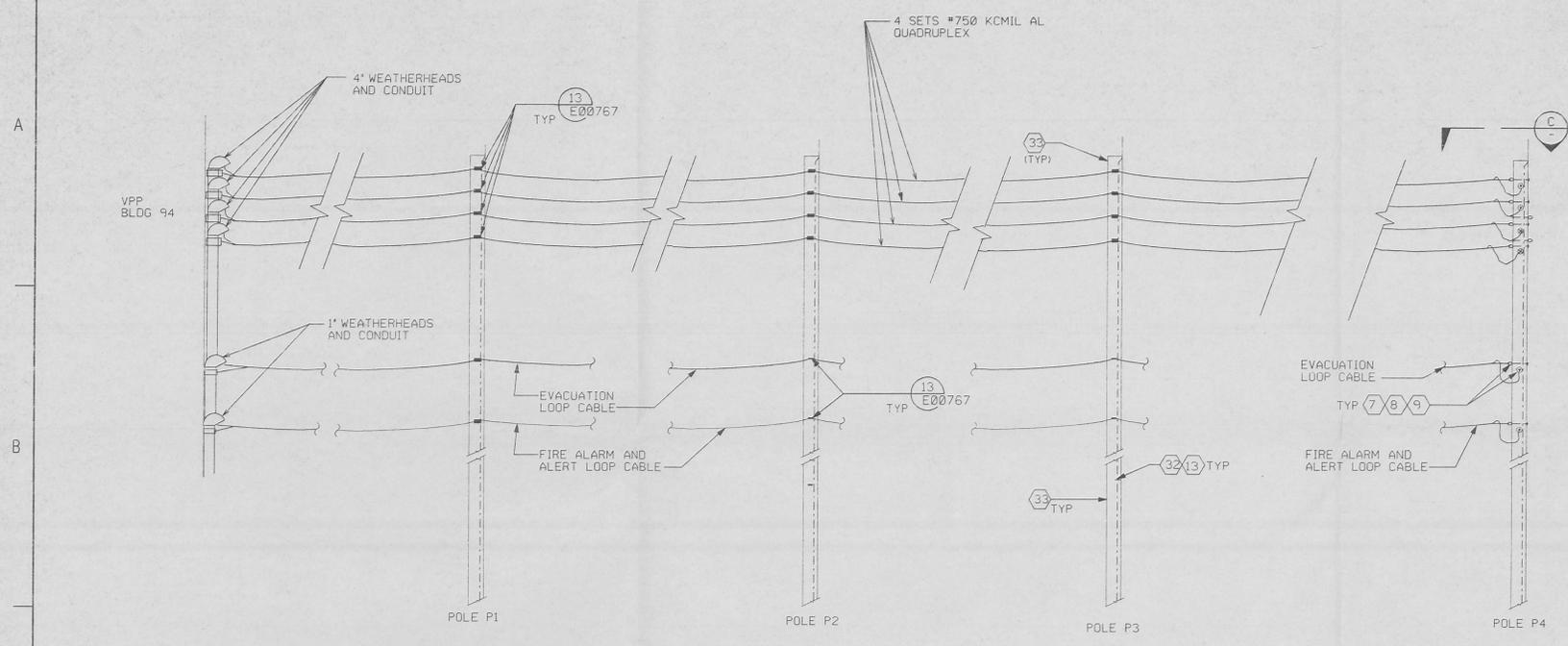
**UNITED STATES DEPARTMENT OF ENERGY**  
**FERNALD ENVIRONMENTAL MANAGEMENT PROJECT**  
 THIS DRAWING PREPARED BY  
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 THE RALPH M. PARSONS CO. - PARSONS MAIN, INC. - ENGINEERING-SCIENCE, INC.  
 CINCINNATI, OHIO

PROJECT NAME  
**SITE PREPARATION / UNDERGROUND UTILITIES**  
**FERNALD RESIDUES VITRIFICATION PLANT**

DRAWING TITLE  
**ELECTRICAL POWER POLE DETAILS**  
**SHEET 1 OF 2**

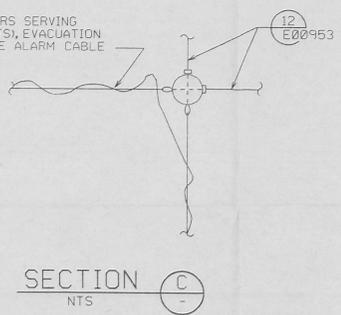
DRAWN BY R. PROSK.1	DATE 11-03-95	LEAD ENGINEER	DATE	CHECKED BY J. L. COOPER	DATE 11/15/95
PLANT/BLDG. NO.	FLOOR	SCALE NONE	CLASS		
SUBMITTED FOR APPROVAL	DATE	PERMID APPROVAL N/A		N/A	

PREPARED UNDER PARSONS PROJECT ORDER NUMBER CRU4/P0146	PROJECT NO. WBS 1.1.1.4.3	FEMP PROJECT NO. 00-90701	DRAWING INDEX CODE NO. 94X-5900-E-00952	SHEET NO. E0007	REV. NO. 0
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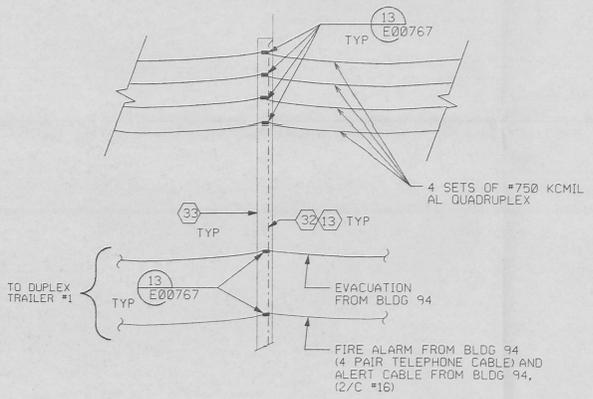


DETAIL 4 REF E00952 E00938  
 POLES P1, P2, P3, AND P4  
 NTS

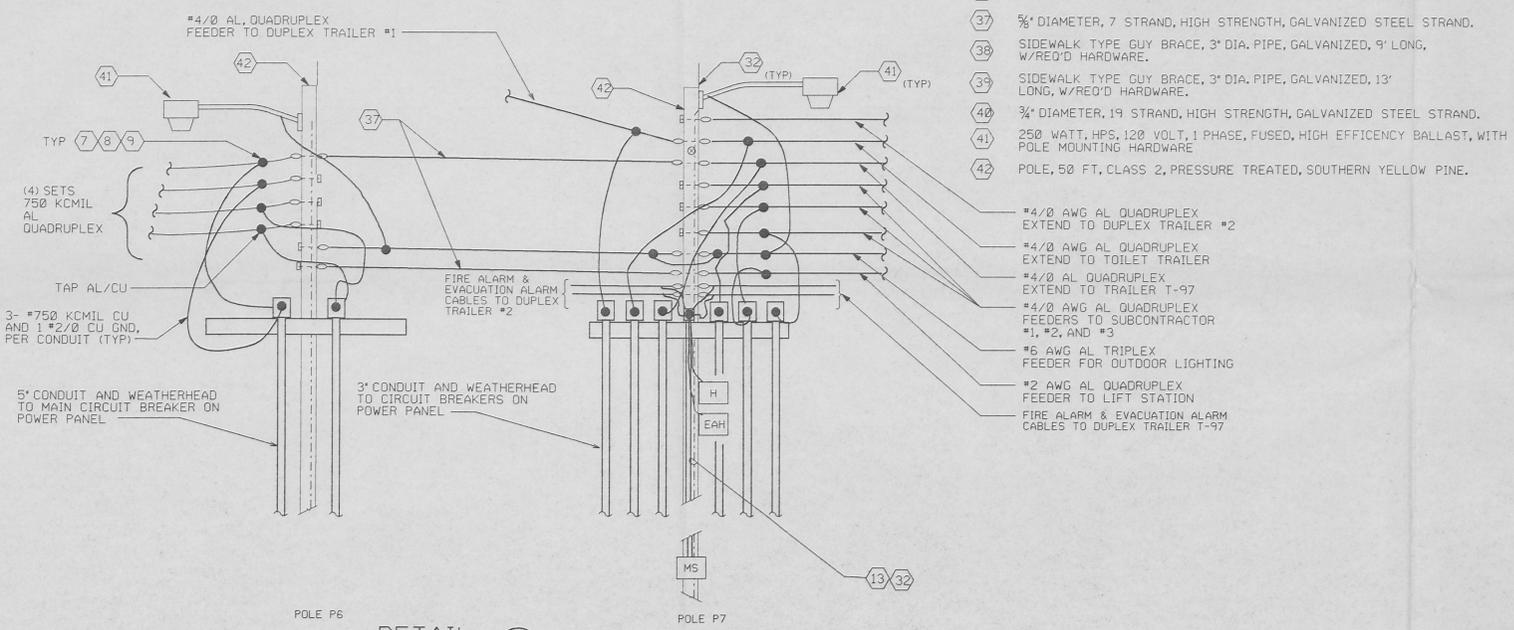
750 KCMIL CONDUCTORS SERVING TRAILER AREA (4 SETS), EVACUATION LOOP CABLE, AND FIRE ALARM CABLE



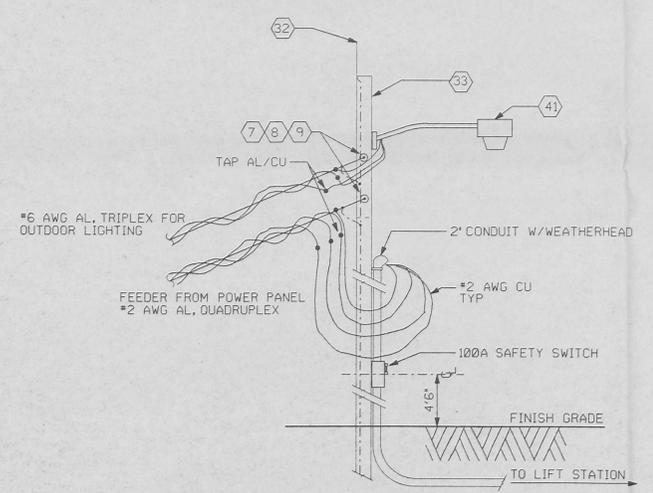
SECTION C  
 NTS



DETAIL 5 REF E00952 E00949  
 POLE P5  
 NTS



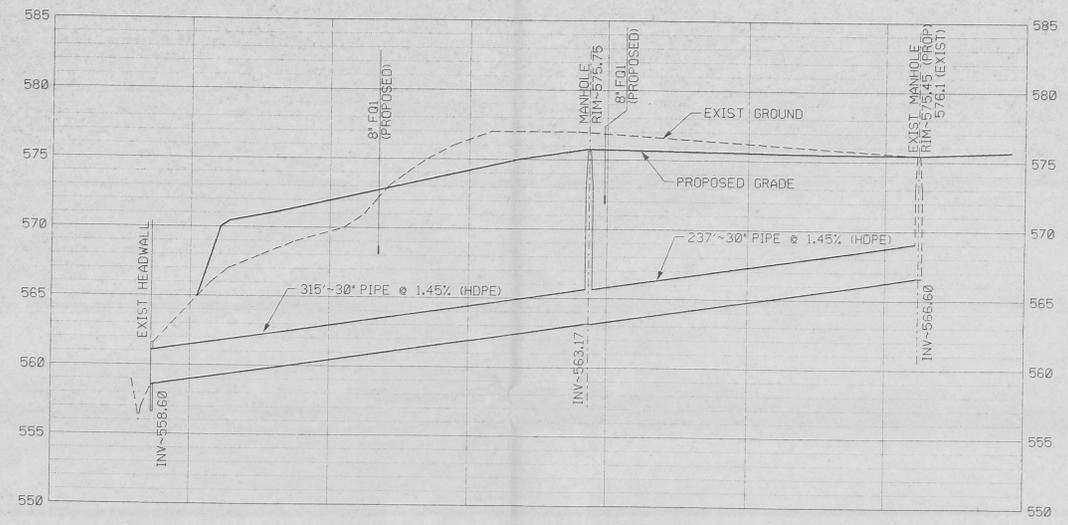
DETAIL 6 REF E00952 E00978  
 POLE P6 AND P7  
 NTS



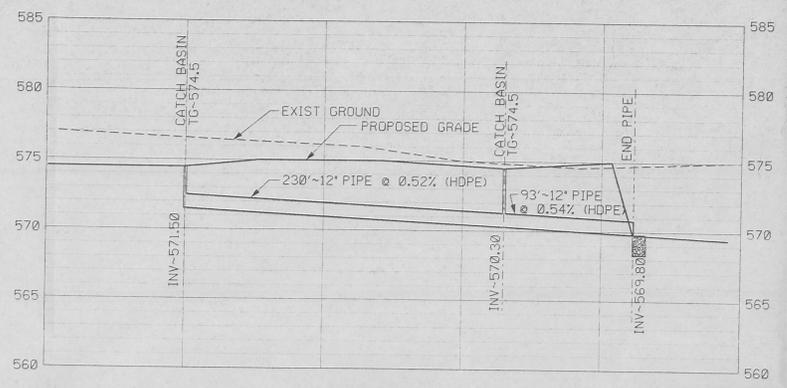
DETAIL 3 REF E00952 E00938  
 POLE P12  
 NTS

NOTES

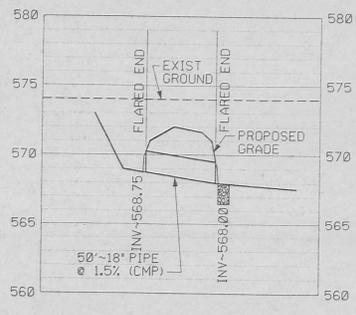
ABBREVIATIONS  
 TG - TOP OF GRATE:  
 FLAT GRATES OR FRAME ELEVATION FOR NON-FLAT GRATES.



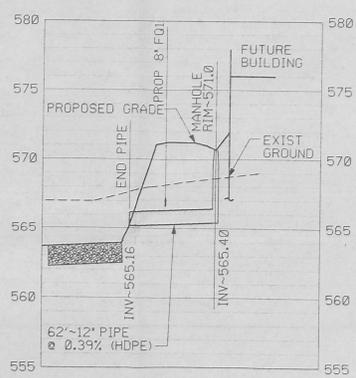
PROFILE A REF  
 SCALE: HOR 1"=50'  
 VER 1"=5'  
 G00908 G00906



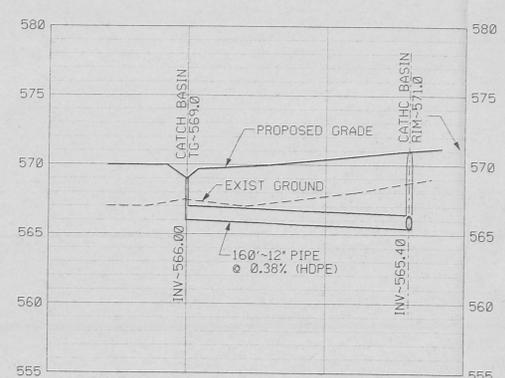
PROFILE B REF  
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 VER 1"=5'  
 G00908 G00906



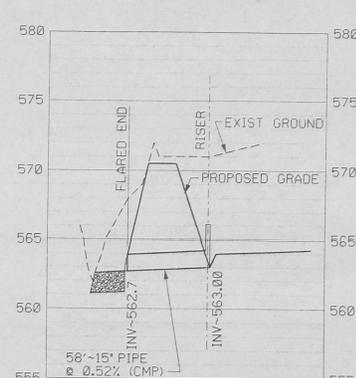
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 VER 1"=5'  
 G00908 G00906



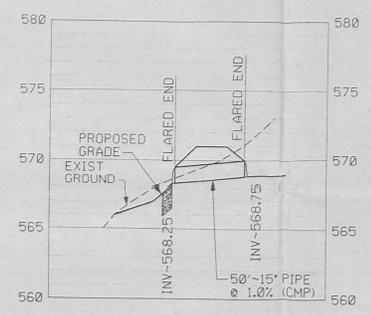
PROFILE D REF  
 SCALE: HOR 1"=50'  
 VER 1"=5'  
 G00908 G00906



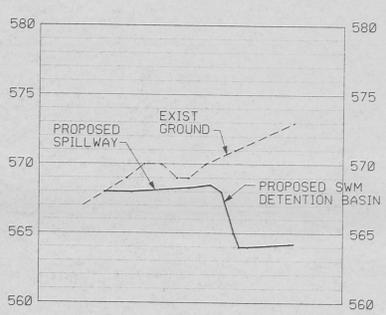
PROFILE E REF  
 SCALE: HOR 1"=50'  
 VER 1"=5'  
 G00908 G00906



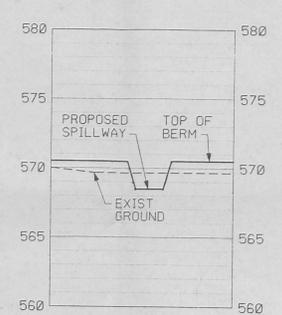
PROFILE F REF  
 SCALE: HOR 1"=50'  
 VER 1"=5'  
 G00908 G00906



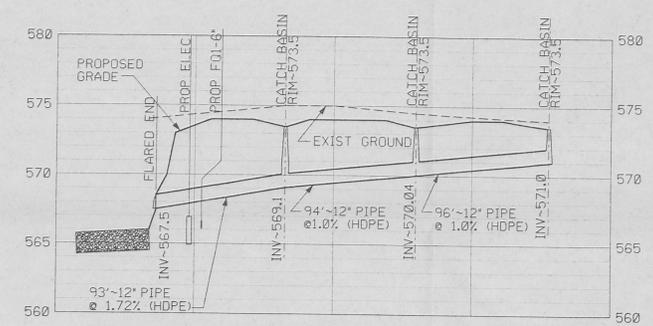
PROFILE G REF  
 SCALE: HOR 1"=50'  
 VER 1"=5'  
 G00908 G00906



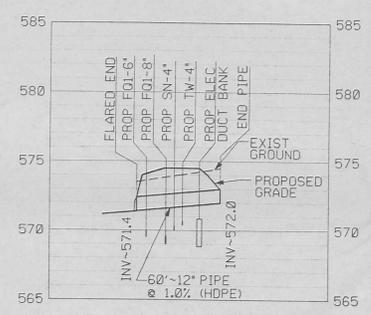
SECTION A REF  
 SCALE: HOR 1"=50'  
 VER 1"=5'  
 G00908 G00906



SECTION B REF  
 SCALE: HOR 1"=50'  
 VER 1"=5'  
 G00908 G00906



SECTION H REF  
 SCALE: HOR 1"=50'  
 VER 1"=5'  
 G00908 G00906



SECTION I REF  
 SCALE: HOR 1"=50'  
 VER 1"=5'  
 G00908 G00906

11 28 95 1688

CDC/UNCONTROLLED

REF DWG NO.	DRAWING TITLE
94X-5900-X-00926	DRAWING INDEX
94X-5900-X-00927	LEGEND AND SYMBOLS
94X-5900-G-00906	GRADING AND DRAINAGE PLAN
94X-5900-G-00913	STORMWATER MANAGEMENT DETAILS - SHEET 1 OF 2

APPROVED FOR CONSTRUCTION		NA	
REV NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	DATE
		INITIALS AND DATE	

**UNITED STATES DEPARTMENT OF ENERGY**  
**FERNALD ENVIRONMENTAL MANAGEMENT PROJECT**

THIS DRAWING PREPARED BY  
**PARSONS**  
 THE RALPH M. PARSONS CO. - PARSONS MAIN, INC. - ENGINEERING-SCIENCE, INC., CINCINNATI, OHIO

PROJECT NAME  
**SITE PREPARATION/UNDERGROUND UTILITIES FERNALD RESIDUES VITRIFICATION PLANT**

DRAWING TITLE  
**CIVIL STORM DRAIN PROFILES**

DRAWN BY R. LINDGREN	DATE 7/7/95	LEAD ENGINEER	DATE	CHECKED BY K. GERARD	DATE 8/15/95
PLANT/ELDC NO.	FLOOR	SCALE	AS SHOWN	CLASS	

SUBMITTED FOR APPROVAL	FERMCO CRU APPROVAL	DATE
<i>[Signature]</i>	NA	11/21/95

PREPARED UNDER PARSONS PROJECT ORDER NUMBER CRU4/P01846	FERMCO PROJECT NO. WBS 1.1.1.4.3 00-90701	DRAWING INDEX CODE NO. 94X-5900-G-00908 G0004 0	SHEET NO.	REV. NO.
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1. FINISH SUBGRADE UNDER BUILDING IS ASSUMED TO BE 1.0' BELOW FINISH FLOOR ELEVATION.
2. SWM DETENTION BASIN TO BE USED AS A SEDIMENT BASIN DURING CONSTRUCTION. CONTRACTOR TO REMOVE ALL SEDIMENT TO PROPOSED CONTOURS AT THE END OF CONSTRUCTION OR WHEN THE SEDIMENT ELEVATION REACHES THE SEDIMENT CLEANOUT ELEVATION (SEE DETAIL 3, DRAWING 94X-5900-G-00913).
3. INSTALL STRAW BALES AROUND CATCH BASINS AS SHOWN ON DRAWING 94X-5900-G-00902.
4. GRADES SHOWN ARE FINAL GRADES IN ALL AREAS, EXCEPT UNDER ROADS AND UNDER BUILDING FOOTPRINT. GRADES SHOWN UNDER ROADS AND BUILDING FOOTPRINT ARE TO SUBGRADE. THESE GRADES MAY NEED TO BE ADJUSTED WITH FINAL BUILDING DESIGN.
5. ALL SLOPES STEEPER THAN 3:1 SHALL BE PROTECTED WITH AN EROSION CONTROL BLANKET SIMILAR TO CURLEX-II. INSTALL PER MANUFACTURER'S RECOMMENDATIONS.
6. SEE DRAWING 94X-5900-G-00898 FOR DRAINAGE STRUCTURE COORDINATES.
7. FIELD RUN SURVEY AND FLYOVER CONTOURS DO NOT LINE UP. FIELD VERIFY ELEVATIONS AND ADJUST GRADING ACCORDINGLY.
8. CURRENT EXISTING TOPOGRAPHY IS NOT AVAILABLE FOR THIS AREA. EXISTING BITUMINOUS ROAD WAS CONSTRUCTED AFTER THE FLYOVER. FIELD VERIFY ELEVATIONS AND ADJUST GRADING ACCORDINGLY.

STORMWATER MANAGEMENT BASIN			
POINT NO.	NORTHING	EASTING	DESCRIPTION
1	480114.4	1347416.3	565 ELEVATION
2	480112.9	1347452.4	565 ELEVATION
3	480085.3	1347476.1	565 ELEVATION
4	480079.2	1347695.9	565 ELEVATION
5	480027.4	1347752.0	565 ELEVATION
6	480014.1	1347752.0	565 ELEVATION
7	479954.4	1347663.0	565 ELEVATION
8	480049.0	1347517.7	565 ELEVATION
9	480049.0	1347487.2	565 ELEVATION
10	480077.0	1347433.7	565 ELEVATION

REF DWG NO.	DRAWING TITLE
94X-5900-X-00926	DRAWING INDEX
94X-5900-X-00927	LEGEND AND SYMBOLS
94X-5900-G-00902	DETAILS - SHEET 1 OF 2
94X-5900-G-00909	DETAILS - SHEET 2 OF 2
94X-5900-G-00908	STORM DRAIN PROFILES
94X-5900-G-00913	STORMWATER MANAGEMENT DETAILS - SHEET 1 OF 2
94X-5900-G-00912	STORMWATER MANAGEMENT DETAILS - SHEET 2 OF 2
94X-5900-G-00898	UTILITY PLAN

11 28 95 1688  
CDC/UNCONTROLLED

0	APPROVED FOR CONSTRUCTION	NA
REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E FERMCO DATE INITIALS AND DATE

**UNITED STATES DEPARTMENT OF ENERGY**  
**FERNALD ENVIRONMENTAL MANAGEMENT PROJECT**  
 THIS DRAWING PREPARED BY  
**PARSONS**  
 THE RALPH M. PARSONS CO. - PARSONS MAIN, INC. - ENGINEERING-SCIENCE, INC.  
 CINCINNATI, OHIO

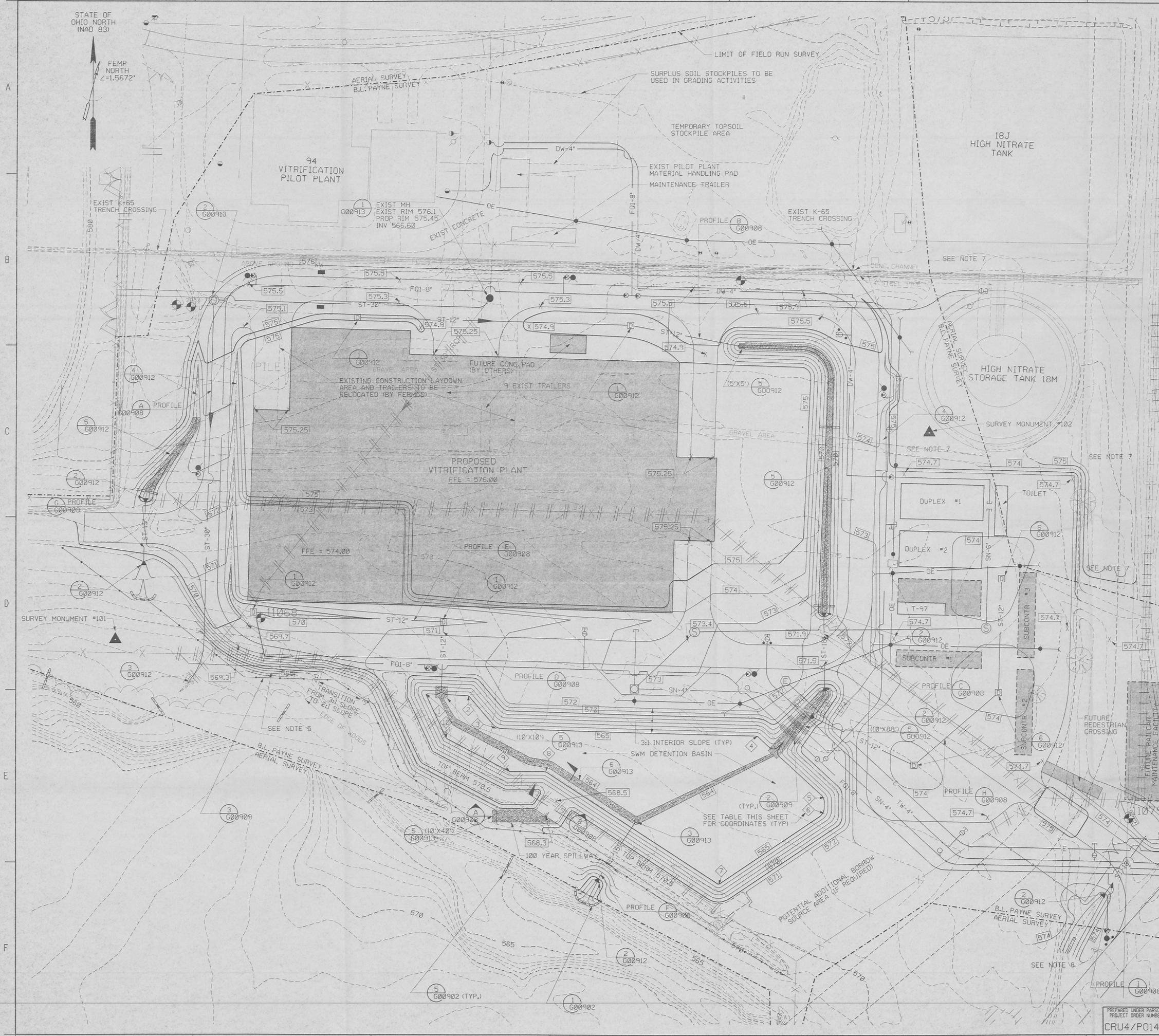
PROJECT NAME  
**SITE PREPARATION/UNDERGROUND UTILITIES**  
**FERNALD RESIDUES VITRIFICATION PLANT**

DRAWING TITLE  
**CIVIL GRADING AND DRAINAGE PLAN**

DRAWN BY R. LINDGREN	DATE 6-20-95	LEAD ENGINEER	DATE	CHECKED BY K. GERARD	DATE 11/10/95
PLANT/BLDG. NO.	FLOOR	SCALE 1"=30'	CLASS		

SUBMITTED FOR APPROVAL	FERMCO CRU APPROVAL	DATE 11/21/95	DATE
	NA		NA

PREPARED UNDER PARSONS PROJECT ORDER NUMBER CRU4/PO146	WBS PROJECT NO. WBS 1.1.1.4.3 00-90701	DRAWING INDEX CODE NO. 94X-5900-G-00906	SHEET NO. G0003	REV. NO. 0
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- EXISTING CONDITIONS SHOWN ON THIS DRAWING WERE PREPARED FROM FEMP SITE PROVIDED DATA FROM THE DOCUMENTS LISTED BELOW.  
EXISTING SITE DATA SOURCE (IN PLANT FILES)  
PARSONS TOPOGRAPHY, 1992  
FEMP CADD GRID/UTILITY DRAWINGS  
FEMP CONTRACTOR PROJECT DESIGN DOCUMENTS  
FIELD SURVEY BY B.L. PAYNE AND ASSOCIATES JULY 1995
- END PROPOSED UTILITY LINES AT LOCATIONS SHOWN. UTILITY TIE-IN LOCATIONS TO THE FACILITY WILL BE DETERMINED AS PART OF FACILITY TITLE II DESIGN.
- FOR ELECTRICAL DUCT BANK ARRANGEMENT, SEE ELECTRICAL DRAWING 94X-5900-E-00938.
- BELOW IS A SCHEDULE OF PIPING MATERIALS AND MINIMUM DEPTH TO BE USED:  
CE - HDPE SDR 11, 42' MINIMUM DEPTH  
DW - HDPE SDR 11, 42' MINIMUM DEPTH  
FO - HDPE SDR 11, 48' MINIMUM DEPTH  
SN - HDPE SDR 17 (FORCE MAIN), 36' MINIMUM DEPTH  
SN - HDPE SDR 26 (GRAVITY), 36' MINIMUM DEPTH  
TW - HDPE SDR 11, 36' MINIMUM DEPTH  
SEE MECHANICAL DRAWING 94X-5900-N-00920 FOR LINE DESIGNATIONS.
- EXISTING MONITORING WELLS TO REMAIN. CONTRACTOR TO PROTECT WELLS DURING CONSTRUCTION. ANY DAMAGE TO EXISTING WELLS CAUSED BY CONTRACTOR SHALL BE BROUGHT TO THE ATTENTION OF THE CONSTRUCTION MANAGER IMMEDIATELY.
- EXISTING POWER/LIGHT POLES TO BE REMOVED OR RELOCATED PRIOR TO CONSTRUCTION. ANY DISRUPTION TO SERVICE TO BE COORDINATED WITH CONSTRUCTION MANAGER.
- LOCATION AND ELEVATIONS OF EXISTING UNDERGROUND UTILITIES ARE APPROXIMATE. CONTRACTOR TO FIELD VERIFY PRIOR TO CONSTRUCTION.

REF DWG NO.	DRAWING TITLE
94X-5900-X-00926	INDEX SHEET
94X-5900-X-00927	LEGEND AND SYMBOLS
94X-5900-G-00900	UTILITY PROFILES SHEET 1 OF 2
94X-5900-G-00902	DETAILS - SHEET 1 OF 2
94X-5900-G-00909	DETAILS - SHEET 2 OF 2
94X-5900-G-00910	SANITARY SEWER AND UTILITY PROFILES
94X-5900-G-00911	UTILITY DETAILS
94X-5900-G-00924	WATER LINE DETAILS
94X-5900-G-00913	STORMWATER MANAGEMENT DETAILS - SHEET 1 OF 2
94X-5900-E-00938	ELECTRICAL SITE PLAN - UNDERGROUND DUCT BANK
94X-5900-G-00908	STORM DRAIN PROFILES
94X-5900-G-00912	STORMWATER MANAGEMENT DETAILS - SHEET 2 OF 2
94X-5900-N-00920	PIPING AND INSTRUMENTATION DIAGRAM - UNDERGROUND UTILITIES

11 28 95 1688  
CDC/UNCONTROLLED

0	APPROVED FOR CONSTRUCTION		
REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	FEMPNO DATE

**UNITED STATES DEPARTMENT OF ENERGY**  
**FERNALD ENVIRONMENTAL MANAGEMENT PROJECT**  
THIS DRAWING PREPARED BY  
**PARSONS**  
THE RALPH M. PARSONS CO. - PARSONS MAIN, INC. - ENGINEERING-SCIENCE, INC.  
CINCINNATI, OHIO

PROJECT NAME  
**SITE PREPARATION/UNDERGROUND UTILITIES**  
**FERNALD RESIDUES VITRIFICATION PLANT**

DRAWING TITLE  
**CIVIL**  
**LAYOUT OF UTILITIES AND TIE-INS**

DRAWN BY D. BABAYAN	DATE 6/14/95	LEAD ENGINEER	DATE	CHECKED BY K. GERARD	DATE 11/8/95
PLANT/BLDG. NO.	FLOOR	SCALE 1"=50'	CLASS		

SUBMITTED FOR APPROVAL	FEMPNO CRU APPROVAL	N/A	N/A
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PREPARED UNDER PARSONS PROJECT ORDER NUMBER CRU4/PO146	DATE 11/21/95	DATE	SHEET NO. 00002	REV. NO. 0
CODE PROJECT NO. WBS 1.1.1.4.3	FEMP PROJECT NO. 00-90701	DRAWING INDEX CODE NO. 94X-5900-G-00898		

**ELECTRIC POLE COORDINATES**

POLE NO	NORTHING	EASTING
1	480513.2	1347542.2
2	480497.1	1347635.4
3	480493.8	1347757.6
4	480415.5	1347814.8
5	480307.6	1347811.8
6	480232.6	1347809.8
7	480216.6	1347809.3
8	480222.6	1347916.5
9	480156.4	1347807.6
10	480152.9	1347933.6
11	480106.6	1347681.0
12	480109.0	1347591.7

**UNDERGROUND UTILITY COORDINATES**

POINT NO	NORTHING	EASTING	DESCRIPTION	POINT NO	NORTHING	EASTING	DESCRIPTION	POINT NO	NORTHING	EASTING	DESCRIPTION
1	479948.36	1348341.43	90° BEND	30	479976.93	1347850.68	END BEND	59	480156.56	1347229.61	BEGIN BEND
2	479953.36	1348341.57	90° BEND	31	480111.01	1347705.67	BEGIN BEND	60	480452.02	1347531.72	8"x6" TEE
3	479963.08	1347990.82	8"x6" TEE	32	480116.31	1347692.65	END BEND	61	480558.83	1347589.17	BEGIN BEND
4	479966.87	1347854.11	BEGIN BEND	33	480119.02	1347591.74	LIFT STATION	62	480564.35	1347470.89	BEGIN BEND
5	479972.19	1347841.08	END BEND	34	480169.09	1347593.10	END PIPE	63	480573.83	1347480.88	END BEND
6	480056.59	1347749.78	8"x8" TEE	35	479981.61	1348044.52	ELEC MANHOLE	64	480573.83	1347574.17	BEGIN BEND
7	480123.50	1347677.42	8"x8" TEE	36	480125.57	1347719.36	ELEC MANHOLE	65	480553.83	1347594.17	END BEND
8	480126.89	1347673.75	BEGIN BEND	37	479986.25	1347877.35	BEGIN BEND	66	480295.31	1347891.58	90° BEND
9	480132.20	1347660.72	END BEND	38	479991.55	1347864.33	END BEND	67	479995.00	1348022.43	END PIPE
10	480135.28	1347549.14	8"x6" TEE	39	480182.98	1347271.36	CATCH BASIN	68	479946.01	1347987.79	FLARED END
11	480138.97	1347415.50	8"x6" TEE	40	480174.94	1347431.20	CATCH BASIN	69	480094.74	1347743.13	FLARED END
12	480337.67	1347805.82	PIV	41	480116.58	1347429.59	END PIPE	70	480054.89	1347827.31	CATCH BASIN
13	480140.19	1347371.27	BEGIN BEND	42	480431.66	1347358.30	CATCH BASIN	71	480116.00	1347898.56	CATCH BASIN
14	480205.55	1347240.99	END BEND	43	480425.31	1347588.21	CATCH BASIN	72	480211.96	1347901.24	CATCH BASIN
15	480293.79	1347243.43	8"x6" TEE	44	480407.77	1347679.75	END PIPE	73	480167.14	1347642.57	SN MANHOLE
16	480439.75	1347247.47	BEGIN BEND	45	480180.04	1347751.43	FLARED END	74	480170.31	1347888.07	SN MANHOLE
17	480459.19	1347268.01	END BEND	46	480120.04	1347752.07	FLARED END	75	479976.35	1347873.32	BEGIN BEND
18	480459.05	1347273.01	8"x6" TEE	47	480538.23	1347460.04	BEGIN BEND	76	479981.65	1347860.31	END BEND
19	480450.43	1347589.17	8"x8" TEE	48	480547.70	1347470.03	END BEND	77	480120.90	1347709.65	BEGIN BEND
20	480445.01	1347788.78	BEGIN BEND	49	480456.32	1347594.17	90° BEND	78	480136.13	1347703.23	END BEND
21	480424.47	1347808.23	END BEND	50	480451.39	1347774.96	90° BEND	79	480270.27	1347890.84	END PIPE
22	480298.65	1347770.73	90° BEND	51	480417.29	1347774.01	4" TEE	80	480257.68	1347800.61	8"x8" TEE
23	480364.50	1347806.56	8"x6" TEE	52	479963.88	1348322.98	JOIN EXIST	81	480257.55	1347808.61	8"x8" TEE
24	480117.93	1347799.74	BEGIN BEND	53	480275.55	1347180.34	FLARED END	82	479966.00	1348246.68	4"x4" TEE
25	480104.91	1347794.43	END BEND	54	480225.57	1347178.96	FLARED END	83	479970.64	1348079.22	4"x4" TEE
26	480170.25	1347550.09	END PIPE	55	480164.98	1347704.02	END PIPE	84	479973.42	1347978.90	4"x2" TEE
27	480578.83	1347569.17	END BEND	56	480007.97	1347593.47	STANDPIPE	85	479985.54	1347856.10	4"x2" TEE
28	479959.26	1348308.72	JOIN EXIST	57	479959.36	1347561.86	FLARED END	86	480147.70	1347356.53	END BEND
29	479971.61	1347863.72	BEGIN BEND	58	480446.22	1347237.65	ST MANHOLE	87	480154.93	1347282.20	BEGIN BEND

**POINT NO NORTHING EASTING DESCRIPTION**

88	480404.42	1347619.63	BEGIN PIPE
89	480444.58	1347620.72	90° BEND
90	480439.09	1347822.43	BEGIN RADIUS
91	480455.15	1347868.97	END RADIUS
92	480454.60	1347888.53	END PIPE

NOTES

- EXISTING CONDITIONS SHOWN ON THIS DRAWING WERE PREPARED FROM FEMP SITE PROVIDED DATA FROM THE DOCUMENTS LISTED BELOW.  
EXISTING SITE DATA SOURCE (IN PLANT FILES)  
PARSONS TOPOGRAPHY, 1992  
FEMP CADD GRID/UTILITY DRAWINGS  
FEMP CONTRACTOR PROJECT DESIGN DOCUMENTS  
FIELD SURVEY BY B.L. FAYNE & ASSOCIATES, INC., JULY 1995.
- FACILITY SHOWN IS APPROXIMATE ONLY, THE CONCEPTUAL FOOTPRINT SHOWN WAS DEFINED IN A 7/21/95 MEETING BETWEEN FERMCO AND PARSONS.
- CONTRACTOR SHALL REMOVE EXISTING FENCE AND SALVAGE TO THE EXTENT POSSIBLE FOR REUSE AT THE NEW LOCATION. CONTRACTOR IS RESPONSIBLE FOR MAINTAINING SECURITY DURING FENCE REMOVAL AND ERECTION.
- COORDINATES FOR SURVEY MONUMENTS 101 AND 102 ARE APPROXIMATE AND SHALL BE ESTABLISHED FOR HORIZONTAL AND VERTICAL CONTROL BY FERMCO PRIOR TO CONSTRUCTION. AS SURVEYED INFORMATION SHALL BE PROVIDED TO THE CONTRACTOR BY THE CONSTRUCTION MANAGER.
- EXISTING SOIL STOCKPILES TO BE USED AS NEEDED DURING CUT AND FILL OPERATIONS.
- EXISTING CONTRACTOR TRAILER AND LAYDOWN AREA TO BE RELOCATED BY OTHERS PRIOR TO CONSTRUCTION.
- SEE DRAWING 94X-5900-G-00898 FOR MONITORING WELL NUMBERS AND UTILITIES, SEE DRAWING 94X-5900-G-00906 FOR GRADING AND DRAINAGE.
- FERMCO TO FIELD LOCATE OTHER TRAILERS AS REQUIRED.

CONTROL POINTS (SEE NOTE 4)			
POINT NO.	NORTHING	EASTING	DESCRIPTION
101	480160	1347155	CONCRETE MONUMENT
102	480335	1347840	CONCRETE MONUMENT

BUILDING AND CONCRETE COORDINATES			
POINT NO.	NORTHING	EASTING	DESCRIPTION
50	480193.12	1347266.65	SW CORNER OF BUILDING
51	480394.16	1347629.36	NE CORNER OF BUILDING

PROPOSED TRAILER COORDINATES			
POINT NO.	NORTHING	EASTING	DESCRIPTION
52	480292.4	1347816.4	NW CORNER DUPLEX #1
53	480290.4	1347786.4	NE CORNER DUPLEX #1
54	480289.9	1347906.4	NE CORNER TOILET
55	480247.9	1347905.2	SE CORNER TOILET
56	480252.4	1347815.3	NW CORNER DUPLEX #2
57	480250.4	1347885.3	NE CORNER DUPLEX #2
58	480182.4	1347813.4	SW CORNER T-97
59	480181.3	1347853.4	SE CORNER T-97
60	480152.4	1347812.6	NW CORNER SUBCONTR #1
61	480150.4	1347884.5	NE CORNER SUBCONTR #1
62	480063.2	1347926.1	SE CORNER SUBCONTR #2
63	480135.2	1347928.1	NE CORNER SUBCONTR #2
64	480145.2	1347925.4	SE CORNER SUBCONTR #3
65	480217.2	1347930.4	NE CORNER SUBCONTR #3

REF DWG NO.	DRAWING TITLE
94X-5900-X-00926	DRAWING INDEX
94X-5900-X-00927	LEGEND AND SYMBOLS
94X-5900-G-00898	LAYOUT OF UTILITIES AND TIE-INS
94X-5900-G-00906	GRADING AND DRAINAGE PLAN
94X-5900-G-00909	DETAILS - SHEET 2 OF 2

11 28 95 1688

CDC/UNCONTROLLED

0	APPROVED FOR CONSTRUCTION	NA	NA
REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	FERMCO DATE INITIALS AND DATE

**UNITED STATES DEPARTMENT OF ENERGY**  
**FERNALD ENVIRONMENTAL MANAGEMENT PROJECT**

THIS DRAWING PREPARED BY  
**PARSONS**  
 THE RALPH M. PARSONS CO. - PARSONS MAIN, INC. - ENGINEERING-SCIENCE, INC.  
 CINCINNATI, OHIO

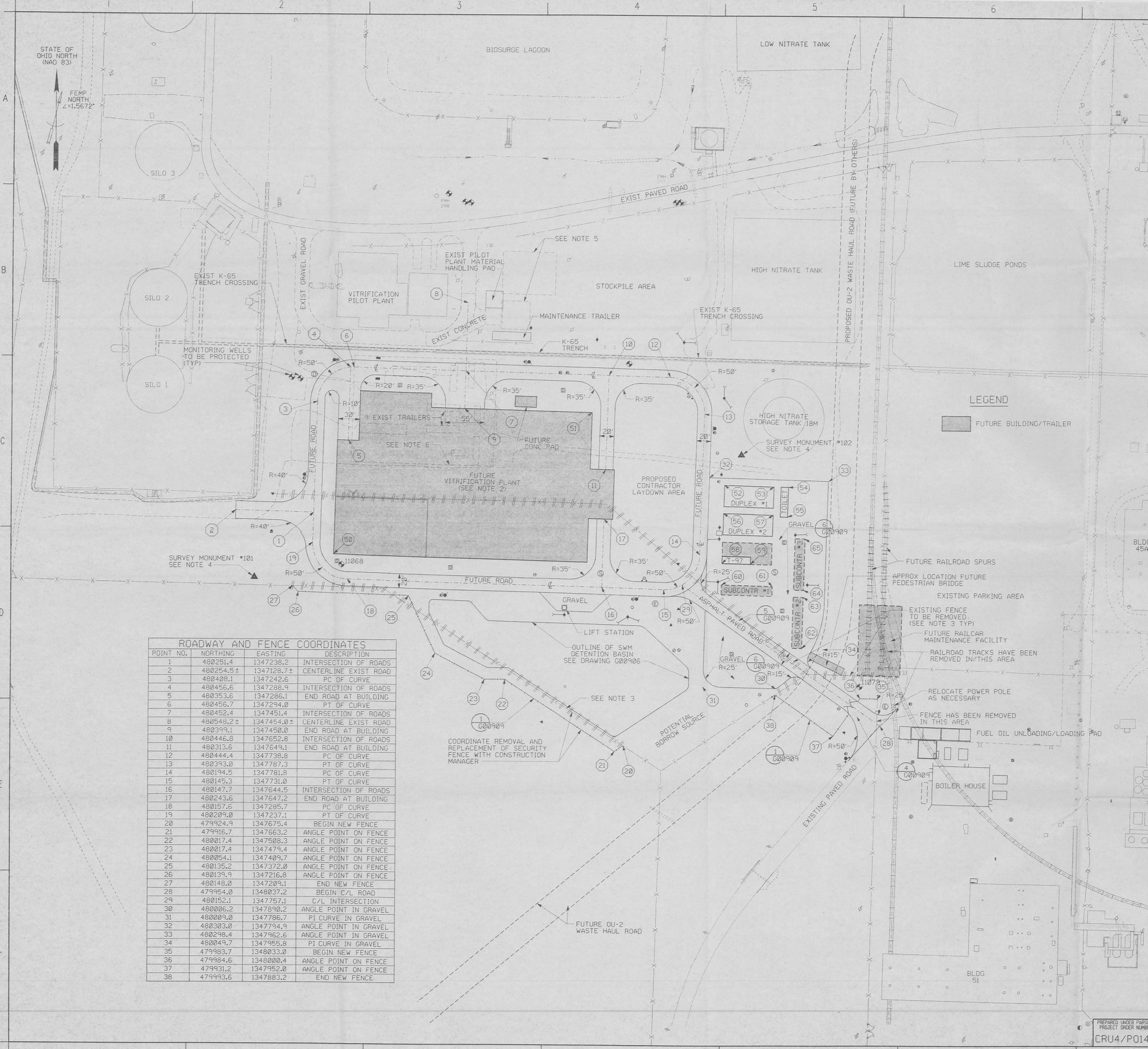
PROJECT NAME  
**SITE PREPARATION/UNDERGROUND UTILITIES**  
**FERNALD RESIDUES VITRIFICATION PLANT**

DRAWING TITLE  
**CIVIL**  
**SITE PLAN**  
**PLANT LAYOUT AND ACCESS**

DRAWN BY D. BABAYAN	DATE 6/14/95	LEAD ENGINEER	DATE	CHECKED BY K. GERARD	DATE 8/15/95
PLANT/BLDG. NO.	FLOOR	SCALE	CLASS	1"-50'	

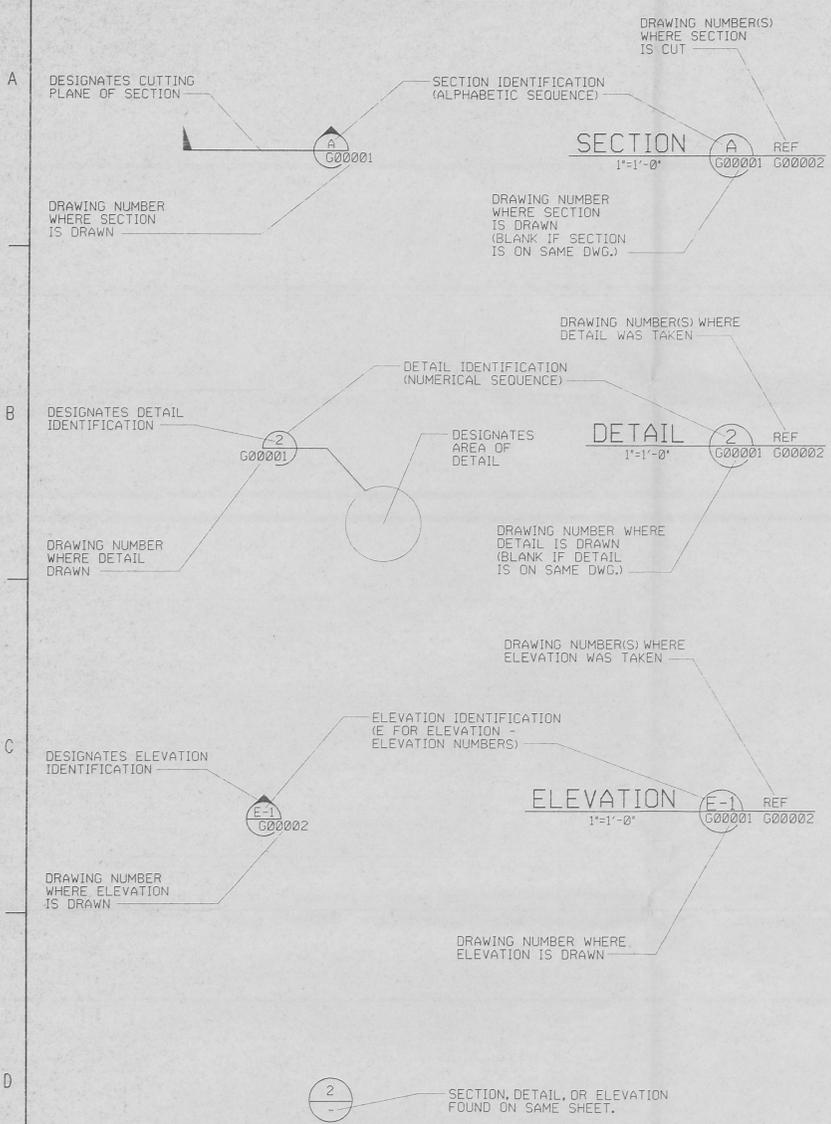
SUBMITTED FOR APPROVAL <i>G.P.M.</i>	DATE 11/21/95	FERMCO CRU APPROVAL NA	DATE	NA
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PREPARED UNDER PARSONS PROJECT ORDER NUMBER CRU4/PO146	CODE PROJECT NO. WBS 1.1.1.4.3	FEMP PROJECT NO. 00-90701	DRAWING INDEX CODE NO. 94X-5900-G-00899	SHEET NO. G0001	REV. NO. 0
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ROADWAY AND FENCE COORDINATES			
POINT NO.	NORTHING	EASTING	DESCRIPTION
1	480251.4	1347238.2	INTERSECTION OF ROADS
2	480254.5±	1347128.7±	CENTERLINE EXIST ROAD
3	480408.1	1347242.6	PC OF CURVE
4	480456.6	1347288.9	INTERSECTION OF ROADS
5	480353.6	1347286.1	END ROAD AT BUILDING
6	480456.7	1347294.0	PT OF CURVE
7	480452.4	1347451.4	INTERSECTION OF ROADS
8	480548.2±	1347454.0±	CENTERLINE EXIST ROAD
9	480399.1	1347450.0	END ROAD AT BUILDING
10	480446.8	1347652.8	INTERSECTION OF ROADS
11	480313.6	1347649.1	END ROAD AT BUILDING
12	480444.4	1347738.8	PC OF CURVE
13	480393.0	1347787.3	PT OF CURVE
14	480194.5	1347781.8	PC OF CURVE
15	480145.3	1347731.0	PT OF CURVE
16	480147.7	1347644.5	INTERSECTION OF ROADS
17	480243.6	1347647.2	END ROAD AT BUILDING
18	480157.6	1347285.7	PC OF CURVE
19	480209.0	1347237.1	PT OF CURVE
20	479924.9	1347675.4	BEGIN NEW FENCE
21	479916.7	1347663.2	ANGLE POINT ON FENCE
22	480017.4	1347508.3	ANGLE POINT ON FENCE
23	480017.4	1347479.4	ANGLE POINT ON FENCE
24	480054.1	1347409.7	ANGLE POINT ON FENCE
25	480135.2	1347372.0	ANGLE POINT ON FENCE
26	480139.9	1347216.8	ANGLE POINT ON FENCE
27	480148.0	1347209.1	END NEW FENCE
28	479954.0	1348037.2	BEGIN C/L ROAD
29	480152.1	1347757.1	C/L INTERSECTION
30	480006.2	1347890.2	ANGLE POINT IN GRAVEL
31	480009.0	1347786.7	PI CURVE IN GRAVEL
32	480303.0	1347794.9	ANGLE POINT IN GRAVEL
33	480298.4	1347962.6	ANGLE POINT IN GRAVEL
34	480049.7	1347955.8	PI CURVE IN GRAVEL
35	479983.7	1348033.0	BEGIN NEW FENCE
36	479984.6	1348000.4	ANGLE POINT ON FENCE
37	479931.2	1347952.0	ANGLE POINT ON FENCE
38	479993.6	1347883.2	END NEW FENCE

### GENERAL LEGEND



**NOTE:**  
ABBREVIATED DRAWING NUMBERS WILL BE USED FOR ALL SECTIONS, DETAILS, ELEVATIONS, AND WITHIN NOTES AND CALL OUTS IN THE BODY OF THE DRAWING.  
FOR EXAMPLE; 95X-5900-G-00002 = DRAWING NUMBER  
G00002 = ABBREVIATED DRAWING NUMBER

**DIMENSIONING:**  
DIMENSIONS AND/OR ELEVATIONS MARKED THUS (N/A) SHALL BE VERIFIED IN THE FIELD BY CONTRACTOR.  
USE DIMENSIONS AS SHOWN, DO NOT SCALE.  
NTS (NOT TO SCALE) IS SHOWN ONLY WHERE DIMENSION IS OBVIOUSLY OUT OF SCALE.

### UTILITY SYMBOLS

EXISTING		PROPOSED
--- ST ---	STORM SEWER	— ST —
--- SN ---	SANITARY SEWER	— SN —
--- FG ---	FUEL GAS	— FG —
--- DW ---	DRINKING WATER	— DW —
--- FO1 ---	FIRE PROTECTION	— FO1 —
--- LS ---	LIVE STEAM	— LS —
--- WS ---	WATER SUPPLY	— WS —
--- WR ---	COOLING WATER RETURN	— WR —
--- TW ---	PROCESS WATER	— TW —
--- CE ---	CONTAMINATED WATER	— CE —
--- FT ---	FILTRATE OR EFFLUENT	— FT —
--- DF ---	DEIONIZED FEED	— DF —
--- PW ---	DEIONIZED WATER	— PW —
--- BR ---	BRINE	— BR —
--- RW ---	RAW WATER	— RW —
--- A ---	ALARM	— A —
--- CN ---	STEAM CONDENSATE	— CN —
--- VE ---	VENT LINES	— VE —
--- SD ---	SUB-SURFACE DRAINAGE	— SD —
--- SL ---	SUMP LIQUOR	— SL —
--- E ---	ELECTRICAL	— E —
--- OE ---	OVERHEAD ELECTRICAL	— OE —
--- T ---	TELEPHONE	— T —
--- G ---	ELECTRIC GROUND	— G —
--- PA ---	PLANT AIR	— PA —
--- SA ---	INSTRUMENT AIR SUPPLY	— SA —
	ABANDONED	

### BALLOON LEGEND

	PIV POST INDICATOR VALVE
	SMH SANITARY MANHOLE
	EMH ELECTRICAL MANHOLE
	TMH TELEPHONE MANHOLE
	CB STORM SEWER CATCH BASIN
	HFH HIGH PRESSURE FIRE HYDRANT
	LFH LOW PRESSURE FIRE HYDRANT
	FE FLARED END SECTION

### GRADING SYMBOLS

EXISTING		PROPOSED
X 584.9	SPOT ELEVATION	X [583.4]
--- 584 ---	CONTOUR - MINOR	--- 584 ---
--- 585 ---	CONTOUR - MAJOR	--- 585 ---
	SLOPE INDICATOR	

### ARCHITECTURAL LEGEND

EXISTING		PROPOSED
	DOOR NUMBER	
	ROOM NUMBER	

### SYMBOLS LEGEND

EXISTING		PROPOSED
	POST INDICATOR VALVE (PIV)	
	FIRE HYDRANT (FH)	
	MANHOLE (MH)	
	CATCH BASIN (CB)	
	LIGHT POLE	
	PIPE SUPPORT	
	ELECTRICAL MANHOLE	
	TELEPHONE MANHOLE	
	STREET WASHERS	
	VALVE BOX	
	MONITORING WELL	
	SURFACE DRAINAGE FLOW	
	POWER POLE	
	GRAVEL ROADWAY/DRIVEWAY	
	ASPHALT ROADWAY/DRIVEWAY	
	CONCRETE PAD/ROADWAY/DRIVEWAY	
	BUILDING/TRAILER	
	RAILROAD TRACK	
	OU BOUNDARY	
	FENCE	
	TREE LINE	
	DECIDUOUS TREE	
	CONIFEROUS TREE	
	CENTERLINE DRAINAGE DITCH	
	RIVER/CREEK	
	POLE TO BE RELOCATED	
	TO BE REMOVED	
	SILT FENCE	
	ELECTRICAL TRANSFORMER	
	TRANSMISSION TOWER	
	HEADWALL	
	BENCH MARK	
	CONSTRUCTION/WIND BARRIER FENCE	
	SIGN	
	BOLLARD/GUARD POST	
	ELECTRICAL PULL BOX	
	SURVEY MONUMENT	
	ROAD CENTERLINE OR BASELINE	
	BEND	
	TEE	
	THRUST BLOCK	
	UNKNOWN	
	STRAW BALE SILT BARRIER	
	CHECK DAM	
	FENCE GATE	
	FLARED END SECTION	

REF DWG NO.	DRAWING TITLE
94X-5900-X-00926	DRAWING INDEX

11 28 95 1688

CDC/UNCONTROLLED

0	APPROVED FOR CONSTRUCTION	AA	N/A
REV NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	DATE
		INITIALS AND DATE	

**UNITED STATES DEPARTMENT OF ENERGY**  
**FERNALD ENVIRONMENTAL MANAGEMENT PROJECT**  
 THIS DRAWING PREPARED BY  
**PARSONS**  
 THE RALPH M. PARSONS CO. - PARSONS MAIN, INC. - ENGINEERING-SCIENCE, INC.  
 CINCINNATI, OHIO  
 PROJECT NAME  
**SITE PREPARATION/UNDERGROUND UTILITIES FERNALD RESIDUES VITRIFICATION PLANT**

DRAWN BY		DATE	LEAD ENGINEER	DATE	CHECKED BY	DATE
R. LINDGREN		07-28-95			K. GERARD	8/15/95
PLANT/BLDG. NO.		FLOOR	SCALE		CLASS	
			NONE			
SUBMITTED FOR APPROVAL			FERMCO CRU APPROVAL			
			N/A		N/A	

INDEX OF DRAWINGS

INDEX CODE NO.	DRAWING NO.	SHEET NO.	REVISION NO.	DRAWING TITLE	REMARKS
	94X-5900-X-00925	X0001	0	PROJECT TITLE SHEET	
	94X-5900-X-00926	X0002	0	DRAWING INDEX	
	94X-5900-X-00927	X0003	0	LEGEND AND SYMBOLS	
	94X-5900-G-00899	G0001	0	CIVIL - SITE PLAN - PLANT LAYOUT AND ACCESS	
	94X-5900-G-00898	G0002	0	CIVIL - UTILITY PLAN - LAYOUT OF UTILITIES AND TIE-INS	
	94X-5900-G-00906	G0003	0	CIVIL - GRADING AND DRAINAGE PLAN	
	94X-5900-G-00908	G0004	0	CIVIL - STORM DRAIN PROFILES	
	94X-5900-G-00900	G0005	0	CIVIL - WATER LINE PROFILES	
	94X-5900-G-00910	G0006	0	CIVIL - SANITARY SEWER AND UTILITY PROFILES	
	94X-5900-G-00902	G0007	0	CIVIL - DETAILS - SHEET 1 OF 2	
	94X-5900-G-00909	G0008	0	CIVIL - DETAILS - SHEET 2 OF 2	
	94X-5900-G-00911	G0009	0	CIVIL - UTILITY DETAILS	
	94X-5900-G-00913	G0010	0	CIVIL - STORMWATER MANAGEMENT DETAILS - SHEET 1 OF 2	
	94X-5900-G-00912	G0011	0	CIVIL - STORMWATER MANAGEMENT DETAILS - SHEET 2 OF 2	
	94X-5900-G-00924	G0012	0	CIVIL - WATER LINE DETAILS	
	94X-5900-F-00919	F0001	0	MECHANICAL PROCESS - UTILITY FLOW DIAGRAM - UNDERGROUND UTILITIES	
	94X-5900-N-00921	N0001	0	MECHANICAL PROCESS - PIPING AND INSTRUMENTATION DIAGRAM - SYMBOLS AND LEGEND SHEET	
	94X-5900-N-00920	N0002	0	MECHANICAL PROCESS - PIPING AND INSTRUMENTATION DIAGRAM - UNDERGROUND UTILITIES	
	94X-5900-E-00954	E0001	0	ELECTRICAL - SINGLE LINE DIAGRAM - TRAILER AREA	
	94X-5900-E-00938	E0002	0	ELECTRICAL - ELECTRICAL SITE PLAN - UNDERGROUND DUCT BANK ROUTING AND TRAILER AREA	
	94X-5900-E-00948	E0003	0	ELECTRICAL - SITE PLAN - TRAILER AREA	
	94X-5900-E-00949	E0004	0	ELECTRICAL - FIRE ALARM AND EVACUATION ALARM - RISER DIAGRAM - TRAILER AREA	
	94X-5900-E-00950	E0005	0	ELECTRICAL - DETAILS - PANELBOARD INSTALLATION - TRAILER AREA	
	94X-5900-E-00951	E0006	0	ELECTRICAL - DETAILS - MANHOLE AND DUCTBANK	
	94X-5900-E-00952	E0007	0	ELECTRICAL - POWER POLE DETAILS - SHEET 1 OF 2	
	94X-5900-E-00953	E0008	0	ELECTRICAL - POWER POLE DETAILS - SHEET 2 OF 2	

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0	APPROVED FOR CONSTRUCTION				
REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	FERMCO	DATE	INITIALS AND DATE

**UNITED STATES  
DEPARTMENT OF ENERGY  
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT**

THIS DRAWING PREPARED BY  
**PARSONS**  
THE RALPH M. PARSONS CO. - PARSONS MAIN, INC. - ENGINEERING-SCIENCE, INC.  
CINCINNATI, OHIO

PROJECT NAME  
**SITE PREPARATION/UNDERGROUND UTILITIES  
FERNALD RESIDUES VITRIFICATION PLANT**

DRAWING TITLE

**DRAWING INDEX**

DRAWN BY R. LINDGREN	DATE 07-20-95	LEAD ENGINEER	DATE	CHECKED BY K. GERARD	DATE 08/15/95
PLANT/BLDG. NO.	FLOOR	SCALE NONE	CLASS		
SUBMITTED FOR APPROVAL		FERMCO CRU APPROVAL		N/A	
DATE 11/2/95		DATE		N/A	

PREPARED UNDER PARSONS PROJECT ORDER NUMBER CRU4/P0146	DOE PROJECT NO. WBS 1.1.1.4.3	FEMP PROJECT NO. 00-90701	DRAWING INDEX CODE NO. 94X-5900-X-00926	SHEET NO. X0002	REV. NO. 0
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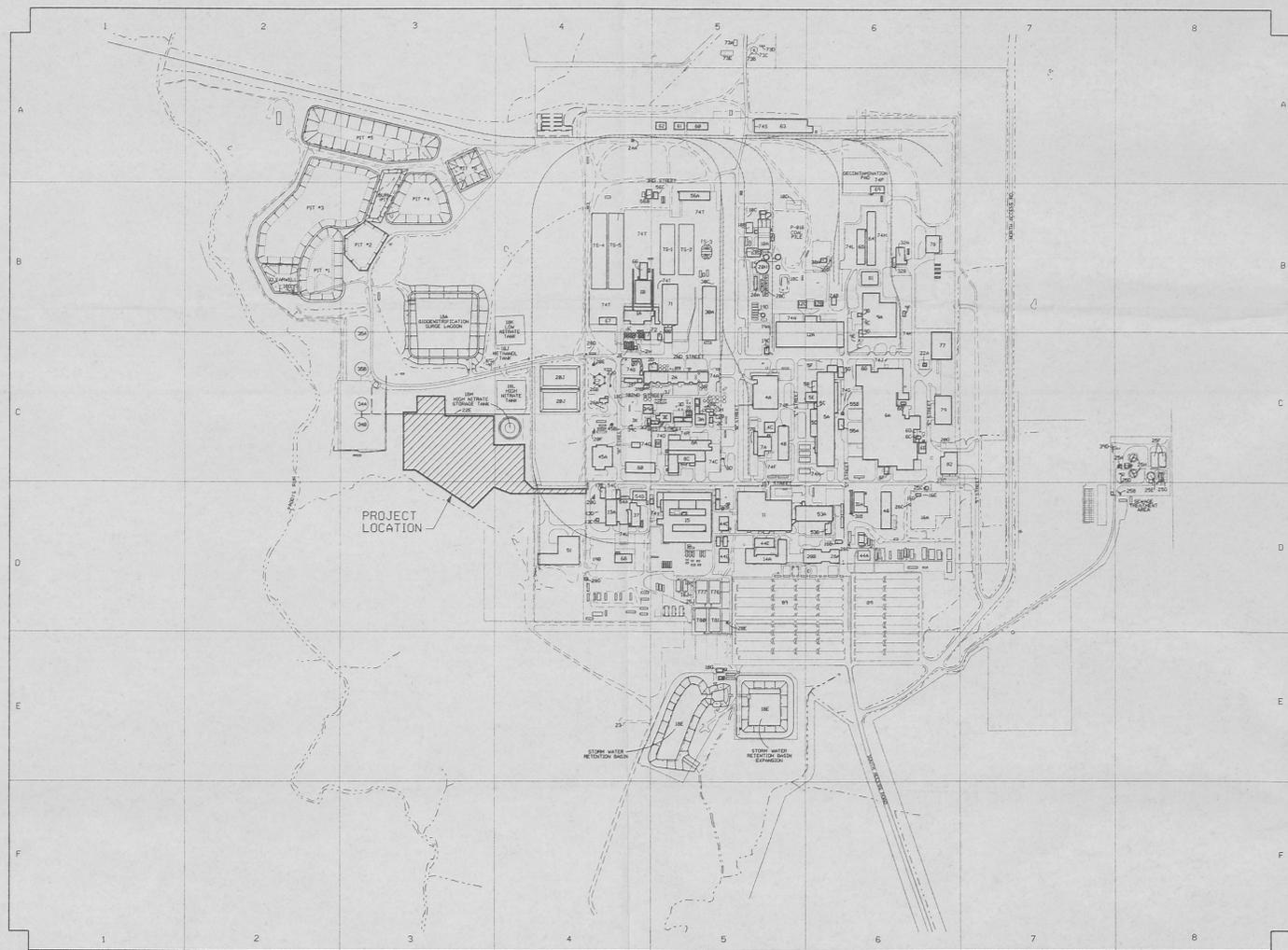
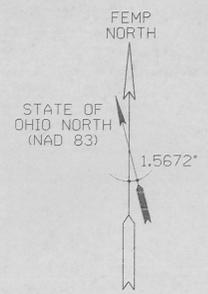
# UNITED STATES DEPARTMENT OF ENERGY

## FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

### SITE PREPARATION / UNDERGROUND UTILITIES

### OPERABLE UNIT 4 - PROJECT ORDER 146

NOTES



## PARSONS

The Ralph M. Parsons Company \* Parsons Main, Inc. \* Engineering-Science, Inc.

## ARCHITECTS - ENGINEERS CINCINNATI, OHIO

REF DWG NO.	DRAWING TITLE
94X-5900-X-00926	DRAWING INDEX

11 28 95 1688

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0	APPROVED FOR CONSTRUCTION	[Signature]	N/A
REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	INITIALS AND DATE	A-E FERMCO DATE

UNITED STATES  
DEPARTMENT OF ENERGY  
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

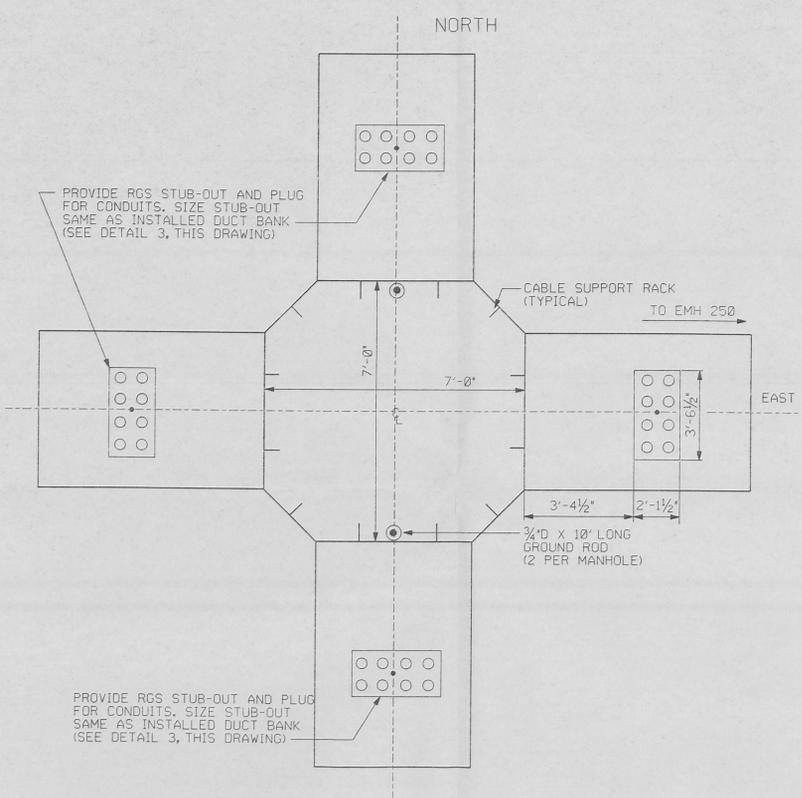
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CINCINNATI, OHIO

PROJECT NAME  
**SITE PREPARATION/UNDERGROUND UTILITIES  
FERNALD RESIDUES VITRIFICATION PLANT**

DRAWING TITLE

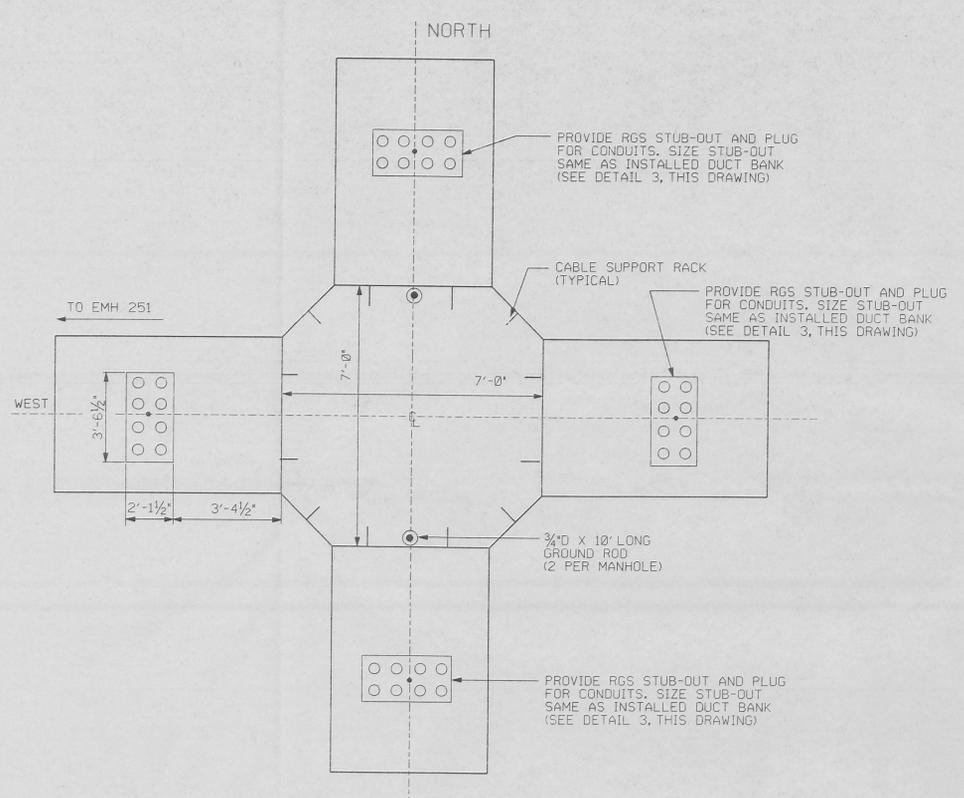
PROJECT TITLE SHEET			
DRAWN BY R. LINDGREN	DATE 07-28-95	LEAD ENGINEER K. GERARD	DATE 8/15/95
PLANT/BLDG. NO.	FLOOR	SCALE NONE	CLASS
SUBMITTED FOR APPROVAL [Signature]	DATE 8/15/95	FERMCO CRU APPROVAL N/A	N/A

PREPARED UNDER PARSONS PROJECT ORDER NUMBER CRU4/PO146	DOE PROJECT NO. WBS 1.1.1.4.3 00-90701	FEMP PROJECT NO. 94X-5900-X-00925	DRAWING INDEX CODE NO. X0001 0
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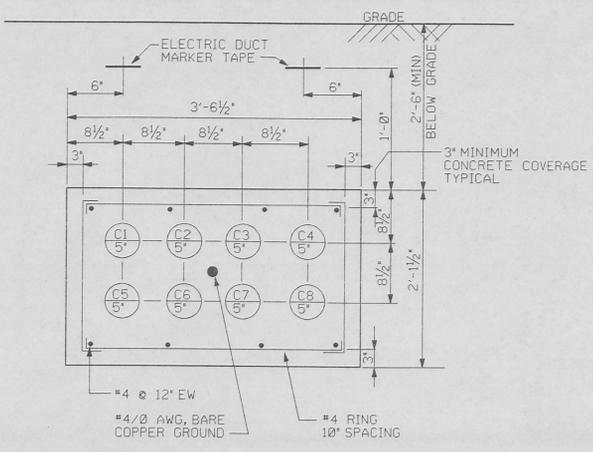
ELECTRICAL MANHOLE EMH 251

DETAIL 1 REF E00951 E00938  
NTS



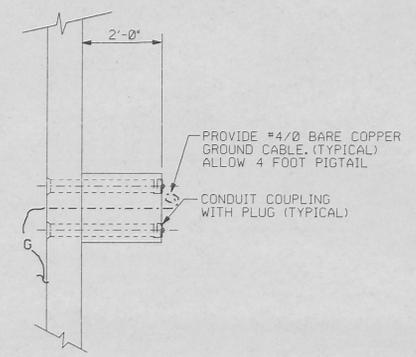
ELECTRICAL MANHOLE EMH 250

DETAIL 2 REF E00951 E00938  
NTS



UNDERGROUND DUCTBANK

SECTION A REF E00951 E00938  
NTS



MANHOLE STUB-OUT DETAIL

DETAIL 3 REF E00951 E00938  
NTS

NOTES

- SEE DRAWING 94X-5900-X-00926 FOR DRAWING INDEX.
- SEE DRAWING 94X-5900-E-00938 FOR ELECTRICAL SITE PLAN

REF DWG NO.	DRAWING TITLE
94X-5900-E-00926	DRAWING INDEX SHEET
94X-5900-E-00938	ELECTRICAL SITE PLAN UNDERGROUND DUCTBANK ROUTING

11 28 95 1688

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0	APPROVED FOR CONSTRUCTION	APP	1/10
REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	INITIALS AND DATE	

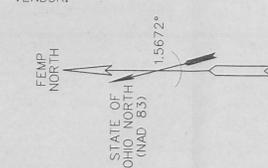
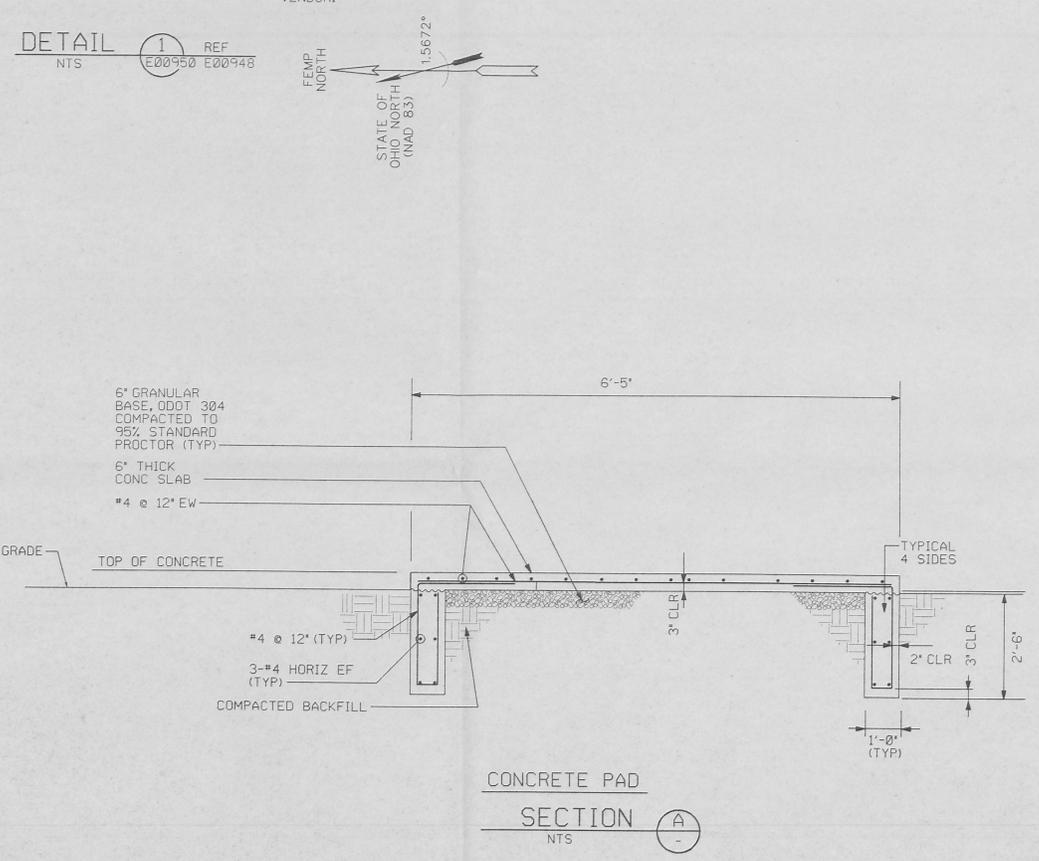
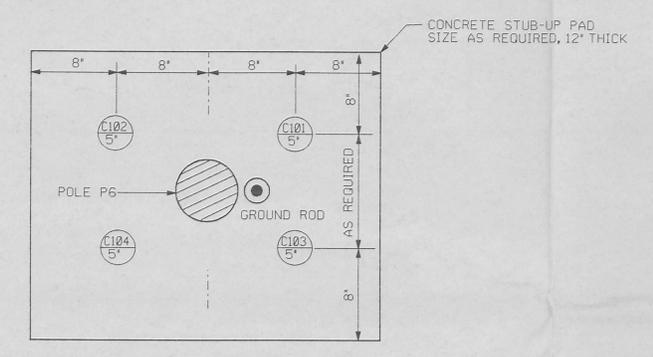
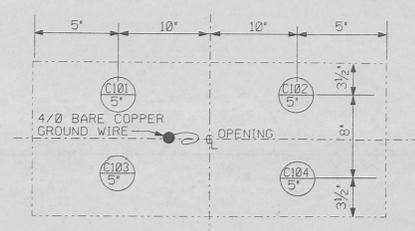
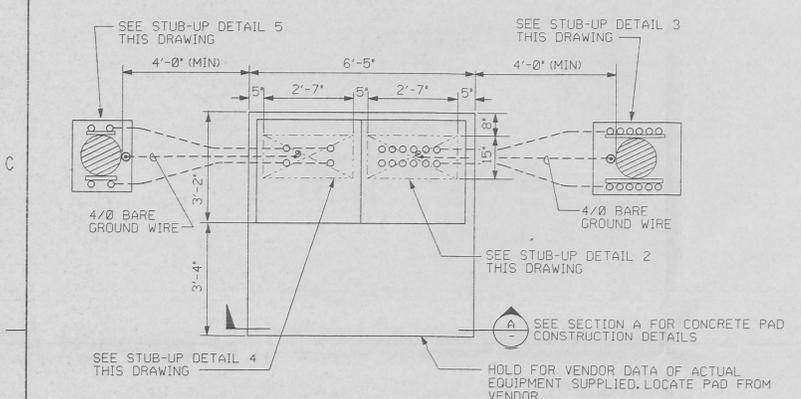
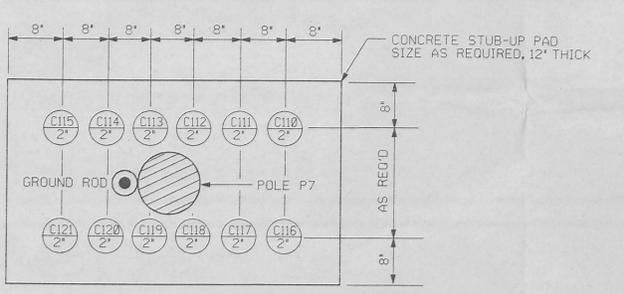
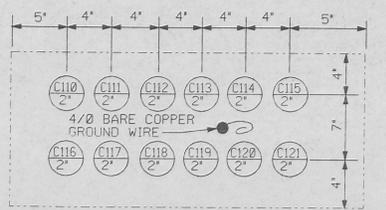
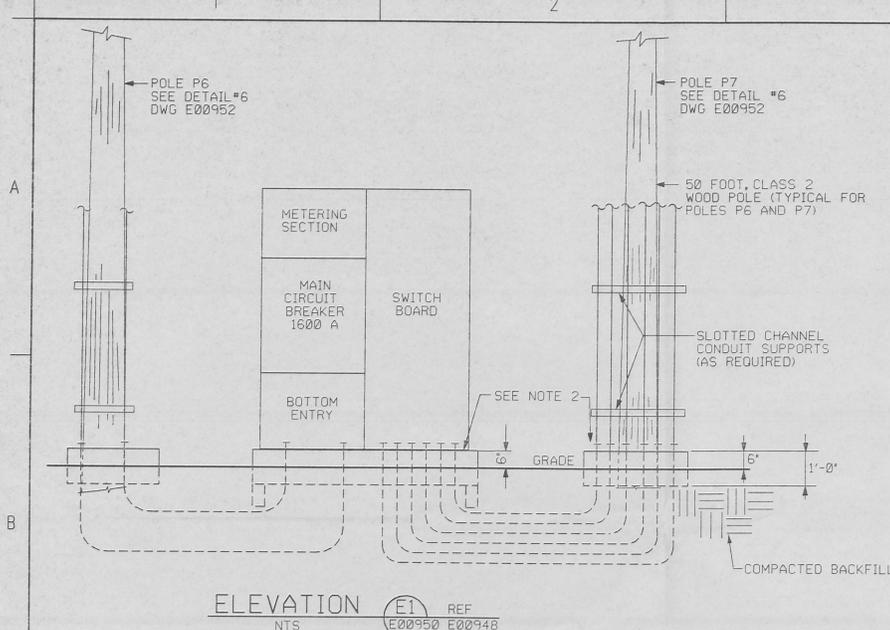
**UNITED STATES DEPARTMENT OF ENERGY**  
**FERNALD ENVIRONMENTAL MANAGEMENT PROJECT**  
 THIS DRAWING PREPARED BY  
**PARSONS**  
 THE RALPH M. PARSONS CO. - PARSONS MAIN, INC. - ENGINEERING-SCIENCE, INC.  
 CINCINNATI, OHIO

PROJECT NAME  
**SITE PREPARATION / UNDERGROUND UTILITIES**  
**FERNALD RESIDUES VITRIFICATION PLANT**

DRAWING TITLE  
**ELECTRICAL MANHOLE AND DUCT BANK**

DRAWN BY R.PROSKI	DATE 11-03-95	LEAD ENGINEER	DATE	CHECKED BY J. L. COOPER	DATE 11/15/95
PLANT/BLDG. NO.	FLOOR	SCALE NONE	CLASS		
SUBMITTED FOR APPROVAL	DATE 11/10/95	FERNCO CRU APPROVAL N/A	DATE		N/A

PREPARED UNDER PARSONS PROJECT ORDER NUMBER CRU4/P0146	DOE PROJECT NO. WBS 1.1.1.4.3	FEMP PROJECT NO. 00-90701	DRAWING INDEX CODE NO. 94X-5900-E-00951	SHEET NO. E0006	REV. NO. 0
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- NOTES
- SEE 94X-5900-X-00926 FOR DRAWING INDEX
  - CONCRETE PADS SHALL EXTEND 6" ABOVE GRADE. CONDUIT STUB-UPS SHALL EXTEND 6" ABOVE CONCRETE PADS.
  - DIMENSIONS SHOWN ARE APPROXIMATE. REFER TO EQUIPMENT MANUFACTURER'S DATA SHEETS FOR FINAL DIMENSIONS.
  - INSTALL A 3/4" X 10' LONG GROUND ROD AT POLES P6 AND P7 AND CONNECT AIR TERMINAL, GUY WIRES, & POLE BUTT GROUND. ALSO RUN A 4/0 BARE COPPER GROUND ALONG WITH CONDUITS TO SWITCHBOARD AND STUB UP AN 8'-0" PIGTAIL FOR CONNECTION TO SWITCHBOARD GROUND BUS (BOTH SIDES).

REF DWG NO.	DRAWING TITLE
94X-5900-X-00926	DRAWING INDEX SHEET
94X-5900-E-00948	SITE PLAN - TRAILER AREA

11 28 95 1688

CDC/UNCONTROLLED

0	APPROVED FOR CONSTRUCTION	INITIALS AND DATE
REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E FEMCO DATE

UNITED STATES  
DEPARTMENT OF ENERGY  
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY  
**PARSONS**

THE RALPH M. PARSONS CO. - PARSONS MAIN, INC. - ENGINEERING-SCIENCE, INC.  
CINCINNATI, OHIO

PROJECT NAME  
SITE PREPARATION / UNDERGROUND UTILITIES  
FERNALD RESIDUES VITRIFICATION PLANT

DRAWING TITLE					
ELECTRICAL DETAILS PANELBOARD INSTALLATION - TRAILER AREA					
DRAWN BY R.PROSKI	DATE 11-03-95	LEAD ENGINEER	DATE	CHECKED BY J.L.COOPER	DATE 11/15/95
PLANT/BLDG. NO.	FLOOR	SCALE NONE	CLASS		
SUBMITTED FOR APPROVAL		FEMCO CRU APPROVAL		N/A	
DATE		DATE		N/A	

PREPARED UNDER PARSONS PROJECT ORDER NUMBER CRU4/PO146	DOE PROJECT NO. WBS 1.1.1.4.3 00-90701	FEMP PROJECT NO. 94X-5900-E-00950	DRAWING INDEX CODE NO. E00950	SHEET NO. 00025	REV. NO. 0
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NOTES

1. SEE DRAWING 94X-5900-E-00948 FOR FIRE ALARM SYSTEM PANEL'S LOCATION.
2. SEE CONSTRUCTION SPECIFICATION SECTION 16720 FOR MATERIAL AND EQUIPMENT SPECIFICATIONS.
3. 4 PAIR TELEPHONE CABLE AND 2/C #16 AWG CABLE WILL BE ROUTED BETWEEN BLDG 94 AND DUPLEX TRAILER #1 ON SAME MESSENGER.

LEGEND

- MS MANUAL PULL STATION
- TS TAMPER SWITCH
- FS FLOW SWITCH
- H FIRE ALARM HORN
- LP LIGHTNING PROTECTOR
- EAH EVACUATION SPEAKER
- SD SMOKE DETECTOR

REF DWG NO.	DRAWING TITLE
94X-5900-E-00948	SITE PLAN, TRAILER AREA
94X-5900-X-00926	INDEX SHEET

11 28 95 1688

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REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	PERMCO DATE
		INITIALS AND DATE	

**UNITED STATES  
DEPARTMENT OF ENERGY  
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT**

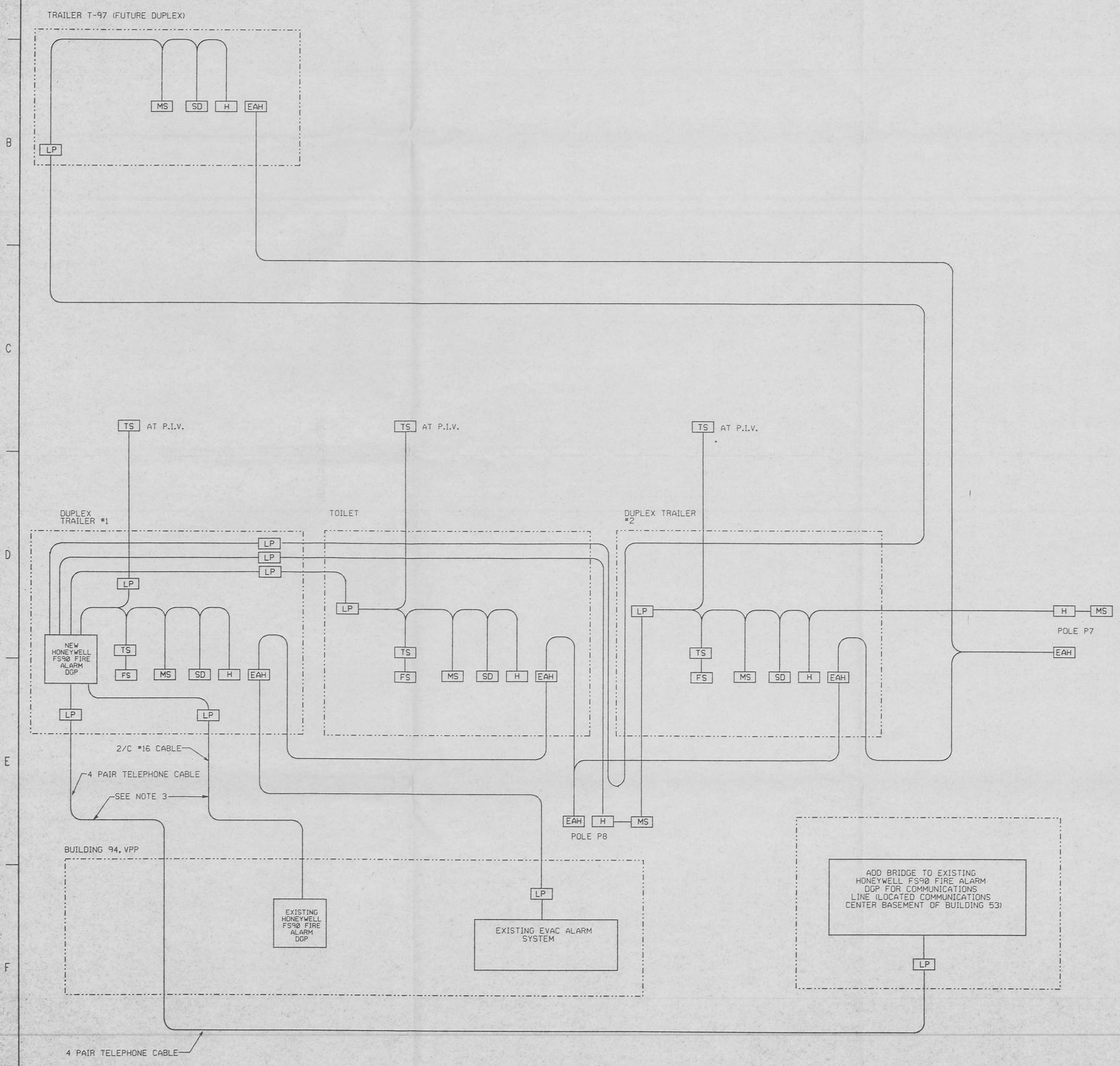
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CINCINNATI, OHIO

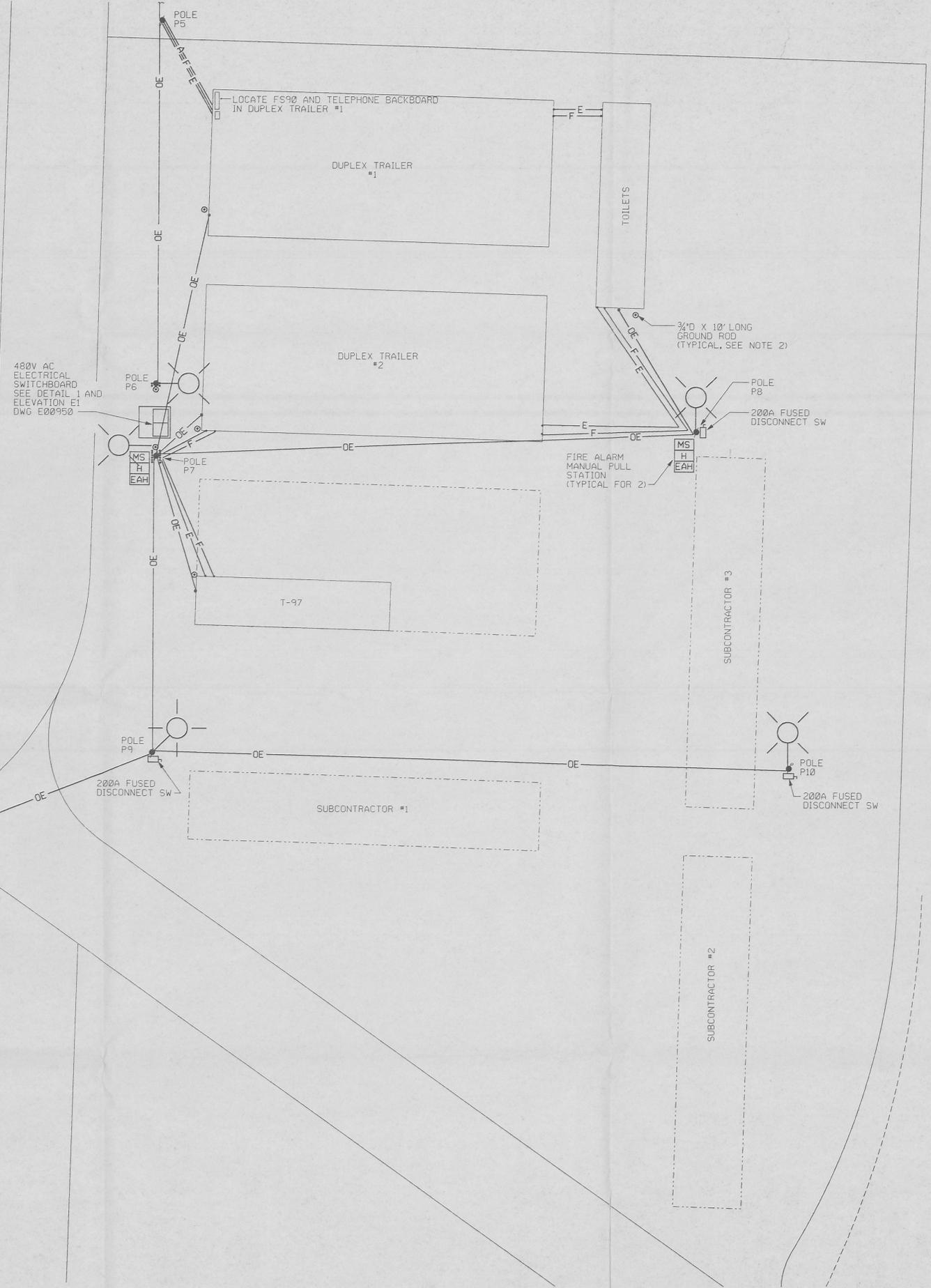
PROJECT NAME  
**SITE PREPARATION / UNDERGROUND UTILITIES  
FERNALD RESIDUES VITRIFICATION PLANT**

DRAWING TITLE  
**ELECTRICAL  
FIRE ALARM AND EVACUATION ALARM  
RISER DIAGRAM, TRAILER AREA**

DRAWN BY R.PROSKI	DATE 11-03-95	LEAD ENGINEER	DATE	CHECKED BY J.L.COOPER	DATE 11/15/95
PLANT/BLDG. NO.	FLOOR	SCALE NONE	CLASS		
SUBMITTED FOR APPROVAL	DATE <i>[Signature]</i> 11/21/95	FERMCO CRU APPROVAL N/A		N/A	

PREPARED UNDER PARSONS PROJECT ORDER NUMBER CRU3/P0146	USE PROJECT NO. WBS 1.1.1.4.3 00-90701	TRAILER PROJECT NO. 94X-5900-E-00949	DRAWING INDEX CODE NO. E0004	SHEET NO. 0	REV. NO.
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NOTES

- SEE DRAWING 94X-5900-X-00926 FOR DRAWING INDEX.
- INSTALL 3/4" X 10' LONG GROUND ROD AT POLES P1 & P12 (NOT SHOWN), POLES P6 AND P7 AND NEAR SERVICE ENTRANCE OF EACH TRAILER. (9 TOTAL)
- SEE SINGLE LINE DIAGRAM, DRAWING 94X-5900-E-00954 FOR POWER DISTRIBUTION TO TRAILERS.
- SEE DRAWING 94X-5900-E-00950 FOR 480V AC PANELBOARD INSTALLATION DETAILS.
- SEE DRAWING 94X-5900-E-00949 FOR FIRE ALARM AND EVACUATION SYSTEMS RISER DIAGRAM.
- SEE DRAWINGS 94X-5900-E-00952 AND E-00953 FOR POWER POLE INSTALLATION DETAILS.
- 200 AMP, 480 VOLT, 3 PHASE SERVICE PROVIDED TO A POLE MOUNTED FUSED DISCONNECT SWITCH AT EACH OF THREE SUBCONTRACTOR TRAILERS. CONTINUATION TO TRAILERS AND VOLTAGE STEP DOWN TRANSFORMERS AND GROUNDING SHALL BE THE RESPONSIBILITY OF THE SUBCONTRACTOR.

LEGEND

- NEW WOODEN POWER POLE
- ⊙ 3/4" X 10' LONG GROUND ROD
- OE — AERIAL ELECTRICAL POWER CABLE
- E — EVACUATION ALARM LOOP CABLE
- F — FIRE ALARM LOOP CABLE
- A — ALERT SYSTEM CABLE
- [MS] FIRE ALARM MANUAL PULL STATION (SUITABLE FOR OUTDOOR INSTALLATION)
- [H] FIRE ALARM HORN (SUITABLE FOR OUTDOOR INSTALLATION)
- [EAH] EVACUATION SPEAKER (SUITABLE FOR OUTDOOR INSTALLATION)
- ☉ 250 WATT HPS POLE MOUNTED LIGHT FIXTURE

REF DWG NO.	DRAWING TITLE
94X-5900-X-00926	DRAWING INDEX
94X-5900-E-00954	SINGLE LINE DIAGRAM
94X-5900-E-00938	ELECTRICAL SITE PLAN UNDERGROUND DUCT BANK ROUTING RISER DIAGRAM
94X-5900-E-00949	FIRE ALARM AND EVACUATION ALARM RISER DIAGRAM
94X-5900-E-00950	DETAILS - PANELBOARD INSTALLATION
94X-5900-E-00952	POWER POLE DETAILS - SHEET 1
94X-5900-E-00953	POWER POLE DETAILS - SHEET 2

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REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	FERMCO
		INITIALS AND DATE	

**UNITED STATES DEPARTMENT OF ENERGY**  
**FERNALD ENVIRONMENTAL MANAGEMENT PROJECT**

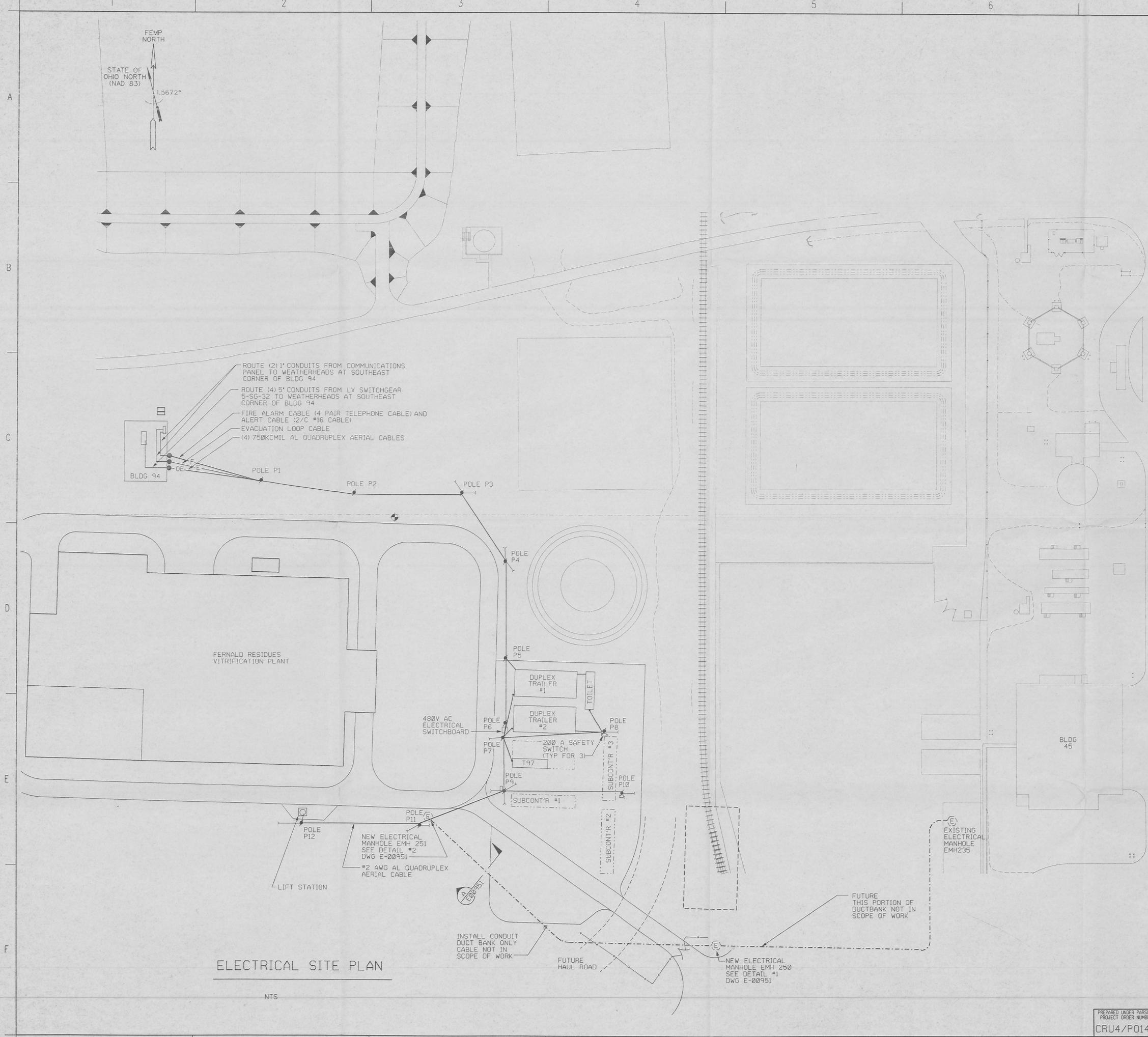
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PROJECT NAME  
**SITE PREPARATION / UNDERGROUND UTILITIES**  
**FERNALD RESIDUES VITRIFICATION PLANT**

DRAWING TITLE  
**ELECTRICAL SITE PLAN TRAILER AREA**

DRAWN BY R. PROSKI	DATE 11-03-95	LEAD ENGINEER	DATE	CHECKED BY J. L. COOPER	DATE 11/15/95
PLANT/BLDG. NO.	FLOOR	SCALE 3/8" = 1'	CLASS		
SUBMITTED FOR APPROVAL		FERMCO CRU APPROVAL	N/A		

PREPARED UNDER PARSONS PROJECT ORDER NUMBER CRU4/PO146	WBS PROJECT NO. 1.1.1.4.3 00-90701	FEMP PROJECT NO. 94X-5900-E-00948	DRAWING INDEX CODE NO. E0003	SHEET NO. 0	REV. NO.
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- NOTES
- SEE DRAWING 94X-5900-X-00926 FOR DRAWING INDEX.
  - SEE DRAWING 94X-5900-G-00898, CIVIL - UTILITY PLAN, FOR SITE COORDINATES OF NEW ELECTRICAL MANHOLES AND POWER POLES.
  - MANHOLE GENERAL NOTES:
    - 6'-6" MIN. INSIDE CLEAR HEIGHT
    - PROVIDE PULLING-IN IRONS IN WALLS OPPOSITE DUCT ENTRANCE
    - PROVIDE 10'-0" X 3/4" GROUND RODS ON EACH END.
    - DIMENSIONS ARE APPROXIMATE.
    - GROUND CABLE SUPPORT RACKS AND PULLING-IN IRONS WITH #8 COPPER GROUND CABLE.
    - PROVIDE 27" ROUND MANHOLE COVER.
  - SEE DRAWING 94X-5900-E-00948 FOR ENLARGED PLAN OF TRAILER AREA.
  - SEE SINGLE LINE DIAGRAM, DRAWING 95X-5900-E-00954 FOR 480V AC POWER DISTRIBUTION TO TRAILERS.
  - SEE DRAWINGS 94X-5900-E-00948 AND E-00949 FOR FIRE AND EVACUATION SYSTEM WIRING TO TRAILERS.
  - SEE DRAWINGS 94X-5900-E-00952 AND E-00953 FOR POWER POLE DETAILS

- LEGEND:
- NEW FEATURES (HEAVY LINE WEIGHT)
  - - - EXISTING FEATURES (LIGHT LINE WEIGHT)
  - (E) ELECTRICAL MANHOLE (EMH XXX)
  - ⚡ ELECTRICAL POWER POLE (PX)

REF DWG NO.	DRAWING TITLE
94X-5900-X-00926	DRAWING INDEX
94X-5900-E-00954	SINGLE LINE DIAGRAM
94X-5900-G-00898	UTILITY PLAN
94X-5900-E-00948	SITE PLAN - TRAILER AREA
94X-5900-E-00949	FIRE ALARM AND EVACUATION ALARM RISER DIAGRAM
94X-5900-E-00951	DETAILS - MANHOLE AND DUCTBANK
94X-5900-E-00952	POWER POLE DETAILS - SHEET 1
94X-5900-E-00953	POWER POLE DETAILS - SHEET 1

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REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	INITIALS	DATE

**UNITED STATES DEPARTMENT OF ENERGY**  
**FERNALD ENVIRONMENTAL MANAGEMENT PROJECT**  
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PROJECT NAME  
**SITE PREPARATION / UNDERGROUND UTILITIES**  
**FERNALD RESIDUES VITRIFICATION PLANT**

DRAWING TITLE <b>ELECTRICAL SITE PLAN</b> <b>UNDERGROUND DUCTBANK ROUTING &amp; TRAILER AREA</b>			
DRAWN BY J. ALLFORD	DATE 06/18/95	LEAD ENGINEER T. FERRELL	DATE 08/18/95
PLANT/BLDG. NO.	FLOOR	SCALE	CLASS
SUBMITTED FOR APPROVAL		FERMACO CRU APPROVAL	NONE
DATE		N/A	N/A

PREPARED UNDER PARSONS PROJECT ORDER NUMBER CRU4/P0146	BOE PROJECT NO. WBS 1.1.1.4.3	FEMP PROJECT NO. 00-90701	DRAWING INDEX CODE NO. 94X-5900-E-00938	SHEET NO. E0002	REV. NO. 0
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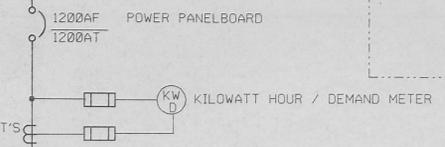
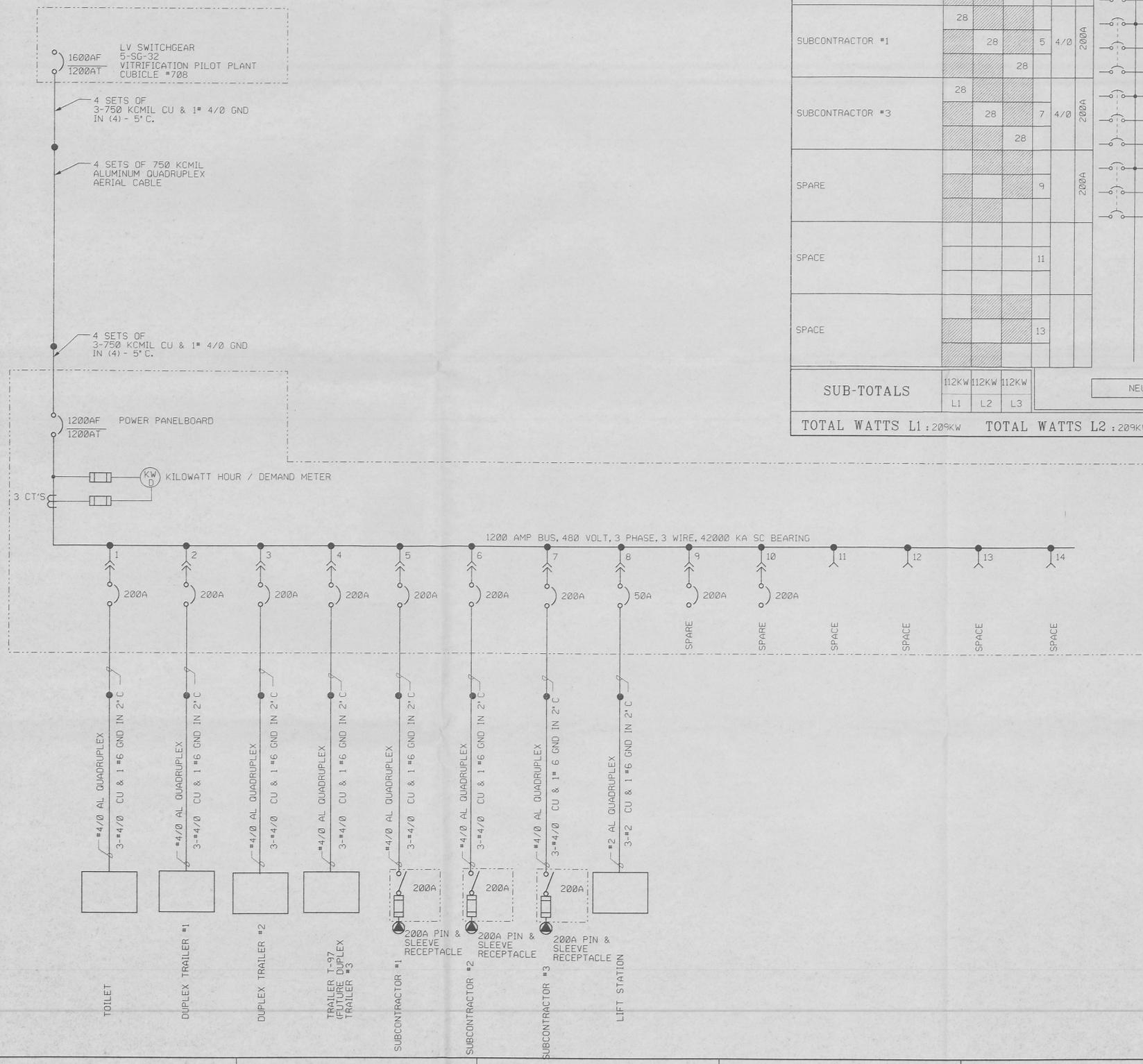
- 1. SEE DRAWING 94X-5900-X-00926 FOR DRAWING INDEX.
- 2. SEE DRAWING 94X-5900-E-00938 FOR ELECTRICAL SITE PLAN.

# 480V, POWER PANEL PP-1

VOLTAGE : 480V, 3 PHASE  
 MAIN BKR : 1200  
 MOUNTING : SURFACE  
 REMARKS : 1. \* INDICATES 6MA GFCI CLASS A, \*\* INDICATES 30MA GFCI CLASS B  
 2. ALL BREAKERS SHALL BE LOCKABLE IN THE "OFF" POSITION  
 MAIN BUS 1600 AMP

DIRECTORY	KILOWATTS LOAD			CKT NO	WIRE SIZE	BKR AMPS	L1 L2 L3 MAIN			BKR AMPS	WIRE SIZE	CKT NO	KILOWATTS LOAD			DIRECTORY
	L1	L2	L3				L1	L2	L3				L1	L2	L3	
TOILET	28			1	4/0	200A				200A	4/0	2	28			DUPLEX TRAILER #1
DUPLEX TRAILER #2	28			3	4/0	200A				200A	4/0	4	28			TRAILER T-97 (FUTURE DUPLEX)
SUBCONTRACTOR #1	28			5	4/0	200A				200A	4/0	6	28			SUBCONTRACTOR #2
SUBCONTRACTOR #3	28			7	4/0	200A				50A	#2	8	13			LIFT STATION
SPARE				9		200A				200A		10				SPARE
SPACE				11								12				SPACE
SPACE				13								14				SPACE
SUB-TOTALS		112KW	112KW	112KW				NEUTRAL BUS			97KW	97KW	97KW	SUB-TOTALS		
TOTAL WATTS L1 : 209KW					TOTAL WATTS L2 : 209KW						TOTAL WATTS L3 : 209KW			TOTAL WATTS : 627KW		

A  
B  
C  
D  
E  
F



REF SHEET NO.	DRAWING TITLE
94X-5900-X-00926	DRAWING INDEX
94X-5900-E-00938	ELECTRICAL SITE PLAN UNDERGROUND DUCTBANK ROUTING

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REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	FERMCO DATE
		INITIALS AND DATE	

**UNITED STATES DEPARTMENT OF ENERGY**  
**FERNALD ENVIRONMENTAL MANAGEMENT PROJECT**

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PROJECT NAME  
 SITE PREPARATION / UNDERGROUND UTILITIES  
 FERNALD RESIDUES VITRIFICATION PLANT

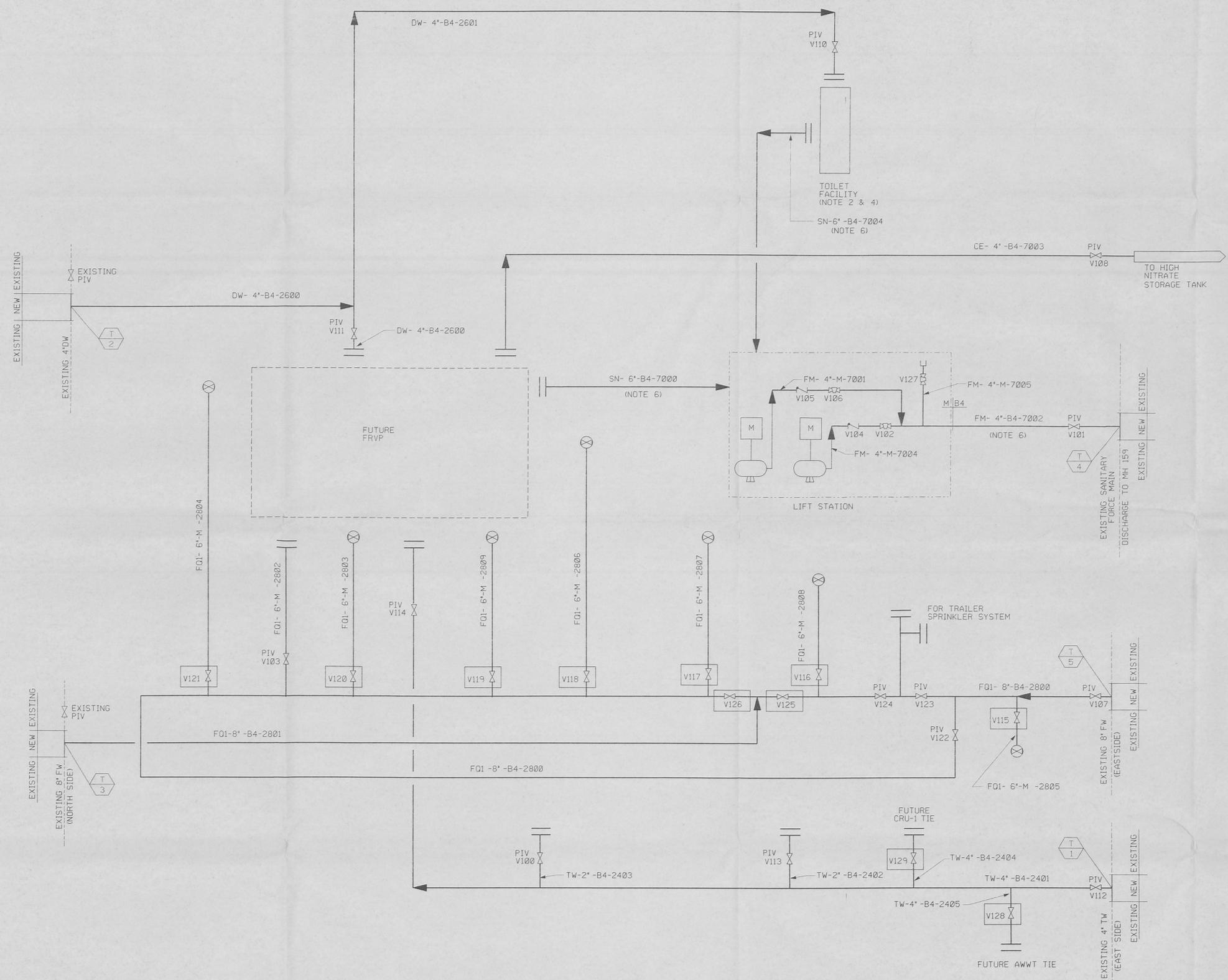
DRAWING TITLE  
 ELECTRICAL SINGLE LINE DIAGRAM, TRAILER AREA

DRAWN BY J. ALLFORD	DATE 08/10/95	LEAD ENGINEER	DATE	CHECKED BY J. L. COOPER	DATE 11/15/95
PLANT/BLDG. NO.	FLOOR	SCALE	NONE	CLASS	
SUBMITTED FOR APPROVAL	DATE 11/21/95	FERMCO CRU APPROVAL N/A		N/A	

PREPARED UNDER PARSONS PROJECT ORDER NUMBER CRU4/P0146	DOE PROJECT NO. WBS 1.1.1.4.3	FEMP PROJECT NO. 00-90701	DRAWING INDEX CODE NO. 94X-5900-E-00954	SHEET NO. E0001	REV. NO. 0
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NOTES

1. LINE SIZES ARE PRELIMINARY.
2. TRAILER INSTALLER TO MAKE ALL UTILITY DROPS TO MATCH DETAIL 4 ON CIVIL DRAWING 94X-5900-G-00911. TRAILER CONNECTIONS ARE OUTLINED IN SPECIFICATION 13125. HEAT TRACING SHALL BE FROM TRAILER DOWN TO 3 FEET BELOW GRADE.
3. FOR PIPING DETAILS SEE CIVIL DRAWING 94X-5900-G-00924. FOR HYDRANT DETAILS, SEE CIVIL DRAWING 94X-5900-G-00902.
4. ONLY THE TOILET TRAILER IS SHOWN FOR CLARITY. IT IS THE ONLY TRAILER OF THE SEVEN REQUIRING WATER AND SANITARY SERVICES.
5. FIRE HYDRANTS ARE FREEZEPROOF SELF-DRAINING TYPE.
6. SEE CIVIL DRAWING 94X-5900-G-00998 FOR LOCATION OF MANHOLES AND CLEANOUTS ON SANITARY SEWER LINE.



LAST VALVE NO.	V129
REFER DWG NO.	REFERENCE DWG TITLE
94X-5900-N-00921	P & ID SYMBOLS AND LEGEND SHEET
94X-5900-X-00926	DRAWING INDEX
94X-5900-G-00924	WATER LINE DETAILS
94X-5900-G-00911	UTILITY DETAILS
94X-5900-G-00902	DETAILS

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REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	PERIOD DATE
			INITIALS AND DATE

**UNITED STATES DEPARTMENT OF ENERGY**  
**FERNALD ENVIRONMENTAL MANAGEMENT PROJECT**  
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 CINCINNATI, OHIO  
 PROJECT NAME  
**SITE PREPARATION/UNDERGROUND UTILITIES**  
 FERNALD RESIDUES VITRIFICATION PLANT  
 DRAWING TITLE  
**MECHANICAL PROCESS PIPING AND INSTRUMENTATION DIAGRAM**  
 UNDERGROUND UTILITIES

DRAWN BY P. A. WILSON	DATE 6/22/95	LEAD ENGINEER <i>[Signature]</i>	DATE 11/21/95	CHECKED BY D. CARLSON	DATE 6/26/95
PLANT/BLDG. NO.	FLOOR	SCALE	NONE	CLASS	
SUBMITTED FOR APPROVAL		FERMACO CRU APPROVAL		N/A	
<i>[Signature]</i> 11/21/95		N/A		N/A	

PREPARED UNDER PARSONS PROJECT ORDER NUMBER CRU4/P0146	WBS PROJECT NO. WBS 1.1.1.4.3.2 00-90701	DRAWING INDEX CODE NO. 94X-5900-N-00920	SHEET NO. N0002	REV. NO. 0
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