7311 U-007-451.4

TRANSMITTAL OF THE SOUTH FIELD EXTRACTION SYSTEM DESIGN PACKAGE

10/26/95

DOE-0105-96
DOE-FN EPAS
300
REPORT

F-7311

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

OCT 26 1995

DOE-0105-96

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:

TRANSMITTAL OF THE SOUTH FIELD EXTRACTION SYSTEM DESIGN PACKAGE

Reference: 1) Letter, J. A. Saric to J. R. Craig, "Approval of OU5 PSP for the South Field Groundwater Extraction System," dated September 14, 1995.

2) Letter, T. A. Schneider to J. R. Craig, "Approval PSP South Field Extraction System," dated September 14, 1995.

This letter transmits the U.S. Department of Energy, Fernald Area Office's (DOE-FN) Design Package for the South Field Extraction System.

If you have any questions concerning this transmittal, please contact Robert Janke at (513) 648-3124, or John Kappa at (513) 648-3149.

Sincerely,

Susan M Peterman for

Johnny W. Reising
Fernald Remedial Action
Project Manager

FN:Kappa

Enclosure: As Stated

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Recycled and Recyclable

cc w/enc:

K. H. Chaney, EM-423/GTN
L. Griffin, EM-423/GTN
B. Skokan, EM-423/GTN
G. Jablonowski, USEPA-V, 5HRE-8J
Manager, TSPP/DERR, OEPA-Columbus
F. Bell, ATSDR
D. S. Ward, GeoTrans
R. Vandergrift, ODOH
S. McClellan, PRC
R. D. George, FERMCO/52-2
T. Hagen, FERMCO/65-2
AR Coordinator, FERMCO

cc w/o enc:

D. Carr, FERMCO/52-5
C. Little, FERMCO
M. Yates, FERMCO

1-7311

South Field Extraction System Technical Specifications

Operable Unit 5
Project Order 126
WBS No. 1.1.1.1.5.3.1
September 1995
Revision 0

Environmental Remedial Action Project
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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F-7311

U.S DEPARTMENT OF ENERGY

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

FERMCO Subcontract No. 2-21487

SOUTH FIELD EXTRACTION SYSTEM TECHNICAL SPECIFICATIONS

PARSONS

Approved by: _____ 9-15-95

R. Brettin, CRU-5 Project Manager Date

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South Field Extraction System
Technical Specifications

Operable Unit 5
Project Order 126
WBS No. 1.1.1.1.5.3.1
September 1995
Revision 0

Environmental Remedial Action Project
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. 2-21487

PROJECT ORDER 126
WBS NO. 1.1.1.1.5.3.1
SPECIFICATIONS

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16500	LIGHTING	0	09/15/95
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END OF SECTION

U.S DEPARTMENT OF ENERGY

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

FERMCO Subcontract No. 2-21487

SOUTH FIELD EXTRACTION SYSTEM

Division 01 - General Requirements

PARSONS

Prepared by: _____ 9/15/95
Date

Checked by: _____ 9/15/95
Date

SECTION 01010
GENERAL REQUIREMENTS

PART 1 GENERAL

1.1 SCOPE

These general requirements form a part of all the technical divisions of these specifications.

PARSONS has prepared these specifications. In all cases where the words "A/E Subcontractor" appear in these specifications, it shall be understood to refer to PARSONS or to such other individuals or organizations acting within the scope of the specific duties entrusted to them.

In all cases where the terms "Vendor" or "Seller" or "Manufacturer" or similar terms appear in these specifications or in the appendices to these specifications, they shall be understood to refer to an individual or firm(s) providing materials, equipment, or services, as noted, under a subcontract to Fernald Environmental Restoration Management Corporation (FERMCO).

In all cases where the term "Subcontractor" appears in these specifications, it shall be understood to refer to the Construction Contractor or Subcontractor.

In all cases where the words "Owner's Agent" or "Construction Manager" appear, they shall be understood to refer to FERMCO.

The Subcontractor shall perform all construction acceptance tests as coordinated and supervised by FERMCO. In addition, before the final acceptance of the work, the Subcontractor shall perform an integrated system construction acceptance test as coordinated and supervised by FERMCO.

The Subcontractor shall provide written procedures for FERMCO's review and approval of all tests to be performed as identified in the drawings and specifications. These procedures shall provide detailed step-by-step operations with sign-off columns and shall be submitted and approved prior to testing.

Generally, all field test instruments shall have been calibrated, within 12 months prior to use on this subcontract, by a calibration laboratory whose calibration equipment and instruments are fully traceable to National Institute of Science and Technology (NIST) standards. The Subcontractor shall provide individual certification of calibration and NIST standards traceability for all field test instruments used on this subcontract.

All work shall be accomplished in accordance with the following code requirements:

A. Ohio Basic Building Code (OBBC) 1995.

B. Uniform Building Code (UBC) 1994.

C. Code for Safety to Life from Fire in Buildings and Structures (NFPA 101, Life Safety Code) - 1994.

D. All other National Fire Protection Association (NFPA) Codes - All inclusive, including 1995 revisions.

E. Occupational Safety and Health Administration (OSHA) - 29 CFR 1910 and 29 CFR 1926.

1.2 SITE AND SCOPE

The intent of these specifications is to provide all work required and necessary to provide the building structure and its appurtenances for the South Field Extraction System.

The Subcontractor shall provide all labor, services, materials, and equipment, and shall do all work necessary to accomplish this within the limits of work as defined in the accepted bid and/or contract.

1.3 LISTS OF MATERIALS, MANUFACTURERS, OR EQUIPMENT SUPPLIERS

A. The listing of materials, equipment, manufacturers' names, or equipment suppliers in these specifications in no way precludes the offerer from proposing alternate materials, equipment, manufacturers' names,

or equipment suppliers of any of the items to be furnished within the scope of these specifications. These lists are intended to identify the types and general quality of those items that will be included in the offerer's proposal. It is the offerer's responsibility to propose the materials, manufacturers' names, or equipment that is best suited for this project in combined terms of quality and price.

1.4 SUBMITTALS - SHOP DRAWINGS, SAMPLES, AND OTHER DATA

A. Refer to Part 6, Statement of Work, in the Invitation for Bid for submittal requirements as listed on the Documentation Requirements Form. Any submittals not in conformance with these requirements will be returned without review for correction and resubmittal:

1. Submittals for unrelated items shall not be included in the same transmittal, and each separate submittal shall be coordinated and shall include all drawings and data required for the item or system covered.
2. Submittals shall indicate project name; identification by specification division, section, subsection, and article under which equipment or material is described; and by name, number, and intended use as designated by contract drawings and specifications. Each submittal, if required by the specification, shall contain certificates of conformance for all items, certifying that the materials and equipment specified meet contract requirements.
3. When more than one item of equipment is included on a single drawing or catalog cut, each project equipment item must be separately identified thereon, with clear delineation as to which model or catalog number, or performance data applies to each project item.
4. Assemble and submit, if required, in logically arranged folders, the following:
   a. All instruction bulletins, diagrams, lubrication schedules, operating instructions, parts lists, and pamphlets for equipment and apparatus furnished, including

vendor's or manufacturer's recommended procedure for lifting, handling, and installing equipment.

5. Submittals for equipment shall include manufacturer's catalog "cut sheets" or similar information bulletins indicating the model number or catalog number, ratings, size, weight, and performance curves and data. Indicate operating point on curves and tabular data for each piece of equipment that curves or data represent.
6. Submit wiring diagrams or connection diagrams for equipment items, accompanied by adequately defined symbols list. Schematic and wiring diagrams must be prepared in accordance with ANSI/IEEE Publication Y32E, "Electrical and Electronics Graphics Symbols and Reference Designations." Individual 8-1/2 by 11-inch elementary and wiring drawings are not acceptable.
7. Indicate all performance data, construction material finishes, and modifications to manufacturer's standard design specified.
8. Locate termination points for all required external wiring.
9. Indicate roughing-in, foundation, and support point dimensions.
10. Submit written test procedures for all required testing. Include criteria for acceptable performance. Submit test reports after completion of tests.
11. Submit Material Safety Data Sheets (MSDSs), if required, for all cutting oils, caulks, sealants, lubricants, paints, etc., and all other similar compounds.
12. The A/E Subcontractor's review of such submittals shall not relieve the Subcontractor from any responsibility for deviations from contract drawings or specifications, unless the Subcontractor has in writing called the A/E Subcontractor's attention to such deviations at the time of submission, nor shall it relieve the Subcontractor from responsibility for errors of any sort in the submittals nor from responsibility

for the proper fitting and construction of the work.

13. Submittals will be reviewed with respect to such factors as quality of draftsmanship, legibility, and evidence that the Subcontractor is aware of the necessity and importance of adequately detailing and illustrating special features and conditions relating to the work. Dimensions, sizes, construction details, and directive notes shown will be reviewed for accuracy, compliance with the specifications, adequacy, interferences, etc., on a spot check or incomplete basis to establish that the Subcontractor has given such factors careful attention.
14. Any changes marked on submittals during review will be for the purpose of indicating the requirements of the contract documents, and no change in the contract amount is authorized by such markings.
15. When submittals are found to be satisfactory with respect to the above factors and within the scope of the review outlined above, they will be returned by FERMCO to the Subcontractor bearing certificate attachment permitting the Subcontractor to employ them in the furtherance of the Subcontractor's work under the contract, but only with the express understanding that such permission shall not relieve the Subcontractor of the responsibilities for the full performance of the work required under the contract in conformance with the contract documents governing such performance, nor for any other deficiencies in the submittals such as inaccuracies, discrepancies, omissions, interferences in the work itself, or with the work of other contractors, whether or not such deficiencies were observed or noted in the course of the review of the shop drawings.
16. The Subcontractor shall verify all field dimensions required for shop drawings.

B. Submittal Requirements: Submittals required include drawings and/or data for all items listed below; refer to Attachment 1 of this specification section:

1. "AA" designates that shop drawings and pertinent performance data and curves are required.
2. "BB" designates that catalog data and pertinent performance data and curves are required.
3. "CC" designates that these items are to be included on a listing giving the manufacturer and a brief type description for each item. Such listing shall be submitted after notice to proceed, unless noted otherwise by FERMCO. Note that shop drawings or catalog data may also be required for items included on this list.
4. "DD" designates that samples of finishes are required with full range of color choices and/or patterns submitted.
5. "EE" designates that physical samples of materials are required.
6. "FF" designates that individual certifications for conformity to qualifications and standards specified are required. For equipment items, this indicates that certified equipment drawings are to be submitted.
7. "GG" designates that the technical specifications contain specific submittal requirements.
8. "HH" designates that engineering calculations are required.
9. "II" designates that spare parts list is required.
10. "JJ" designates that an installation, operation, and maintenance manual is required.
11. "KK" indicates that manufacturer's material safety data sheets are required.
12. "LL" indicates that test reports are required for tests noted in the technical specifications.
13. "MM" indicates that wiring diagrams for power, signal, and control wiring are required.
14. "NN" indicates that tests which are to be witnessed by the FERMCO Construction Manager or their representative are required.

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1.5 OPERATING MANUALS AND SPARE PARTS LISTS

A. Copies of a priced recommended spare parts list shall be submitted prior to the shipment of any item of equipment.

B. An Installation, Operation, and Maintenance (IOM) Manual shall be prepared so as to provide optimum operation and maintenance of the equipment and systems being furnished.

C. The cover of the IOM Manual shall include the following information:

1. Project Title -
2. WBS No. -
3. A/E Subcontractor - PARSONS.
4. Construction Manager - FERMCO.
5. Subcontractor (Name of Subcontractor, if any).

D. The IOM Manuals shall be bound into one or more volumes for ease of handling and shall have an index. The manual shall include descriptive literature, drawings, performance curves and rating data, test reports, and spare parts lists. The maintenance section shall divide maintenance procedures into two categories, "Preventive Maintenance" and "Corrective Maintenance," and a subsection for "Safety Precautions." Preventive maintenance shall include cleaning and adjustment instructions. Corrective Maintenance shall include instructions and data arranged in the normal sequence of corrective maintenance (i.e., troubleshooting) (logical effect to cause), then repair and replacement of parts, then the parts list. Safety Precautions shall comprise a list of safety precautions and instructions to be followed before, during, and after making repairs, adjustments, or routine maintenance.

E. Submit complete sets of final, approved manuals prior to the shipment of the equipment or system.

1.6 SPECIFICATION EXPLANATION

A. General: The technical specifications are of the abbreviated, simplified, or streamlined type and include incomplete sentences. Omissions of words or phrases such as "the contractor shall," "in conformity therewith," "shall be," "as noted on the drawings," "according to the plans," "a," "the," and "all" are intentional. Omitted words or phrases shall be supplied by inference in the same manner as they are when a "note" occurs on the drawings.

The Subcontractor shall provide all items, articles, materials, operations, or methods listed, mentioned, or scheduled either on the drawings, or specified herein, or both, including all labor, materials, equipment, and incidentals necessary and required for their completion and installation.

For convenience of reference and to facilitate the letting of contracts, the specifications may be separated into titled divisions. Such separations, however, shall not operate to make the engineer an arbitrator to establish the limits of subcontracts in any manner. The following defines the separations referred to in the specifications.

1. Division: Separate numbered division of specifications (e.g., Div. 16)
2. Section: Separate numbered section of a division (e.g., Sec. 16020)
3. Article: Separate numbered article of a subsection (e.g., Article 2.1)

B. Definitions: Certain terms and words as used throughout the specifications shall be defined as follows, unless otherwise particularly specified:

1. "Provide": Furnish and install, complete, in place.
2. "Indicated": As shown on the drawings and/or specified.

3. "Directed," "Authorized," "Permitted": Shall be as directed, authorized, or permitted by FERMCO.
4. "Selected": Shall be as selected by the A-E/Subcontractor or FERMCO.
5. "Satisfactory," "Acceptable": Satisfactory or acceptable to FERMCO.
6. "Necessary," "Required," "Suitable": As necessary, required, or suitable for the intended purpose as determined by FERMCO.
7. "Submit": Submit to FERMCO unless otherwise specified.

In all cases where the words "or equal" appear in these specifications, they shall be understood to mean "or approved equal."

1.7 ABBREVIATIONS FOR REFERENCED STANDARDS AND SPECIFICATIONS

A. The following list denotes abbreviations used in the technical portions of these specifications:

Abbreviation	Authority
AASHTO	American Association of State Highway and Transportation Officials.
ACI	American Concrete Institute
ADC	Air Diffusion Council
AGC	Associated General Contractors of America
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AMCA	Air Movement and Control Association
ANSI	American National Standards Institute

Abbreviation	Authority
APA	American Plywood Association
ARI	Air Conditioning and Refrigeration Institute
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating, Refrigerating, and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
AWS	American Welding Society
AWWA	American Water Works Association
CFR	Code of Federal Regulations
DHI	Door and Hardware Institute
FGMA	Flat Glass Marketing Association
FM	Factory Mutual System
GA	Gypsum Association
ICBO	International Conference of Building Officials
IEEE	Institute of Electrical and Electronics Engineers
IMIAC	International Masonry Industry All-Weather Council
MBMA	Metal Building Manufacturers Association
NAAMM	National Association of Architectural Metal Manufacturers
NCMA	National Concrete Masonry Association
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
NIST	National Institute of Science and Technology
NPCA	National Paint and Coatings Association
ODOT	Ohio Department of Transportation
PCA	Portland Cement Association
PCI	Prestressed Concrete Institute

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Abbreviation	Authority
PDCA	Painting and Decorating Contractors of America
PS	United States Department of Commerce, Voluntary Products Standards
SDI	Steel Deck Institute
SDI	Steel Door Institute
SIGMA	Sealed Insulating Glass Manufacturers Association
SJI	Steel Joist Institute
SMACNA	Sheet Metal and Air Conditioning Contractors National Association
SSPC	Steel Structures Painting Council
UL	Underwriters Laboratories, Inc.

1.8 WARRANTIES

A. Equipment shall be warranted to include parts and labor by the supplier.

B. Execute and assemble documents from subcontractors, suppliers, and manufacturers.

C. Refer to FERMCO's "General Terms and Conditions," in the Invitation for Bid.

END OF SECTION

PARSONS
ERA PROJECT

Attachment 1 to Section 01010 of Specifications
Submittal Listing
Division 2

Material/Equipment/Item/Description	Shop Dwgs AA	Cat/ Curves BB	List Only CC	Fin Smpl DD	Phys Smpl EE	Mat/Per Certif FF	Tech Specs GG	Eng'g Calcs HH	Parts List II	IOM Mnls JJ	M.S. D.S. KK	Test Rept LL	Wiring Diagram MM	Tests Witnessed NN
Section 02110 - Site Clearing														
Traffic Control Plan							X							
Waste Handling Plan							X							
Section 02200 - Earthwork														
Fill Material						X	X				X	X		
Compaction Test						X	X					X		X
As-Built Drawings							X							
Section 02270 - Slope Protection and Erosion Control														
Maintenance/Instruction							X							
Seed						X	X							
Product Data		X			X		X							
Section 02512 - Crushed Aggregate Paving														
Materials						X	X					X		
Compaction Test														X

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Attachment 1 to Section 01010 of Specifications
Submittal Listing
Division 2

Material/Equipment/Item/Description	Shop Dwgs AA	Cat/ Curves BB	List Only CC	Fin Smpl DD	Phys Smpl EE	Mat/Per Certif FF	Tech Specs GG	Eng'g Calcs HH	Parts List II	IOM Mnls JJ	M.S. D.S. KK	Test Rept LL	Wiring Diagram MM	Tests Witnessed NN
Section 02667 - Site Water Lines														
Pipe						X	X					X		
Fittings						X	X					X		
As-Built Drawings							X							
Hydrostatic Test														X
Section 02720 - Site Drainage														
Pipe						X	X							
Castings	X					X								
Manholes and Inlets						X	X							
As-Built Drawings							X							
Section 02831 - Chain Link Fences and Gates														
Fence	X					X	X							
As-Built Drawings							X							

PARSONS
ERA PROJECT

Attachment 1 to Section 01010 of Specifications
Submittal Listing
Division 3

Material/Equipment/Item/Description	Shop Dwgs AA	Cat/ Curves BB	List Only CC	Fin Smpl DD	Phys Smpl EE	Mat/Per Certif FF	Tech Specs GG	Eng'g Calcs HH	Parts List II	IOM Mnls JJ	M.S. D.S. KK	Test Rept LL	Wiring Diagram MM	Tests Witnessed Diagram NN
Section 03001 - Concrete														
Reinforcing Steel Shop Drawing Showing Placement Details	X													
Concrete Mix Design					X	X					X			
Concrete Supplier Name and Address of Concrete Supplier, Typical Batch Ticket and History			X											
Aggregate Sources and Sieve Analysis						X	X							
Compressive Strength												X		

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ERA PROJECT

Attachment 1 to Section 01010 of Specifications
Submittal Listing
Division 5

Material/Equipment/Item/Description	Shop Dwgs AA	Cat/ Curves BB	List Only CC	Fin Smpl DD	Phys Smpl EE	Mat/Per Certif FF	Tech Specs GG	Eng'g Calcs HH	Parts List II	IOM Mnls JJ	M.S. D.S. KK	Test Rept LL	Wiring Diagram MM	Tests Witnessed NN
Section 05120 - Structural Steel														
Structural Steel Shop Drawings	X						X							
Welder's Certificates						X								
Manufacturer's Mill Certificates						X								
Mill Test Reports						X								

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ERA PROJECT

Attachment 1 to Section 01010 of Specifications
Submittal Listing
Division 7

Material/Equipment/Item/Description	Shop Dwgs AA	Cat/ Curves BB	List Only CC	Fin Smpl DD	Phys Smpl EE	Mat/Per Certif FF	Tech Specs GG	Eng'g Calcs HH	Parts List II	IOM Mnls JJ	M.S. D.S. KK	Test Rept LL	Wiring Diagram MM	Tests Witnessed NN
Section 07900 - Joint Sealers		X				X	X				X			
Section 07466 - Preformed Metal Sides and Roofing	X			X		X	X							

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PARSONS
ERA PROJECT

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Attachment 1 to Section 01010 of Specifications
Submittal Listing
Division 8

Material/Equipment/Item/Description	Shop Dwgs AA	Cat/ Curves BB	List Only CC	Fin Smpl DD	Phys Smpl EE	Mat/Per Certif FF	Tech Specs GG	Eng'g Calcs HH	Parts List II	IOM Mnls JJ	M.S. D.S. KK	Test Rept LL	Wiring Diagram MM	Tests Witnessed NN
Section 08110 - Standard Steel Doors and Frames	X	X				X	X							
Section 08710 - Door Hardware	X	X				X	X		X	X				

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ERA PROJECT

Attachment 1 to Section 01010 of Specifications
Submittal Listing
Division 9

Material/Equipment/Item/Description	Shop Dwgs AA	Cat/ Curves BB	List Only CC	Fin Smpl DD	Phys Smpl EE	Mat/Per Certif FF	Tech Specs GG	Eng'g Calcs HH	Parts List II	IOM Mnls JJ	M.S. D.S. KK	Test Rept LL	Wiring Diagram MM	Tests Witnessed NN
Section 09900 - Painting		X		X			X				X			

PARSONS
ERA PROJECT

Attachment 1 to Section 01010 of Specifications
Submittal Listing
Division 10

Material/Equipment/Item/Description	Shop Dwgs AA	Cat/ Curves BB	List Only CC	Fin Smpl DD	Phys Smpl EE	Mat/Per Certif FF	Tech Specs GG	Eng'g Calcs HH	Parts List II	IOM Mnls JJ	M.S. D.S. KK	Test Rept LL	Wiring Diagram MM	Tests Witnessed NN
Section 10211 - Metal Louvers	X	X				X	X			X				

PARSONS
ERA PROJECT

Attachment 1 to Section 01010 of Specifications
Submittal Listing
Division 13

Material/Equipment/Item/Description	Shop Dwgs AA	Cat/ Curves BB	List Only CC	Fin Smpl DD	Phys Smpl EE	Mat/Per Certif FF	Tech Specs GG	Eng'g Calcs HH	Parts List II	IOM Mnls JJ	M.S. D.S. KK	Test Rept LL	Wiring Diagram MM	Tests Witnessed NN
Section 13123 - Pre-Engineered Buildings	X			X		X	X	X		X				
Section 13400 - Instruments and Controls	X	X				X	X			X		X	X	
Section 13401 - Process Control System	X	X			X	X			X	X			X	

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Attachment 1 to Section 01010 of Specifications
Submittal Listing
Division 15

Material/Equipment/Item/Description	Shop Dwgs AA	Cat/ Curves BB	List Only CC	Fin Smpl DD	Phys Smpl EE	Mat/Per Certif FF	Tech Specs GG	Eng'g Calcs HH	Parts List II	IOM Mnls JJ	M.S. D.S. KK	Test Rept LL	Wiring Diagram MM	Tests Witnessed NN
Section 15500 - Heating, Ventilation & Air Conditioning														
Propeller Fan	X	X				X	X		X			X	X	
Eletric Unit Heater	X	X				X	X		X			X	X	
Section 15060 - Pipe, Fittings, Valves and Acessories	X	X				X	X			X		X		X
Section 15090 - Piping Supports and Anchors	X	X				X	X							
Section 15160 - Pumps	X	X				X	X		X	X				X
Section 15170 - Motors	X	X				X	X		X	X		X	X	
Section 15250 - Insulation		X				X				X				

PARSONS
ERA PROJECT

Attachment 1 to Section 01010 of Specifications
Submittal Listing
Division 16

Material/Equipment/Item/Description	Shop Dwgs AA	Cat/ Curves BB	List Only CC	Fin Smpl DD	Phys Smpl EE	Mat/Per Certif FF	Tech Specs GG	Eng'g Calcs HH	Parts List II	IOM Mnls JJ	M.S. D.S. KK	Test Rept LL	Wiring Diagram MM	Tests Witnessed NN
Section 16050 - Basic Electrical Materials and Methods														
Motor Starters	X	X				X							X	
Selector Switches		X				X							X	
Receptacles		X				X								
Wall Switches		X				X								
Conduit		X				X								
Wire and Cable		X				X						X		
Instrument Cable		X				X						X		
Nameplates		X				X								
Wire marker		X				X								
Wireway		X				X								
Splicing and Termination Components		X				X								
Boxes		X				X								
Cabinets	X	X				X								
Supporting Devices		X				X								
Motor Test														X

0000031

PARSONS
ERA PROJECT

0000250000

Attachment 1 to Section 01010 of Specifications
Submittal Listing
Division 16

Material/Equipment/Item/Description	Shop Dwgs AA	Cat/ Curves BB	List Only CC	Fin Smpl DD	Phys Smpl EE	Mat/Per Certif FF	Tech Specs GG	Eng'g Calcs HH	Parts List II	IOM Mnls JJ	M.S. D.S. KK	Test Rept LL	Wiring Diagram MM	Tests Witnessed NN
Section 16118 - Underground Ductbanks and Ducts														
Conduit and Fittings		X				X								X
Ductbank														X
Section 16121 - Medium Voltage Cable														
Medium Voltage Cable		X				X					X	X		
Cable Terminations		X				X					X	X		
Section 16129 - Fiber Optic Cable and Accessories														
Fiber Optic Cable and Accessories		X				X			X	X	X	X	X	
Section 16170 - Grounding and Bonding														
Grounding Electrodes		X				X					X	X		
Grounding Conductors		X				X					X	X		
Grounding Test Well		X				X					X	X		
Section 16311 - Primary Switchgear														
15 KV Switchgear	X	X				X			X	X	X	X	X	X

PARSONS
ERA PROJECT

Attachment 1 to Section 01010 of Specifications
Submittal Listing
Division 16

Material/Equipment/Item/Description	Shop Dwgs AA	Cat/ Curves BB	List Only CC	Fin Smpl DD	Phys Smpl EE	Mat/Per Certif FF	Tech Specs GG	Eng'g Calcs HH	Parts List II	IOM Mnls JJ	M.S. D.S. KK	Test Rept LL	Wiring Diagram MM	Tests Witnessed NN
Section 16370 - Overhead Power Distribution														
Pole Hardware and Conductors	X	X				X					X			
Pole Mounted Transformers	X	X				X				X	X	X	X	
Section 16462 - Dry Type Transformer/ Panelboards														
Combination Transformer/ Panelboards	X	X				X				X		X	X	
Section 16483 - Variable Frequency Drive														
Variable Frequency Drive	X	X				X	X		X	X		X	X	

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PARSONS
ERA PROJECT

Attachment 1 to Section 01010 of Specifications
Submittal Listing
Division 16

0000334

Material/Equipment/Item/Description	Shop Dwgs AA	Cat/ Curves BB	List Only CC	Fin Smpl DD	Phys Smpl EE	Mat/Per Certif FF	Tech Specs GG	Eng'g Calcs HH	Parts List II	IOM Mnls JJ	M.S. D.S. KK	Test Rept LL	Wiring Diagram MM	Tests Witnessed NN
Section 16500 - Lighting														
Luminaires, Lampholders*		X				X								X
Ballasts		X				X								
Lamps		X				X								
Exit Signs		X				X								
Emergency Lighting Units		X				X								
Section 16855 - Heating Cables														
Heating Cables and Accessories		X				X							X	X

*Also photogrammetric and beam spread plots.

SECTION 01011
SCHEDULE OF DRAWINGS

1.1 DRAWINGS

A. The following drawings are hereby made a part of this contract:

	Drawing Number	Drawing Title
1)	95X-5900-X-00202	Project Title Sheet
2)	95X-5900-X-00203	Drawing Index
3)	95X-5900-X-00204	Legend and Symbols
4)	95X-5900-A-00224	Architectural - Plan and Elevations - Well House Nos. 15, 16, 17, 18, 19, 20, and 21
5)	95X-5900-A-00225	Architectural - Sections and Details - Well House Nos. 15, 16, 17, 18, 19, 20, and 21
6)	95X-5900-A-00226	Architectural - Plans - Well House Nos. 13 and 14
7)	95X-5900-A-00227	Architectural - Elevations - Well House Nos. 13 and 14
8)	95X-5900-A-00228	Architectural - Plan - Valve House
9)	95X-5900-A-00229	Architectural - Elevations - Valve House
10)	95X-5900-A-00230	Architectural - Sections and Details - Valve House
11)	95X-5900-A-00231	Architectural - Sections and Details - Well House Nos. 13 and 14 and Switchgear Slab
12)	95X-5900-E-00235	Electrical - Single Line Diagram
13)	95X-5900-E-00238	Electrical - Elementary and Interconnection Diagram
14)	95X-5900-E-00239	Electrical - Panel Schedules
15)	95X-5900-E-00240	Electrical - Sections and Details - 15 kV Switchgear and Details
16)	95X-5900-E-00241	Electrical - Section and Details - Pole Details, Sheet 1
17)	95X-5900-E-00242	Electrical - Cable Schedule, Sheet 1
18)	95X-5900-E-00243	Electrical - Conduit Schedule
19)	95X-5900-E-00244	Electrical - 13.2 kV Distribution and Communications Plan

	Drawing Number	Drawing Title
20)	95X-5900-E-00245	Electrical - Well House and Valve House Power and 120 V Distribution Plans
21)	95X-5900-E-00246	Electrical - Sections and Details - Pole Details, Sheet 2
22)	95X-5900-E-00248	Electrical - Symbols and Legend - Sheet 1
23)	95X-5900-E-00249	Electrical - Symbols and Legend - Sheet 2
24)	95X-5900-E-00270	Electrical - Cable Schedule - Sheet 2
25)	95X-5900-E-00276	Electrical - Sections and Details - Pole and Miscellaneous Details, Sheet 3
26)	95X-5900-E-00277	Electrical - Sections and Details - Miscellaneous Details, Sheet 4
27)	95X-5900-G-00219	Civil - Details Sheet 1 of 3
28)	95X-5900-G-00220	Civil - Details Sheet 2 of 3
29)	95X-5900-G-00221	Civil - Details Sheet 3 of 3
30)	95X-5900-G-00251	Civil - Grading/Site/Utility Plan - Sheet 1 of 5
31)	95X-5900-G-00252	Civil - Grading/Site/Utility Plan - Sheet 2 of 5
32)	95X-5900-G-00253	Civil - Grading/Site/Utility Plan - Sheet 3 of 5
33)	95X-5900-G-00254	Civil - Grading/Site/Utility Plan - Sheet 4 of 5
34)	95X-5900-G-00260	Civil - Road 18 Profile - Sheet 1 of 3
35)	95X-5900-G-00261	Civil - Road 19 and Road 20 Profiles - Sheet 2 of 3
36)	95X-5900-G-00262	Civil - Road 16 and Road 17 Profiles - Sheet 3 of 3
37)	95X-5900-G-00265	Civil - Enlarged Grading/Site/ Utility Plans
38)	95X-5900-G-00266	Civil - Index Map and Overall Site Plan
39)	95X-5900-G-00269	Civil - Grading/Site/Utility Plan - Sheet 5 of 5
40)	95X-5900-N-00189	P&ID - Symbols and Legends
41)	95X-5900-N-00190	P&ID - Sheet 1 of 2
42)	95X-5900-N-00191	P&ID - Sheet 2 of 2

	Drawing Number	Drawing Title
43)	95X-5900-N-00271	Instrumentation Interconnection Diagram - Well House DCS RTV
44)	95X-5900-N-00272	Instrumentation Interconnection Diagram - Valve House DCS RTV
45)	95X-5900-N-00273	Instrumentation - Control System Architecture
46)	95X-5900-P-00207	Piping/Plant Design - Well House Piping Plan
47)	95X-5900-P-00208	Piping/Plant Design - Well House Piping Section
48)	95X-5900-P-00223	Piping/Plant Design - Piping Plan - South Field Valve House
49)	95X-5900-P-00233	Piping/Plant Design - Piping Section - South Field Valve House
50)	95X-5900-P-00250	Piping Plant Design - Pipe Support Details
51)	95X-5900-P-00255	Civil - Pipe Profile - Sheet 1 of 4
52)	95X-5900-P-00256	Civil - Pipe Profile - Sheet 2 of 4
53)	95X-5900-P-00257	Civil - Pipe Profiles - Sheet 3 of 4
54)	95X-5900-P-00258	Civil - Pipe Profiles - Sheet 4 of 4

END OF SECTION

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U.S DEPARTMENT OF ENERGY

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

FERMCO Subcontract No. 2-21487

SOUTH FIELD EXTRACTION SYSTEM

Division 02 - Site Work

PARSONS

Prepared by: Steve Nolan for Ed Kabrick 9/15/95
Date

Checked by: for Ken Conrad 9/15/95
Date

Date: 09/15/95 02000 WBS No.: 1.1.1.1.5.3.1
Rev.: 0 RE: TH 1 of 1 ERA/CRU No.: 5/PO-126

SECTION 02110
SITE CLEARING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Remove surface debris.

B. Remove paving.

C. Clear site of plant life and grass, where it affects construction only.

D. Remove fencing as shown on construction drawings.

E. Topsoil excavation.

F. Traffic control.

G. Control of fugitive emissions.

1.2 RELATED SECTIONS

A. Section 01010 - General Requirements.

B. Section 02200 - Earthwork.

C. Section 02270 - Slope Protection and Erosion Control.

D. Section 02831 - Chain Link Fences and Gates.

1.3 REFERENCE DRAWINGS

A. See Section 01011 for the Schedule of Drawings.

1.4 QUALITY ASSURANCE

A. Erosion and sedimentation control shall comply with requirements of Section 02270 of this specification package.

1.5 SUBMITTALS

A. Prior to the placement of debris into containers, the Subcontractor shall submit a detailed waste handling plan in accordance with the Subcontract, Part 6, Scope of Work, for approval by the Construction Manager and FERMCO Quality Assurance.

B. Submit Traffic Control Plan and details on the type of barricade to be used.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Chemical additives for the control of fugitive emissions shall be handled and stored according to the manufacturer's recommendations.

1.7 SEQUENCING AND SCHEDULING

A. Coordination
   1. Coordinate clearing work with the Construction Manager.
   2. Sequence clearing work with erosion control measures stated in Section 02270 of this specification package.

PART 2 PRODUCTS

2.1 MATERIALS

A. Fugitive emission control materials shall be nonhazardous. Water shall be potable.

2.2 EQUIPMENT

A. Access control barricades are to be portable so they can be moved daily to allow through traffic during non-work periods. They should be marked with 4-inch to 8-inch-wide reflective orange and white diagonal strips.

PART 3 EXECUTION

3.1 PREPARATION

A. Verify that existing utilities and features designated to remain are staked, flagged, and identified.

B. Install perimeter sediment control measures according to Section 02270 prior to any clearing or earthmoving operations.

3.2 ERECTION/INSTALLATION/APPLICATION

A. Clearing:
1. Clear and grub areas along new groundwater lines, valve chambers, well houses, new roads, and areas accessing the site. Coordinate clearing limits with the Construction Manager.
2. Remove paving and gravel according to the construction drawings.
3. During site clearing and earth-moving operations, fugitive emissions, principally dust, shall be controlled using water misting techniques. All resulting runoff water shall be contained and collected. Disposition of the collected runoff will be at the discretion of the Construction Manager.

B. Removal:
1. Remove debris, rock, and extracted plant life.
2. Remove existing fencing and replace where shown on the drawings.

C. Topsoil Excavation:
1. Excavate topsoil from areas to be graded.
2. Stockpile in area designated on site to a height not exceeding 8 feet. Protect from erosion. Remove excess topsoil not re-used from the stockpile to a site designated by the Construction Manager.

3.3 PROTECTION

A. Locate, identify, and protect from damage all utilities that remain.

B. Protect trees, plant growth, and features designated to remain as final landscaping.

C. Protect survey benchmarks, monitoring wells, and existing structures from damage or displacement.

D. Maintain existing roadways at the construction site, including dust control.

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.

1.2 RELATED SECTIONS

A. Section 01010 - General Requirements.

B. Section 02110 - Site Clearing.

C. Section 02270 - Slope Protection and Erosion Control.

D. Section 02512 - Crushed Aggregate Paving.

E. Section 02667 - Site Water Lines.

F. Section 02720 - Site Drainage.

G. Section 02831 - Chain Link Fences and Gates.

H. Section 03001 - Concrete.

I. Section 16118 - Underground Ductbanks and Ducts.

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/[600 kn-m/m]).
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.

C. Occupational Safety and Health Administration (OSHA):

1.	29 CFR 1926	Subpart P - Excavations.

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1.5 SUBMITTALS

A. Materials Source: Submit name of imported materials suppliers. Change of source requires the Construction Manager's approval.

B. Material suppliers shall be required to certify that supplied materials meet specifications prior to use.

C. Accurately record actual locations of utilities (i.e., buried pipe, conduit, or cable) remaining, by horizontal dimensions, elevations or inverts, and slope gradients. Submit information on as-built drawings.

D. Submit name and address of soil testing laboratory for approval. Provide Construction Manager with copies of all lab and field soil tests and visual inspections of compaction performed by soil testing laboratory within 1 week from date of test.

1.6 QUALITY ASSURANCE

A. Unless noted otherwise, all work shall be done in accordance with ODOT specifications.

B. The Subcontractor shall arrange and pay for the services of a qualified, independent soil testing laboratory.

C. If tests indicate that the materials do not meet specified requirements, change the material and retest at no cost to FERMCO.

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, SC.

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.

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 - Aggregate Base.

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	9-33
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:

0000-C

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

PART 3 EXECUTION

3.1 PREPARATION

A. The Subcontractor is responsible for all earthwork layout.
   1. The Construction Manager will provide 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. Verify that survey benchmark and intended elevations for the work are as indicated.

C. Identify and flag known utility locations which exist in the construction area.

D. Maintain and protect existing utilities to remain.

E. The Subcontractor shall notify the Construction Manager when the actual conditions differ in any manner from that specified in the contract documents or when soft or spongy areas or other unusual soil conditions are encountered. Discontinue affected work until notified by the Construction Manager to resume work.

F. No backfill shall be placed around or upon any structure/foundation until it is shown that the concrete has attained satisfactory strength in accordance with Section 03001 of this specification package and that the structure as a whole is ready to receive backfill. The compressive strength of the

concrete shall also be determined in accordance with Section 03001.

G. Install erosion and sediment control measures in accordance with Section 02270 of this specification package.

3.2 ERECTION/INSTALLATION/APPLICATION

A. Excavation:

1. Excavate subsoil required to accommodate foundations, slabs on grade, paving, site structures, and construction operations.
2. Slope banks to angle of repose or less, unless shored.
3. Correct unauthorized excavation at no extra cost to FERMCO.
4. Hand-trim excavation for structural footings. Remove loose material.
5. Do not interfere with 45-degree bearing splay of foundations.
6. Stockpile excess soil in the area designated on the contract drawings or as directed by the Construction Manager.
7. Perform grading and other operations to maintain site drainage. No water shall be permitted to accumulate in excavations under structures, paving areas, or equipment pads. Control water by means of ditches, dams, temporary pumps and piping, plastic coverings, tarps, or other methods acceptable to the Construction Manager. See Section 02720 for permanent storm drains.
8. 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 G. At the Subcontractor's option, a lean concrete (2,500 psi at 28 days) may be installed.
9. Remove debris, lumped subsoil, boulders, and rock up to 1/3 cubic yard.

B. Topsoil Excavation:
   1. Excavate topsoil and stockpile clean topsoil in the area designated on the contract drawings.

C. Trenching:
   1. Cut trenches sufficiently wide to enable installation of utilities.
   2. Excavation is to be free of loose matter.
   3. Backfill trenches to required contours and elevations.
   4. Install trace wire as indicated in Section 02667.
   5. Trenching shall conform to OSHA requirements.

D. Rough Grading:
   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 S1 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 in an area of backfill are observed, excavate unsatisfactory material to satisfactory subgrade as approved by the Construction Manager.
      b. Backfill with fill material required for specific area. Compact to density required for the area.
   5. Place and compact fill materials in continuous level layers not exceeding 8 inches loose depth.
   6. Maintain optimum moisture content as determined by ASTM D698 (within 3 percent) of backfill materials to attain required compaction density.
   7. Backfill against foundations and pads as specified in Article 3.3, Paragraph G.

8. Slope grade away from foundations and pads a minimum 1/4 inch per foot, unless noted otherwise.
9. Backfill simultaneously on each side of unsupported foundation walls.

E. Fill over Underground Utilities in trenches:
1. Fill Type S1 or S2, above bedding. Layer thickness shall not exceed 6 inches loose depth.
2. Pipe bedding shall be Type A3 material compacted in layers not exceeding 6 inches loose depth.
3. Each layer of pipe bedding and trench backfill shall be compacted by 5 passes of compaction equipment. Each pass shall overlap each preceding pass by at least 2 inches. Compaction equipment shall be vibratory and impart at least 2,000 foot-pounds of impact energy with a frequency of 500 bpm, which is similar to a medium size excavator mounted tamping plate/ram.
4. Do not use wet soil materials. Maintain moisture of backfill materials to within 3 percent of optimum moisture as determined by ASTM D698. Do not place backfill on material that is wet.

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 of compacted topsoil on all such areas prior to final acceptance of the project by the Construction Manager.
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. Stockpile materials on site at a location designated by the Construction Manager.

2. Separate differing materials with dividers or stockpile apart to prevent mixing.
3. Direct surface water away from stockpile site to prevent erosion or deterioration of materials. Prevent silt migration at the stockpile perimeter.
4. 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 in accordance with Section 02110.

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

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.

K. The Subcontractor may use lean concrete, minimum compressive strength of 2,500 psi, to correct over-excavation.

L. Debris and waste shall be handled as specified in Section 02110.

3.3 FIELD QUALITY ASSURANCE

A. Compaction testing will be performed in accordance with ASTM D698, ASTM D1556, ASTM D2922, and ASTM D3017. Trenches will be compacted by method only.

B. Grain size analysis shall be performed in accordance with ASTM D422.

C. If compaction tests indicate that work does not meet specified requirements, remove work and replace at no

additional charge to FERMCO. If visual inspection indicates that work has not been performed as specified, repeat procedure at no additional charge to FERMCO.

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, or footer.
   e. Once at each spread footing subgrade and at 50-foot centers on strip footing subgrade.
   f. Under each foundation at subgrade.
   g. Once every 200 feet of trench.
   h. Continuous visual inspection will be necessary for compaction of trenches.

E. The Subcontractor shall notify the Construction Manager of activities that will require testing/ inspection, at least 24 hours prior to the start of such activities.

F. Minimum Compaction Requirements:

Location	Required Compaction
Under foundation	100 percent Standard Proctor
Under Slabs Fill Type A2	95 percent Standard Proctor
Trenches	By Method (See Article 3.2)
Under all pavements Subsoil Fill Type A2	 95 percent Standard Proctor 100 percent Standard Proctor
All other fill (roads & grading)) (Fill Type S1 or S2)	95 percent Standard Proctor
Topsoil	90 percent Standard Proctor

Standard Proctor - ASTM D698.

3.4 ADJUSTING

A. Grading and Filling: Plus or minus 1 inch of indicated finish subgrade at structures. Other areas graded to drain at plus or minus 3 inches.

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

3.5 CLEANING

A. Remove soil stockpiles, leaving 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 re-compact 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 02270.

END OF SECTION

SECTION 02270
SLOPE PROTECTION AND EROSION CONTROL

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Maintenance of erosion control measures already in place within the Subcontractor's work area.

B. 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.

C. Maintenance and removal of temporary erosion control facilities.

D. Maintenance of seeded areas until final acceptance of contract work.

E. Seed and mulch to stabilize disturbed areas.

F. Dumped rock for storm drain lines.

1.2 RELATED SECTIONS

A. Section 01010 - General Requirements.

B. Section 02110 - Site Clearing.

C. Section 02200 - Earthwork.

D. Section 02720 - Site Drainage.

1.3 REFERENCE DRAWINGS

A. See Section 01011 for the Schedule of Drawings.

1.4 REFERENCES

A. State of Ohio, Department of Transportation (ODOT), Construction and Material Specifications, January 1, 1995.

1. 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.

B. American Society of Testing and Materials (ASTM):

1.	ASTM D977-91	Standard Specification for Emulsified Asphalt.
2.	ASTM D1777-64	Standard Test Method for Measuring Thickness of Textile Materials (R 1975).
3.	ASTM D3776-85	Standard Test Method for Mass per Unit Area (Weight) of Woven Fabric (R 1990).
4.	ASTM D3786-87	Standard Test Method for Hydraulic Bursting Strength of Knitted Goods and Nonwoven Fabrics - Diaphragm Bursting Strength Tester Method.
5.	ASTM D4491-92	Standard Test Method for Water Permeability of Geotextiles by Permissivity.
6.	ASTM D4533-91	Standard Test Method for Trapezoid Tearing Strength of Geotextiles.
7.	ASTM D4632-91	Standard Test Method for Grab Breaking Load and Elongation of Textiles.
8.	ASTM D4751-93	Standard Test Method for Determining Apparent Opening Size of a Geotextile.
9.	ASTM D4833-88	Standard Test Method for Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products.

1.5 SYSTEM DESCRIPTION

A. Subcontractor shall have full responsibility for construction, maintenance, and removal of temporary erosion control measures.

B. Items to be protected from sedimentation deposits shall include (but shall not be limited to) all downstream property, natural waterways, streams, lakes, ponds, catch basins, drainage ditches, roads, gutters, and natural buffer zones.

1.6 SUBMITTALS

A. 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.

B. 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.

C. Product Data:
1. Filter fabric catalog data and sample.
2. Mulch for seeding.

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 percentages of each seed variety.
2. Year of production, percentage of purity, and minimum germination rate. 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. Mowing: Prior to acceptance, the Subcontractor shall be responsible for mowing all grass to a height of 3 inches when the grass has reached a height of 5 inches. Seeded areas shall be cut at least three times, none of which shall be closer than 10 days apart.
2. Apply plant nutrients as required in recommendations of agricultural authority such as the Soil Conservation Service, landscape architect, etc.
3. Water to prevent grass and soil from drying out.
4. Immediately re-seed areas which show bare spots. Fill in washed out areas with topsoil and reseed.

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.
2. All erosion control measures (i.e., straw bales, gravel ditch checks) shall be inspected after each rainfall event. Bales and gravel ditch checks shall be replaced or repaired as required to maintain integrity of control device.

PART 2 PRODUCTS

2.1 MATERIALS

A. Seed

1. Seed Mixture: Permanent seeding
   a. 40 percent Kentucky Bluegrass (POA Pratensis).
   b. 40 percent Kentucky Fescue (Festuca Rubra).

c. 20 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 Materials

1. Topsoil: As specified in Section 02200.

C. 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 and at least 40 percent passing a No. 100 sieve, and at least 95 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 the Construction Manager. Other grades of agricultural liming materials may be used. Apply substitute material at rates which are dependent on the TNP and fineness of the sample.

D. 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 ratio, 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 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 - Item 667.02 or 668.02.
2. Matting shall be of a uniform open plain weave of undyed and unbleached single jute yarn. The yarn shall be of loosely twisted construction and shall not vary in thickness by more than 1/2 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 pound 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 similar to Trevira No. 1125™ as per the following table:

Minimum Physical Properties (Minimum Average Roll Values)			
Property	**Test Method**	**Units**	**Material**
Unit weight	ASTM D-3776	oz/yd^2	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
Permissivity	ASTM D-4491	$gal/min/ft^2/sec^{-1}$	110 1.47
Permeability	ASTM D-4491	cm/sec	.35
Thickness	ASTM D-1777	mils	95

PART 3 EXECUTION

3.1 EXAMINATION

A. Construct protective devices as specified herein and as required on the construction drawings.

3.2 PREPARATION

A. 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.

B. Remove debris, weeds, and undesirable plants and their roots. Remove contaminated subsoil.

C. Scarify subsoil to a depth of 3 inches where topsoil is to be placed.

D. Repeat cultivation in areas where equipment used for hauling and spreading of topsoil has compacted subsoil.

3.3 ERECTION/INSTALLATION/APPLICATION

A. Placing Topsoil:
1. Spread topsoil to a depth of 4 inches (±1 inch) over areas to be seeded. Rake until smooth.
2. Place topsoil on unsaturated, unfrozen subgrade.
3. Remove vegetable 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.

B. Application of Soil Conditioners:
1. Apply lime conditioners at the rate specified in Article 2.1, Paragraph C, Subparagraph 1.b, or as determined by soil test.
2. Mix thoroughly into the top 2 inches of the topsoil.

C. Application of Plant Nutrients:
1. Apply fertilizer at the rate specified in Article 2.1, Paragraph D, 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.

D. Seeding:
1. 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.
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.

E. Straw Bales and Gravel Erosion Control:
1. Install straw bales and gravel erosion controls in accordance with drawings.

3.4 FIELD QUALITY ASSURANCE

A. Subcontractor shall notify Construction Manager at least 24 hours prior to date of anticipated inspection.
1. To qualify for acceptance, an area shall have a good, clean stand of perennial grass.
2. Coverage shall be at least 95 percent of the area, and no bare spots shall exceed 3 square feet.
3. Areas which fail to meet requirements of the specifications shall be repaired or re-seeded as necessary to produce an acceptable stand of grass.

3.5 CLEANING

A. Erosion control facilities shall be removed at the direction of the Construction Manager.

3.6 PROTECTION

A. 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. Size to prevent overflowing.
2. Utilize hay bale check dams to filter out the suspended matter, as required.
3. Filter fabric shall be placed under all riprap.

B. Erosion Control Barriers: Conform to requirements on the construction drawings.

C. Seed Protection:

1. Apply protection as necessary to retain soil and plant material.
2. Cover seeded slope area with mulch. Cover ditch lines with matting.
3. Where slope exceeds ratio of 3 horizontal to 1 vertical, secure mulch with matting or emulsified asphalt.
4. Mulch:
   a. Mulch seeded area with straw mulch. Spread mulch at a rate 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, 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.

D. Dumped rock will be used to protect storm drain outfalls and ditch lines as indicated on drawings. Dumped rock shall conform to ODOT Type D dumped rock fill.

END OF SECTION

SECTION 02512
CRUSHED AGGREGATE PAVING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Crushed aggregate paving course, compacted, for the service roads.

B. Preparation of subgrade.

1.2 RELATED SECTIONS

A. Section 01010 - General Requirements.

B. Section 02200 - Earthwork.

1.3 REFERENCE DRAWINGS

A. See Section 01011 for the Schedule of Drawings.

1.4 REFERENCES

A. State of Ohio, Department of Transportation, Construction and Material Specifications, January 1, 1995 (ODOT). 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.

1.5 SUBMITTALS

A. Subcontractor shall submit written certification from material suppliers that supplied materials meet the specifications.

B. Subcontractor shall submit the name and address of the testing laboratory for approval by the Construction Manager.

C. Provide Construction Manager with copies of all test reports within 1 week of test results.

1.6 QUALITY ASSURANCE

A. Environmental Requirements

1. Do not place aggregate when base surface temperature is less than 40 degrees F, nor when air temperature is below 45 degrees F. Do not place aggregate when surface is wet or frozen. Do not place aggregate when weather conditions are unfavorable otherwise.

B. The Subcontractor shall arrange and pay for the services of a qualified, independent soil testing laboratory.

C. If tests indicate that the materials or their placement do not meet specified requirements, the Subcontractor shall correct and retest at no cost to FERMCO.

PART 2 PRODUCTS

2.1 MATERIALS

A. Crushed Aggregate Base: Material shall meet the requirements of ODOT Item 304 - Aggregate Base.

1. Materials shall be crushed carbonate stone, crushed gravel, crushed air-cooled slag, granulated slag, a mixture of crushed and granulated slags, or other types of suitable materials meeting the requirements of this item. Crushed carbonate stone, crushed gravel, crushed air-cooled slag, or mixtures of crushed and granulated slags shall meet the following gradation requirements and physical requirements:

Sieve	Total Percent Passing
2-inch	100
1 inch	70-100
3/4 inch	50-90
No. 4	30-60
No. 30	9-33
No. 200	0-13

2. Physical Properties

a) Percentage of wear, Los Angeles test, maximum (stone or gravel) 50

b) Unit weight, compacted, pounds minimum (slag) 65

c) Loss, sodium sulfate soundness test, percent maximum 15

d) Percentage of fractured pieces, minimum 90

e) Deleterious substances shall not exceed the following:
Shale, shaly material, and chert which disintegrates in five cycles of soundness test percent by weight 5

3. The portion of aggregate passing the No. 4 sieve shall have a maximum liquid limit of 25 percent and a maximum plasticity index of 6.

B. Filter fabric shall conform to ODOT Item 712.09, Type D.

PART 3 EXECUTION

3.1 ERECTION/INSTALLATION/APPLICATION

A. Subbase

1. Proofroll the subgrade in accordance with ODOT Item 203.14 - Proof Rolling.

2. The designated areas of subgrade shall be compacted as specified in Section 02200 of this specification package prior to the placing of the overlying course. The subgrade shall then be rolled with one or more coverages of the heavy pneumatic tire roller. One coverage shall be considered to represent two trips of the roller, each trip will be offset from the other by the width of one tire, to obtain complete area coverage. Final subbase shall be relatively smooth surface free of obstructions and debris.

B. Placing Stone Base

1. Filter fabric shall be placed prior to stone with the long dimension parallel to the center of the road and shall be laid loosely but without wrinkles and creases. There shall be a 12-inch

overlap of joints. Use securing pins at 2-foot intervals along joints to prevent slippage.

2. Placing, grading, and compacting shall conform to requirements of ODOT Item 304 - Aggregate Base.

3. Crushed aggregate paving shall be provided to a total compacted thickness of not less than that shown on the construction drawings.

3.2 FIELD QUALITY ASSURANCE

A. Compaction test of the aggregate shall be performed as specified in ODOT Item 304.04.

B. The Subcontractor shall notify the Construction Manager of activities that will require testing/inspection at least 24 hours prior to such activities.

END OF SECTION

SECTION 02667
SITE WATER LINES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Pipe and fittings for groundwater discharge and treatment underground lines.

B. Valves and tap connections.

C. Air-relief manholes, frames, and lid.

D. Clean-outs, covers, and frames.

1.2 RELATED SECTIONS

A. Section 01010 - General Requirements.

B. Section 02200 - Earthwork.

C. Section 03001 - Concrete.

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 D3035-93 Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter.
2. ASTM D3261-93 Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing.
3. ASTM D3350-93 Standard Specification for Polyethylene Plastic Pipe and Fittings Material.

B. American Water Works Association (AWWA):

1.	AWWA C104/ A21.4-90	Cement-Mortar Lining for Ductile Iron Pipe and Fittings for Water.
2.	AWWA C105/ A21.5-93	Polyethylene Encasement for Ductile-Iron Pipe Systems.
3.	AWWA C110/ A21.10-93	Ductile-Iron and Gray-Iron Fittings, 3-Inch through 48-Inch, for Water and Other Liquids.
4.	AWWA C111/ A21.11-90	Rubber-Gasket Joints for Ductile Iron Pressure Pipe and Fittings.
5.	AWWA C115/ A21.15-88	Flanged Ductile Iron Pipe with Threaded Flanges.
6.	AWWA C150/ A21.50-91	Thickness design of Ductile Iron Pipe.
7.	AWWA C151/ A21.51-91	Ductile-Iron Pipe, Centrifugally Cast, for Water or Other Liquids.
8.	AWWA C500-93	Metal-Seated Gate Valves for Water Supply Service.
9.	AWWA C504-94	Rubber-seated Butterfly Valves.
10.	AWWA C512-92	Air-Release, Air/Vacuum, and Combination Air Valves for Waterworks Service.
11.	AWWA C600-93	Installation of Ductile-Iron Water Mains and Their Appurtenances.
12.	AWWA C906-90	Polyethylene (PE) Pressure Pipe and Fittings, 4-Inch through 63-Inch, for Water Distribution.

1.5 SUBMITTALS

A. Product Data: Provide data on all pipe materials, pipe fittings, valves, accessories, the methods and equipment for HDPE fusion welding, HDPE manholes, and manhole frame and cover.

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B. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

C. 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.

D. As-built drawings, signed and sealed by a professional surveyor registered in the State of Ohio.

1.6 QUALITY ASSURANCE

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

1.7 DELIVERY, STORAGE, AND HANDLING

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

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

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 per AWWA C150. All fittings and pipe at valves shall be flanged per AWWA C115.
   b. Jackets: AWWA C105, PE encasement.
   c. Cement Lined: AWWA C104, cement mortar lined.

2. High-Density PE Pipe: AWWA C906 (PE 3408), ASTM D3035, SDR 11 for 150 psi pressure rating (150 psi test 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 "water service" in large letters.

B. Gate Valves
1. AWWA C500, iron body, bronze trim, non-rising stem with square nut, single wedge, Class 125 flanged ends, control rod, extension box, and valve key.

C. Bedding Materials
1. Bedding: Fill Type A3 as specified in Section 02200 of this specification package.

D. Manhole: HDPE, ASTM D3350. Pipe resin is cell classification 3454-34C.

E. Manhole frame and lid shall be heavy-duty cast iron as noted on the drawings.

F. Air Release Valve: Valve shall be screwed inlet connection and shall be cast iron body, top and inlet flange, stainless steel float and trim with BUNA-N seat to meet AWWA C512.

G. Post Indicating Valves: Post Indicating Valves Assembly - U.L. listed and FM approved.
1. Sizes 4 inches - 14 inches, AWWA C500 gate valves, flanged ends Class 150, post assembly shall show open and shut, handcrank operator above ground, non-rising stem, and break-flange to separate the top works without removing the valve from the line.

2. Size 16 inches - 24 inches, add to 1.3, B Class 150, flanged ends, buried butterfly valve and above-grade indicator and manual operator of the traveling nut type.

2.2 ACCESSORIES

A. Concrete: 3,000 psi (minimum) as specified in Section 03001. Poured against undisturbed soil or compacted fill.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions. Bring any discrepancies to the Construction Manager for resolution prior to start of work. Any discrepancies should be brought to FERMCO's attention in a written statement immediately upon discovery.

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 of this specification package for work of this section. Locate all existing utilities in the area and determine if they will interfere with the proposed utility. Notify the Construction Manager if there is an interference.

E. Remove existing pipe to the extent necessary to make new tie ins. Tie-in locations shall be adjusted to conform to field conditions.

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 5/8 inches 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. Slope water pipe and position drain at low points.
7. Form and place concrete for thrust blocks at each elbow or change of direction of pipe main.
8. Establish elevations of buried piping to ensure not less than 3.5 feet of cover.
9. Backfill trench in accordance with Section 02200 of this specification package.

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 inches at structures.
3. Install HDPE piping and fittings to AWWA C906 (by butt weld fusion method, in accordance with ASTM D3261).
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 or change of direction of pipe main.

8. Establish elevations of buried piping to ensure not less than 3.5 feet of cover. Five feet of cover is required when pipe is within 100 feet of the toe of the active Fly Ash pile.
9. Install trace wire continuous over top of pipe, buried 6 inches below finish grade, above pipe line; coordinate with Section 02200 of this specification package.
10. Backfill trench in accordance with Section 02200 of this specification package.

C. 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.

3.4 FIELD QUALITY ASSURANCE

A. Perform hydrostatic tests on water line in accordance with AWWA C600. Notify the Construction Manager at least 24 hours in advance of planned testing. Submit report to the Construction Manager within 1 week after completion of test.

B. The new pipes shall be hydrostatically tested prior to tie-in. This test shall be run at 50 psi above the working pressure of the water main and hold within specifications for 2 hours.

$$Allowable\ Leakage = \frac{LD\sqrt{p}}{498,168}$$

L = Length of Pipe in Test in Feet
D = Diameter of Pipe in Inches
p = Test Pressure (Operating Pressure + 50 psi = 110 psi + 50 psi)

Answer = Allowable Leakage in Cubic Feet over a 2-Hour Period.

Unless otherwise instructed by the FERMCO construction manager, use 100 psi as the operating pressure for testing purposes.

END OF SECTION

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SECTION 02720
SITE DRAINAGE

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Corrugated steel culvert pipe, end sections, and fittings.

1.2 RELATED SECTIONS

A. Section 01010 - General Requirements.

B. Section 02110 - Site Clearing.

C. Section 02200 - Earthwork.

D. Section 02270 - Slope Protection and Erosion Control.

1.3 REFERENCE DRAWINGS

A. See Section 01011 for the Schedule of Drawings.

1.4 REFERENCES

A. State of Ohio, Department of Transportation, Construction and Material Specification, January 1, 1995 (ODOT). 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.

1.5 SUBMITTALS

A. Product Data: Provide data on all pipe materials, pipe fittings, accessories, and the methods for installation.

B. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

C. 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.
   2. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

D. As-built drawings, signed and sealed by a professional surveyor registered in the State of Ohio.

PART 2 PRODUCTS

2.1 FABRICATION

A. Pipe and Fittings
   1. The pipe and fittings shall conform to ODOT 707.01, Metallic Coated Corrugated Steel Conduits and Underdrains.
   2. The pipe and fittings shall conform to ODOT 707.04, Precoated, Galvanized Steel Culverts.
   3. End sections shall be galvanized and 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.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that excavations are ready to receive work.

3.2 PREPARATION

A. Hand trim excavations. Correct over-excavation according to the requirements of Section 02200 of this specification package.

3.3 ERECTION/INSTALLATION/APPLICATION

A. Installation:
   1. Excavate soil to a depth and width as shown on drawing.

2. Place corrugated steel pipe in properly excavated trench with bedding in place, as shown on the drawing, and properly compact backfill around pipe.

B. Bedding:
1. Place pipe in sand bedding material, and compact as per Section 02200.

3.4 FIELD QUALITY ASSURANCE

A. Inspection: After the Subcontractor has performed the inspections, and prior to testing and backfill, the Subcontractor shall notify the Construction Manager.
1. Inspection shall include checking for proper alignment and location of all piping.
2. Joints shall be tight and properly seated as per the manufacturer's recommendations.
3. Inspection by the Construction Manager is required prior to and immediately after placing backfill over pipe.
4. Piping must be free of debris, dirt, sand, silt, or other foreign matter.

B. The Subcontractor shall notify the Construction Manager of testing/inspection activities at least 24 hours prior to the start of all tests or inspections.

C. 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. Protect storm drains and ditches from siltation during construction as specified in Section 02270. Storm drains and ditches shall be free of sediment and erosion problems at project completion.

END OF SECTION

SECTION 02831
CHAIN LINK FENCES AND GATES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Fence framework, fabric, and accessories.

B. Excavation for post bases, concrete foundation for posts and center drop for gates.

C. Manual gates and related hardware.

1.2 RELATED SECTIONS

A. Section 01010 - General Requirements.

B. Section 02200 - Earthwork.

C. Section 03001 - Concrete.

D. Section 16170 - Grounding and Bonding.

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 A123 Rev. A-89	Standard Specification for Zinc (Hot Dip Galvanized) Coatings on Iron and Steel Products.
2.	ASTM A153-82	Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
3.	ASTM A392 Rev. B-91	Standard Specification for Zinc-Coated Steel Chain-Link Fence Fabric.

4.	ASTM A569/A569M Rev. A-91	Standard Specification for Steel, Carbon (0.15 Maximum Percent), Hot-Rolled Sheet and Strip Commercial Quality.
5.	ASTM F567-93	Standard Practice for Installation of Chain-Link Fence.

1.5 SYSTEM DESCRIPTION

A. Fence Height: Seven feet nominal.

B. Line Post Spacing: At intervals not exceeding 10 feet.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Material shall be stored at a location directed by the Construction Manager.

1.7 SUBMITTALS

A. Shop Drawings: Indicate plan layout, spacing of components, post foundation dimensions, hardware anchorage, and schedule of components.

B. Product Data: Provide data on fabric, posts, accessories, fittings, and hardware.

C. Certificate of Conformance: Manufacturer certifies that supplied products meet or exceed specification requirements.

D. As-built Drawings: Indicate plan layout, size, type, and swing of gates.

1.8 PROJECT CONDITIONS

A. Qualifications

1. Manufacturer: Company specializing in manufacturing the products specified in this section shall have a minimum of 3 years of related experience.

PART 2 PRODUCTS

2.1 MATERIALS

New materials shall conform to the following:

A. Framing (Steel): ASTM A569; hot rolled steel strip, cold formed to pipe configuration, longitudinally welded construction, minimum yield strength of 50 ksi.

B. Fabric Wire (Steel): ASTM A392 zinc-coated, 9-gage, wire fabric.

C. Concrete: 3000 psi strength at 28 days in accordance with Section 03001.

2.2 COMPONENTS

New components shall conform to the following:

A. Line Posts: 2-3/8 inch outside diameter (OD) or 4.10 lbs H-column with drive anchor.

B. Corner and Terminal Posts: 2-7/8-inch, OD.

C. Gate Posts: 2-7/8-inch OD.

D. Top and Brace Rail: 1-5/8-inch OD, plain end, sleeve coupled.

E. Gate Frame: 1-7/8-inch OD.

F. Fabric: 2-inch diamond mesh interwoven wire, No. 9 gage, top selvage twisted tight, bottom selvage knuckle end closed.

G. Tension Wire: No. 6 gage steel, single strand, galvanized.

H. Tie Wire: No. 6 gage steel, single strand, galvanized.

I. Caps: Cast steel galvanized; sized to post diameter, set screw retainer.

J. Rail Ends: Cast steel galvanized, 1 5/8-inch ID.

K. Fittings: Galvanized steel sleeves, bands, clips, tension bars, and fittings.

L. Gate Hardware: Fork latch with gravity drop, center gate stop and drop rod; two 180 degree gate hinges per leaf and hardware for padlock.

M. Drive Anchor: Two angles, 36-inch length, 1-1/4 inches by 1-1/4 inches by 1/4 inch.

N. Fasteners: Galvanized steel.

2.3 FABRICATION

A. Finishes on new items
1. Components and Fabric: Galvanized to ASTM A123, 2.0 ounces/square foot coating.
2. Hardware: Galvanized to ASTM A153, 2.0 ounces/square foot 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 and ASTM F567.

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 are to be set using steel drive anchors. Post is to 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 each gate and 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. Install center and bottom brace rail on corner gate leaves.

G. Stretch fabric between terminal posts.

H. Position bottom of fabric 2 inches above finished grade.

I. Fasten fabric to top rail, line posts, braces, and bottom tension wire with tie wire at maximum 15 inches on centers.

J. Attach fabric to end, corner, and gate posts with tension bars and tension bar clips.

K. Install bottom tension wire stretched taut between terminal posts.

L. Install gate with fabric to match fence. Install three hinges per leaf, latch, catches, drop bolt retainer, and locking clamp.

M. Provide concrete center drop to footing depth and drop rod retainers at center of double gate openings.

N. Make adaptations of existing fence to new fence as required at places where existing and new fences meet.

O. Install grounding as indicated.

3.2 FIELD QUALITY ASSURANCE

A. Construction shall be accomplished in a manner that will provide a rigid, taut fence, closely conforming (within an inch) 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

U.S DEPARTMENT OF ENERGY

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

FERMCO Subcontract No. 2-21487

SOUTH FIELD EXTRACTION SYSTEM

Division 03 - Concrete

PARSONS

Prepared by: _____ 9/15/95
Date

Checked by: _____ 9/15/95
Date

Date: 09/15/95
Rev.: 0 RE: TH

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1 of 1

WBS No.: 1.1.1.1.5.3.1
ERA/CRU No.: 5/PO-126

SECTION 03001
CONCRETE

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Furnish all labor, material, equipment, tools, and services required to complete all concrete work as required by the drawings and/or as specified herein.

B. Concrete work for foundations, slabs, walls, equipment supports, and other miscellaneous concrete.

C. Formwork and accessories.

D. Reinforcement and accessories.

E. Cast-in-place concrete, grout, and accessories.

F. Finishing and curing.

G. Sampling and testing of concrete work by an independent testing laboratory.

1.2 RELATED SECTIONS

A. Section 01010 - General Requirements.

B. Section 02200 - Earthwork.

C. Section 02667 - Site Water Lines.

D. Section 02831 - Chain Link Fences and Gates.

E. Section 05120 - Structural Steel.

F. Section 13123 - Pre-Engineered Buildings.

G. Section 16118 - Underground Ductbanks and Ducts.

H. Section 16170 - Grounding and Bonding.

1.3 REFERENCE DRAWINGS

A. See Section 01011 for the Schedule of Drawings.

1.4 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 A615-A615M-94	Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
2.	ASTM C31-91	Standard Practice for Making and Curing Concrete Test Specimens in the Field.
3.	ASTM C33-93	Concrete Aggregates.
4.	ASTM C39-94	Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
5.	ASTM C94-94	Ready Mixed Concrete.
6.	ASTM C109 Rev. A-94	Standard Test Method for Compressive Strength of Hydraulic Cement Mortars.
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 C157-93	Standard Test Method for Length Change of Hardened Hydraulic Cement Mortar and Concrete.
10.	ASTM C231 Rev. B-91	Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.

11.	ASTM C260-94	Air-Entraining Admixtures for Concrete.
12.	ASTM C309-94	Liquid Membrane-Forming Compounds for Curing Concrete.
13.	ASTM C311 Rev. B-94	Standard Test Methods for Sampling and Testing Fly Ash or Natural Pozzolans for Use as a Mineral Admixture in Portland Cement Concrete.
14.	ASTM C494-92	Chemical Admixtures for Concrete.
15.	ASTM C618 Rev. A-94	Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete.
16.	ASTM C827-87	Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens from Cementitious Mixtures.
17.	ASTM C882-91	Standard Test for Bond Strength of Epoxy-Resin Systems Used with Concrete by Slant Shear.
18.	ASTM C920-94	Elastomeric Joint Sealants.

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

1.	PS 1-83	Plywood.

1.5 SUBMITTALS

A. Shop Drawings: Indicate reinforcing bar sizes, spacings, locations, quantities, bending and cutting schedules, placing drawings, and supporting and spacing devices.

B. Product Data: Concrete mix designs, including documentation of aggregate sources and most recent sieve analysis. Sieve analyses must not be older than 1 year.

C. Concrete Supplier: Name and address of the transit-mix concrete supplier. Supply typical batch ticket and history per ASTM C94.

D. Test Reports: Submit test reports for all tests required under field quality assurance.

1.6 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. Amend Subparagraph 1.3.1 of ACI 301 to change the following titles to read (wherever they occur in ACI 301):

ACI 301	Change To Read
Architect/Engineer	FERMCO Construction Manager
Owner	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.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Reinforcing bars shall be delivered to meet the construction schedule and stored as directed by the FERMCO Construction Manager.

B. 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.

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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.

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 nor impair natural bonding characteristics of subsequent coatings.

D. Reinforcing Steel: ASTM A615, 60 ksi yield grade; deformed billet steel bars; plain finish.

E. Tie Wire: Minimum 16-gage annealed type wire.

F. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for strength and support of reinforcement during concrete placement conditions.

G. Fabrication: Fabricate concrete reinforcing in accordance with ACI SP-66 and Chapter 7 and 12 of ACI 318.

H. Cement:
   1. Normal, Portland cement, conforming to requirements of ASTM C150, Type I.

I. Fly Ash:
   1. Class F, conforming to requirements of ASTM C618 and ASTM C311.

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. Joint Sealer: Elastomeric joint sealant conforming to ASTM C920; Type S or Type M, Grade P, Class 25.
   1. Acceptable products and suppliers (or equal):
      a. Sikadur 51 SL, by Sika Corp.
      b. Sonolastic SL-1, by Sonneborn Building Products.

E. Nonshrink Grout Under Equipment: Premixed compound consisting of nonmetallic aggregate, cement, water reducing and plasticizing agent; capable of developing

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minimum compressive strength of 7,000 psi in 28 days; conforming to ASTM C109 and ASTM C827.

1. Acceptable products and suppliers (or equal):
   a. Masterflow 713, by Master Builders.
   b. SikaGrout 212, by Sika Corp.
   c. Sealtight 588, by W.R. Meadows.

F. Patching Grout: Premixed, nonshrink epoxy grout, capable of developing minimum compressive strength of 3,000 psi in 24 hours, conforming to ASTM C109. The grout must not shrink or expand more than 5 percent when tested in accordance with ASTM C157 and achieve a minimum bond strength of 1,200 psi in 24 hours when tested in accordance with ASTM C882.

G. Bonding Agent: Polyvinyl acetate polymer or acrylic polymer, water resistant when cured.

H. Curing Compound: Conforming to the requirements of ASTM C309, clear; must not impair natural bonding characteristics of subsequent coatings.

I. Epoxy Coating: Epoxy coating for all slab surfaces, sumps, trench drains, and tank containment areas. See Section 09815 for application.

J. Waterstops: Polyvinyl chloride, minimum 1,750 psi tensile strength, minimum 50 degrees F to plus 175 degrees F. Working temperature range, preformed corners, with heat-welded jointing.

2.3 FABRICATION

A. General: All concrete used in the work shall be composed of Portland cement, fine and coarse aggregate, and the specified admixtures. Design mixes shall be submitted to the FERMCO Construction Manager for approval before any concrete is placed. 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. 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.

c. Ductbank

Specified Strength (28 days)	2,500 psi
Specified Slump:	6 inches ±1-1/2
Maximum Aggregate Size:	3/8 inch
Maximum Water/Cement Ratio:	0.67 (per ACI 318, Section 5-4).

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 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 proportions of all materials in the concrete shall be subject to review by the FERMCO Construction Manager. 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 use compressed air 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.

F. Preparation for Grouting:

1. To ensure proper bond to concrete, all grease, oil, dirt, and other deleterious materials shall be completely removed.
2. Roughen the surfaces by chipping, sandblasting, or other mechanical means to ensure bond of the grout to the existing concrete.
3. After concrete surfaces have been washed clean, they shall then be saturated with water for 24 hours prior to placement of cement-based grout.
4. Upon completion of saturation period, excess water shall be removed prior to grouting.

3.2 ERECTION/INSTALLATION/APPLICATION

A. Place, support, and secure reinforcement against displacement. Do not deviate from required position. Make electrical ground system connection where required by Section 16170.

B. Maintain concrete cover around reinforcing according to the requirements of Chapter 5 of ACI 301 and 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. Notify the FERMCO Construction Manager a minimum of 24 hours prior to commencement of operations.
3. Ensure that reinforcement and forms are not disturbed during concrete placement.

G. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.

H. Installation of Grout:
1. Follow the manufacturer's instructions for mixing, placing, and curing of grout.

3.3 FIELD QUALITY ASSURANCE

A. Testing: The Subcontractor shall pay and provide for services of an independent testing agency. 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.
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 floor 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

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U.S DEPARTMENT OF ENERGY

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

FERMCO Subcontract No. 2-21487

SOUTH FIELD EXTRACTION SYSTEM

Division 05 - Metals

PARSONS

Prepared by: _____ 9/15/95
Date

Checked by: _____ 9/15/95
Date

Date: 09/15/95 | 05000 | WBS No.: 1.1.1.1.5.3.1
Rev.: 0 RE: TH | 1 of 1 | ERA/CRU No.: 5/PO-126

SECTION 05120
STRUCTURAL STEEL

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Furnish all labor, material, equipment, tools, and services required to complete all structural steel work as required by the drawings and/or as specified herein.

B. Structural steel framing members, baseplates, connection bolts, anchor bolts, welding, and detail material required to complete the work.

C. Grouting under baseplates.

1.2 RELATED SECTIONS

A. Section 01010 - General Requirements.

B. Section 09900 - Painting.

C. Section 16170 - Grounding and Bonding.

1.3 REFERENCE DRAWINGS

A. See Section 01011 for the Schedule of Drawings.

1.4 REFERENCES

A. American Institute of Steel Construction (AISC):

1.	AISC-85	Allowance Stress Design Specification for Structural Joints Using ASTM A325 or A490 Bolts - Allowable Stress Design.
2.	AISC-86	Code of Standard Practice for Steel Buildings and Bridges.
3.	AISC-89	Manual of Steel Construction - Allowable Stress Design (ASD) (Ninth Edition).

4.	AISC-89	Specification for Structural Steel Buildings, Allowable Stress Design and Plastic Design (ASD).

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

1.	ASTM A36/A36M-94	Carbon Structural Steel.
2.	ASTM A53-94	Pipe, Steel, Black and Hot Dipped, Zinc-Coated, Welded and Seamless.
3.	ASTM A325-94	Structural Bolts, Steel, Heat-Treated, 120/105 ksi Minimum Tensile Strength.
4.	ASTM C109 Rev. A-94	Standard Test Method for Compressive Strength of Hydraulic Cement Mortars.
5.	ASTM C827-87	Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens from Cementitious Mixtures.

C. American Welding Society, Inc. (AWS):

1.	AWS A2.4-93	Standard Symbols for Welding, Brazing, and Nondestructive Examination.
2.	AWS D1.1-94	Structural Welding Code - Steel.

D. Steel Structures Painting Council (SSPC):

1.	SSPC SP 3-89	Surface Preparation Specification No. 3 - Power Tool Cleaning.
2.	SSPC SP 6-91	Surface Preparation Specification No. 6 - Commercial Blast Cleaning.

E. American National Standards Institute (ANSI):

1.	ANSI A10.13-89	Construction and Demolition Operations - Steel Erection - Safety Requirements.
2.	ANSI A14.3-92	Safety Requirements for Fixed Ladders.

1.5 SUBMITTALS

A. Shop Drawings:
   1. Indicate sizes, spacing, and locations of structural members, bolted connections, and welded connections.
   2. Provide details of connections not shown on the drawings. Connections shall be designed for the full capacity of the member unless loads are indicated on the drawings.
   3. Indicate welded connections with AWS A2.4 welding symbols. Indicate net weld lengths.

B. Welder's Certificates: Certify welders employed on the work, verifying AWS qualification to specified procedures within the previous 12 months, as per Section 5, Part C of AWS D1.1.

C. Manufacturer's Mill Certificate: Factory mill certification that ASTM A325 bolts and other listed products meet specified requirements.

D. Mill Test Reports: Submit report indicating structural strength, destructive, and nondestructive test analysis for each batch of steel from each supplier.

1.6 QUALITY ASSURANCE

A. Fabricate structural steel members in accordance with AISC-89 Specification for Structural Steel Buildings (ASD) and AISC-89 Manual of Steel Construction (ASD). Maintain one copy of each document on site.

B. The connections not detailed on the drawings are to be designed under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State of Ohio.

C. Fabricator: Company specializing in performing the work of this section with minimum of 3 years documented experience.

D. Erector: Company specializing in performing the work of this section with minimum of 3 years documented experience.

1.7 DELIVERY, STORAGE, AND HANDLING

A. ASTM A325 high-strength bolts shall be delivered to the site in the original labeled containers, and once on site shall not be transferred into unlabeled containers. The label information shall include the type of bolt, purchase order number, and the name of the supplier. All bolts shall be made in the U.S.A.

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.

2.1 MATERIALS

A. Structural Steel Members: ASTM A36.

B. Bolts, Nuts, and Washers: ASTM A325.

C. Anchor Bolts: ASTM A36.

D. Welding Materials: Conforming to AWS D1.1; E70XX.

E. Expansion Anchors: Drilled expansion bolts for securing steel to concrete.
   1. Acceptable manufacturers (or approved equal):
      a. Kwik Bolt, by Hilti, Inc.
      b. Parabolt, by Molly Fastener Group.
      c. Wedge Anchors, by ITW Ramset/Red Head.

F. Grout: Nonshrink type, pre-mixed compound consisting of nonmetallic aggregate, cement, water reducing and plasticizing agent, capable of developing a minimum

compressive strength of 7,000 psi at 28 days; conforming to ASTM C109 and ASTM C827.

1. Acceptable products and suppliers (or approved equal):
   a. Masterflow 713, by Master Builders.
   b. SikaGrout 212, by Sika Corp.
   c. Sealtight 588, by W.R. Meadows.

G. Shop and Touch-Up Primer: As per Section 09900.

H. Pipe Sleeves: ASTM A53.

2.2 FABRICATION

A. Shop Fabrication Assembly:
1. Fabricate and assemble structural assemblies in shop to greatest extent possible. Fabricate items of structural steel in accordance with AISC-85 Specifications, AISC-86 Code of Standard Practice, and as indicated on final shop drawings.
2. Properly mark and match-mark materials for field assembly.
3. Members shall be free from twists, kinks, or open joints and shall be made so that when assembled, the parts shall come together without shimming.
4. Open holes shall be provided for bolted connections of work specified in other sections.

B. Connections:
1. Field connections shall be bolted, unless shown as welded on the drawings.
2. Provide 3/4-inch diameter, high-strength threaded fasteners for all bolted connections per ASTM A325.
3. Beam connections shall be fabricated with double angle connection. Clips shall be shop welded to the beam and field bolted to the supporting member.
4. All members meeting at a point shall have their gravity axis intersecting at a common work point unless shown otherwise.
5. Bolted connections shall have a minimum of two bolts, unless noted otherwise on the drawings.

C. High-Strength Bolted Construction: Install high-strength threaded fasteners in accordance with AISC-85 Specification.

D. Welded Construction: Comply with AWS D1.1 for procedure, appearance, and quality of welds; and for methods used in correcting welding work. Continuously seal joined members subject to exterior exposure by continuous welds. Grind exposed welds smooth.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.2 PREPARATION

A. Prepare structural component surfaces in accordance with SSPC SP 6.

B. Shop and Touch-Up Primer: Per Section 09900.

3.3 ERECTION/INSTALLATION/APPLICATION

A. Steel erection shall conform to the following codes and standards:
1. ANSI A10.13.
2. Code of Standard Practice for Steel Buildings and Bridges (AISC-86).
3. ANSI A14.3.

B. Allow for erection loads. Provide temporary bracing to maintain framing in alignment until completion of erection and installation of permanent bridging and bracing. Provide temporary foundations as required for erection. The foundations shown on construction drawings are designed for final loads.

C. Field-weld components indicated on construction drawings. Field welding shall be in accordance with AWS D1.1.

000107

D. Do not field-cut or alter structural members without approval of the FERMCO Construction Manager.

E. Do not enlarge unfair holes in members by burning or by use of drift pins.

F. Gas Cutting:
1. Do not use gas cutting torches in the field for correcting fabrication errors in structural framing.
2. Cutting will be permitted only on secondary members which are not under stress, as approved by the FERMCO Construction Manager.
3. Finish gas-cut sections equal to a sheared appearance when permitted.

G. Permanent bolting or welding shall be done after structure has been properly aligned and plumbed.

H. Field-bolt structural members with 3/4-inch-diameter A325 bolts. Tighten high-strength bolts to the minimum tension required by AISC-85 Specification. Tightening shall be by the turn of the nut method. All other fasteners shall be tightened in accordance with AISC-86 Code of Standard Practice.

I. After erection, prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete.

J. Install drilled expansion anchor bolts as indicated on drawings to anchor steel framing.

K. Make grounding system connections to structural steel members as required by Section 16170.

L. Grout under baseplates in accordance with grout manufacturer's instructions and recommendations.

M. Touch-up Painting: Field welds, bolted connections, abraded areas, and other areas where shop coat is discontinuous shall be cleaned in accordance with SSPC

SP3 and shall receive one coat of prime paint to match the shop coating system specified in Section 09900.

3.4 FIELD QUALITY ASSURANCE

A. The Subcontractor shall pay and provide for services of an independent testing agency to inspect high-strength bolted connections and welded connections, and to perform tests and prepare test reports.

B. The testing agency shall conduct and interpret tests, shall state in each report whether test specimens comply with requirements, and shall specifically state any deviations.

C. Testing Program:

1. The testing agency may inspect structural steel at the shop before shipment; however, the FERMCO Construction Manager reserves the right, at any time before final acceptance, to reject material not complying with specified requirements.
2. High-Strength Bolted Connections:
   a. Inspect in accordance with AISC-85 Specification, and as follows:
      1) Visually inspect all bolts.
      2) Check for proper torque with a calibrated torque wrench:
         a) Minimum of two bolts of every third connection between beams and girders.
         b) Minimum of two bolts of every other connection between girders and columns.
         c) All bolted connections that fail shall be corrected and all bolts in that connection shall be retested by FERMCO Quality Control. Cost of retests on connections that fail shall be borne by Subcontractor.
3. Shop and Field Welding:
   a. During fabrication and erection of structural steel assemblies, inspect and test all shop

and field welds in accordance with AWS D1.1 and as follows:

1) Conduct inspections and tests as required. Record types and locations of all defects found in the work. Record work required and performed to correct deficiencies.
2) Perform visual inspection of all welds.
3) Perform nondestructive tests of welds as follows:
   a) Fillet Welds: One spot test per member. Magnetic particle testing may be used.
4) All welds that fail shall be rewelded and retested until passing. Cost of retesting shall be borne by the Subcontractor.
5) Perform additional tests to reconfirm any noncompliance of the original work and as may be necessary to show compliance of corrected work. Cost of all retesting shall be borne by the Subcontractor.

D. Cooperation of Subcontractor with testing agency:
   1. Provide access for testing agency to places where structural steel work is being fabricated or produced so that inspection and testing can be accomplished as required.
   2. Subcontractor shall assist testing agency by providing access to all bolts and welds to be inspected.

E. Correction of Work:
   1. Correct deficiencies in structural steel work which inspections and laboratory test reports have indicated to be not in compliance with requirements at no additional expense to FERMCO.

END OF SECTION

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U.S DEPARTMENT OF ENERGY

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

FERMCO Subcontract No. 2-21487

SOUTH FIELD EXTRACTION SYSTEM

Division 07 - Thermal and Moisture Protection

PARSONS

Prepared by: _____ 9/15/95
Date

Checked by: _____ 9/15/95
Date

Date: 09/15/95 | 07000 | WBS No.: 1.1.1.1.5.3.1
Rev.: 0 RE: TH | 1 of 1 | ERA/CRU No.: 5/PO-126

SECTION 07466
PREFORMED METAL SIDING AND ROOFING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Preformed metal siding system for walls and roofing, with insulation liners, related flashings, and accessory components.

1.2 RELATED SECTIONS

A. Section 01010 - General Requirements.

B. Section 05500 - Structural Steel.

C. Section 08110 - Standard Steel Doors and Frames.

1.3 REFERENCE DRAWINGS

A. See Section 01011 for the Schedule of Drawings.

1.4 REFERENCES

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

1. ASTM A446/A446M-91 Steel Sheet, Zinc-Coated Galvanized by the Hot-Dip Process, Structural Physical Quality.
2. ASTM C665-91 Mineral Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.

B. American Society of Civil Engineers (ASCE):

1. ASCE 7-93 Minimum Design Loads for Buildings and Other Structures.

C. Building Officials and Code Administrators International (BOCA):
1. Ohio Basic Building Code - 1995 (OBBC).

1.5 SYSTEM DESCRIPTION

A. System: Preformed and prefinished metal siding system of vertical profile; site assembled with sub-girt framing assembly.

B. Design and size components to withstand dead and live loads caused by positive and negative wind pressure acting normal to plane of wall, to a design pressure of 20 lb/sq ft. plus any negative pressure required by operational design.

C. Wind Loads:
1. The site-specific basic wind speed shall be 80 mph, per OBBC Section 1112.3.2. The importance factor, I, shall be 1.07, Exposure Category C.
2. Load shall be proportioned and applied as horizontal and uplift forces according to the requirements of ASCE 7.

D. Maximum Allowable Deflection of Panel: 1/180.

E. System to accommodate, without damage to components or deterioration of seals, movement within system; movement between system and perimeter components when subject to seasonal temperature cycling; dynamic loading and release of loads; deflection of structural support framing.

1.6 SUBMITTALS

A. Shop Drawings: Indicate dimensions, layout, joints, construction details, and methods of anchorage.

B. Samples: Submit two samples of siding finish, 24 inches by 24 inches in size, illustrating finish color, sheen, and texture.

C. Work Plan: Include a clear description of how the Subcontractor will include the requirements for the design, erection, bracing, and stability of the building, and to mitigate potential collapse during erection. The plan shall include provisions for high wind and any other applicable safety hazards related to building erection and worker safety, including a worker's fall protection plan.

D. Product Data. Submit manufacturer's data on:
1. Prefinished sheet-metal items (including profiles).
2. Accessories.

E. Manufacturer's Installation Instructions: Prior to construction, submit installation and erection requirements for information only.

F. Certificate of Conformance: The manufacturer shall certify and provide data which indicate that all products supplied meet or exceed specification requirements.

1.7 QUALITY ASSURANCE

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

B. Installer: Company specializing in performing the work of this section, with minimum 5 years documented experience approved by manufacturer.

1.8 DELIVERY, STORAGE, AND HANDLING

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

B. Protect panels from accelerated weathering by removing or venting sheet plastic shipping wrap.

C. Stack prefinished material to prevent twisting, bending, or abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.

D. Prevent contact with materials that may cause discoloration or staining.

1.9 WARRANTY

A. Provide 10-year warranty.

B. Warranty: Include coverage for degradation of panel finish including color fading caused by exposure to weather.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. 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.

1. H.H. Robertson Co.
2. Steelite Inc.
3. E.G. Smith Co.
4. Butler Manufacturing Co.

2.2 MATERIALS

A. Precoated Galvanized Steel: ASTM A446, Grade A G90 zinc coating; shop precoated with polyvinyl fluoride (PVF) coating (Kynar™).

B. Exterior Sheet: Similar to Butler Stylwall™ II Flat Wall System, thickness: 24-gage precoated steel stock profile as indicated; 16-inch-wide panels with interlocking fitted with continuous gaskets filled with sealant. Depending on width of panels used, use gage thickness appropriate. Color as specified by FERMCO Construction Manager.

C. Liner: 24-gage thick steel stock; 16-inch-wide panels; interlocking edges, fitted with continuous gaskets filled with sealant.

D. Sub Girts: 16-gage thick steel, hat shaped, 3/4-inch profile; to attach panel system to building structural frame.

E. Internal and External Corners: Same material, thickness, and finish as panels; profile to suit system; brake formed to required angles.

F. Expansion Joints: Same material, thickness, and finish as exterior sheets; exposed fasteners same finish as panel system.

G. Trim, Closure Pieces: Same material, thickness, and finish as exterior sheets; brake formed to required profiles.

H. Anchors: Galvanized steel.

2.3 ACCESSORIES

A. Insulation: ASTM C665 Type I Class A glass fiber blanket; thermal resistance R of 11 in the walls and R of 20 in the roof.

B. Gaskets: Manufacturer's standard type, suitable for use with system, permanently resilient; ultraviolet and ozone resistant; color as selected by FERMCO Construction Manager.

C. Sealants: Manufacturer's standard type, suitable for use with installation of system.

D. Fasteners: Manufacturer's standard type to suit application; with soft neoprene washers.

E. Field Touch-up Paint: As recommended by panel manufacturer.

2.4 FABRICATION

A. Form sections true to shape, accurate in size, square, and free from distortion or defects.

B. Form pieces in longest practical lengths.

C. Fabricate corners in one continuous piece with minimum 18-inch returns and seams.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that framing members are ready to receive panel system.

3.2 INSTALLATION

A. Install metal siding system on walls in accordance with manufacturer's instructions.

B. Fasten siding to structural supports; aligned, level, and plumb.

C. Locate joints over supports. End lap minimum 2 inches.

D. Provide expansion joints if required.

E. Seal and place gaskets to prevent weather penetration. Maintain neat appearance.

3.3 FIELD QUALITY ASSURANCE

A. Maximum Offset From True Alignment Between Adjacent Members Butting or In Line: 1/16 inch.

B. Maximum Variation from Plane or Location Indicated on Drawings: 1/4 inch.

3.4 CLEANING

A. Remove site cuttings from finish surfaces.

B. Clean and wash prefinished surfaces with mild soap and water; rinse with clean water.

END OF SECTION

SECTION 07900
JOINT SEALERS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Preparing substrate surfaces.

B. Sealant and joint backing.

1.2 RELATED SECTIONS

A. Section 01010 - General Requirements.

B. Section 03001 - Concrete - Miscellaneous.

C. Section 13123 - Pre-Engineered Buildings.

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 C919-84 Use of Sealants in Acoustical Applications.
2. ASTM C920-87 Elastomeric Joint Sealants.
3. ASTM D1056-85 Flexible Cellular Materials - Sponge or Expanded Rubber.

B. Sealant, Waterproofing, and Restoration Institute (SWRI):
1. SWRI - Sealant and Caulking Guide Specification.

1.5 SUBMITTALS

A. Product Data: Provide data indicating sealant chemical characteristics, performance criteria, substrate preparation, limitations, and color availability prior to use.

B. Samples: Submit two samples, 1 inch by 1 inch, illustrating sealant colors for selection prior to use.

C. Manufacturer's Installation Instructions: Submit special procedures, surface preparation, and perimeter conditions requiring special attention prior to use.

D. Certificate of Conformance: Manufacturer shall certify and provide data which indicate that all supplied products meet or exceed specification requirements prior to use.

1.6 QUALITY ASSURANCE

A. Perform work in accordance with SWRI requirements for materials and installation.

B. Perform acoustical sealant application work in accordance with ASTM C919.

1.7 PROJECT CONDITIONS

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

B. Applicator: Company specializing in performing the work of this section with minimum 5 years documented experience.

C. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

D. Any products to be used shall not contain lead or asbestos, or be defined as possible carcinogens.

1.8 WARRANTY

A. Provide 10-year warranty at completion of work.

B. Warranty: Include coverage for installed sealants and accessories which fail to achieve air-tight seal, exhibit loss of adhesion or cohesion, or do not cure.

C. Submit manufacturer's letter stating that actual samples have been tested for adhesion and compatibility, and that surface preparation recommendations are made based upon those tests.

PART 2 PRODUCTS

2.1 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. It is the offerer's responsibility to propose equipment that is best suited for this project in combined terms of quality and price.

A. Dow Corning Corp.

B. General Electric.

C. W.R. Meadows Co.

2.2 MATERIALS

A. Silicone Sealant (Type A): ASTM C920, Grade NS, Class 25, Use NT; single component, solvent curing, nonsagging, nonstaining, color as selected; 795 manufactured by Dow Corning.
   1. Elongation Capability: 25 percent.
   2. Service Temperature Range: -65 to 180 degrees F.
   3. Shore A Hardness Range: 30.

B. Silicone Sealant (Type B): ASTM C920, Grade NS, Class 25, Use N; single component, chemical curing, nonsagging, nonstaining, color as selected; 791 manufactured by Dow Corning.
   1. Elongation Capability: 25 percent.
   2. Service Temperature Range: -65 to 180 degrees F.
   3. Shore A Hardness Range: 30.

2.3 ACCESSORIES

A. Primer: Nonstaining type, (recommended by sealant manufacturer) to suit application.

B. Joint Cleaner: Noncorrosive and nonstaining type, recommended by sealant manufacturer; compatible with joint forming materials.

C. Joint Backing: ASTM D1056; cell polyethylene foam rod; oversized 30 to 50 percent larger than joint width.

D. Bond Breaker: Pressure-sensitive tape recommended by sealant manufacturer to suit application.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that substrate surfaces and joint openings are ready to receive work.

B. Verify that joint backing and release tapes are compatible with sealant.

3.2 PREPARATION

A. Remove loose materials and foreign matter which might impair adhesion of sealant.

B. Clean joints in accordance with manufacturer's instructions.

C. Perform preparation in accordance with manufacturer's instructions.

D. Protect elements surrounding the work of this section from damage or disfigurement.

3.3 ERECTION/INSTALLATION/APPLICATION

A. Install sealant in accordance with manufacturer's instructions.

B. Measure joint dimensions and size materials to achieve 2:1 width/depth ratios.

C. Install joint backing to achieve a neck dimension no greater than 1/3 of the joint width.

D. Install bond breaker where joint backing is not used.

E. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.

F. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

G. Tool joints channel shaped.

3.4 CLEANING

A. Clean adjacent soiled surfaces.

3.5 SCHEDULES

A. Type A - All glazing and all building materials as indicated on drawings.

B. Type B - All expansion and control joints.

END OF SECTION

U.S DEPARTMENT OF ENERGY

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

FERMCO Subcontract No. 2-21487

SOUTH FIELD EXTRACTION SYSTEM

Division 08 - Doors and Windows

PARSONS

Prepared by: _____ 9/15/95
Date

Checked by: _____ 9/15/95
Date

SECTION 08110
STANDARD STEEL DOORS AND FRAMES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Steel doors and frames.

1.2 RELATED SECTIONS

A. Section 01010 - General Requirements.

B. Section 08710 - Door Hardware.

C. Section 09900 - Painting.

1.3 REFERENCE DRAWINGS

A. See Section 01011 for the Schedule of Drawings.

1.4 REFERENCES

A. American National Standards Institute (ANSI):
   1. ANSI-A117.1-86 Buildings and Facilities - Providing Accessibility and Usability for Physically Handicapped People.

B. American Society for Testing and Materials (ASTM):
   1. ASTM-A525 Rev. B-91 Sheet Steel, Zinc Coated (Galvanized) by the Hot-Dip Process, General Requirements.

C. Steel Door Institute (SDI):
   1. ANSI/SDI-100-91 Standard Steel Doors and Frames.

D. Door Hardware Institute (DHI):
   1. The Installation of Commercial Steel Doors and Steel Frames, Insulated Steel Doors in Wood Frames, and Builder's Hardware.

1.5 SUBMITTALS

A. Shop Drawings: Indicate door and frame elevations, internal reinforcement, closure method, and finish.

B. Product Data: Indicate door and frame configurations and location of cut-outs for hardware and reinforcement.

C. Manufacturer's Installation Instructions: Indicate special installation instructions.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements, and meet design loads.

1.6 QUALITY ASSURANCE

A. Conform to requirements of ANSI/SDI-100 and ANSI A117.1.

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

1.7 DELIVERY, STORAGE, AND HANDLING

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

B. Protect doors with resilient packaging sealed with heat-shrunk plastic.

C. Break seal on site to permit ventilation.

1.8 PROJECT CONDITIONS

A. Verify that field measurements are as indicated on shop drawings.

B. Coordinate the work with door opening construction, door frame, and door hardware installation.

PART 2 PRODUCTS

2.1 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.

A. Steelcraft.

B. Republic Builders Products.

C. Amweld.

2.2 MATERIALS

A. Exterior Doors Nonthermally Broken: SDI-100 Grade II Model 1.

B. Frames: 16-gage metal with a 2-inch face.

2.3 ACCESSORIES

A. Face: Steel sheet in accordance with ANSI/SDI-100.

B. Core: Polyurethane with vertical steel stiffeners.

C. Silencers: Resilient rubber, fitted to drilled hole.

D. Removable Stops: Rolled steel shape, mitered corners; prepared for countersunk style screws.

E. Window: Small, wired glass window to allow viewing through door.

F. Labels: Containing the well house number; constructed of nonreflective materials; black characters on white background, minimum character height of 3 inches.

2.4 FABRICATION

A. Fabricate doors and frames with hardware reinforcement welded in place.

B. Close top and bottom edge of exterior doors with flush end closure. Seal joints watertight.

C. Configure exterior doors and frames with special profile to receive recessed weatherstripping.

D. Terminate door stops 6 inches above finished floor. Cut stop at a 45-degree angle and close.

E. Prepare frames for silencers. Provide three single silencers for single doors on strike side. Provide two single silencers on frame head at double doors without mullions.

F. Finish:
1. Steel Sheet: Galvanized to ASTM A525.
2. Primer: Air dried.
3. Factory Finish: Baked enamel.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that opening sizes and tolerances are acceptable.

3.2 ERECTION/INSTALLATION/APPLICATION

A. Install doors and frames in accordance with ANSI/SDI-100 and DHI.

B. Coordinate installation of glass and glazing.

C. Coordinate installation of doors and frames with installation of hardware specified in Section 08710.

D. Install roll-formed steel reinforcement channels between two abutting frames. Anchor to structure and floor.

E. Touch up factory finished doors in accordance with Section 09900.

3.3 FIELD QUALITY ASSURANCE

A. Maximum Diagonal Distortion: 1/16 inch measured with straight edge, corner to corner.

3.4 ADJUSTING

A. Adjust door for smooth and balanced movement.

END OF SECTION

SECTION 08710
DOOR HARDWARE

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Hardware for hollow steel doors.

B. Thresholds.

C. Weatherstripping, seals, and door gaskets.

D. Products furnished but not installed under this section.
   1. Section 13123 - Pre-Engineered Buildings: Furnish templates for door and frame preparation.

1.2 RELATED SECTIONS

A. Section 01010 - General Requirements.

B. Section 08110 - Standard Steel Doors and Frame.

1.3 REFERENCE DRAWINGS

A. See Section 01011 for the Schedule of Drawings.

1.4 REFERENCES

A. American National Standards Institute (ANSI):
   1. ANSI A117.1-86 Buildings and Facilities - Providing Accessibility and Usability for Physically Handicapped People.
   2. ANSI A156.2-89 Bored and Preassembled Locks and Latches.

B. National Fire Protection Association (NFPA):
   1. NFPA 80-90 Fire Doors and Windows.
   2. NFPA 252-90 Fire Tests of Door Assemblies.

C. American Disabilities Act 1992 (ADA).

D. Door Hardware Institute (DHI):
1. The Installation of Commercial Steel Doors and Steel Frames, Insulated Steel Doors in Wood Frames, and Builder's Hardware.

1.5 SYSTEM DESCRIPTION

A. Provide all hardware as required by hardware schedule, Article 3.6 of this section. Hardware to be installed per ADA 1992.

1.6 SUBMITTALS

A. Refer to Part 3, General Terms and Conditions, Paragraph A.88; and Part 6, Submittal Requirements, of the FERMCO Contract Documents for submittals.

B. Product Data: Submit manufacturer's technical product data for each item of hardware.

C. Hardware Schedule: Coordinate hardware with doors, frames, and related work.
1. Organize hardware schedule into "hardware sets" indicating every item required for each door or opening, including:
   a. Type, style, function, size, and finish of each hardware item.
   b. Name and manufacturer of each item.
   c. Explanation of all abbreviations, symbols, codes, etc. contained in schedule.
   d. Mounting locations for hardware.
   e. Door and frame sizes and materials.
   f. Keying information.
2. Submittal Sequence: Submit schedule at earliest possible date.
3. Keying Schedule: Submit separate schedule indicating FERMCO's desired keying of locks.

D. Maintenance Data: Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.

E. Provide special wrenches and tools applicable to each different or special hardware component.

F. Provide maintenance tools and accessories supplied by hardware component manufacturer.

G. Product data sheets and hardware schedule shall be submitted prior to use. All maintenance data and special tools shall be submitted at completion of work.

1.7 QUALITY ASSURANCE

A. Perform work in accordance with the following requirements:
1. ANSI A117.1.
2. NFPA 80.
3. NFPA 252.

B. Manufacturer: Obtain each type of hardware from a single manufacturer.

1.8 DELIVERY, STORAGE, AND HANDLING

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

B. Tag each item of package separately with identification related to final hardware schedule, and include basic installation instructions with each item or package.

C. Packaging of hardware is the responsibility of the supplier. As material is received by the hardware supplier from various manufacturers, sort, and repackage in containers clearly marked to match set numbers of approved hardware schedule.

D. Inventory hardware jointly with hardware supplier and hardware installer to verify correct count.

E. Deliver individually packaged hardware items at the proper times to the proper locations (shop or project site) for installation.

F. Provide secure lock-up for hardware delivered to the project but not yet installed. Control handling and installation of hardware items that are not immediately replaceable, so that completion of the work will not be delayed by hardware losses, both before and after installation.

1.9 SEQUENCING AND SCHEDULING

A. Coordinate the work with other directly affected sections involving manufacture or fabrication of internal reinforcement for door hardware.

1.10 WARRANTY

A. Provide 5-year warranty. Warranty shall be submitted at completion of work.

PART 2 PRODUCTS

2.1 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. It is the offerer's responsibility to propose equipment that is best suited for this project in combined terms of quality and price.

A. Locks and Latches
   1. Sargent.
   2. Schlage.
   3. Best.
   4. Russwin.

B. Cylinders
1. Best (existing grandmaster keying system).

C. Butt Hinges
(By Building Manufacturer).

D. Door Closers
1. LCN.
2. Dorma.
3. Sargent.

E. Silencers
1. Glynn Johnson.
2. Ives.

F. Thresholds
1. National Guard Products (NGP).
2. Reese.
3. Zero.

2.2 MATERIALS

A. Hardware throughout to be substantially manufactured and fabricated, and assembled parts well fitted and of easy operation. Cast work to be true, free from seams, blisters, or other defects. All lines, edges, and ornamental work to be sharp and true. All hardware shall be certified under ANSI A156.2 Series 4000.

B. Finish of hardware to be 26D, except as noted.

C. Door Closers
1. Provide drop plates, brackets, and inverted mounting for conditions where required, LCN 4110 Series or equal.

D. Levers and Escutcheons
1. All trim similar to Sargent 10 Line Series.

E. Cylinders
1. Provide appropriate type cylinders for all locks as required by the function of the lock.

2. Test all cylinders and package cylinders with their respective locks.
3. Provide keys as specified below for each keyed, different set.
4. Provide cylinders with a minimum of five pin-tumblers for master or grandmaster keying.

F. Strike Plates
1. Strike plates to be wrought, box type.

G. Silencers: Provide silencers, Glynn Johnson GJ 64 or equal, on all interior hollow metal frames as required.

H. Locksets and Latchsets
1. Provide heavy-duty locksets, Sargent 10 Line Series or equal.
2. Locks to have face plates, proper backset, an anti-rejection split latch bolt, and radius strikes; and to fit ANSI standard cutout.

I. Cylinders
1. "Best" 7 pin figure eight key removable cores shall be supplied with temporary construction cores installed.
2. Construction cores will be returned to "Best" after installation of final cores by FERMCO.
3. Final cores shall be keyed to the Site Standard Master Keyed System; account #FEE125, "M" keyway, 7 pin, series "BF" or modified to a keying plan.
4. Final cores, with one key each and a control key for the construction cores, shall be shipped directly to FERMCO. FERMCO will install final cores and make additional keys as required.

J. Closers: Provide LCN 1460 series or equal.

2.3 ACCESSORIES

A. Master Keys
1. Master key all locks to complement existing system.
2. Grandmaster key all locks, as appropriate.

PART 3 EXECUTION

3.1 PREPARATION

A. Factory or shop prepare all materials for installation of hardware.

3.2 ERECTION/INSTALLATION/APPLICATION

A. Follow hardware manufacturer's instructions and recommendations.

B. Install surface-mounted items after substrates have been completely finished; install recessed items and recessed portions of items before finishes are applied and provide suitable, effective protection.
   1. When surface-mounted items are installed before final finish, remove, store, and reinstall, or apply suitable effective protection.

C. Mount at heights indicated in "Recommended Locations for Builder's Hardware for Standard Steel Doors and Frames" by the Door Hardware Institute.

D. Set units level, plumb, and true to line and location.

E. Reinforce substrates as necessary for proper installation and operation.

F. Set thresholds in full bed of sealant.

3.3 ADJUSTMENT

A. Adjust each operating item of hardware and each door for proper operation and function; replace units which cannot be adjusted to operate freely and smoothly.

B. Adjust door closers to compensate for operation of heating and ventilating systems.

3.4 CLEANING

A. Clean adjacent surfaces soiled by hardware installation.

3.5 DEMONSTRATION

A. Deliver keys and extra blanks (two for every key) to the FERMCO Construction Manager.

3.6 HARDWARE SCHEDULE

A. Hardware Sets

1. Exterior Doors
   a. One cylinder; Best 26D.
   b. One lockset; Sargent 10 Line, 26D.
   c. One closer; LCN 4010 Series Smoothee.
   d. One threshold.

END OF SECTION

7311

U.S DEPARTMENT OF ENERGY

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

FERMCO Subcontract No. 2-21487

SOUTH FIELD EXTRACTION SYSTEM

Division 09 - Finishes

PARSONS

Prepared by: _____ Date 9/15/95

Checked by: _____ Date 9/15/95

Date: 09/15/95
Rev.: 0 RE: TH

09000
1 of 1

WBS No.: 1.1.1.1.5.3.1
ERA/CRU No.: 5/PO-126

000138

SECTION 09900
PAINTING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Furnish all labor, material, equipment, tools, and services required to complete all painting work as required by the drawings and/or as herein specified.

B. Except as otherwise indicated or hereinafter specified, include all necessary preparation and complete finishing of the following:
1. All miscellaneous iron items, both prime coated and galvanized.
2. Field painting and/or touch-up of all piping.
3. Metal doors and frames.
4. Uninsulated piping, exposed electric raceway, electrical cabinets, boxes, etc., in contracts for other divisions of the work and furnished either bare, zinc-coated (galvanized), or prime coated.
5. Color coding or indication of piping as specified.

C. Surfaces not painted under this section:
1. Stainless steel and aluminum.

1.2 RELATED SECTIONS

A. Section 01010 - General Requirements.

B. Section 05120 - Structural Steel.

C. Section 07900 - Joint Sealers.

D. Section 08110 - Standard Steel Doors and Frame.

E. Section 15060 - Pipe, Fittings, Valves, and Accessories.

F. Section 15090 - Pipe Supports and Anchors.

G. Section 16050 - Basic Electrical Materials and Methods.

1.3 REFERENCE DRAWINGS

A. See Section 01011 for the Schedule of Drawings.

1.4 REFERENCES, CODES, AND STANDARDS

A. American Society for Testing and Materials (ASTM):
   1. ASTM D16-91 — Standard Terminology Relating to Paint, Varnish, Lacquer, and Related Products.

B. National Paint and Coatings Association (NPCA):
   1. Guide to U.S. Government Paint Specifications - 1988.

C. Painting and Decorating Contractors of America (PDCA):
   1. Architectural Specifications Manual - Rev. 90.

D. Steel Structures Painting Council (SSPC):
   1. Steel Structures Painting Manual - Rev. 91.
      a. SP-6 - Commercial Blasting Cleaning.
      b. Paint 13 - Red or Brown One-Coat Shop Paint.
      c. Paint 20 - Zinc-Rich Primers.

E. American National Standards Institute (ANSI):
   1. ANSI A13.1-81 — Scheme for the Identification of Piping Systems.
   2. ANSI Z53.1-79 — Safety Color Code for Marking Physical Hazards.
   3. ANSI Z535.5-92 — Accident Prevention Tags for Temporary Hazards.

F. Federal Specifications (Fed. Spec.):
   1. Fed. Spec. TT-E-505A — Enamel, Odorless Alkyd-High Gloss, Interior, White and Light Tints.
   2. Fed. Spec. TT-E-508C — Interior Semigloss Tints and White.
   3. Fed. Spec. TT-E-543 — Enamel, Interior, Undercoat, Tints and White.
   4. Fed. Spec. TT-P-636 — Primer Coating, Alkyd, Wood and Ferrous Metal.

5.	Fed. Spec. TT-P-650C Type I (R/M)	Primer-Latex Base Interior White for Gypsum Board Primer Coating.

G. Federal Standards (FS):

1.	FS No. 595A	Colors.

H. Occupational Safety and Health Administration (OSHA):

1.	OSHA 1910.144-93	Safety Color Code for Marking Physical Hazards.
2.	OSHA 1910.145-93	Specifications for Accident Prevention Signs and Tags.

1.5 SYSTEM DESCRIPTION

A. Conform to ASTM D16 for interpretation of terms used in this section.

B. Any products to be used shall not contain lead or asbestos, or be defined as possible carcinogens.

1.6 SUBMITTALS

A. Refer to Part 3, General Terms and Conditions, Paragraph A.88; and Part 6, Submittal Requirements, of the FERMCO Contract Documents for submittals.

B. Product Data: Provide data on all finishing products, including a Material Safety Data Sheet for each product used.

C. Samples: Submit two sets of samples illustrating range of colors and textures available for each surface-finishing product scheduled; color selection by the FERMCO Construction Manager.

D. Samples: Submit two sets of samples illustrating selected colors and textures for each color selected.

E. Manufacturer's Instructions: Indicate special surface preparation procedures and substrate conditions requiring special attention.

F. All product data sheets, samples, and instructions shall be submitted prior to use.

1.7 QUALITY ASSURANCE

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

B. Applicator: Company specializing in performing the work of this section, with minimum 5 years documented experience approved by manufacturer.

1.8 DELIVERY, STORAGE, AND HANDLING

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

B. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

C. Container label to include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, clean-up requirements, color designation, and instructions for mixing and reducing. Labels to be kept readable at all times.

D. Store paint materials at a minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area and a paint storage safety cabinet as required by manufacturer's instructions and where directed by the FERMCO Construction Manager. Keep storage space clean and accessible. Oil or paint-soaked rags or waste shall be placed in tight-covered metal containers or removed from the premises at the close of each day's work. Take every precaution to avoid damage by fire. In no case shall the amount of materials stored exceed that permitted by local ordinances.

1.9 PROJECT CONDITIONS

A. Exterior painting shall not be done during or immediately following rainy or frosty weather, or when the temperature is below 50 degrees F or likely to drop to freezing. Avoid the application of treatments while surfaces are exposed to hot sun, or when temperature is above 90 degrees F or likely to be, during the drying period.

B. Interior work shall be done only when the building has been thoroughly dried out by natural or artificial heat, and when the work area is properly heated and ventilated, clean, and as dust-free as possible. Apply interior finishes only when a room temperature of at least 60 degrees F can be maintained during application of treatments and until coatings are dry.

1.10 MAINTENANCE

A. Provide 1 gallon of each color, type, and surface texture to the FERMCO Construction Manager.

B. Label each container with color, type, texture, and room locations in addition to the manufacturer's label.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Generally, the naming of acceptable products and manufacturers has been avoided in specifying the kinds of materials to be used for this work; however, the FERMCO Construction Manager may desire that the painting Subcontractor shall, generally, use only those products of the kinds and types specified which, in the manager's judgment and based on past experience, are best for the treatments specified. Each product used must, however, be of the highest quality in its particular category and must be made by a manufacturer having an established reputation as a maker of superior products. Manufacturer must agree to cooperate with the FERMCO Construction Manager and the painting

Subcontractor in securing the proper use and application of the products and to accept joint responsibility with the painting Subcontractor for satisfactorily completed work. All coatings used must be satisfactory to the FERMCO Construction Manager.

B. So that the major portion of the work will be covered by a single "joint responsibility" agreement, Subcontractor should propose a manufacturer who offers a comprehensive line of first quality materials of the types specified.

2.2 MATERIALS

A. Coatings: Ready mixed, except field catalyzed coatings. Process pigments to a soft paste consistency capable of being readily and uniformly dispersed to a homogeneous coating; good flow and brushing properties; capable of drying or curing free of streaks or sags. Coatings shall be compatible. All coatings (i.e., primer and finish coats) shall be free of lead and chromates.

B. Accessory Materials: Linseed oil, shellac, turpentine, paint thinners, and other materials not specifically indicated but required to achieve the finishes specified of commercial quality.

C. Patching Materials: Latex filler.

D. Fastener Head Cover Materials: Latex filler.

E. Follow NPCA guide for government specifications.
   1. Paints and paint types are as follows:
      a. Finish coating, gloss alkyd, conforming to Fed. Spec. TT-E-505A.
      b. Finish coating, alkyd, conforming to Fed. Spec. TT-E-508C.
      c. Primer coating, alkyd, conforming to Fed. Spec. TT-E-543.
      d. Primer coating, alkyd, conforming to Fed. Spec. TT-P-636.

e. Finish coating, latex, conforming to Fed. Spec. TT-P-650C.

PART 3 EXECUTION

3.1 EXAMINATION

A. Before commencing work on surfaces of any type, the Subcontractor shall carefully inspect same and be satisfied that they are dry and in all other respects suitable to receive the specified treatment. If the condition of any surface is such that it cannot be put in proper condition by normal preparatory methods, and arrangements for prompt correction cannot be made at once, the Subcontractor shall not undertake surface preparation and shall instead address a written request to the FERMCO Construction Manager for corrections which will provide an acceptable surface.

B. Application of any coating to a surface will constitute acceptance of the surface by the Subcontractor. If, after treatment, the completed finish (or any portion thereof) blisters, checks, peels, or otherwise shows indication of dampness or other irregular condition of surface, the Subcontractor shall remove the applied treatment and refinish the part affected at no cost to the Owner and to the satisfaction of the FERMCO Construction Manager. (The painting Subcontractor should determine dryness of all moisture-holding materials by use of a reliable electronic moisture meter.)

3.2 PREPARATION

A. General

1. It shall be the responsibility of the Subcontractor to properly prepare all surfaces to receive the particular treatment specified.
2. All usual preparatory measures common to painters' work, as well as such special procedures as are herein stipulated, shall be employed.

B. Structural Steel

1. Prepare surfaces in accordance with SSPC (SP-6, Paint 13, and Paint 20) procedures. Spot prime all bare metal areas immediately with compatible, rust-inhibiting primer, as approved by the FERMCO Construction Manager. Prepare steel for final coat.

C. Prime-coated miscellaneous and ornamental ferrous metal

1. Prepare surfaces of miscellaneous and ornamental ferrous metal items such as steel door frames, hollow metal doors, exposed lintels, railings, ornamental brackets, etc., as specified for exposed-to-view structural steel parts in Article 3.2, Paragraph B.
2. Fill any open joints and bare tool marks in parts furnished in manufacturer's baked-on prime coat with mineral filler, to make inconspicuous; sand smooth, then spot prime.

D. Zinc-coated metal parts; galvanized, or zinc-coated by other process

1. Unless the prime coat material to be used is recommended by its manufacturer for application over zinc-coated surfaces of the type at hand, after cleaning and any necessary de-glossing only, surfaces must be given phosphate pretreatment prior to application of prime coat; usual "vinegar etch" or acid pretreatment (wash) will not be permitted.
2. Phosphate pretreatment: Crystalline zinc phosphate type; either "Lithoform," made by the American Chemical Paint Co., Ambler, Pa., or "Galaprep No. S," made by Neilson Chemical Co., Detroit, Michigan, as approved by the FERMCO Construction Manager. Follow manufacturer's directions exactly as to cleaning prior to treatment, application of treatment, and after-rinse.
3. Preparation of surfaces for directly-applied prime coat: Clean all surfaces thoroughly with mineral spirits, naphtha, or other approved solvent, completely removing all oil, grease, and other

film. Roughen with steel wool, as necessary, to remove gloss.

4. Primer must be applied at once, following either cleaning only or phosphate pretreatment.

E. Caulking

1. Other required caulking common to painter's work shall be performed under Section 07900.
2. Use a resin-base, gun type, elastic caulking compound, free of volatile thinners; add no thinner.
3. Apply with gun and follow with tool, as required, to form a smooth coved fillet of the minimum required width, at projecting, overlapping, and fully recessed frames. Fill flush and tool slightly concave, where frame is flush, or just scant of flush. Apply well in advance of scheduled paint treatment; compound must have formed a firm, dust-free surface skin before prime coat is applied. Avoid smearing adjacent wall and/or metal; clean off any misplaced compound at once.

3.3 APPLICATION

A. All work shall be done by skilled mechanics in a workmanlike manner; all coats flowed on, or brushed out, to a uniform film. Completed work shall be free of runs, sags, blocked angles, raised grain, and all other evidence of poor or careless workmanship. Follow PDCA instruction manual.

B. Tint all undercoats toward the color of the final coat, with shade of each coat sufficiently different from that of work in place to permit easy identification.

C. Allow sufficient time before recoating to ensure proper drying of the preceding coat.

D. Exercise care to avoid getting material on a surface not intended to receive it. Remove any misplaced material or resultant stain, leaving the surface in proper condition.

E. General

1. Following surface preparation as specified; apply coats or treatments as listed below on the several kinds of surfaces required to be treated.
2. Refer to finish schedule and architectural drawings for the extent of wall and ceiling surfaces, metal doors, frames, trim, etc., requiring finish, and to drawings and specifications for mechanical and electrical work for extent of ductwork, piping, conduit, mechanical system devices, heating units, grilles, etc.
3. All coats specified herein are in addition to primer, sealer, or other preparatory or protective coats specified in other sections of this specification package or in the specifications for other contracts.

F. Structural Steel for Pre-Engineered Buildings.

1. Finish Treatment: Two coats latex gloss enamel.

G. New Work

1. Metal doors and metal frames:
   a. Primer: One coat primer.
   b. Finish treatment: Two coats exterior latex gloss enamel.
2. Exposed miscellaneous steel items, lintels:
   a. Primer: One coat primer.
   b. Finish treatment: Two coats exterior latex gloss enamel.
3. Mechanical equipment items:
   a. Finish treatment: First coat - exterior latex gloss enamel.
   b. Second coat - exterior latex gloss enamel.
4. Pipe, Valves, and Fittings - Carbon Steel:
   a. Two coats of epoxy-polyamids coating. Dry film thickness of 4 mils per coat.
5. Other Piping, Electrical Conduit in Exposed Locations:
   a. Primed: One coat primer.
   b. Finish Treatment: Two coats exterior gloss latex enamel.

6. Pipe Covering in Exposed Locations:
   a. Primer: One coat primer.
   b. Finish Treatment: Two coats exterior semi-gloss latex enamel.

H. Miscellaneous and ornamental fabricator-primed ferrous metals
   1. Includes prime-coated equipment items and their supports, in addition to parts regularly classified as "miscellaneous and ornamental ferrous metals." Any parts as named, but furnished bare, shall receive one coat of metal primer (as approved), followed by the treatment herein specified.

I. Steel ladders, steel grating, and other similarly located parts
   1. Two coats alkyd porch and floor enamel.

J. Outside surfaces of ductwork, metal housings
   1. First coat - pigmented primer-sealer.
   2. Second coat - final coat as on adjacent wall or ceiling.

K. Mechanical equipment items furnished in prime coat
   1. Finish treatment: Two coats latex interior-exterior enamel; gloss or machinery enamel.

3.4 CLEANING

A. As work proceeds, promptly remove paint where spilled, splashed, or splattered.

B. During progress of work, maintain premises free of unnecessary accumulation of tools, equipment, surplus materials, and debris.

C. Collect cotton waste, cloths, and materials which may constitute a fire hazard; place in closed metal containers as directed by the FERMCO Construction Manager.

3.5 PROTECTION

A. Provide clean drop cloths and other protection as approved to protect floors, doors, and other parts from damage. Where any work is accidentally spattered, clean promptly, and leave in satisfactory condition.

3.6 SAFETY PAINTING

A. The Subcontractor shall apply safety painting for the marking of physical hazards, and identification of piping systems, as required herein and as directed by the FERMCO Construction Manager. Accident prevention signs will be provided by others.

B. Safety colors shall be applied by the Subcontractor where and as required on and in the appropriate areas and equipment. The safety color code shall mark physical hazards and shall continue to provide an orderly, coordinated standard of practice for the plant and the safety of workers.

C. Color coding and designation shall comply with current OSHA 1910.144, OSHA 1910.145, ANSI Z535.5, ANSI Z53.1, and Federal Standard No. 595A.

D. The following safety colors shall have Federal Standard numbers as follows:

1. Red - No. 11105
2. Yellow - No. 13655
3. Orange - No. 12246
4. Green - No. 14260
5. Blue - No. 15102
6. Black - No. 17038

E. The color codes shall be used for the following identifications:

1. Red - Exposed fire protection systems shall be painted a continuous red.
2. Vivid Orange - Vivid orange shall be restricted to surface areas, machine guards where there is the potential for cutting, crushing, thermal burns, or electrical shock to personnel.

3. Green - Green shall be the basic color for designating safety and location of first aid equipment (other than fire fighting equipment).
4. Blue - Blue is limited to electrical equipment. Main electrical disconnects in all buildings shall be identified by stencil or label.
5. Black, White, or a Combination of These Two - Black, white, or a combination of these two shall be the basic colors for designating housekeeping and traffic markings.

F. Color coding for identification of piping systems shall conform to ANSI A13.1. Piping systems are defined as conduits for the transport of gases, liquids, and semi-liquids.
1. The Contractor shall identify pipes as follows:
   a. Content and direction of flow of piping systems shall be identified by stencil or Brady "Quik-Labels" (mastic back) painted or fixed on pipe or pipe covering. Such identification shall be located so as to ensure immediate recognition of piping system content and direction of flow.
   b. Piping shall be color coded by applying a painted solid color band completely encircling the pipe. The band shall be a minimum of 9 inches in length, longer when necessary to accommodate the full identification, and shall provide a minimum 2-inch border. The color bands shall be applied close to all valves, branches, and changes of direction, on both sides of each floor, wall, or barrier through which the line passes, every connection to equipment or service outlet, and at a maximum of 50-foot intervals on straight runs of pipe.
2. Line identification and directional flow arrows shall be arranged and located so as to be easily read by a person standing on the floor or at the normal access location of the pipe. Color codes, service codes, service descriptions, line numbers, and other required information is provided in the Subcontract Special Conditions.

3. As an aid to the Subcontractor in identifying line numbers and flow direction, piping will have been marked in black ink with the line numbers and flow arrows at each end of each pipe spool after piping installation is complete.

   a. The stenciled or mastic-backed labels shall include pipe content identification, line number, and unusual qualities of the pipe contents (i.e., hot, cold, pressure in lbs./sq. in.).

   b. On service piping, either liquid or gas, apply black arrows of same height and with same background color as adjacent identification labels, to indicate direction of flow.

   c. Lettering size shall be in accordance with the information in the chart below:

Nominal Pipe Diameter*	Size of Legend Letters*
3/4 to 1-1/4	1/2
1-1/2 to 2	3/4
2-1/2 to 6	1-1/4
8 to 10	2-1/2
Over 10	3-1/2

* All dimensions are given in inches.

   d. Pipes to be marked shall first be wiped clean of dirt, dust, grease, and moisture. When applying mastic-backed label, pressure must be applied so that the label will lie smooth and flat. Apply a brush coat of clear lacquer after label has been applied to pipe, making sure edges of label are well covered. Stencils may be used without use of lacquer cover.

e. Labels shall be applied only after the final inspection of the piping systems. The labels shall be applied on piping systems that require painting after the final coat has cured. Labels shall be applied in accordance with the manufacturer's recommendations.

END OF SECTION

U.S DEPARTMENT OF ENERGY

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

FERMCO Subcontract No. 2-21487

SOUTH FIELD EXTRACTION SYSTEM

Division 10 - Specialties

PARSONS

Prepared by: _____ 9/15/95
Date

Checked by: _____ 9/15/95
Date

SECTION 10211
METAL WALL LOUVERS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Fixed louvers and frames.

B. Bird screening.

1.2 RELATED SECTIONS

A. Section 01010 - General Requirements.

B. Section 07900 - Joint Sealers.

C. Section 13123 - Pre-Engineered Buildings.

D. Section 15500 - Heating, Ventilating, and Air Conditioning.

1.3 REFERENCE DRAWINGS

A. See Section 01011 for the Schedule of Drawings.

1.4 REFERENCES

A. Air Movement Control Association (AMCA):
1. AMCA 500-82 Test Method for Louvers, Dampers, and Shutters.

1.5 SYSTEM DESCRIPTION

A. Louver: To permit passage of air at a velocity as required by AMCA 500 without blade vibration or noise.

B. Louver: To permit 50 percent free area, minimum.

1.6 SUBMITTALS

A. Refer to Part 3, General Terms and Conditions, Paragraph A.88; and Part 6, Submittal Requirements, of the FERMCO Contract Documents for submittals.

B. Shop Drawings: Indicate the louver layout plan and elevations; opening and clearance dimensions; tolerances; head, jamb, and sill details; blade configuration; screens; blankout areas required; and frames. Submit shop drawings prior to use.

C. Product Data: Provide data prior to use, describing design characteristics, maximum recommended air velocity, maximum free area, materials, and finishes.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements prior to use.

E. Maintenance Data: Include lubrication schedules and adjustment requirements at completion of work.

1.7 QUALITY ASSURANCE

A. Perform work in accordance with AMCA Certification for Louvers.

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

1.8 PROJECT CONDITIONS

A. Verify that field measurements are as indicated on shop drawings.

B. Coordinate the work with installation of metal siding.

1.9 WARRANTY

A. Provide standard 20-year warranty at completion of work.

B. Include warranty coverage for degradation of siliconized polyester finish.

PART 2 PRODUCTS

2.1 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. It is the offerer's responsibility to propose equipment that is best suited for this project in combined terms of quality and price.

A. Airolite Co.

B. Louvers & Dampers, Inc.

C. Ruskin.

D. Other manufacturers who meet or exceed the requirements of this specification.

2.2 MATERIALS

A. Furnish and install extruded aluminum drainable blade louver similar to Type K6746, as manufactured by the Airolite Company, Marietta, Ohio. Louvers shall be 6 inches deep and assembled entirely by welding. Blades and frame shall be 0.81 inch extruded aluminum, alloy 6063-T5. All louvers shall be factory finished after assembly with a Kynar® 500 coating in a color selected from the manufacturer's chart.

B. Louvers shall bear AMCA Licensed Ratings Seals for air performance and water penetration ratings.

C. Bird Screen: Interwoven wire mesh of aluminum, 0.063-inch-diameter wire, 1/2-inch open weave, diagonal design.

D. Backdraft Damper (if required): Shall be extruded aluminum with linkage concealed in frame, mounted behind the cover (see Section 15500 for coordination).

2.3 ACCESSORIES

A. Fasteners and Anchors: Stainless steel type.

B. Primer: Zinc chromate, alkyd type.

C. Flashings: Of same material as louver frames.

D. Sealants: Type specified in Section 07900.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that prepared openings and flashings are ready to receive work and that opening dimensions are as indicated on shop drawings.

3.2 INSTALLATION

A. Install louver assembly in accordance with manufacturer's instructions.

B. Install louvers level and plumb.

C. Install flashings and align louver assembly to ensure that moisture is shed from flashings and diverted to exterior.

D. Secure louvers in opening framing with concealed fasteners.

E. Install bird screen and frame to interior of louver.

F. Install perimeter sealant and backing rod in accordance with Section 07900.

3.3 **ADJUSTING**

A. Adjust backdraft dampers for freedom of movement of control mechanism. Lubricate operating joints.

3.4 **CLEANING**

A. Clean surfaces and components.

3.5 **SCHEDULE**

A. See drawings for sizes and locations of louvers.

END OF SECTION

U.S DEPARTMENT OF ENERGY

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

FERMCO Subcontract No. 2-21487

SOUTH FIELD EXTRACTION SYSTEM

Division 13 - Special Construction

PARSONS

Prepared by: Billy J Jasper Sept 15, 1995
Date

Checked by: James L Cooper 15 SEPT 1995
Date

Prepared by: Dan W Sweeney 9/15/95
Date

Checked by: Herman D Rice 9/15/95
Date

SECTION 13123
PRE-ENGINEERED BUILDINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Pre-engineered, shop-fabricated metal buildings.

1.2 RELATED SECTIONS

A. Section 01010 - General Requirements.

B. Section 09900 - Painting.

C. Section 07900 - Joint Sealers.

D. Section 08710 - Door Hardware.

E. Section 10211 - Metal Wall Louvers.

1.3 REFERENCE DRAWINGS

A. See Section 01011 for the Schedule of Drawings.

1.4 REFERENCES

A. American Institute of Steel Construction (AISC):
   1. AISC S335-89 Specification for Structural Steel Buildings.

B. American Iron and Steel Institute (AISI):
   1. AISI SG-673 Part II-86 Design of Cold-Formed Steel Structural Members, Cold-Formed Steel Design Manual.

C. American Society of Civil Engineers (ASCE):
   1. ASCE 7-93 Minimum Design Loads for Buildings and Other Structures.

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

1.	ASTM A36/36M-94	Structural Steel.
2.	ASTM A153-89a	Zinc (Hot Dipped Galvanized) Coatings on Iron and Steel Products.
3.	ASTM A307 Rev. A93	Standard Specification for Carbon Steel Bolts and Studs.
4.	ASTM A325-93	Structural Bolts, Steel, Heat-Treated 120/105 ksi, Minimum Tensile Strength.
5.	ASTM A525-93	Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, General Requirements.
6.	ASTM A666-93	Standard Specifications for Anstenitic Stainless Steel Sheet.

E. American Welding Society, Inc. (AWS):

1. AWS D1.1-94 Structural Welding Code.

F. International Conference of Building Officials (ICBO):

1. ICBO Uniform Building Code - UBC 1991.

G. Building Officials and Code Administrator International (BOCA):

1. Ohio Basic Building Code - 1995 (OBBC).

H. Metal Building Manufacturer's Association (MBMA):

1. Low-Rise Building Systems Manual - 1988.

1.5 SYSTEM DESCRIPTION

A. Design Requirements:

1. Pre-engineered, shop-fabricated, structural steel building frame. Work of this section begins at the top of the concrete foundation slab except as required specifically otherwise herein.
   a. Primary Framing: The buildings covered by these specifications shall be of self-framing design using the roof and wall panels as the primary structural supporting members.
   b. Horizontal Dimensions: As shown on drawings.

c. Height from Slab to Eave: As shown on drawings.
d. Roof Slope: As shown on drawings.

2. Prefinished metal wall and roof panels.
3. Steel doors and frames and related hardware.
4. Gutters and downspouts.
5. Building and its components shall provide weathertight building under loads and exposure required herein.

B. Design Criteria:

1. Except as required specifically otherwise herein, prefabricated metal building shall be designed, fabricated, and erected in accordance with requirements of MBMA Low-Rise Building Systems Manual.
2. Structural steel sections or welded-up plate sections shall be designed in accordance with AISC.
3. Cold-formed steel structural members shall be designed in accordance with AISI SG-673.
4. Roof and wall panels shall be cold-formed and shall be designed in accordance with AISI SG-673.

C. Performance Requirements:

1. Design Loads:
   a. Dead load shall include weight of building construction plus all collateral loads.
   b. Live loads shall be as defined and stated in ASCE 7 except as stated otherwise herein.
   c. Vertical Live Loads:
      1) Primary Framing (Frames): 20 psf uniformly distributed over the roof area which it supports.
      2) The vertical live loads shall be in addition to the applicable dead loads and shall be applied to the horizontal projection of the roof.
   d. Wind Loads:
      1) The site-specific basic wind speed shall be 80 mph per OBBC Section 1112.3.2. The importance factor, "I," shall be

1.07 for Category II. Use exposure G for velocity pressure coefficient.

2) Load shall be proportioned and applied as horizontal and uplift forces according to the requirements of ASCE 7.

e. Snow Loads:

1) The ground snow load shall be 25 psf per OBBC Section 1112.2.

2) Roof snow loads, including balanced and unbalanced loads, shall be determined in accordance with ASCE 7. The importance factor for snow loads shall be 1.0.

f. Auxiliary and Collateral Loads:

1) Other static load shall be considered as a part of the design requirements and shall be combined with the design loads (wind, live, etc.) as prescribed in contract documents.

2) Static Loads: 5 psf on purlins and frames.

g. Combination of Loads: The combining of normal and auxiliary loads for design purposes shall be as prescribed and recommended by the MBMA Low Rise Building Systems Manual and the UBC, whichever produces the greater effect.

h. Deflection:

1) Roof panels shall not deflect more than 1/180 of span under design loads.

2) Roof purlins shall not deflect more than 1/180 of span under design loads.

3) Girts shall not deflect more than 1/180 of span under design loads.

2. Provide drainage to exterior for water entering or condensation occurring within wall or roof system.

3. Assembly shall permit movement of components without buckling, failure of joint seals, undue stress on fasteners, or other detrimental effects, when subject to temperature range of 100 degrees F.

1.6 SUBMITTALS

A. Shop Drawings:
1. Indicate location, arrangement, dimensions, materials, finishes, anchorage, fastenings, closures, sealants, accessories, and relation to adjacent work.
2. Indicate vertical and horizontal loads and forces at bearing on concrete foundation slab.
3. Indicate framing anchor bolt settings, sizes, and locations from foundation loads.

B. Product Data: Submit manufacturer's data on:
1. Prefinished sheet-metal items (including profiles).
2. Accessories.

C. Manufacturer's Installation Instructions: Submit installation and erection requirements for information only.

D. Samples: Submit complete set of manufacturer's standard finishes to indicate color. Finish shall be actual materials on metal. Size shall be not less than 3 inches by 5 inches.

E. Design Calculations: Submit set of design calculations to confirm compliance with structural requirements of this section. Calculations shall be signed by engineer as required under Article 1.7 and shall bear the engineer's seal.

F. Certificate of Conformance: Manufacturer certifies that the supplied product meets or exceeds specification requirements.

G. Work Plan: Include a clear description of how the Subcontractor will include the requirements for the design, erection, bracing, and stability of the pre-engineered building, and to mitigate potential collapse during erection. The plan shall include provisions for high wind and any other applicable safety hazards

related to building erection and worker safety, including a worker's fall protection plan.

1.7 QUALITY ASSURANCE

A. Design of Structural and Building Components:
   1. Design of structural systems and building components shall be performed by a structural engineer experienced in the design of pre-engineered, prefabricated metal building systems and who is licensed and registered in the State of Ohio.
   2. Engineer's signature and seal shall be placed on calculations and engineering drawings required to be submitted herein.
   3. Design shall include confirmation that building will perform as required under the design loads required in this section.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store prefabricated components, sheets, panels, and other manufactured items so they will not be damaged or deformed.

B. Stack materials on platforms or pallets above grade or on concrete slab, covered with opaque tarpaulins or other approved weather-resistant ventilated covering.

C. Store metal sheets and panels if subjected to water accumulation so they will drain freely. Do not store sheets and panels in contact with other materials which might cause staining.

D. Damaged material must be reported to determine if replacement is required.

E. Inspect panels to prevent moisture between panels, and secure as required.

1.9 WARRANTY

A. Warranty: Include coverage for exterior prefinished surfaces to cover prefinished color coat against chipping; cracking; or crazing, blistering, peeling, chalking, or fading.

B. Warranty: Include coverage for weathertightness of building enclosure elements after installation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Standard: For purposes of designating type and quality of the pre-engineered, prefabricated metal building and its accessories for work of this section, subcontract documents are based on products and systems as manufactured by Parkline, Inc., Winfield, WV 25213.

B. Building systems equivalent to or better than those of the following manufacturers will be acceptable in addition to the manufacturer above for use on the project when approved (in writing) by the Construction Manager. Products and systems shall provide for the functions, construction, and arrangement as required by the subcontract documents.

1. Steelox Building Systems, Cincinnati, OH 45246-6522.
2. Butler Manufacturing Co, Kansas City, MO 64141-0917.

2.2 MATERIALS

A. Fasteners:

1. Fasteners for primary framing shall comply with the requirements of ASTM A325. Provide equivalent nuts and washers. Bolts, nuts, and washers shall be galvanized to provide for requirements of ASTM A153.
2. Fasteners for secondary framing shall comply with the requirements of ASTM A307. Bolts, nuts, and

washers shall be galvanized to comply with the requirements of ASTM A153.

3. Fasteners for roof covering, wall covering, trim and flashing, gutters and downspouts, and other sheet metal work shall be AISI Alloy Type 302 or 304 as specified in ASTM A666. Provide with neoprene gaskets where used to make weathertight.

B. Sealants: Tube sealant shall be a synthetic elastomer-based material which becomes tack-free in less than 2 hours at 75 degrees F but retains flexibility. Service range shall be from -30 degrees F to +160 degrees F.

C. Tape Mastic: Preformed butyl-rubber based compound. Compound shall be nonhardening, noncorrosive to metal, and shall have excellent adhesion properties. Service range shall be from -30 degrees F to +160 degrees F.

D. Resilient Closures: Preformed to match panel configuration. Closed-cell sponge of Ethylene Propylene Diene Monomer.

E. Gutter Sealant: Manufacturer's standard.

2.3 ACCESSORIES

A. Trim and Flashing: Trim, flashing, and metal closures shall be fabricated from the same sheet metal material (thickness, composition, and finish) as required for wall panels.

B. Gutters and Downspouts:

1. Fabricate from same material and finish as required for roofing metal.
2. Form sections of gutters and downspouts in maximum possible lengths. Hem exposed edges.
3. Fabricate support straps of same material and finish as roofing metal.

C. Finishes:

1. Primary framing, purlins, girts, and miscellaneous secondary framing shall be cleaned and primed with shop primer.

2. Color of finish by FERMCO construction manager.

2.4 FABRICATION

A. Primary Framing:
1. Fabricate from structural steel plate, bar, tube, or rolled structural shapes complying with the requirements of ASTM A36 or better.
2. Fabricate components in accordance with the requirements of AISC.

B. Purlins: Cold-formed steel. Configuration and thickness shall be manufacturer's standard. Finish shall be factory-applied shop primer.

C. Girts: Cold formed steel. Configuration and thickness shall be manufacturer's standard. Finish shall be factory-applied shop primer.

D. Framed Openings:
1. Provide framed openings for doors, louvers, etc., as shown on subcontract drawings and as specified herein.
2. Openings shall be designed to structurally support the panels or framing which they replace and shall support the equipment for which they are provided.
3. Include framing, clips, and fasteners as necessary to install the opening.

E. Roof Panels:
1. Roof panels shall be supplied in a single continuous length from eave line to ridge line and shall be designed to tightly interlock so that no fasteners are required at intermediate points along the panel side laps.
2. Roof panels shall be maximum of 16 inches wide with a flat surface between the interlocking side ribs. The interlocking ribs shall be a minimum of 3 inches high and shall be turned upward. All roof panels shall be factory punched for connection at the eave line of the building.
3. Roof panels shall be minimum 24-gage steel coated on both sides with a corrosion-resistant aluminum-

zinc alloy applied by a continuous hot-dipping process. Coating weight shall be a minimum of 0.32 ounces of aluminum-zinc alloy per square foot of coated sheet (both sides) equivalent to about 0.80 mil thickness on each side. Minimum yield strength of panel material shall be 50,000 psi.

F. Wall Covering:

1. Exterior wall panels of the building shall be a single continuous length from the base channel to the roof line of the building at the sidewalls and endwalls of the building except where interrupted by wall openings.
2. Wall panels shall be 16 inches wide with a 3-inch-deep, inward-turned interlocking side rib. Wall panels shall contain two 3/4-inch-deep by 3-1/8-inch-wide fluted recesses, each starting 2-7/16 inches from each panel edge.
3. Wall panels shall be fastened internally to the base channel and eave cap of the building with 3/8-inch diameter electrogalvanized machine bolts placed within the panel interlock. The fastening system shall be designed so that no wall fasteners are exposed on the exterior surfaces of the walls.
4. Wall panels shall be minimum 24-gage galvanized steel conforming to ASTM A525 specifications with the galvanized coating conforming to G90 (1-1/4 ounce) standards. Minimum yield strength of panel material shall be 40,000 psi. Panel material shall be embossed with a random pattern pebble embossure of approximately 0.007-0.008 depth.
5. The bases of the wall panels shall be closed off with closure plugs conforming to the panel profile.

PART 3 EXECUTION

3.1 EXAMINATION

A. Installation and erection of work of this section shall be in accordance with the requirements of the subcontract documents and approved submittals.

B. Work shall be plumb and level, true to line and plane, rigid, and weathertight.

C. Work shall be free of rattles and loose components. Allow for expansion and contraction to prevent damage to components.

D. Prefinished surfaces shall be free of dents, scars, and blemishes. Repairs (if allowed by Construction Manager) shall match adjacent finish and shall match durability of adjacent finishes.

3.2 ERECTION/INSTALLATION/APPLICATION

A. Framing Members: 1/4 inch from level, 1/8 inch from plumb.

B. Siding and Roofing: 1/8 inch from true position.

END OF SECTION

SECTION 13400
INSTRUMENTS AND CONTROLS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Design and performance requirements of the instrumentation and controls that will support the South Field Extraction System. This section includes:
   1. Pressure gauges.
   2. Pressure indicating transmitters.
   3. Transit-time ultrasonic flowmeter.

B. Refer to Attachment A, Instrument Data Sheets, at the end of this section for detailed information and requirements for the instrumentation and controls defined herein. Refer to Section 15060, "Pipe, Fittings, Valves, and Accessories," for position switches.

C. Calibration of instruments and the installation of instrument piping and tubing systems, including piping, tubing, fittings, gauges, valves, meters, and other accessories (see Part 3 of this section). Refer to Attachment B at the end of this section for installation details.

1.2 RELATED SECTIONS

A. Section 01010 - General Requirements.

B. Section 16050 - Basic Electrical Materials and Methods.

C. Section 15060 - Pipe, Fittings, Valves, and Accessories.

1.3 REFERENCE DRAWINGS

A. See Section 01011 for the Schedule of Drawings.

1.4 REFERENCES

A. American Society of Mechanical Engineers (ASME):
   1. ASME B31.3-93 Chemical Plant and Petroleum Refining Piping.

B. American Society for Testing and Materials (ASTM):
   1. ASTM B68-92 Seamless Copper Tubing, Bright Annealed.
   2. ASTM B75-93 Seamless Copper Tube.

C. National Institute of Standards and Technology (NIST).

1.5 SYSTEM DESCRIPTION

A. General Design Requirements: For description of instrumentation equipment and detailed design requirements, reference Attachment A of this section.
   1. Electronic analog transmitters and receivers shall have their input and output signals isolated from ground.
   2. Contact closure outputs shall be "dry" contacts isolated from ground.
   3. Instruments and control devices which require external power shall accept 120 volts, 60 Hz as the power source.
   4. Indication devices shall be located for ease of operator readability.
   5. Instruments operating at 50 volts or greater shall be insulated in front and back to avoid accidental contact by personnel.

B. General Performance Requirements
   1. For detailed performance requirements for all instrumentation for this design package, reference Attachment A of this section.
   2. All instruments shall be accurate to the tolerance levels specified in Attachment A, Instrument Data Sheets, and shall maintain these tolerance levels in conditions as described Article 1.9 of this section.

3. Instrumentation shall perform to the stated requirements whether stationary or mobile and require calibration if remounted or moved.

1.6 SUBMITTALS

A. Provide submittals as required per Section 01010.

B. Product Data: Include catalog "cut sheets" and completed data sheets.

C. Shop Drawings: Include assembly drawings and wiring diagrams with shipment.

D. Installation instructions, including recommended calibration procedures and installation details, with shipment.
   1. Include frequency of calibration required at the time after system installation and regular intervals thereafter.
   2. Certification of test equipment (calibration records) used to complete the work as described herein.

E. Provide inspection and test procedures to the FERMCO Construction Manager for review prior to testing.

F. Test reports: Test reports shall be typewritten, listing equipment used, person or persons performing the tests, date tested, device or circuit tested, and results of test, with shipment.

G. Calibration reports, with shipment.

H. Operation and maintenance (O&M) manuals, with shipment.

I. Suggested spare parts inventory for each type of equipment with bid.

1.7 QUALITY ASSURANCE

A. Compatibility and Calibration: Instrumentation equipment provided shall be compatible with intended service.

1. Instrument equipment shall be calibrated to manufacturer's standards.
2. Test equipment shall be calibrated and shall be traceable by tag number, make, and model number to the instrument certified by the National Institute of Standards and Technology (NIST).

B. Manufacturers' Qualifications: Manufacturers shall have 5 years of verifiable experience in the production of instrumentation equipment of the same type and similar performance as that specified herein.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Packing and Shipping

1. Product shipping container(s) shall contain packing materials to prevent the entrance of water to instrument surfaces, interior, and exterior.
2. Product shipping container(s) shall be clearly marked "FRAGILE - DO NOT DROP," and shall be furnished with an itemized invoice stating the contents and quantity of products contained therein.
3. Ports for process and electrical connections shall be plugged to prevent the interior accumulation of dirt and moisture.
4. Control components assembled prior to shipment shall be packaged to minimize entry of dirt and moisture.
5. Exposed ports for process, electrical, and/or pneumatic connections shall be plugged to prevent interior accumulation of dirt and moisture.
6. Ensure that closures used for covering, wrapping, or plugging openings shall not be made of polyvinyl chloride (PVC) or other plastics that contain chlorides.

B. Acceptance at FEMP

1. Products arriving at the FEMP shall be examined for general damage during shipping. Those products found to be damaged shall not be accepted at the FEMP.

C. Storage and Protection

1. Instrumentation equipment shall be stored according to manufacturer's requirements for storage, if information regarding storage is provided by the manufacturer. In cases where specific storage requirements are not provided, equipment shall be stored in a clean, dry area, protected from the weather, until required for installation.

1.9 PROJECT CONDITIONS

A. Services

1. Operating Hours: 24 hours/day, 7 days/week, 52 weeks/year.
2. Industrial design with plant life of 30 years.

B. Ambient Conditions

1. Plant Location: Fernald, Ohio.
2. Plant Elevation: 580 feet above sea level.
3. Ambient Temperature Range: -10 to 100 degrees F.
4. Barometric Pressure, inches Hg absolute (mean at 70 degrees F): 29.4.
5. Relative Humidity: Varies from 20 percent to 95 percent.

C. Electrical Supply: 120 volts, single phase, 60 Hz or 24 volts DC as indicated on drawings.

1.10 SEQUENCING AND SCHEDULING

A. The sequencing of work and scheduling of tasks shall follow the project schedule and milestones approved by FERMCO. Acquisition/delivery of instrumentation and controls shall adhere to and support the approved project schedule.

1.11 MAINTENANCE

A. Maintenance Service

1. Preventive/scheduled maintenance shall be performed per the manufacturer's instructions. Maintenance service numbers and information shall be provided along with product documentation sent in shipping. Maintenance policies and procedures shall be fully described in the maintenance documentation.

B. Extra Materials

1. Any extra/replacement parts or materials required to maintain acceptable product performance levels shall be referenced in the product documentation provided with shipping.

PART 2 PRODUCTS

The listing of equipment suppliers below in no way precludes the offerer from proposing alternate suppliers. The equipment listed is intended to identify the type of equipment that is best suited for this project in combined terms of quality and price.

2.1 EQUIPMENT

A. Pressure Gauges (See Attachment A, Sheet 1)

1. Pressure element shall be bourdon tube and shall be manufactured from material suitable for specific process application, nonpotable water.
2. Scale shall be selected so that normal operating range is between 33 percent and 67 percent of span.
3. Manufacturers: Helicoid, Dwyer, or McDaniel.

B. Pressure Indicating Transmitters (See Attachment A, Sheets 2 and 3)

1. Pressure element shall be bourdon tube or diaphragm. Bourdon tube or diaphragm shall be manufactured from material suitable for specific process application, nonpotable water.

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2. Range shall be selected so that normal operating pressure is between 33 percent and 67 percent of span.
3. Pressure transmitter shall have an output of 4-20 mA DC. Minimum output signal shall be equal to 0 percent of span and maximum output shall be equal to 100 percent of span.
4. Accuracy shall be a maximum of 2 percent of calibrated rate with repeatability of 0.1 percent of rate.
5. Manufacturer: Dwyer, Rosemount, or McDaniel.

B. Transit-Time Ultrasonic Flow Meter (See Attachment A, Sheets 4, 5, 6, and 7)

1. Ultrasonic flow meter shall comply with the following performance requirements:
   a. Single-channel transit-time flow meter shall be a clamp-on design precluding the requirement of penetrating into the pipe.
   b. Wetted transducers or electrodes will not be acceptable.
   c. Flow meters shall have the ability to indicate flow rate, flow velocity, total flow, etc.
2. Flow meter electronics shall be housed in a NEMA 4 enclosure and powered by 120 VAC, 60 hertz. Provide an isolated 4-20 mA DC output proportional to flow and capable of driving a 1000 ohm resistive load.
3. Flow meter accuracy shall be plus and minus 2 percent over the flow range.
4. Repeatability shall be 0.1 percent of flow with a sensitivity of 0.001 feet per second.
5. Manufacturer: Controlotron, Rosemount, or Polysonics.

2.2 MATERIALS

A. See Attachments A and B for materials of construction.

2.3 SOURCE QUALITY ASSURANCE

A. Test controls and instruments prior to shipment to ensure performance in compliance with requirements of these specifications under simulated operating conditions.

2.4 LABELING

A. Instrument Tagging (see Attachment C, sheets 1, 2, 3, and 4): Instruments shall be tagged accordingly with three-layer, laminated plastic plate 1-inch by 2-1/2 inches, having a minimum thickness of 1/16 inch.
   1. Lettering shall be minimum 1/4 inch high and boldly stamped black on white background.
   2. Tags shall be secured to the instruments by a beaded SST chain or SST wire, 16 AWG minimum, so that they will remain attached to the instrument and not inhibit its operation.

PART 3 EXECUTION

3.1 EXAMINATION

A. Perform work of placing initial operation equipment installed or wired following the instructions of the equipment manufacturers.
   1. After energizing and prior to start-up, check control circuits and programs for proper sequence of operation and interlocking functions.
   2. Any wiring changes required as a result of such checks shall be properly identified by changing terminal strip and/or wiring markers.

B. Prior to installation, instruments and materials shall be free from contamination in accordance with the following:
   1. No residual contaminants present that could cause the instrument to become inoperative.
   2. No residual moisture present.
   3. No corrosion products, such as rust, present.

3.2 SPECIAL INSTRUCTIONS

A. General

1. Instrument locations shall be as indicated on drawings approved for construction. Any proposed deviation from the indicated locations shall be submitted to the FERMCO Construction Manager for approval prior to implementation.
2. The hand valves shall be positioned so that handwheels or handles shall be facing the operator and easily accessible without any obstruction or interference.
3. Drain and blowdown valves shall be located so that they are accessible without a ladder or a portable platform and away from walkways, aisles, and operating areas.
4. Joiners (length of pipe made by welding together pieces shorter than 20 feet) shall not be permitted unless approved by the FERMCO Construction Manager. Where joiners are permitted, the welds shall be made by welders qualified and certified in accordance with the requirements specified in Article 3.3, Paragraph C. Where piping line classes interface with instrument piping classes, a threaded NPT pipe connection shall be used.
5. Support: Provide supports and brackets as necessary to make the installation rigid.
6. Instrument lines, tubing, or piping, in process, shall not be pocketed.
7. Traps in instrument lines are not acceptable.

B. Threaded Connections

1. When installing instruments, sealant compound shall be applied to male threads only. Sealant compound or tape shall cover all male threads.
2. In making threads, care shall be taken to cut the minimum thread for proper engagement; excessive threads shall be avoided. After each thread is made, burrs shall be removed from the inside and outside of pipe.
3. Prior to final connection of tubing to the instruments, ensure that pipes, valves, pipe

fittings, tubing, tubing fittings, instruments, and every component have been thoroughly cleaned and dried, internally and externally, of oil, grease, thread compound, water, dust, thread burrs, and any other foreign material.

4. In general, instrument installation, including supports, air headers, subheaders, valves, instruments, fittings, and all associated work, will be inspected by the FERMCO Construction Manager.

C. Welding

1. General: Welding and weld inspections, examinations, and tests of instrument piping shall conform to proper weld procedure and practices in compliance with the requirements of Piping Welding Specifications and the additional requirements specified herein.
2. Welding on Galvanized Pipe: Where it becomes necessary to do welding on galvanized pipe or components, the galvanizing shall be cleaned away a minimum distance of 3 inches from the welding joint. After welding and weld examinations are completed, the cleaned areas and ungalvanized components shall be coated with a hand-applied, zinc-rich compound.

3.3 FIELD QUALITY ASSURANCE

A. Testing: Instrument piping and tubing shall be pneumatically pressure tested after installation, using FERMCO-approved testing procedures.

1. Test each field transmitter, etc., for proper operation and document the test results.
2. Check interlocking circuits installed for conformance to schematic diagrams and document the check results.
3. To protect sensitive instruments from overpressure damage, the instruments shall be disconnected from the piping and tubing to be tested.
4. Instrument openings shall be covered, capped, or plugged to prevent ingress of foreign matter.

5. Disconnected ends of piping and tubing shall be plugged with appropriate pipe and tube fittings.
6. Joints, including welds, shall be visibly exposed during testing of the installation.
7. Instruments, all connections, piping, and tubing shall be cleaned and reconnected, and the system shall be tested under normal operating pressures.

B. Testing Procedures: Testing shall include the following:
1. Instrument tubing shall be pneumatically pressure tested with clean, dry, compressed air and in accordance with ASME B31.3A, Paragraph 345.5.
2. The pneumatic test pressure shall be continuously maintained for a minimum of 20 minutes at the required examination pressure and for such additional time as may be necessary to conduct the examination of joints for leakage with a bubble-type leak test.
   a. The bubble test procedures shall be submitted for review and shall, as a minimum, include soap application procedure and soap material to be used.

C. Joints reconnected after initial test shall be service tested in accordance with ASME B31.3A, Paragraph 345.5.

3.4 ADJUSTING

A. Calibration
1. Calibrate instruments and components in accordance with manufacturer's calibration data over the full operational range; verify instruments to be within published specification and accuracy.
2. Instruments shall be calibrated individually and, where applicable, as a system.
3. Components that have adjustable features shall be carefully set for specific conditions and applications of their project. Affix a calibration sticker.
4. Calibration sticker shall contain the following information:
   a. Equipment identification tag number.

b. Range of calibration.
c. Date and name of persons doing calibration.

B. Calibration Ranges
1. Field Transmitters: Check zero and span at 10 percent, 50 percent, and 90 percent of range by impressing measured signal into input or signal connections, in accordance with manufacturer's instructions.

C. Repairs and Retesting: Test failures that require repairs shall be repaired and retested as specified in Article 3.4, Paragraph A.

3.5 CLEANING

A. Instruments shall be cleaned in accordance with the manufacturer's recommended cleaning procedures.

B. After cleaning, work shall be free from contamination in accordance with the following:
1. No residual contaminants present that could cause the instrument to become inoperative.
2. No residual moisture present.
3. No corrosion products, such as rust, present.

3.6 ATTACHMENTS

A. The following Instrument Data Sheets are attached:

1.	Pressure Gauges	1
2.	Pressure Instruments	2 and 3
3.	Transit-Time Ultrasonic flowmeter	4, 5, 6, and 7

B. The following Instrument Installation Details are attached:

1.	Pressure Gauge with Isolation Valve	1
2.	Pressure Transmitter	2
3.	Transit-Time Ultrasonic Flowmeter	3
4.	Instrument Mounting Stand	4

C. Instrument Index 1, 2, 3, and 4

END OF SECTION

ATTACHMENT A

INSTRUMENT DATA SHEETS

7311

REQUISITION NO.						VENDOR				
Reference Specification Sheet No.			NOTES APPLY TO ALL GAUGES			Model No.				
1	Type:	X	Indicating		Receiver	8	Pressure Element:	X	Bourdon	Bellows
			Other						Other	
2	Mounting:		Surface	X	Local	9	Element Material:			X Steel
			Flush				Type:		Stain. Steel	Other
3	Dial Diameter:	4 1/2 inches				10	Socket Material:		Bronze	X Steel
4	Dial Color:		Black	X	White w/ Black Markings		Type:		Stain. Steel	Other
5	Case Material:		Cast Iron		Aluminum X Phenol	11	Connection: (NPT)		1/4 - in.	X 1/2 - in.
6	Ring Material:	X	Screwed		Hinged Slip			X	Bottom	Back
7	Case Fill:		Liquid Filled		Glycerine Filled	12	Movement:	X	Bronze	Stain. Steel
			Other						Nylon	Other
						13	Blowout Disk	X	Yes	No

Rev	Tag No.	Item No.	P & ID No. and Section	Range (psi) Tube	Range (psi) Dial	Operating Pressure	Service	
	PI-050		N-00191		0-150	90 PSI	SOUTH PLUME DISCHARGE PRESSURE	
	PI-051		N-00191		0-150	90 PSI	SFES TREATMENT HEADER PRESSURE	
	PI-052		N-00191		0-150	90 PSI	SFES DISCHARGE FORCE MAIN PRESSURE	
	PI-053		N-00191		0-150	90 PSI	SFES TREATMENT HEADER PRESSURE	
	PI-054		N-00191		0-150	90 PSI	SFES DISCHARGE FORCE MAIN PRESSURE	
	PI-055		N-00191		0-150	90 PSI	SFES DISCHARGE FORCE MAIN PRESSURE	

NOTES:
1. LENS SHALL BE POLYCARBONATE.
2. MAXIMUM TEMPERATURE: 120 DEG F.
3. ACCURACY SHALL BE +/- 2% OF FULL SCALE.

PARSONS ERA PROJECT		Sheet	Job No.
INSTRUMENT DATA SHEET	PRESSURE GAUGES	1	CRU5 / PO126
WBS 1.1.1.1.5.3.1		Document Number 13400-ATTACHMENT 1	Rev 0

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ENG 031

05-Sep-95

REQUISITION NO.

Reference Specification Sheet No.

VENDOR

Model No.

GENERAL

1 Description: ___ Recorder ___ Indicator X Blind ___ Controller X Transmitter

2 Case: ___ Rectangular ___ Circular X Standard Other ___

3 Case Color: ___ Black X Standard Other ___

4 Mounting: ___ Flush ___ Surface X Yoke

5 No. Points: ___ Recording X Indicating ___

6 Chart Type: ___ 12-inch Circ. ___ Other ___

7 Chart Range ___ Number ___

8 Scale Range ___ Type ___

9 Chart Drive: ___ Spring ___ Electric ___ Pneumatic

10 Chart Speed ___ Wind ___

11 Volts/Hertz ___ ___ Explosion Proof ___ Air Pressure ___

12 Other : NEMA 4X HOUSING

TRANSMITTER

13 Type: ___ Pneumatic X Electric

14 Output: ___ 3-15 psi X 4-20 mA DC ___ Other ___

15 TWO (2) WIRE, ADJ. DAMPING

CONTROLLER N/A

16 Type : ___ Pneumatic ___ Electric Other ___

17 Proportional ___ Percent ___ Auto-Reset ___ Rate-Action ___ On-Off Other ___

18 Output ___ 3-15 psi ___ 4-20 mA DC Other ___

19 On Measurement Increase Output ___ Increases ___ Decreases

AUTO MANUAL SWITCH N/A

20 No. Positions ___ ___ External ___ Internal ___ Integral

SETPOINT ADJUSTMENTS N/A

21 Manual: X Internal ___ External

22 Remote: ___ Pneumatic ___ Electric

23 Control Point Span: ___ Fixed ___ Adjustable

24 Others ___

PRESSURE ELEMENT

25 ___ Spiral ___ Bellows ___ Bourdon X Diaphram ___ Helical Other ___

26 Material: ___ Bronze X Stainless Steel ___ Carbon Steel ___ Other ___

27 Absolute Head Compensation ___

28 Static Head Compensation ___ Head ___

29 Range ___ X psig ___ in. Mercury Vacuum ___ psia ___ Other ___

30 Connection ___ 1/4 in. NPT X 1/2 in. NPT ___ Back ___ Bottom ___ Other ___

ACCESSSORIES

31 Filter and Regulator ___

32 Air Supply Gauge ___

33 Local Indicator YES

34 Charts and Inkset ___

35 Mounting Yoke YES

36 Pulsation Dampener ___

37 Manifold ___

38 Alarm Switch ___ ___ Hermetically Sealed ___ Explosion Proof ___ General Purpose

Notes:

1. PIT-031, 032, 033, 034, 002, 005, 006, 007, 008,009 WILL BE PRE ASSEMBLED WITH SILICONE FILLED 316 SS ARMOURED BRAID CAPILLIARY TO REMOTE ASHCROFT DIAPHRAGM SEAL (OPTIONAL)
2. OPERATING PRESSURE AND SET POINT: SEE TABLE ON SHEET 2

REQUISITION NO.	VENDOR
Reference Specification Sheet No. SEE SHEET 1	Model No.

FOR PIT REQUIREMENT SEE SHEET 1

1	Type:	___ Indicating	___ Receiver		8	Pressure Element:	___ Bourdon	___ Bellows
		___ Other	_____				___ Other	_____
2	Mounting:	___ Surface	___ Local	___ Flush	9	Element Material:	___	___ Steel
3	Dial Diameter:	_____				Type:_____	___ Stain. Steel	___ Other _____
4	Dial Color:	___ Black	___ White w/ Black Markings		10	Socket Material:	___ Bronze	___ Steel
5	Case Material:	___ Cast Iron	___ Aluminum	___ Phenol		Type:_____	___ Stain. Steel	___ Other _____
6	Ring Material:	___ Screwed	___ Hinged	___ Slip	11	Connection: (NPT)	___ 1/4 - in. ___ Bottom	___ 1/2 - in. ___ Back
7	Fill:	___ Liquid Filled	___ Glycerine Filled		12	Movement:	___ Bronze	___ Stain. Steel
		___ Other	_____				___ Nylon	___ Other _____
					13	Blowout Disk	___ Yes	___ No

Rev	Tag No.	Item No.	P & ID No. and Section	Range (psi) ADJ.	Range (psi) SET	Operating Pressure	Service	Line No.
	PIT-031	1	N-00190	0-500	0-110	40 TO 65	WELL PUMP 18 DISCHARGE	GW-8"-2914-IC
	PIT-032	2	N-00190	0-500	0-110	40 TO 65	WELL PUMP 19 DISCHARGE	GW-6"-2916-IC
	PIT-033	3	N-00190	0-500	0-110	40 TO 65	WELL PUMP 20 DISCHARGE	GW-6"-2918-IC
	PIT-034	4	N-00190	0-500	0-110	40 TO 65	WELL PUMP 21 DISCHARGE	GW-6"-2920-IC
	PIT-005	5	N-00191	0-500	0-110	40 TO 65	WELL PUMP 13 DISCHARGE	GW-8"-2900-IC
	PIT-006	6	N-00191	0-500	0-110	40 TO 65	WELL PUMP 14 DISCHARGE	GW-8"-2904-IC
	PIT-007	7	N-00191	0-500	0-110	40 TO 65	WELL PUMP 15 DISCHARGE	GW-8"-2910-IC
	PIT-008	8	N-00191	0-500	0-110	40 TO 65	WELL PUMP 16 DISCHARGE	GW-8"-2908-IC
	PIT-009	9	N-00191	0-500	0-110	40 TO 65	WELL PUMP 17 DISCHARGE	GW-6"-2912-IC
	PIT-002	10	N-00191	0-500	0-70	25 TO 45	VALVE HOUSE DISCHARGE	GW-20"-2924-IC

NOTES:

PARSONS ERA PROJECT		Sheet	Job No.
INSTRUMENT DATA SHEET	PRESSURE INSTRUMENT	3	CRU5/PO126
WBS 1.1.1.1.5.3.1		Document Number 13400-ATTACHMENT 1	Rev 0

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ENG 031

	REQUISITION NO.			VENDOR					
1	Loop Tag No.			FE/FIT-031		FE/FIT-032		FE/FIT-033	
2	Item No.								
3	Model No.			NOTE (1)		NOTE (1)		NOTE (1)	
4	Service			WELL PUMP 18 DISCHARGE		WELL PUMP 19 DISCHARGE		WELL PUMP 20 DISCHARGE	
5	Line No.			GW-8"-A-2914-IC		GW-6"-A-2916-IC		GW-6"-A-2918-IC	
6	P&ID No./Section			95X-5900-N-00190		95X-5900-N-00190		95X-5900-N-00190	
	SERVICE CONDITIONS								
7	Fluid			CLEAN WATER		CLEAN WATER		CLEAN WATER	
8	Normal Flow (units)			400 GPM		400 GPM		400 GPM	
9	Flow (units)	Max.	Min.	500 GPM	100 GPM	500 GPM	100 GPM	500 GPM	100 GPM
10	Temperature (units)	Max.	Min.	90 DEG F	40 DEG F	90 DEG F	40 DEG F	90 DEG F	40 DEG F
11	Pressure (units)	Max.	Min.	65 PSIG	40 PSIG	65 PSIG	40 PSIG	65 PSIG	40 PSIG
12	Velocity (units)	Max.	Min.	3.21 FPS	0.64 FPS	5.55 FPS	1.11 FPS	5.55 FPS	1.11 FPS
13	Conductivity (µMHOS/ c)	Norm.	Min.	LOW	LOW	LOW	LOW	LOW	LOW
14	Specific Gravity	Max.	Norm.	1	1	1	1	1	1
15	% Solids	Max.	Norm.	1	1	1	1	1	1
16	Extra Conditions or Requirements								
	MEASURING ELEMENT			FE-031 B		FE-032 B		FE-033 B	
17	Tube Size (units) Matl. Sched.			8"	SCH 40	6"	SCH 40	6"	SCH 40
18	Liner Material			N/A		N/A		N/A	
19	End Connections / Type Material			N/A	-	N/A	-	N/A	-
20	Electrode And Or Tranducer Material			NOTE (1)		NOTE (1)		NOTE (1)	
21	Meter Casing			N/A		N/A		N/A	
22	Power Requirements / Electrical Code			120V, 60HZ	GENERAL	120V, 60HZ	GENERAL	120V, 60HZ	GENERAL
23	Enclosure Class			NEMA 4		NEMA 4		NEMA 4	
24	Grounding Type / Material			N/A		N/A		N/A	
25	Ultrasonic Cleaning			N/A		N/A		N/A	
26	Extra Features or Requirements			NOTE (1)		NOTE (1)		NOTE (1)	
	TRANSMITTER			FIT-031 A		FIT-032 A		FIT-033 A	
27	Output Signal (units)			4-20 mA		4-20 mA		4-20 mA	
28	Calibrated Flow Range (units)			NOTE (1)		NOTE (1)		NOTE (1)	
29	Conduit Conn. Size (units)			1/2"		1/2"		1/2"	
30	Mounting			TO THE PIPE OR WALL		TO THE PIPE OR WALL		TO THE PIPE OR WALL	
31	Enclosure Class			NEMA 4		NEMA 4		NEMA 4	
32	Signal Cable Length (units)			500 FT. MAX.		500 FT. MAX.		500 FT. MAX.	
33	Power Requirement / Elect. Code			120V, 60HZ	GENERAL	120V, 60HZ	GENERAL	120V, 60HZ	GENERAL
34	Integrator			OPTIONAL		OPTIONAL		NO	
35	Zero Return			N/A		N/A		N/A	
36	Alarms			OPTIONAL		OPTIONAL		OPTIONAL	
37	Special Modification			N/A		N/A		N/A	
38	Extra Features or Requirements								

Notes:

1. INFORMATION SUPPLIED BY MANUFACTURER

	REQUISITION NO.			VENDOR					
1	Loop Tag No.			FE/FIT-034		FE/FIT-005		FE/FIT-006	
2	Item No.								
3	Model No.			NOTE (1)		NOTE (1)		NOTE (1)	
4	Service			WELL PUMP 21 DISCHARGE		WELL PUMP 13 DISCHARGE		WELL PUMP 14 DISCHARGE	
5	Line No.			GW-6"-A-2920-IC		GW-8"-A-2900-IC		GW-6"-A-2904-IC	
6	P&ID No./Section			95X-5900-N-00190		95X-5900-N-00191		95X-5900-N-00191	
	SERVICE CONDITIONS								
7	Fluid			CLEAN WATER		CLEAN WATER		CLEAN WATER	
8	Normal Flow (units)			400 GPM		400 GPM		400 GPM	
9	Flow (units)	Max.	Min.	500 GPM	100 GPM	500 GPM	100 GPM	500 GPM	100 GPM
10	Temperature (units)	Max.	Min.	90 DEG F	40 DEG F	90 DEG F	40 DEG F	90 DEG F	40 DEG F
11	Pressure (units)	Max.	Min.	65 PSIG	40 PSIG	65 PSIG	40 PSIG	65 PSIG	40 PSIG
12	Velocity (units)	Max.	Min.	5.55 FPS	1.11 FPS	3.21 FPS	0.64 FPS	3.21 FPS	0.64 FPS
13	Conductivity (µMHOS/	c) Norm.	Min.	LOW	LOW	LOW	LOW	LOW	LOW
14	Specific Gravity	Max.	Norm.	1	1	1	1	1	1
15	% Solids	Max.	Norm.	1	1	1	1	1	1
16	Extra Conditions or Requirements								
	MEASURING ELEMENT			FE-034 B		FE-005 B		FE-006 B	
17	Tube Size (units) Matl. Sched.			6"	SCH 40	6"	SCH 40	8"	SCH 40
18	Liner Material			N/A		N/A		N/A	
19	End Connections / Type Material			N/A	-	N/A	-	N/A	-
20	Electrode And Or Tranducer Material			NOTE (1)		NOTE (1)		NOTE (1)	
21	Meter Casing			N/A		N/A		N/A	
22	Power Requirements / Electrical Code			120V, 60HZ	GENERAL	120V, 60HZ	GENERAL	120V, 60HZ	GENERAL
23	Enclosure Class			NEMA 4		NEMA 4		NEMA 4	
24	Grounding Type / Material			N/A		N/A		N/A	
25	Ultrasonic Cleaning			N/A		N/A		N/A	
26	Extra Features or Requirements			NOTE (1)		NOTE (1)		NOTE (1)	
	TRANSMITTER			FIT-034 A		FIT-005 A		FIT-006 A	
27	Output Signal (units)			4-20 mA		4-20 mA		4-20 mA	
28	Calibrated Flow Range (units)			NOTE (1)		NOTE (1)		NOTE (1)	
29	Conduit Conn. Size (units)			1/2"		1/2"		1/2"	
30	Mounting			TO THE PIPE OR WALL		TO THE PIPE OR WALL		TO THE PIPE OR WALL	
31	Enclosure Class			NEMA 4		NEMA 4		NEMA 4	
32	Signal Cable Length (units)			500 FT. MAX.		500 FT. MAX.		500 FT. MAX.	
33	Power Requirement / Elect. Code			120V, 60HZ	GENERAL	120V, 60HZ	GENERAL	120V, 60HZ	GENERAL
34	Integrator			OPTIONAL		OPTIONAL		NO	
35	Zero Return			N/A		N/A		N/A	
36	Alarms			OPTIONAL		OPTIONAL		OPTIONAL	
37	Special Modification			N/A		N/A		N/A	
38	Extra Features or Requirements								

Notes:

1. INFORMATION SUPPLIED BY MANUFACTURER

	REQUISITION NO.			VENDOR					
1	Loop Tag No.			FE/FIT-007		FE/FIT-008		FE/FIT-009	
2	Item No.								
3	Model No.			NOTE (1)		NOTE (1)		NOTE (1)	
4	Service			WELL PUMP 15 DISCHARGE		WELL PUMP 16 DISCHARGE		WELL PUMP 17 DISCHARGE	
5	Line No.			GW-8"-A-2910-IC		GW-8"-A-2908-IC		GW-8"-A-2912-IC	
6	P&ID No./Section			95X-5900-N-00191		95X-5900-N-00191		95X-5900-N-00191	
	SERVICE CONDITIONS								
7	Fluid			CLEAN WATER		CLEAN WATER		CLEAN WATER	
8	Normal Flow (units)			400 GPM		400 GPM		400 GPM	
9	Flow (units)	Max.	Min.	500 GPM	100 GPM	500 GPM	100 GPM	500 GPM	100 GPM
10	Temperature (units)	Max.	Min.	90 DEG F	40 DEG F	90 DEG F	40 DEG F	90 DEG F	40 DEG F
11	Pressure (units)	Max.	Min.	65 PSIG	40 PSIG	65 PSIG	40 PSIG	65 PSIG	40 PSIG
12	Velocity (units)	Max.	Min.	3.21 FPS	0.64 FPS	3.21 FPS	0.64 FPS	3.21 FPS	0.64 FPS
13	Conductivity (µMHOS/ c)	Norm.	Min.	LOW	LOW	LOW	LOW	LOW	LOW
14	Specific Gravity	Max.	Norm.	1	1	1	1	1	1
15	% Solids	Max.	Norm.	1	1	1	1	1	1
16	Extra Conditions or Requirements								
	MEASURING ELEMENT			FE-007 B		FE-008 B		FE-009 B	
17	Tube Size (units) Matl. Sched.			8"	SCH 40	6"	SCH 40	6"	SCH 40
18	Liner Material			N/A		N/A		N/A	
19	End Connections / Type Material			N/A	-	N/A	-	N/A	-
20	Electrode And Or Tranducer Material			NOTE (1)		NOTE (1)		NOTE (1)	
21	Meter Casing			N/A		N/A		N/A	
22	Power Requirements / Electrical Code			120V, 60HZ	GENERAL	120V, 60HZ	GENERAL	120V, 60HZ	GENERAL
23	Enclosure Class			NEMA 4		NEMA 4		NEMA 4	
24	Grounding Type / Material			N/A		N/A		N/A	
25	Ultrasonic Cleaning			N/A		N/A		N/A	
26	Extra Features or Requirements			NOTE (1)		NOTE (1)		NOTE (1)	
	TRANSMITTER			FIT-007 A		FIT-008 A		FIT-009 A	
27	Output Signal (units)			4-20 mA		4-20 mA		4-20 mA	
28	Calibrated Flow Range (units)			NOTE (1)		NOTE (1)		NOTE (1)	
29	Conduit Conn. Size (units)			1/2"		1/2"		1/2"	
30	Mounting			TO THE PIPE OR WALL		TO THE PIPE OR WALL		TO THE PIPE OR WALL	
31	Enclosure Class			NEMA 4		NEMA 4		NEMA 4	
32	Signal Cable Length (units)			500 FT. MAX.		500 FT. MAX.		500 FT. MAX.	
33	Power Requirement / Elect. Code			120V, 60HZ	GENERAL	120V, 60HZ	GENERAL	120V, 60HZ	GENERAL
34	Integrator			OPTIONAL		OPTIONAL		NO	
35	Zero Return			N/A		N/A		N/A	
36	Alarms			OPTIONAL		OPTIONAL		OPTIONAL	
37	Special Modification			N/A		N/A		N/A	
38	Extra Features or Requirements								

Notes:

1. INFORMATION SUPPLIED BY MANUFACTURER

	REQUISITION NO.				VENDOR			
1	Loop Tag No.			FE/FIT-001				
2	Item No.							
3	Model No.			NOTE (1)				
4	Service			VALVE HOUSE DISCHARGE				
5	Line No.			GW-20"-A-2924-1C				
6	P&ID No./Section			95X-5900-N-00191				
	SERVICE CONDITIONS							
7	Fluid			CLEAN WATER				
8	Normal Flow (units)			1400 GPM				
9	Flow (units)	Max.	Min.	2000 GPM	400 GPM			
10	Temperature (units)	Max.	Min.	90 DEG F	40 DEG F			
11	Pressure (units)	Max.	Min.	25 PSIG	15 PSIG			
12	Velocity (units)	Max.	Min.	3.05 FPS	0.61 FPS			
13	Conductivity (µMHOS/ c)	Norm.	Min.	LOW	LOW			
14	Specific Gravity	Max.	Norm.	1	1			
15	% Solids	Max.	Norm.	1	1			
16	Extra Conditions or Requirements							
	MEASURING ELEMENT			FE-001 B				
17	Tube Size (units) Matl. Sched.			.20"	SCH 40			
18	Liner Material			N/A				
19	End Connections / Type Material			N/A	-			
20	Electrode And Or Tranducer Material			NOTE (1)				
21	Meter Casing			N/A				
22	Power Requirements / Electrical Code			120V, 60HZ	GENERAL			
23	Enclosure Class			NEMA 4				
24	Grounding Type / Material			N/A				
25	Ultrasonic Cleaning			N/A				
26	Extra Features or Requirements			NOTE (1)				
	TRANSMITTER			FIT-001 A				
27	Output Signal (units)			4-20 mA				
28	Calibrated Flow Range (units)			NOTE (1)				
29	Conduit Conn. Size (units)			1/2"				
30	Mounting			TO THE PIPE OR WALL				
31	Enclosure Class			NEMA 4				
32	Signal Cable Length (units)			500 FT. MAX.				
33	Power Requirement / Elect. Code			120V, 60HZ	GENERAL			
34	Integrator			OPTIONAL				
35	Zero Return			N/A				
36	Alarms			OPTIONAL				
37	Special Modification			N/A				
38	Extra Features or Requirements							

Notes:

1. INFORMATION SUPPLIED BY MANUFACTURER

PARSONS ERA PROJECT	ULTRASONIC FLOWMETER	Sheet 7	Job Number CRU5/PO126
SPECIFICATION WBS 1.1.1.1.5.3.1	CLAMP-ON	Document Number 13400-ATTACHMENT 1	Rev 0

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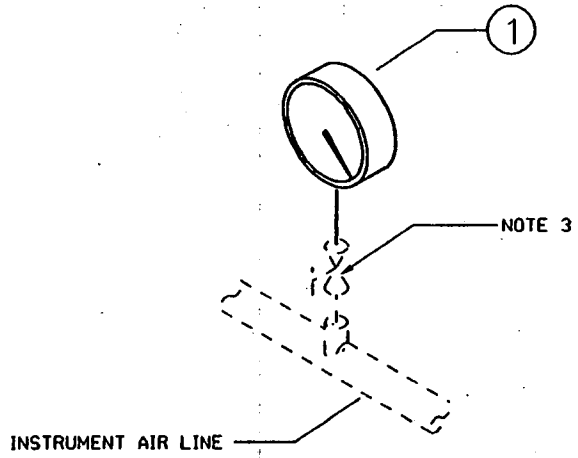
ENG034

7311

ATTACHMENT B

INSTRUMENT INSTALLATION DETAILS

Date: 09/15/95 13400 WBS No.: 1.1.1.1.5.3.1
Rev.: 0 RE: BJJ ERA/CRU No.: 5/PO-126



BILL OF MATERIAL

ITEM	QUANTITY REQUIRED	UM	DESCRIPTION	NOTES	VENDOR CAT. NO.
1	1	EA	PRESSURE GAUGE PER DATA SHEET	2	

NOTES:

1. CONTRACTOR SHALL PROVIDE ALL MISCELLANEOUS HARDWARE INCLUDING FITTINGS, NOT IDENTIFIED IN THE BILL OF MATERIAL, IN ORDER TO PROVIDE A COMPLETE ASSEMBLY.
2. PROVIDED BY OTHERS.
3. ISOLATION VALVE NUMBER SHALL BE IV"PI TAG NUMBER". (i.e. PI061 SHALL HAVE ASSOCIATED ISOLATION VALVE IV061)

INST. TAG NO.	ISOLATION VALVE NO.
PI050	IV050
PI051	IV051
PI052	IV052
PI053	IV053
PI054	IV054
PI055	IV055

PRESSURE GAUGE WITH ISOLATION VALVE

PARSONS ERA PROJECT

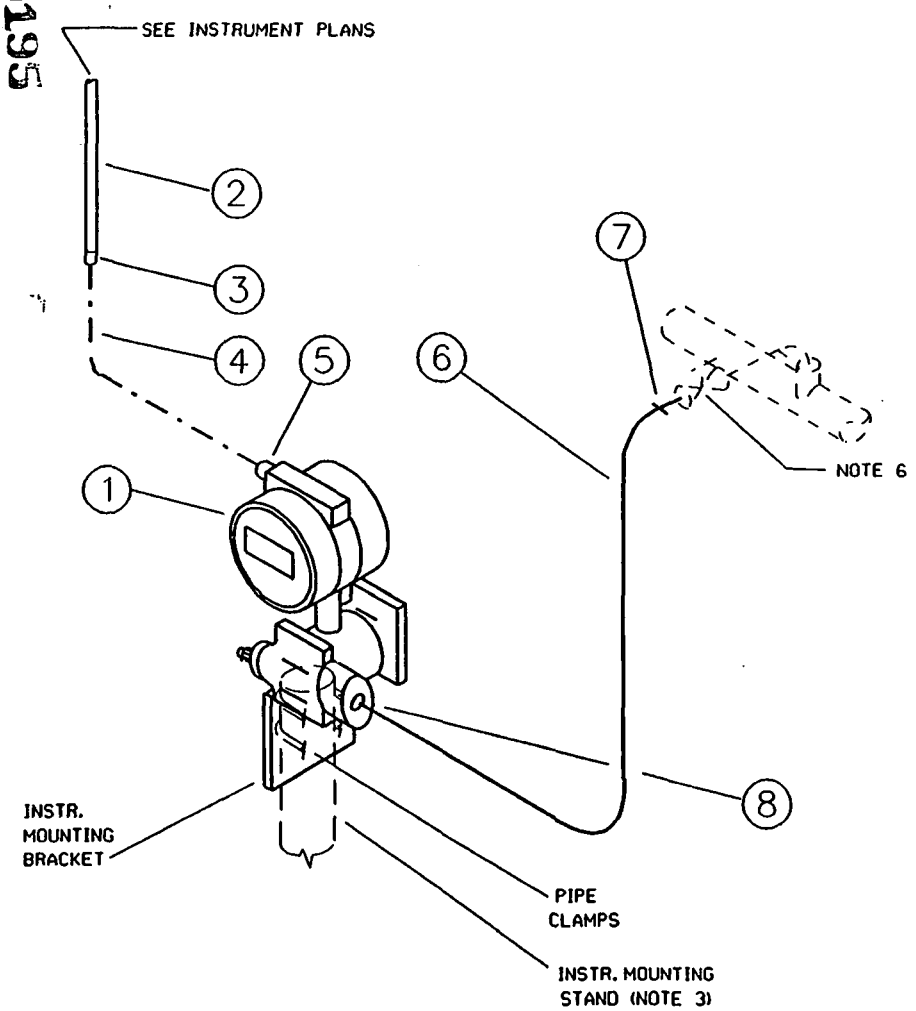
WBS 1.1.1.1.5.3.1

SHEET	JOB NUMBER
1	CRU5/P0126
DOCUMENT NUMBER	REV
13400-ATTACHMENT B	0

SK-N-03895

167000

000195



BILL OF MATERIAL

ITEM#	QUANTITY REQUIRED	UM	DESCRIPTION	NOTES	VENDOR CAT. NO.
1	1	EA	D/P INDICATING TRANSMITTER W/ MOUNTING	5	
			BRACKET PER DATA SHEET.		
2	AS REQ'D	FT	CABLE, CONDUIT AND FITTINGS		
3	1	EA	¾" X½" WATERTIGHT FLEX CONNECTOR		
4	AS REQ'D	FT	½" WATERTIGHT FLEX CONDUIT		
5	1	EA	½" WATERTIGHT FLEX CONNECTOR		
6	AS REQ'D	FT	¼" OD X.035" WALL CU TUBING	4	
7	1	EA	½" MNPT X ¼" TBG BRASS CONN		
8	1	EA	¼" MNPT X ¼" TBG BRASS CONN		

NOTES:

1. CONTRACTOR SHALL PROVIDE ALL MISCELLANEOUS HARDWARE INCLUDING FITTINGS, NOT IDENTIFIED IN THE BILL OF MATERIAL, IN ORDER TO PROVIDE A COMPLETE ASSEMBLY.
2. QUANTITIES ARE FOR ESTIMATES ONLY.
3. CONTRACTOR SHALL PROVIDE INSTRUMENT STAND SHOWN ON SHEET 6 OF THIS ATTACHMENT OR EQUAL.
4. PER ASTM B68 AND B75
5. PROVIDED BY OTHERS.
6. ISOLATION VALVE NUMBER SHALL BE IV'PI TAG NUMBER'. (i.e. PI061 SHALL HAVE ASSOCIATED ISOLATION VALVE IV061)

INST. TAG NO.'S	ISOLATION VALVE NO.
PIT031	IV031
PIT032	IV032
PIT033	IV033
PIT034	IV034
PIT005	IV005
PIT006	IV006
PIT007	IV007
PIT008	IV008
PIT009	IV009
PIT002	IV002

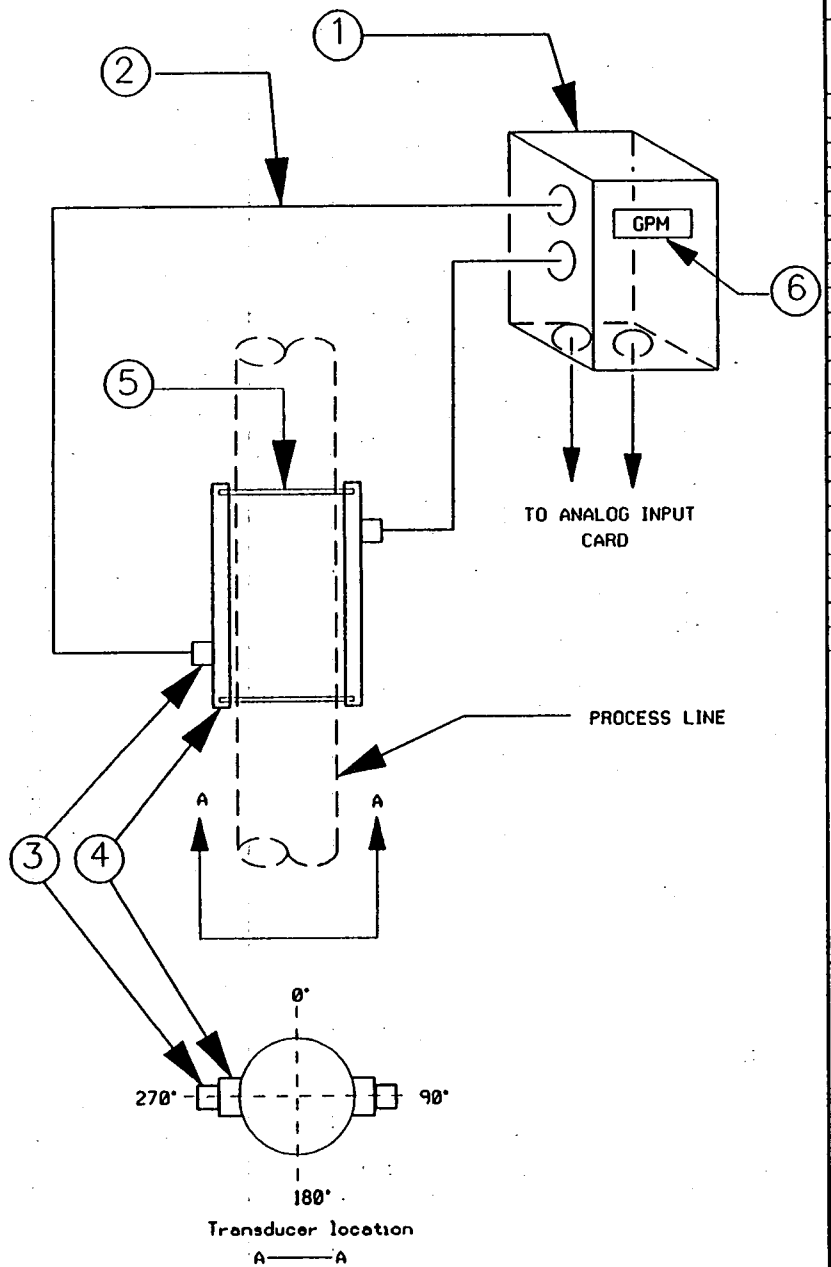
PRESSURE INDICATING TRANSMITTER

PARSONS ERA PROJECT

WBS 1.1.1.1.5.3.1

SHEET	JOB NUMBER
2	CRU5/P0126
DOCUMENT NUMBER	REV
13400-ATTACHMENT B	0

SK-N-03893



BILL OF MATERIAL

ITEM#	QUANTITY REQUIRED	UM	DESCRIPTION	NOTES	VENDOR CAT. NO.
1	1	EA	SINGLE CHANNEL NEMA 4X ULTRASONIC FLOW TRANSMITTER		
2	AS REQ'D	FT	CABLE, CONDUIT AND FITTINGS		
3	2	EA	TRANDUCERS		
4	2	EA	MOUNTING TRACK ASSEMBLY		
5	AS REQ'D	FT	STAINLESS STEEL MOUNTING CHAIN		
6	1	EA	DIGITAL LCD FLOW INDICATOR		

NOTES:

1. CONTRACTOR SHALL PROVIDE ALL MISCELLANEOUS HARDWARE INCLUDING FITTINGS, NOT IDENTIFIED IN THE BILL OF MATERIAL, IN ORDER TO PROVIDE A COMPLETE ASSEMBLY.
2. QUANTITIES ARE FOR ESTIMATES ONLY.

INST. TAG NO.

FIT001
FIT005
FIT006
FIT007
FIT008
FIT009
FIT031
FIT032
FIT033
FIT034

0001296

SINGLE CHANNEL ULTRASONIC FLOWMETER CLAMP-ON

PARSONS ERA PROJECT

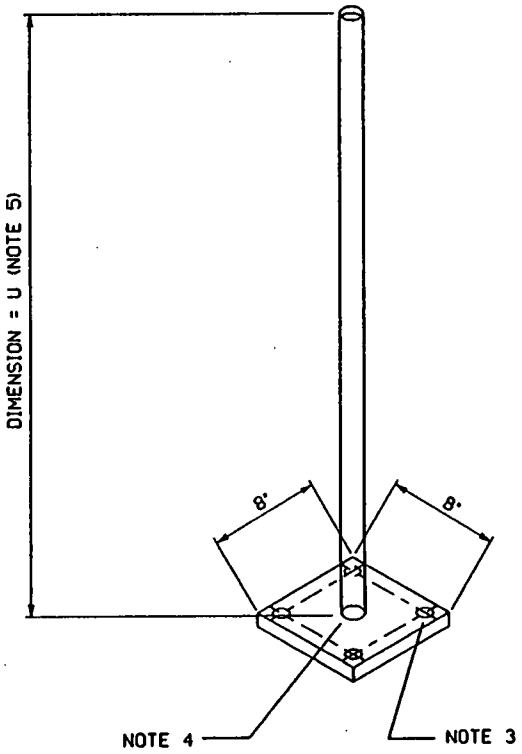
WBS 1.1.1.1.5.3.1

SHEET	JOB NUMBER
3	CRU5/P0126
DOCUMENT NUMBER	REV
13400-ATTACHMENT B	0

SK-N-03780

2 of 3

000197



BILL OF MATERIAL

ITEM	QUANTITY REQUIRED	UM	DESCRIPTION	NOTES	VENDOR CAT. NO.
1	1	EA	2" DIA. SCH 40 CARBON STEEL PIPE		
2	1	EA	3/8" CARBON STEEL PLATE		

NOTES:

1. CONTRACTOR SHALL PROVIDE ALL MISCELLANEOUS HARDWARE INCLUDING FITTINGS NOT IDENTIFIED IN THE BILL OF MATERIAL, IN ORDER TO PROVIDE A COMPLETE ASSEMBLY.
2. QUANTITIES ARE FOR ESTIMATES ONLY. ACTUAL QUANTITIES ARE BY CONTRACTOR.
3. DRILLING HOLE SIZE AND DIMENSIONS ARE BY CONTRACTOR.
4. PIPE SHALL BE WELDED TO PLATE WITH NO BURRS.
5. "U" DIMENSION SHALL BE DETERMINED BY THE CONTRACTOR AT THE TIME OF INSTALLATION SEE PARAGRAPH 3.3-A.6.

INST. TAG NO.

INSTRUMENT MOUNTING STAND

PARSONS ERA PROJECT

WBS 1.1.1.1.5.3.1

SHEET 4	JOB NUMBER CRU5/P0126
DOCUMENT NUMBER 13400-ATTACHMENT B	REV 0

SK-N-03894

ATTACHMENT C

INSTRUMENT INDEX

INSTRUMENT INDEX

INSTRUMENT TAG NUMBER	SERVICE	P&ID DWG SECTION	PANEL	LINE OR EQUIPMENT NO.	SPECIFICATION DATA SHEET NO	SPECIFICATION DETAIL SHEET NO	INSTRUMENT PLAN	PIPING ISO/ PLAN	I/O DRAWING I/O NUMBER	PO NUMBER REQUISITION NO.
FY-034	PMP-21 SPEED	N00190	VSD-21	VSD-21	-	-	E00245	-	NOO271	
	SPEED CONTROL	C1			-	-		-	RTU21-2111	
FE/FIT-034	WELL HOUSE #21	NOO190	-	GW-6"-A-2920-IC	13400, ATTCH A	13400, ATTCH B	EOO245	P00207 &	N00271	
	FLOW	C1			SHEET 5	SHEET 3		P00208	RTU21-2101	
PIT-034	PMP-21	N00190	-	GW-6"-A-2920-IC	13400, ATTCH A	13400, ATTCH B	EOO245	P00207 &	N00271	
	DISCHARGE PRESSURE	C1			SHEET 2 & 3	SHEET 2		P00208	RTU21-2102	
ZSC-035	V152 CLOSED	N00190	-	GW-6"-A-2920-IC	15060, PIPE MAT'L	-	EOO245	-	N00271	
	(TO DISCHARGE)	D2			A, PAGE 3 OF 3	-		-	RTU21-2122	
ZSO-035	V152 FULL OPEN	N00190	-	GW-6"-A-2920-IC	15060, PIPE MAT'L	-	EOO245	-	N00271	
	(TO DISCHARGE)	D2			A, PAGE 3 OF 3	-		-	RTU21-2121	
ZSC-036	V153 CLOSED	N00190	-	GW-6"-A-2906-IC	15060, PIPE MAT'L	-	EOO245	-	N00271	
	(TO SFES TRT HEADER)	C2			A, PAGE 3 OF 3	-		-	RTU21-2124	
ZSO-036	V153 FULL OPEN	N00190	-	GW-6"-A-2906-IC	15060, PIPE MAT'L	-	EOO245	-	N00271	
	(TO SFES TRT HEADER)	C2			A, PAGE 3 OF 3	-		-	RTU21-2123	
FY-033	PMP-20 SPEED	N00190	VSD-20	VSD-20	-	-	E00245	-	NOO271	
	SPEED CONTROL	D2			-	-		-	RTU20-2011	
FE/FIT-033	WELL HOUSE #20	NOO190	-	GW-6"-A-2918-IC	13400, ATTCH A	13400, ATTCH B	EOO245	P00207 &	N00271	
	FLOW	D3			SHEET 4	SHEET 3		P00208	RTU20-2001	
PIT-033	PMP-20	N00190	-	GW-6"-A-2918-IC	13400, ATTCH A	13400, ATTCH B	EOO245	P00207 &	N00271	
	DISCHARGE PRESSURE	D3			SHEET 2 & 3	SHEET 2		P00208	RTU20-2002	
ZSC-038	V160 CLOSED	N00190	-	GW-6"-A-2918-IC	15060, PIPE MAT'L	-	EOO245	-	N00271	
	(TO DISCHARGE)	E3			A, PAGE 3 OF 3	-		-	RTU20-2022	
ZSO-038	V160 FULL OPEN	N00190	-	GW-6"-A-2918-IC	15060, PIPE MAT'L	-	EOO245	-	N00271	
	(TO DISCHARGE)	E3			A, PAGE 3 OF 3	-		-	RTU20-2021	
ZSC-039	V161 CLOSED	N00190	-	GW-6"-A-2919-IC	15060, PIPE MAT'L	-	EOO245	-	N00271	
	(TO SFES TRT HEADER)	D3			A, PAGE 3 OF 3	-		-	RTU20-2024	
ZSO-039	V161 FULL OPEN	N00190	-	GW-6"-A-2919-IC	15060, PIPE MAT'L	-	EOO245	-	N00271	
	(TO SFES TRT HEADER)	D3			A, PAGE 3 OF 3	-		-	RTU20-2023	
FY-032	PMP-19 SPEED	N00190	VSD-19	VSD-19	-	-	E00245	-	NOO271	
	SPEED CONTROL	A3			-	-		-	RTU19-1911	
FE/FIT-032	WELL HOUSE #19	NOO190	-	GW-6"-A-2916-IC	13400, ATTCH A	13400, ATTCH B	EOO245	P00207 &	N00271	
	FLOW	A4			SHEET 4	SHEET 3		P00208	RTU19-1901	
PIT-032	PMP-19	N00190	-	GW-6"-A-2916-IC	13400, ATTCH A	13400, ATTCH B	EOO245	P00207 &	N00271	
	DISCHARGE PRESSURE	A4			SHEET 2 & 3	SHEET 2		P00208	RTU19-1902	
ZSC-040	V164 CLOSED	N00190	-	GW-6"-A-2916-IC	15060, PIPE MAT'L	-	EOO245	-	N00271	
	(TO DISCHARGE)	A4			A, PAGE 3 OF 3	-		-	RTU19-1922	
ZSO-040	V164 FULL OPEN	N00190	-	GW-6"-A-2916-IC	15060, PIPE MAT'L	-	EOO245	-	N00271	
	(TO DISCHARGE)	A4			A, PAGE 3 OF 3	-		-	RTU19-1921	
ZSC-041	V165 CLOSED	N00190	-	GW-6"-A-2917-IC	15060, PIPE MAT'L	-	EOO245	-	N00271	
	(TO SFES TRT HEADER)	A4			A, PAGE 3 OF 3	-		-	RTU19-1924	
ZSO-041	V165 FULL OPEN	N00190	-	GW-6"-A-2917-IC	15060, PIPE MAT'L	-	EOO245	-	N00271	
	(TO SFES TRT HEADER)	A4			A, PAGE 3 OF 3	-		-	RTU19-1923	

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INSTRUMENT TAG NUMBER	SERVICE	P&ID DWG SECTION	PANEL	LINE OR EQUIPMENT NO.	SPECIFICATION DATA SHEET NO	SPECIFICATION DETAIL SHEET NO.	INSTRUMENT PLAN	PIPING ISO/ PLAN	I/O DRAWING I/O NUMBER	PO NUMBER REQUISITION NO.
FY-031	PMP-18 SPEED	N00190	VSD-18	VSD-18	-	-	E00245	-	NOO271	
	SPEED CONTROL	C4			-	-		-	RTU18-1811	
FE/FIT-031	WELL HOUSE #18	NOO190	-	GW-8"-A-2914-IC	13400, ATTCH A	13400, ATTCH B	EOO245	P00207 &	N00271	
	FLOW	C4			SHEET 5	SHEET 3		P00208	RTU18-1801	
PIT-031	PMP-18	N00190	-	GW-8"-A-2914-IC	13400, ATTCH A	13400, ATTCH B	EOO245	P00207 &	N00271	
	DISCHARGE NUMBER	C5			SHEET 2 & 3	SHEET 2		P00208	RTU18-1802	
ZSC-042	V168 CLOSED	N00190	-	GW-8"-A-2914-IC	15060, PIPE MAT'L	-	EOO245	-	N00271	
	(TO DISCHARGE)	D5			A, PAGE 3 OF 3	-		-	RTU18-1822	
ZSO-042	V168 FULL OPEN	N00190	-	GW-8"-A-2914-IC	15060, PIPE MAT'L	-	EOO245	-	N00271	
	(TO DISCHARGE)	D5			A, PAGE 3 OF 3	-		-	RTU18-1821	
ZSC-043	V169 CLOSED	N00190	-	GW-8"-A-2915-IC	15060, PIPE MAT'L	-	EOO245	-	N00271	
	(TO SFES TRT HEADE	C5			A, PAGE 3 OF 3	-		-	RTU18-1824	
ZSO-043	V169 FULL OPEN	N00190	-	GW-8"-A-2915-IC	15060, PIPE MAT'L	-	EOO245	-	N00271	
	(TO SFES TRT HEADE	C5			A, PAGE 3 OF 3	-		-	RTU18-1823	
FY-009	PMP-17 SPEED	N00191	VSD-17	VSD-17	-	-	E00245	-	NOO271	
	SPEED CONTROL	E4			-	-		-	RTU17-1711	
FE/FIT-009	WELL HOUSE #17	NOO191	-	GW-6"-A-2912-IC	13400, ATTCH A	13400, ATTCH B	EOO245	P00207 &	N00271	
	FLOW	D4			SHEET 6	SHEET 3		P00208	RTU17-1701	
PIT-009	PMP-17	N00191	-	GW-6"-A-2912-IC	13400, ATTCH A	13400, ATTCH B	EOO245	P00207 &	N00271	
	DISCHARGE NUMBER	D4			SHEET 2 & 3	SHEET 2		P00208	RTU17-1702	
ZSC-019	V119 CLOSED	N00191	-	GW-6"-A-2912-IC	15060, PIPE MAT'L	-	EOO245	-	N00271	
	(TO DISCHARGE)	E4			A, PAGE 3 OF 3	-		-	RTU17-1722	
ZSO-019	V119 FULL OPEN	N00191	-	GW-6"-A-2912-IC	15060, PIPE MAT'L	-	EOO245	-	N00271	
	(TO DISCHARGE)	E4			A, PAGE 3 OF 3	-		-	RTU17-1721	
ZSC-018	V118 CLOSED	N00191	-	GW-6"-A-2913-IC	15060, PIPE MAT'L	-	EOO245	-	N00271	
	(TO SFES TRT HEADE	E5			A, PAGE 3 OF 3	-		-	RTU17-1724	
ZSO-018	V118 FULL OPEN	N00191	-	GW-6"-A-2913-IC	15060, PIPE MAT'L	-	EOO245	-	N00271	
	(TO SFES TRT HEADE	E5			A, PAGE 3 OF 3	-		-	RTU17-1723	
FY-008	PMP-16 SPEED	N00191	VSD-16	VSD-16	-	-	E00245	-	NOO271	
	SPEED CONTROL	B3			-	-		-	RTU16-1611	
FE/FIT-008	WELL HOUSE #16	NOO191	-	GW-8"-A-2908-IC	13400, ATTCH A	13400, ATTCH B	EOO245	P00207 &	N00271	
	FLOW	B3			SHEET 6	SHEET 3		P00208	RTU16-1601	
PIT-008	PMP-16	N00191	-	GW-8"-A-2908-IC	13400, ATTCH A	13400, ATTCH B	EOO245	P00207 &	N00271	
	DISCHARGE NUMBER	B3			SHEET 2 & 3	SHEET 2		P00208	RTU16-1602	
ZSC-016	V110 CLOSED	N00191	-	GW-8"-A-2908-IC	15060, PIPE MAT'L	-	EOO245	-	N00271	
	(TO DISCHARGE)	A3			A, PAGE 3 OF 3	-		-	RTU16-1622	
ZSO-016	V110 FULL OPEN	N00191	-	GW-8"-A-2908-IC	15060, PIPE MAT'L	-	EOO245	-	N00271	
	(TO DISCHARGE)	A3			A, PAGE 3 OF 3	-		-	RTU16-1621	
ZSC-017	V111 CLOSED	N00191	-	GW-8"-A-2909-IC	15060, PIPE MAT'L	-	EOO245	-	N00271	
	(TO SFES TRT HEADE	B4			A, PAGE 3 OF 3	-		-	RTU16-1624	
ZSO-017	V111 FULL OPEN	N00191	-	GW-8"-A-2909-IC	15060, PIPE MAT'L	-	EOO245	-	N00271	
	(TO SFES TRT HEADE	B4			A, PAGE 3 OF 3	-		-	RTU16-1623	

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INSTRUMENT TAG NUMBER	SERVICE	P&ID DW SECTION	PANEL	LINE OR EQUIPMENT NO	SPECIFICATION DATA SHEET NO	SPECIFICATION DETAIL SHEET NO.	INSTRUMENT PLAN	PIPING ISO/ PLAN	I/O DRAWIN I/O NUMBER	PO NUMBER REQUISITION NO.
FY-007	PMP-15 SPEED	N00191	VSD-15	VSD-15	-	-	E00245	-	NOO271	
	SPEED CONTROL	D4			-	-		-	RTU15-1511	
FE/FIT-007	WELL HOUSE #15	NOO190	-	GW-8"-A-2910-IC	13400, ATTCH A	13400, ATTCH B	EOO245	P00207 &	N00271	
	FLOW	D4			SHEET 6	SHEET 3		P00208	RTU15-1501	
PIT-007	PMP-15	N00191	-	GW-8"-A-2910-IC	13400, ATTCH A	13400, ATTCH B	EOO245	P00207 &	N00271	
	DISCHARGE NUMBER	D4			SHEET 2 & 3	SHEET 2		P00208	RTU15-1502	
ZSC-014	V114 CLOSED	N00191	-	GW-8"-A-2910-IC	15060, PIPE MAT'L	-	EOO245	-	N00271	
	(TO DISCHARGE)	D4			A, PAGE 3 OF 3	-		-	RTU15-1522	
ZSO-014	V114 FULL OPEN	N00191	-	GW-8"-A-2910-IC	15060, PIPE MAT'L	-	EOO245	-	N00271	
	(TO DISCHARGE)	D4			A, PAGE 3 OF 3	-		-	RTU15-1521	
ZSC-015	V115 CLOSED	N00191	-	GW-8"-A-2911-IC	15060, PIPE MAT'L	-	EOO245	-	N00271	
	(TO SFES TRT HEADER	D4			A, PAGE 3 OF 3	-		-	RTU15-1524	
ZSO-015	V115 FULL OPEN	N00191	-	GW-8"-A-2911-IC	15060, PIPE MAT'L	-	EOO245	-	N00271	
	(TO SFES TRT HEADER	D4			A, PAGE 3 OF 3	-		-	RTU15-1523	
FY-006	PMP-14 SPEED	N00191	VSD-14	VSD-14	-	-	E00245	-	NOO271	
	SPEED CONTROL	B1			-	-		-	RTU14-1411	
FE/FIT-006	WELL HOUSE #14	NOO191	-	GW-6"-A-2904-IC	13400, ATTCH A	13400, ATTCH B	EOO245	P00207 &	N00271	
	FLOW	B1			SHEET 4	SHEET 3		P00208	RTU14-1401	
PIT-006	PMP-14	N00191	-	GW-6"-A-2904-IC	13400, ATTCH A	13400, ATTCH B	EOO245	P00207 &	N00271	
	DISCHARGE NUMBER	B2			SHEET 2 & 3	SHEET 2		P00208	RTU14-1402	
ZSC-012	V106 CLOSED	N00191	-	GW-6"-A-2904-IC	15060, PIPE MAT'L	-	EOO245	-	N00271	
	(TO DISCHARGE)	A2			A, PAGE 3 OF 3	-		-	RTU14-1422	
ZSO-012	V106 FULL OPEN	N00191	-	GW-6"-A-2904-IC	15060, PIPE MAT'L	-	EOO245	-	N00271	
	(TO DISCHARGE)	A2			A, PAGE 3 OF 3	-		-	RTU14-1421	
ZSC-013	V107 CLOSED	N00191	-	GW-6"-A-2905-IC	15060, PIPE MAT'L	-	EOO245	-	N00271	
	(TO SFES TRT HEADER	B2			A, PAGE 3 OF 3	-		-	RTU14-1424	
ZSO-013	V107 FULL OPEN	N00191	-	GW-6"-A-2905-IC	15060, PIPE MAT'L	-	EOO245	-	N00271	
	(TO SFES TRT HEADER	B2			A, PAGE 3 OF 3	-		-	RTU14-1423	
FY-005	PMP-13 SPEED	N00191	VSD-13	VSD-13	-	-	E00245	-	NOO271	
	SPEED CONTROL	D1			-	-		-	RTU13-1311	
FE/FIT-005	WELL HOUSE #13	NOO191	-	GW-8"-A-2900-IC	13400, ATTCH A	13400, ATTCH B	EOO245	P00207 &	N00271	
	FLOW	C1			SHEET 4	SHEET 3		P00208	RTU13-1301	
PIT-005	PMP-13	N00191	-	GW-8"-A-2900-IC	13400, ATTCH A	13400, ATTCH B	EOO245	P00207 &	N00271	
	DISCHARGE NUMBER	C1			SHEET 2 & 3	SHEET 2		P00208	RTU13-1302	
ZSC-010	V103 CLOSED	N00191	-	GW-8"-A-2900-IC	15060, PIPE MAT'L	-	EOO245	-	N00271	
	(TO DISCHARGE)	D1			A, PAGE 3 OF 3	-		-	RTU13-1322	
ZSO-010	V103 FULL OPEN	N00191	-	GW-8"-A-2900-IC	15060, PIPE MAT'L	-	EOO245	-	N00271	
	(TO DISCHARGE)	D1			A, PAGE 3 OF 3	-		-	RTU13-1321	
ZSC-011	V102 CLOSED	N00191	-	GW-8"-A-2902-IC	15060, PIPE MAT'L	-	EOO245	-	N00271	
	(TO SFES TRT HEADER	D2			A, PAGE 3 OF 3	-		-	RTU13-1324	
ZSO-011	V102 FULL OPEN	N00191	-	GW-8"-A-2902-IC	15060, PIPE MAT'L	-	EOO245	-	N00271	
	(TO SFES TRT HEADER	D2			A, PAGE 3 OF 3	-		-	RTU13-1323	

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INSTRUMENT TAG NUMBER	SERVICE	P&ID DWG SECTION	PANEL	LINE OR EQUIPMENT NO.	SPECIFICATION DATA SHEET NO	SPECIFICATION DETAIL SHEET NO.	INSTRUMENT PLAN	PIPING ISO/ PLAN	I/O DRAWING I/O NUMBER	PO NUMBER REQUISITION NO.
FE/FIT-001	SFES VALVE HOUSE DISCHARGE FLOW	N00191 A7	-	GW-20"-A-2924	13400, ATTCH A SHEET 7	13400, ATTCH B SHEET 3	E00245	P00223	N00272 RTU8-801	
PIT-002	SFES VALVE HOUSE DISCHARGE PRESSUR	N00191 C6	-	GW-20"-M-2924	13400, ATTCH A SHEET 2 & 3	13400, ATTCH B SHEET 2	E00245	P00207 & P00208	N00272 RTU8-802	
ZSC-022	V122 CLOSED (TO DISCHARGE)	N00191 C6	-	GW-12"-A-2903-IC	15060, PIPE MAT'L A, PAGE 3 OF 3	- -	E00245	- -	N00272 RTU8-811	
ZSO-022	V122 FULL OPEN (TO DISCHARGE)	N00191 C6	-	GW-12"-A-2903-IC	15060, PIPE MAT'L A, PAGE 3 OF 3	- -	E00245	- -	N00272 RTU8-812	
ZSC-023	V123 CLOSED (TO SFES TRT HEADE	N00191 B6	-	GW-20"-A-2906-IC	15060, PIPE MAT'L A, PAGE 3 OF 3	- -	E00245	- -	N00272 RTU8-813	
ZSO-023	V123 FULL OPEN (TO SFES TRT HEADE	N00191 B6	-	GW-20"-A-2906-IC	15060, PIPE MAT'L A, PAGE 3 OF 3	- -	E00245	- -	N00272 RTU8-814	
ZSC-024	V124 CLOSED (TO DISCHARGE)	N00191 B6	-	GW-20"-A-2907-IC	15060, PIPE MAT'L A, PAGE 3 OF 3	- -	E00245	- -	N00272 RTU8-815	
ZSO-024	V124 FULL OPEN (TO DISCHARGE)	N00191 B6	-	GW-20"-A-2907-IC	15060, PIPE MAT'L A, PAGE 3 OF 3	- -	E00245	- -	N00272 RTU8-816	
ZSC-025	V125 CLOSED (TO DISCHARGE)	N00191 B6	-	GW-20"-A-2901-IC	15060, PIPE MAT'L A, PAGE 3 OF 3	- -	E00245	- -	N00272 RTU8-817	
ZSO-025	V125 FULL OPEN (TO DISCHARGE)	N00191 B6	-	GW-20"-A-2901-IC	15060, PIPE MAT'L A, PAGE 3 OF 3	- -	E00245	- -	N00272 RTU8-818	
ZSC-027	V127 CLOSED (TO DISCHARGE)	N00191 B7	-	GW-20"-A-2924-IC	15060, PIPE MAT'L A, PAGE 3 OF 3	- -	E00245	- -	N00271 RTU8-8111	
ZSO-027	V127 FULL OPEN (TO DISCHARGE)	N00191 B7	-	GW-20"-A-2924-IC	15060, PIPE MAT'L A, PAGE 3 OF 3	- -	E00245	- -	N00271 RTU8-8112	
ZSC-030	V130 CLOSED (TO DISCHARGE)	N00191 B6	-	GW-12"-A-2910-IC	15060, PIPE MAT'L A, PAGE 3 OF 3	- -	E00245	- -	N00271 RTU8-8115	
ZSO-030	V130 FULL OPEN (TO DISCHARGE)	N00191 B6	-	GW-12"-A-2910-IC	15060, PIPE MAT'L A, PAGE 3 OF 3	- -	E00245	- -	N00271 RTU8-8116	
PI-050	SOUTH PLUME DISCHARGE PRESSUR	N00191 A6	-	GW-20"-A-2924-IC	13400, ATTCH A SHEET 1	13400, ATTCH B SHEET 1	-	- -	- -	
PI-051	SFES TREATMENT HEADER PRESSURE	N00191 B6	-	GW-20"-A-2906-IC	13400, ATTCH A SHEET 1	13400, ATTCH B SHEET 1	-	- -	- -	
PI-052	SFES TREATMENT FORCE MAIN PRESSU	N00191 B6	-	GW-20"-A-2907-IC	13400, ATTCH A SHEET 1	13400, ATTCH B SHEET 1	-	- -	- -	
PI-053	SFES TREATMENT HEADER PRESSURE	N00191 C6	-	GW-20"-A-2903-IC	13400, ATTCH A SHEET 1	13400, ATTCH B SHEET 1	-	- -	- -	
PI-054	SFES TREATMENT FORCE MAIN PRESSU	N00191 C6	-	GW-20"-A-2901-IC	13400, ATTCH A SHEET 1	13400, ATTCH B SHEET 1	-	- -	- -	
PI-055	SFES TREATMENT FORCE MAIN PRESSU	N00191 C6	-	GW-20"-A-2910-IC	13400, ATTCH A SHEET 1	13400, ATTCH B SHEET 1	-	- -	- -	

SECTION 13401
PROCESS CONTROL SYSTEM

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Design and performance requirements of a monitoring and control system for use with South Field Extraction System (SFES), to include the following:
   1. Hardware for interfacing with the existing AWWT Distributed Control System.
   2. Remote input/output hardware.
   3. Sequence of operation.

1.2 RELATED SECTIONS

A. Section 01010 - General Requirements.

B. Section 13400 - Instruments and Controls.

1.3 REFERENCE DRAWINGS

A. See Section 01011 for the Schedule of Drawings.

1.4 REFERENCES

A. National Electric Manufacturers Association (NEMA):
   1. NEMA ICS 6-88 Enclosures for Industrial Control and Systems, Revision 1, March 1989.

1.5 SYSTEM DESCRIPTION

A. Design requirements, regardless of application, shall be as follows:
   1. Signals from analog monitors shall be 4-20 mA dc.
   2. Electronics housing for field instruments shall be NEMA ICS 6, Type 4 as a minimum.
   3. Span and zero shall be externally adjustable.

4. Analog output accuracy shall be plus or minus 0.25 percent of calibrated span, including effects of linearity, hysteresis, and repeatability.
5. Digital output accuracy shall be plus or minus 1 percent of calibrated span.
6. Electronic analog transmitters and receivers shall have their input and output signals isolated from ground.
7. Contact closure outputs shall be "dry" contacts isolated from ground.
8. Installed process control equipment shall not have any exposed terminals, wiring, or any other points where personnel may be exposed to live electrical voltage over 30 volts. This requirement applies to calibrating, servicing, repair, and operation of equipment.
9. All terminals over 30 volts shall be insulated or covered to prevent electrical shock exposure.

B. Performance Requirements: The process control system shall be furnished and installed by the Subcontractor to provide for all monitoring and control systems required to operate the SFES. Data from the SFES well houses and valve house shall be sent to and controlled from the existing AWWT Distributed Control System.
1. The existing Fischer & Porter System Six microprocessor-based AWWT DCS shall be fully intelligent with remote hardware and interconnecting wire and conduit.
2. Existing Fischer & Porter System Six software shall be used for system programming.
3. Provide components compatible with the DCS system as indicated on the construction drawings.

1.6 SUBMITTALS

A. Provide submittals as required per Section 01010.

B. Product Data: Provide data for each system component. Include Fischer & Porter "data sheets" for components added to the DCS.

C. Shop Drawings and Logic
   1. Cable schematic showing programmable remote transmitter unit location(s) and system configuration.
   2. List connected data points for input and output devices.
   3. Indicate system graphics indicating monitored systems, data point addresses, and operator notations.
   4. Show system configuration with peripheral devices, power supplies, diagrams and interconnections.
   5. Indicate description and sequence of operation.

D. Samples: Provide demonstration diskette(s) containing graphics.

E. Process Control System Test: The Subcontractor shall submit a test procedure for approval prior to testing. A final test report shall be submitted after completion of testing.

F. Certificates: Certification of Test Equipment (calibration records) used to complete the work as described herein.

G. Operations and Maintenance (O&M) Data
   1. Indicate manufacturer's installation instructions for all manufactured components.
   2. Include interconnection wiring diagrams for the complete field installed systems with identified and numbered system components and devices.
   3. Include keyboard illustrations and step-by-step procedures indexed for each operator function.
   4. Include inspection period, cleaning methods, cleaning materials recommended, calibration tolerances, and recommended frequency of calibration.

H. Suggested spare parts inventory for each type of equipment.

I. Warranty: Submit manufacturer's warranty, and ensure that forms have been filled out in Owner's name and registered with manufacturer.

1.7 QUALITY ASSURANCE

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

B. Installer Qualifications: Company specializing in performing the work of this section, with minimum 3 years documented experience.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Packaging of the systems shall be in accordance with the following requirements:

1. Items to be installed in the AWWT System Control Room and remote transmitter units shall be wrapped and placed in suitable shipping containers with sufficient cushioning material to prevent damage during shipment and storage.

B. Acceptance at the FEMP

1. Products arriving at the FEMP shall be examined for general damage during shipping. Those products found to be damaged shall not be accepted at the FEMP.

C. Storage and Protection

1. Control system components shall be stored according to manufacturer's requirements for storage, if information regarding storage is provided by the manufacturer. In cases where specific storage requirements are not provided, components shall be stored in a clean, dry area, protected from the weather, until required for installation.

1.9 PROJECT CONDITIONS

A. Services
   1. Operating Hours: 24 hours/day, 7 days/week, 52 weeks/year.
   2. Industrial design with plant life of 5 years.

B. Ambient Conditions
   1. Plant Location: Fernald, Ohio.
   2. Plant Elevation: Approximately 580 feet above sea level.
   3. Ambient Temperature Range: -10 to 100 degrees F.
   4. Barometric Pressure, inches Hg absolute (mean at 70 degrees F): 29.4.
   5. Relative Humidity: Varies from 20 percent to 95 percent.

C. Electrical Supply: 120 volts, single phase, 60 Hz.

1.10 SEQUENCING AND SCHEDULING

A. The sequencing of work and scheduling of tasks shall follow the project schedule and milestones approved by FERMCO. Acquisition/delivery of control system components shall adhere to and support the approved project schedule.

1.11 WARRANTY

A. Special Warranty
   1. Correct defective work within a 1-year period after substantial completion.
   2. Provide 2-year manufacturer's warranty for materials.

1.12 MAINTENANCE

A. Maintenance Service
   1. Preventive/scheduled maintenance shall be performed per the manufacturer's instructions. Maintenance service numbers and information shall be provided along with product documentation sent in shipping. Maintenance policies and procedures

shall be fully described in the maintenance documentation.

B. Extra Materials

1. Any extra/replacement parts or materials required to maintain acceptable product performance levels shall be referenced in the product documentation provided with shipping.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Fischer & Porter, unless otherwise indicated.

2.2 EQUIPMENT

A. AWWT DCS Control Unit

1. Provide control system components as indicated on Drawing 95X-5900-E-00273 at the existing AWWT System DCS DCU3200 Cabinet. Components required include:
   a. 24VDC Power Supply, Fischer & Porter No. PS-01 or equal.
   b. Power Supply Adaptor, Fischer & Porter No. PSC-24.
   c. Fiber Optic Converter, Fischer & Porter No. No. CI-FIBER.
   d. Communications Interface Board (ITB/CIO), Fischer & Porter No. 40TE3209A0.
   e. Distributed I/O Communication Controller Module (DIO), Fischer & Porter No. 40P3205A.
2. Control Unit Functions:
   a. Monitors or controls each input/output point.
   b. Acquires, processes, and transfers information to operator station.
   c. Accesses both data base and control functions simultaneously.
   d. Records, evaluates, and reports changes of state or value that occur among associated points. Continues to perform associated control functions regardless of status of network.

e. Performs in stand-alone mode:
   1) Start/stop.
   2) Duty cycling.
   3) Automatic loop control.
   4) Event initiated control.
   5) Calculated point.
   6) Scanning and alarm processing.
   7) Full direct digital control.
   8) Trend logging.
   9) Global communications.
   10) Maintenance scheduling.

f. Local displays and adjustments: Utilizing digital display and numerical keyboard to display and adjust:
   1) Input/output point information and status.
   2) Controller setpoints.
   3) Controller tuning constants.
   4) Program execution times.
   5) High and low limit and alarm values.
   6) Set/display date and time.
   7) Control outputs connected to the network.
   8) Automatic control outputs.
   9) Perform control unit diagnostic testing.
   10) Points in "Test" mode.

B. Remote I/O Transmitter Units

1. Provide Remote Transmitter Unit components as indicated on the drawings and Panel Layout Diagrams, Attachment A of this section.

C. Communications

1. Communications system consisting of a fiber optic and two wire transmission system as indicated on the drawings. Communications cables required include:
   a. Fiber Optic Cable: see Section 16129.
   b. 2-1/c #22, Direct Burial Twinaxial Cable, Alpha No. 9818D or equal.
   c. Interface Cable between ITB/CIO Board and DIO Model, Fischer & Porter No. 40CA3200A0000.

D. Operating System Software: Utilize existing Fischer & Porter System Six software for operations to allow:

1. Input/Output Capability from Operator Station to:
   a. Request display of current values or status in tabular or graphic format.
   b. Command selected equipment to specified state.
   c. Initiate logs and reports.
   d. Change analog limits.
   e. Add, delete, or change points within each application routine.
   f. Change point input/output descriptors, status, alarm descriptors, and engineering unit descriptors.
   g. Add new input/output to system.
   h. Modify and set up maintenance scheduling parameters.
   i. Develop, modify, delete, or display full range of color graphic displays.
   j. Provide capability to sort and extract data from archived files and to generate custom reports.
   k. Support printer operations:
      1) Alarms: Print alarms, operator acknowledgements, action messages, system alarms, and operator sign-on and sign-off.
      2) Data: Print reports, page prints, and data base prints.
   l. Select daily, weekly or monthly as scheduled frequency to synchronize time and date in digital control units. Accommodate daylight savings time adjustments.
2. Operator System Access: Passwords and level of access shall be coordinated with FERMCO Construction Manager.
3. Alarm Processing:
   a. Off-normal condition: Cause alarm and appropriate message, including time, system, point descriptor, and alarm condition. Select alarm state/value and which alarms shall cause automatic dial-out.

b. Critical alarm or change-of-state: Display message, stored on disk for review and sort, or print.
c. Display alarm reports on video. Display multiple alarms in order of occurrence.
d. Define time delay for equipment start-up or shutdown.
e. Allow unique routing of specific alarms.
f. Operator specifies whether alarm requires acknowledgement.
g. Continue to indicate unacknowledged alarms after return to normal.
h. Alarm notification:
    1) Automatic print.
    2) Display indicating alarm condition.
    3) Selectable audible alarm indication.

E. Test Mode Operation:
1. Place input/output points in test mode to allow testing and developing of control algorithms on line without disrupting field hardware and controlled environment. In test mode:
    a. Inhibit scanning and calculation of input points. Issue manual control to input points (set analog or digital input point to operator determined test value) from work station.
    b. Control output points but change only data base state or value; leave external field hardware unchanged.
    c. Enable control actions on output points but change only data base state or value.

2.3 SEQUENCE OF OPERATION

A. Overall System Description - The South Field Extraction System installation consists of nine well houses and one valve house. Each well house contains a pump (PMP-13 through PM-21, respectively), a pressure transmitter, a flow indicating transmitter, and valve position switches. Well house pumps operate by a Variable Frequency Drive (VFD) for regulating flow output. The Valve House shall allow pumps to divert

groundwater either to the South Plume Valve House or South Plume discharge to the Great Miami River. The SFES Valve House will contain valve position switches and a flow indicating transmitter.

B. Well House Instrument Loop Description - PMP-18, Loop 031 (see P&ID 95X-5900-N-00190)

1. Variable Speed Drive (FY-031)

a. Pump PMP-18 shall have a local-off-remote selector switch and stop/start pushbuttons on Variable Frequency Drive, FY-031, located adjacent to the motor. During normal "remote" operating conditions, PMP-18 shall be controlled from the AWWT DCS. In local operation, PMP-18 shall be controlled at the Variable Speed Drive.

b. Speed Control: Each Variable Frequency Drive has a potentiometer for manual "local" adjustable speed of the motor. In remote operation, speed shall be controlled from AWWT DCS. 4 ma or below indicates zero flow, equivalent to motor "stop." Above 4 mA indicates a flow condition, equivalent to motor "start." The capability of fully de-energizing PMP-18 motor shall be accomplished only at the well house.

2. Pressure Indicating Transmitter (PIT-031) - Pump PMP-18 discharge pressure shall be monitored by pressure transmitter PIT-031. On high and low discharge pressure, the AWWT DCS will send a discrete output signal via FY-031 for zero speed (4 mA) at the pump and provide alarm indications at the DCS monitor. Pressure signals and alarms recorded at the AWWT DCS and displayed at the DCS monitor shall include PIR-031, PAH-031, and PAL-031.

3. Flow Meter (FE-031) - Ultrasonic Flow Meter FE-031 measures Pump PMP-18 discharge flow. Flow indicating transmitter FIT-031 transmits a 4-20 ma DC signal to the AWWT DCS. Flow controller FIC-031 intern sends a 4-20 mA signal to the Variable Speed Drive FY-031. When flow exceeds the setpoint of FIC-031, the output signal shall be

reduced to FY-031, thereby decreasing the speed of pump PMP-18 motor. When the flow falls below the setpoint of FIC-031, the output signal shall be increased to FY-031, thereby speeding up pump PMP-18 motor. Flow signals and alarms recorded by the AWWT DCS and displayed at the DCS monitor shall include FI-031, FQR-031, FAH-031, and FAL-031.

4. Valve Position Switches - Discrete input signals shall be sent to the AWWT DCS for valve position only, corresponding to either fully open or fully closed. Valve positioning shall accomplished manually.

B. Loops 032, 033 and 034 (see P&ID 95X-5900-N-00190) - Identical to PMP-18, except loop tags correspond to pumps PMP-19, PMP-20, and PMP-21, respectively. Valve position switches serve the same function as described in Article 2.3, Paragraph B, Subparagraph 4.

C. Loops 005, 006, 007, 008, and 009 (see P&ID 95X-5900-N-00191) - Identical to PMP-18, except loop tags correspond to pumps PMP-13, PMP-14, PMP-15, PMP-16, and PMP-17, respectively. Valve position switches serve the same function as described in Article 2.3, Paragraph B, Subparagraph 4.

D. SFES Valve House - Loop 001 and Loop 002 (P&ID 95X-5900-N-00191)

1. Flow Meter FE-001 - Ultrasonic Flow Meter FE-001 obtains flow measurements for the groundwater header to South Plume Valve House and South Plume Discharge. Ultrasonic Flow Meter (FE-001) measures groundwater header flow, and flow indicator transmitter (FIT-001) transmits a 4-20 ma DC signal to the AWWT DCS. Flow signals and alarms recorded by the AWWT DCS and displayed at the DCS monitor shall include FIR-001, FQR-001, FAH-001, and FAL-001.
2. Pressure Indicating Transmitter PIT-002 - Pressure indicating transmitter PIT-002 transmits a 4-20 ma DC signal to the AWWT DCS. Pressure signals and alarms recorded at the AWWT DCS and displayed at

the DCS monitor shall include PIR-002, PAL-002, and PIR-002.

3. Valve Position Switches - Discrete input signals shall be sent to the AWWT DCS for valve position only, corresponding to either fully open or fully closed. Valve positioning shall be accomplished manually.

E. DCS Setpoints

1. Setpoints shall be established as follows for the SFES devices. Well House values shall be typical for instrument type. See drawings for corresponding well houses and Valve House instrument tag numbers.

INSTRUMENT	VALUE AT 4 mA	VALUE AT 20 mA	LOW ALARM SETPOINT	HIGH ALARM SETPOINT
Well House Pressure Transmitters	0 psig	110 psig	25 psig at 6 mA	75 psig at 18 mA
Well House Ultrasonic Flow Meters	0 gpm	500 gpm	60 gpm at 6 mA	460 gpm at 18 mA
Well House Variable Speed Drive	0 rpm	1,800 rpm	N/A	N/A
Valve House Pressure Transmitter	0 psig	40 psig	5 psig at 6 mA	35 psig at 18 mA
Valve House Ultrasonic Flow Meter	0 gpm	5,800 gpm	400 gpm at 6 mA	5,300 gpm at 18 mA

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that conditioned power supply is available to the control units. Verify that field end devices, wiring, and tubing have been installed prior to proceeding with installation.

3.2 ERECTION/INSTALLATION/APPLICATION

A. Install control units and associated hardware in the existing DCS DCU320 control cabinet. Install distributed I/O in Remote Transmitter Unit enclosures as shown on Panel Layout Diagrams, Attachment A of this section.

B. Utilize existing software for configuration of control units and existing operator work station. Implement all features of programs to specified requirements and appropriate to sequence of operation.

C. Provide conduit and electrical wiring in accordance with Section 16050.

D. Start and commission systems. Allow sufficient time for start-up and commissioning prior to placing control systems in permanent operation.

3.3 DEMONSTRATION

A. Demonstrate complete and operating system to the FERMCO Construction Manager.

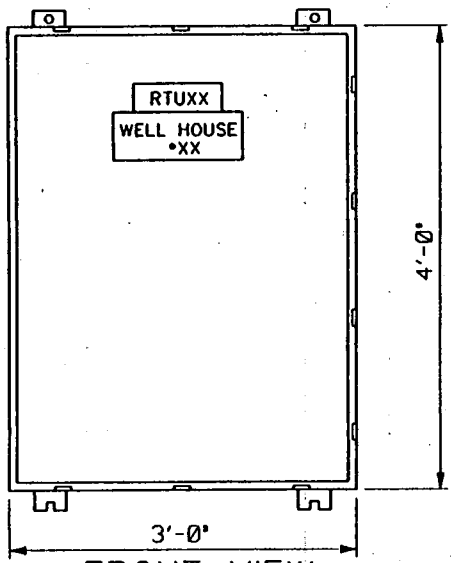
3.4 ATTACHMENTS

A. Panel Layout Diagrams 1 and 2

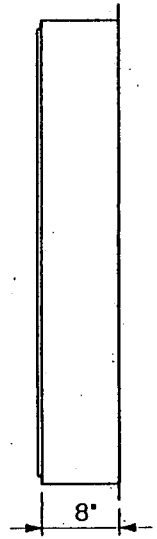
END OF SECTION

ATTACHMENT A

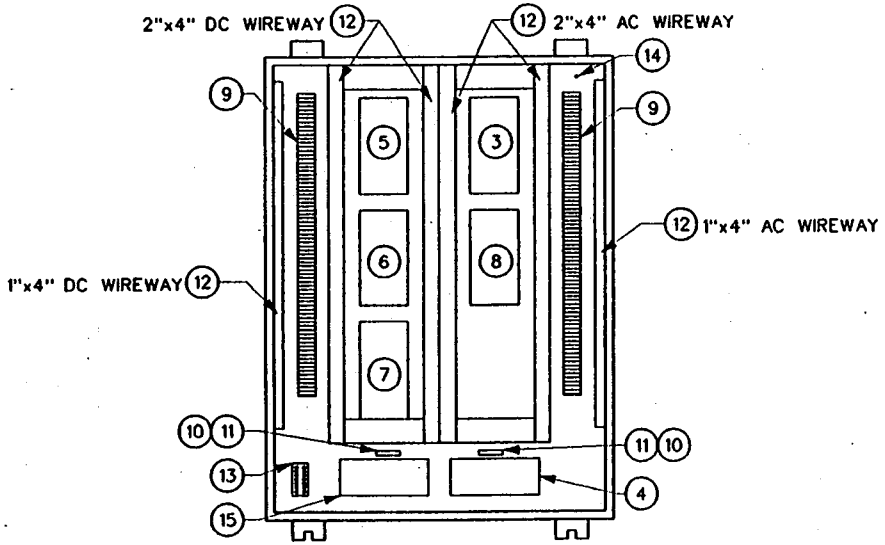
PANEL LAYOUT DIAGRAMS .



FRONT VIEW
NTS



SIDE VIEW
NTS



SUB PANEL LAYOUT
NTS

BILL OF MATERIAL

ITEM	QTY	USED FOR	DESCRIPTION
1	1	ENCLOSURE	NEMA 4 - 48" X 36" X 8" ENCLOSURE
2	1	SUB PANEL	45" X 33" SUB PANEL
3	1	FIBER OPTIC CONVERTER MOD	FISCHER & PORTER NO. CI-FIBER - NOTE 2
4	1	24 VDC POWER SUPPLY	FISCHER & PORTER NO. PS-01 OR EQUAL
5	1	POWER SUPPLY ADAPTER	FISCHER & PORTER NO. PSC-24
6	1	ANALOG INPUT MODULE	FISCHER & PORTER NO. AI1508
7	1	ANALOG OUTPUT MODULE	FISCHER & PORTER NO. AO42008
8	1	DISCRETE INPUT MODULE	FISCHER & PORTER NO. DI2416
9	105	TERMINAL	
10	2	FUSE TERMINAL	
11	2	FUSE	3 AMP, 120 VAC
12	LOT	WIREWAY	
13	1	SHLD GND	ISOLATED SHIELD GND BUS
14	1	AC GND	AC GND LUG
15	1	28V POWER SUPPLY	

NOTES:

1. 'XX' REPRESENTS THE CORRESPONDING WELL HOUSE NUMBER.
2. THE FIBER OPTIC CARD IS REQUIRED AT WELL HOUSES 15 AND 21 ONLY.

4/12/2000

PANEL LAYOUT DIAGRAM

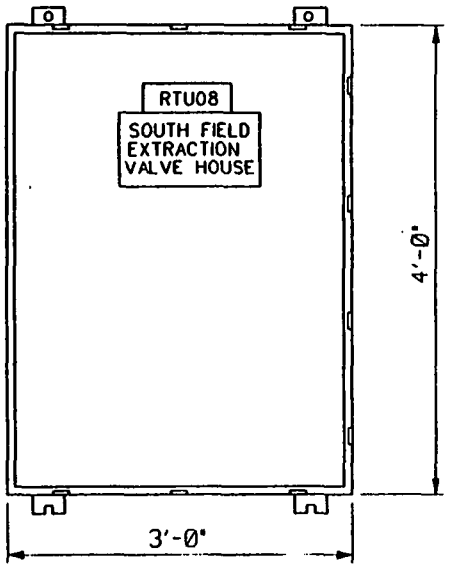
PARSONS ERA PROJECT

WBS 1.1.1.1.5.3.1

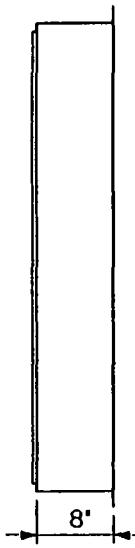
SHEET 1	JOB NUMBER CRU5/P0126
DOCUMENT NUMBER 13401-ATTACHMENT A	REV 0

SK-N-03796

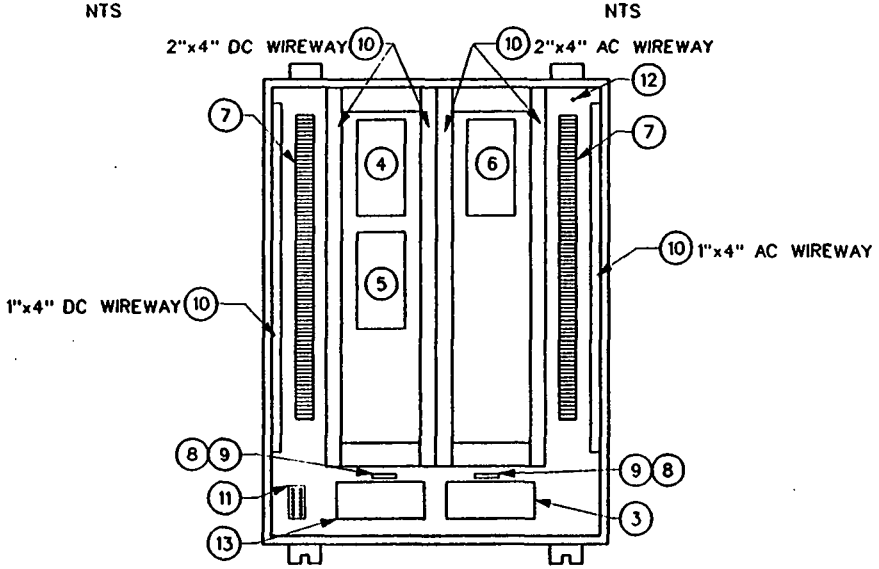
000218



FRONT VIEW
NTS



SIDE VIEW
NTS



SUB PANEL LAYOUT
NTS

BILL OF MATERIAL

ITEM	QTY	USED FOR	DESCRIPTION
1	1	ENCLOSURE	NEMA 4 - 48" X 36" X 8" ENCLOSURE
2	1	SUB PANEL	45" X 33" SUB PANEL
3	1	24 VDC POWER SUPPLY	FISCHER & PORTER NO. PS-01 OR EQUAL
4	1	POWER SUPPLY ADAPTER	FISCHER & PORTER NO. PSC-24
5	1	ANALOG INPUT MODULE	FISCHER & PORTER NO. AI1508
6	1	DISCRETE INPUT MODULE	FISCHER & PORTER NO. DI2416
7	105	TERMINAL	
8	2	FUSE TERMINAL	
9	2	FUSE	3 AMP, 120 VAC
10	LOT	WIREWAY	
11	1	SHLD GND	ISOLATED SHIELD GND BUS
12	1	AC GND	AC GND LUG
13	1	28V POWER SUPPLY	

PANEL LAYOUT DIAGRAM

PARSONS ERA PROJECT

WBS 1.1.1.1.5.3.1

SHEET	JOB NUMBER
2	CRU5/P0126
DOCUMENT NUMBER	REV
13401-ATTACHMENT A	0

SK-N-03797

U.S DEPARTMENT OF ENERGY

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

FERMCO Subcontract No. 2-21487

SOUTH FIELD EXTRACTION SYSTEM

Division 15 - Mechanical

PARSONS

Prepared by: J. Tewell 9/15/95 Date

Checked by: James L Cooper 15 SEPT 1995 Date

Prepared by: A. W. Carlson 9/15/95 Date

Checked by: Sal Chl 9/15/95 Date

Prepared by: Alle Ayanthi 9/15/95 Date

Checked by: [signature] 9/15/95 Date

SECTION 15060
PIPE, FITTINGS, VALVES, AND ACCESSORIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. The scope of work included in this section consists of furnishing all material and labor for fabrication, shipping to the job site, installation, inspection, and testing of all aboveground piping systems. This work shall be performed strictly in accordance with the applicable drawings, references, codes, and standards referenced herein.

1.2 RELATED SECTIONS

A. Section 01010 - General Requirements.

B. Section 09900 - Painting.

C. Section 15090 - Piping Supports and Anchors.

D. Section 15250 - Insulation.

1.3 REFERENCE DRAWINGS

A. See Section 01011 for the Schedule of Drawings.

1.4 REFERENCES, CODES, AND STANDARDS

A. American Society of Mechanical Engineers (ASME):

1. ASME Boiler and Pressure Vessel Code (BPVC), Section IX-92.
2. ASME A13.1-81 Scheme for the Identification of Piping Systems (R1993).
3. ASME B16.5-88 Pipe Flanges and Flanged Fittings.
4. ASME B16.11-91 Forged Fittings, Socket Welding, and Threaded.
5. ASME B16.25-92 Butt Welding Ends.

6.	ASME B31.3a-93	Chemical Plant and Petroleum Refinery Piping.

B. American Society for Nondestructive Testing (ASNT):

1.	ASNT SNT-TC-1A-92	Recommended Practice, December 1992 Edition.

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

1.	ASTM A53-94	Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
2.	ASTM A105/A105M-95	Forgings, Carbon Steel, for Piping Components.
3.	ASTM A126-93	Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
4.	ASTM A193/A193M Rev. C-94	Alloy-Steel and Stainless Steel Bolting Materials for High-Pressure and High-Temperature Service.
5.	ASTM A194/A194M Rev. A-94	Carbon and Alloy Steel Nuts for Bolts for High-Pressure and High-Temperature Service.
6.	ASTM A216/A216M-93	Steel Castings, Carbon, Suitable for Fusion Welding, for High Temperature Service.
7.	ASTM A234/A234M-95	Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures.

D. American Welding Society (AWS):

1.	AWS A5.1-91	Carbon Steel Electrodes for Shielded Metal Arc Welding.

E. National Institute of Standards and Technology (NIST).

1.5 SUBMITTALS

A. Product data for pipe, fittings, valves, and accessories.

B. Shop drawings including spool piece drawings, construction isometric drawings, etc.

C. Installation, maintenance, and operation instruction manuals.

D. Certificates of conformance that material meets specification requirements.

E. Pressure testing procedures including cleaning and flushing prior to testing, test equipment, safety precautions, and cleaning after completion of testing.

F. Pressure test and inspection reports.

G. Quality assurance plan, including procedure for repair or replacement of piping failing pressure tests.

H. Flushing procedure.

I. Welder and procedure qualifications, qualification records, and welding procedure specifications.

1.6 QUALITY ASSURANCE

A. Except where more stringent requirements are specified or indicated, the work specified herein shall conform to ASME B31.3. The Subcontractor shall submit his quality assurance plan to FERMCO for approval prior to start of fabrication or installation.

B. Welding Procedures and Qualifications

1. Fabrication, assembly, and erection shall be in accordance with ASME B31.3.
2. Welder qualifications shall be made available to, and approved by, the FERMCO Construction Manager 10 working days prior to commencement of fabrication, examination, inspection, and installation activities.
3. Nondestructive testing personnel qualifications shall be in accordance with ASNT SNT-TC-1A.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Packaging

1. Packaging shall conform to acceptable industrial practices. Materials shall be cleaned to remove chips, slag, weld spatter, oil, grease, debris, and other foreign material prior to packaging for shipment. Pipe spool openings shall be covered, capped, or plugged to prevent ingress of foreign materials during shipment and storage. Tape alone shall not be used for sealing openings. Pressure sensitive tapes shall be utilized for taping covered, capped, or plugged openings. Closures used for covering, capping, or plugging openings shall not be made of polyvinyl chloride (PVC) or other plastics that contain chlorine.

B. Storage and Handling

1. Piping materials and prefabricated assemblies shall be stored off the ground and handled with care so that physical damage to the piping materials does not occur. End seals of pipe, flange covers, valve covers, and similar protection shall not be removed until necessary for cleaning, fabrication, inspection, and erection.
2. Care shall be taken in the storage and handling of all piping materials and prefabricated assemblies so that contamination or corrosion does not occur.
3. Welding rods and electrodes shall be stored, handled, and identified at all times to ensure the use of the proper welding rod. Electrode ovens for the storage of low-hydrogen welding rods shall be used at all times.

PART 2 PRODUCTS

2.1 PRODUCTS/EQUIPMENT

A. Product Shipping Requirements

1. The Subcontractor shall be responsible for the delivery of all job related materials and/or equipment to the job site. All furnished

materials and equipment shall be delivered clean, undamaged, and in a workable condition.

B. Piping and Valve Specifications

1. All piping materials, valves, and valve operators shall meet the requirements of the referenced specification as indicated on the piping material data sheets.

C. Air and Vacuum Valves

1. Type: Float-operated valve to vent air and break vacuum in vertical turbine pump columns.
2. Provide adjustable device to throttle air flow out while leaving inlet air flow unrestricted.
3. Construction
   a. Body: Cast iron.
   b. Float: Stainless steel.
   c. Seat: Buna-N.
   d. Water diffuser: Brass.
   e. Throttling screw and spring: Stainless steel.
   f. Throttling plug: Teflon.
   g. Connections: Threaded inlet and discharge.
4. Valve size shall match pump size as follows:

Pump Discharge Pipe Size	Valve Size
6"	1"
8"	2"

5. Provide an integrally mounted and piped automatic air release valve to vent air during prolonged pump operation. Provide an isolating gate valve for maintenance.

2.2 SOURCE QUALITY CONTROL

A. Testing

1. Shop testing shall be in accordance with ASME B31.3. The FERMCO Construction Manager shall be given 7 working days advance written notification prior to any testing.

B. Inspection

1. Inspections shall be conducted in accordance with ASME B31.3. A written report of the Subcontractor's and/or fabricator's final inspection shall be submitted to the FERMCO Construction Manager within 3 working days following the successful completion of the test.

2.3 LABELING

A. Valve Identification

1. Each valve shall be identified with the unique valve number and description, as shown in Attachment A.
2. Label size shall be based on available lighting and anticipated reading distances. Labels shall be readable from the normal operation location or position, such that an operator need not manipulate the label to read it.
   a. The minimum character height for a well-illuminated environment is 0.004 times the nominal reading distance (i.e., 0.122 inches height at 28 inches distance).
   b. The minimum character height for a poorly illuminated environment is 0.006 times the nominal reading distance (i.e., 0.168 inches height at 28 inches distance).
   c. An exception to this would be a 1/2-inch diameter pipe buried in a large bank of pipes on an overhead pipe bridge, which probably could not be read but should be labeled.
3. Labels shall be constructed of nonreflective materials. Black characters on a white background or white characters on a black background offer the best contrast and legibility. If white-on-black engraved labels are used, a clear overcoating shall be applied to prevent dirt from obscuring the white engraved characters.
4. Labels, including adhesives and other means of attachment, shall be made from corrosion-resistant materials that are compatible with the component and environment where they are used.

5. Valve identification tags on insulated valves shall be located outside the insulation jacketing and be easily accessible for inspection.

B. Pipe Identification

1. Identify the flow medium and the flow direction for all piping systems including insulated pipe by labeling adjacent to each valve, adjacent to where the pipe passes through a wall or floor, adjacent to abrupt pipe directional change, pipe branches, and at intervals of 50 feet along exposed pipe. Pipes shall be labeled as indicated on the Piping and Instrumentation Diagrams and in accordance with ASME A13.1.
2. Content, size, material type, line number, and insulation requirements for each pipeline are identified on the drawings as follows:

Example GW - 8" - A - 2900 - ET

Medium Code	Size	Material Code	Line Number	Insulation
GW	8"	A	2900	ET

3. Refer to the Piping and Instrumentation Diagram Symbols and Legend Sheet for the flowing medium, medium code, and material code relationship.

C. Product Marking

1. All piping materials shall be marked and identified in accordance with the applicable ASTM specification as indicated on the piping material data sheets.
2. All bundles, boxes, or kegs in which welding rods and electrodes are delivered shall be legibly marked with the following information:
   a. Classification.
   b. Trade Designation.
   c. Standard Size and Length.
   d. Heat Number.
3. All welding rods and electrodes shall be identified with at least one imprint per rod showing an AWS classification number in accordance

with AWS A5.1. In addition, welding rods 1/8-inch diameter and over shall be marked or stamped with positive identification marks at intervals of not more than 18 inches. Such marks shall be clearly distinguishable and shall include the classification number of the welding rod and the trade designation of the manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

A. The FERMCO Construction Manager or a designee will perform all quality control visual pipe examinations. The Subcontractor shall give the FERMCO Construction Manager a minimum of 3 working days notice before a visual examination can be performed.

B. Twenty percent of all fabricated piping will be visually examined by an inspector qualified and certified in accordance with ASNT SNT-TC-1A.

C. Inspectors representing the FERMCO Construction Manager shall have access at all times to all sections of the work that concern the fabrication and erection of the piping on their contract. The inspectors shall be afforded all reasonable facilities to satisfy them that the work is being performed in accordance with the requirements of all applicable specifications and procedures.

3.2 ERECTION/INSTALLATION/APPLICATION

A. Layout, Cutting, and Fitting Up

1. All piping, tubing, fittings, components, welding, bonding, fabrication, erection, and assembly shall be in accordance with ASME B31.3.
2. All piping shall be Category D Fluid Service under ASME B31.3.
3. All assembled piping shall be installed without springing, forcing, or cold bending. Cutting or otherwise weakening of structural members to

facilitate piping installation shall not be permitted.

4. All piping shall be installed to permit free expansion and contraction without damage to joints or supports.
5. Piping connections to equipment must ensure that mating flanges are parallel prior to bolt-up and no springing of pipe is required. All equipment nozzle sizes, locations, and flange facings shall be verified prior to pipe fabrication and/or installation.
6. Piping arrangement shall allow easy access for maintenance, operation, and inspection of equipment. Flanges, unions, and valves shall be accessible for maintenance, operation, and inspection after installation. Piping shall be routed in such a way so as not to create a tripping hazard, or provisions shall be made to protect against a tripping hazard.
7. Threading of steel pipe shall preferably be done after bending, forging, heat treating, or welding operations. Where subsequent threading is very difficult and threads are cut first, they shall be fully protected during the above-mentioned operations. Threads shall be concentric with the outside of the pipe.
8. Pipe dope shall be applied to male threads only. Teflon tape, when used as thread dope, shall not be applied to the first two threads.
9. When welding joints involving two different pipe wall thicknesses, the joints shall be made in accordance with ASME B31.3, Chapter V.
10. Branch connections shall be made in accordance with the requirements specified in ASME B31.3, Chapter V.
11. All butt-welded pipe shall be beveled in accordance with ASME B16.25.
12. All socketwelded pipe shall be square cut to within the tolerances specified in ASME B16.11.
13. Remove plastic or elastomeric components from welded end prior to welding in-line.
14. All welded end valves shall be in the closed position prior to welding in-line. Valves with

nonmetallic seats shall be disassembled and the seat material removed prior to welding. After the weld has cooled, reassemble the seat material in the valve.

15. Arc strikes and weld starts shall not be made on the base metal outside the weld groove nor inside an area which will be encompassed by a fillet or socket weld. Inadvertent arc strikes outside a weld zone shall be removed by grinding or filing, and the arc strike area shall be visually examined under 5X magnification.
16. Branch connection joints shall be prepared to permit full penetration welds of a quality comparable to the circumferential welds in the same piping system.
17. Welding will not be permitted on galvanized carbon steel piping.

B. Welding

1. All welding electrodes shall be in accordance with AWS A5.1.
2. All socketwelds shall be made by shielded metal arc or gas tungsten arc welding process.
3. Socketweld joints shall be assembled so that the space between the end of the pipe and the bottom of the socket is no less than 1/16 inch or no more than 1/8 inch.
4. Branch connections to headers shall be per the material data sheet branch connection charts.

C. Painting

1. All non-insulated carbon steel piping shall be painted in accordance with the requirements of Section 09900.

D. Flanged Joints

1. All flanged joints shall be assembled in accordance with ASME B31.3, Chapter V.
2. The mating surfaces of the flanges shall be in a plane that is perpendicular to the axis of the pipe. Flanges shall be rotated so that the bolt holes straddle the flange centerlines. All gaskets shall be evenly centered between the

flange faces with ring-type gaskets engaging fully upon raised-face flanges. Flanges shall mate flush and the bolts shall be tightened uniformly to draw the flanges evenly and firmly upon the gasket. Bolts shall be torqued within the flange manufacturer's recommended range and tightening sequence.

3. All flanged joints shall be made with new gasket and bolting materials. Bolts and nuts damaged during installation shall be replaced.
4. Flat ring-type gaskets shall be used between steel flanges equipped with raised serrated faces.
5. Where flanges of different ratings are bolted together, the rating of the joint is equal to that of the lower rated flange.
6. Where metallic flanges are bolted to non-metallic flanges, both shall be flat-faced flanges. Full-face gaskets shall be used.
7. Class 150 or Class 300 steel flanges shall be bolted to flanged cast iron valves, fittings, or equipment having integral Class 125 or Class 250 flanges, respectively. When such construction is used, flat-face steel flanges shall be used with a full-face gasket.

3.3 FIELD QUALITY ASSURANCE

A. Inspections and Tests

1. Piping shall be pressure tested in accordance with ASME B31.3, Chapter VI.
2. All pressure testing shall be complete systems testing conducted by the Subcontractor in the presence of the FERMCO Construction Manager or a designee.
3. The Subcontractor shall submit pressure testing procedures to the FERMCO Construction Manager for approval a minimum of 10 working days prior to the start of testing.
4. Pressure testing shall not start until the Subcontractor's or fabricator's testing procedure has been approved by the FERMCO Construction Manager.

5. All connections/joints (including weld) shall be left uninsulated, unpainted, and exposed for examination for leakage during testing.
6. The piping system shall be inspected prior to any pressure tests to ensure that all connections are tight.
7. Test pressure gauges shall be calibrated just prior to the test.
8. Every precaution shall be taken during pressure testing to ensure personnel safety. Systems to be pressurized shall be provided with appropriate gauges and pressure relieving devices set at 10 percent above the test pressure.
9. All pressure vessels, equipment, in-line instruments, gauge glasses, flow meter pots, and all other pressure parts of instruments shall not be included in these tests if they will be damaged by the test pressure.
10. Equipment which is not to be subjected to the pressure test shall be disconnected from the piping and a pipe spool inserted in its place, or the equipment may be isolated by way of a single-line blind. Valves may be used provided that the valve is suitable for the proposed test procedure.
11. Pressure gauges shall not be subjected to pressure in excess of their scale range. All pieces of equipment with no indicated test pressure, or with test pressures below the piping system test pressure, shall be excluded from these tests.
12. Control valves (unless being tested) shall be set and maintained in the full open position.
13. Lines containing check valves shall have the pressure applied upstream of the check valve so that pressure is applied under the seat.
14. Joints found to be defective shall be repaired and retested. Retest pressures shall be the same as those originally specified for the test.
15. Measurement and test equipment shall be calibrated and traceable to NIST. Gauges shall be selected so that test pressures are at the midrange of the gauge.

B. Hydrostatic Testing

1. Potable water or other approved fluids shall be used for hydrostatic pressure testing in accordance with ASME B31.3, Chapter VI.
2. Hydrostatic test pressures shall be 1.5 times the design pressure as shown in the following table:

Service	Medium Code	Design Pressure (psig)	Test Pressure (psig)
Groundwater	GW	100	150

3. Hydrostatic test pressures shall not be applied until the piping system and the testing medium have reached thermal equilibrium.
4. The Subcontractor shall be responsible for providing high-point vents and low-point drains as required for hydrostatic tests.
5. Upon completion of hydrostatic testing, piping shall be blown dry using filtered compressed air. Immediately following the drying operation, all openings shall be covered, capped, or plugged to prevent ingress of foreign matter.

C. Test Reports

1. The Subcontractor shall provide a report for each piping system tested containing the following information:
   a. Date of test
   b. Line designation number
   c. Test fluid
   d. Type of test
   e. Pressure applied
   f. Start time
   g. Completion time
   h. Total time at test pressure
   i. Certification by examiner of acceptability

3.4 CLEANING

A. System Cleaning and Flushing

1. The interior and exterior of all pipe shall be kept clean at all times. Piping shall be free from loose mill scale, sand, dirt, slag, weld spatter, rust, fins, burrs and other foreign matter when erected. Burrs shall be removed by reaming. Other defects shall be removed by machining, chipping, filing, or grinding.
2. After erection and welding of piping, all lines except air shall be flushed with potable water prior to leak testing. Upon completion of flushing, lines shall be drained at all low points.

B. Sandblasted surfaces shall be free of residual quantities of cleaning media such as grit, aluminum oxide, or silicon prior to installation.

C. The use of cleaning fluids containing free chlorine shall be prohibited.

000233

PIPING MATERIAL DATA SHEET	MAT'L CODE A PAGE 1 OF 3

RATING: CLASS 150
MATERIAL:CARBON STEEL

CORROSION ALLOWANCE: 0.125"
PRESSURE LIMIT: PER ASME/ANSI B16.5
TEMPERATURE LIMIT: -20°F TO 200°F

CODE NUMBER	ENCODER	SIZE FROM	SIZE TO	DESCRIPTION	NOTES	REV
				PIPE		
		3/8"	2"	SEAMLESS CARBON STEEL, ASTM A53 GRADE B, EXTRA STRONG. PLAIN ENDS.		
		2-1/2"	20"	SEAMLESS CARBON STEEL, ASTM A53 GRADE B, STANDARD WEIGHT, BEVELED ENDS.		
				FLANGES		
		1/2"	2"	CLASS 150, CARBON STEEL, RF, ASTM A105, SOCKETWELD (XS BORE).		
		2-1/2"	20"	CLASS 150, CARBON STEEL, RFSF, ASTM A105, WELD NECK (STD WT BORE).		
		1/2"	20"	CLASS 150 BLIND, CARBON STEEL, ASTM A105, RFSF.		
				ORIFICE FLANGES		
		2-1/2"	20"	CLASS 300, CARBON STEEL, ASTM A105, RF WITH 1/2" SCREWED TAPS AND JACK SCREWS, WELD NECK, (STD WT BORE).		
				FITTINGS		
		3/8"	2"	CLASS 3000, CARBON STEEL, ASTM A105; SOCKETWELD.		
		3/8"	2"	CLASS 3000, SCREWED CARBON STEEL, ASTM A105 THREADOLET. PLUG, SQUAREHEAD. CAP. PLUG, HEX HEAD.	 1 1 1 3	
		2-1/2"	20"	SEAMLESS CARBON STEEL, BUTT WELD ENDS, ASTM A234 GRADE WPB.		
				SWAGES		
		3/8"	4"	SCHEDULE 80 CARBON STEEL, ASTM A234, GRADE WPB, PREPARE ENDS AS REQUIRED (BEVELED, PLAIN OR THREADED).	2	
				GASKETS		
		1/2"	20"	RED RUBBER, 1/8" THICK		

PIPING MATERIAL DATA SHEET				MAT'L CODE A PAGE 2 OF 3	
CODE NUMBER	ENCODER	SIZE FROM TO	DESCRIPTION	NOTES	REV
			BOLTING		
		1/2" - 20"	STUD BOLTS WITH 2 HEAVY HEX NUTS, ASTM A193 GRADE B7/ASTM A194 GRADE 2H.		
			BRANCHES		
			SEE CHART		
			BALL VALVES		
		3/8" - 2"	CLASS 300 CARBON STEEL, ASTM A105, SOCKETWELD, CHROME PLATED BALL, FEP SEATS, WRENCH OPERATOR.	4	
			BALL VALVES		
		2-1/2" - 8"	CLASS 150 CARBON STEEL, ASTM A216, GRADE WCB RF FLG, CHROME PLATED BALL, FEP SEATS, WRENCH OPERATOR FOR 4" AND SMALLER, GEAR OPERATOR FOR 6" AND LARGER.	4	
			BUTTERFLY VALVES		
		1" - 20"	CLASS 150, CAST IRON, ASTM A126, CLASS B, WAFER STYLE, 316 SS STEM AND DISC, EPDM SEAT, INTEGRAL FLANGE SEALS, LEVER HANDLE OPERATOR FOR 1-4", GEAR OPERATOR FOR 6" AND LARGER.	4,5	
			CHECK VALVES		
		1/2" - 2"	CLASS 150, CAST STEEL, ASTM A216, GRADE WCB, RF FLANGE, SWING TYPE, 11-13 CR TRIM.		
		2-1/2" - 20"	CLASS 150, CAST STEEL, ASTM A216, WAFER STYLE, BRONZE TRIM, STAINLESS STEEL SPRING, SILENT CHECK VALVE.		
			GLOBE VALVES		
		1/2" - 2"	CLASS 800, CARBON STEEL, ASTM A105, SOCKETWELD, BOLTED BONNET, OS&Y, 12% CHROME TRIM, HANDWHEEL OPERATOR	4	
		2-1/2" - 8"	CLASS 150, CARBON STEEL, ASTM A216 GRADE WCB.RF FLANGE, 12% CHROME TRIM, HANDWHEEL OPERATOR	4	
			GATE VALVES	4	
		1/2" - 2"	CLASS 800, CARBON STEEL, ASTM A105, SOCKETWELD ENDS, OS&Y, BOLTED BONNET, SOLID WEDGE, 12% CR TRIM.	4	
		21/2" - 6"	CLASS 150, CAST STEEL, ASTM A216, GRADE WCB, RF FLANGE, 11-13 CR TRIM, O.S. & Y		

PIPING MATERIAL DATA SHEET				MAT'L CODE A PAGE 3 OF 3	
CODE NUMBER	ENCODER	SIZE FROM	SIZE TO	DESCRIPTION	NOTES	REV
				PIPE NIPPLES		
				CARBON STEEL, ASTM A53, GRADE B		
		1/2"	2"	SCH 80, TBE, SMLS 3" LONG		
		1/2"	2"	SCH 80, TBE, SMLS 6" LONG		
		1/2"	2"	SCH 80, POE-TOE, SMLS 3" LONG		
		1/2"	2"	SCH 80, POE-TOE, SMLS 6" LONG		
		1/2"	2"	SCH 80, PBE, SMLS 3" LONG		
		1/2"	2"	SCH 80, PBE, SMLS 6" LONG		
				NOTES		
				1. USE FOR UNVALVED VENTS AND DRAINS. 2. USE SWAGES WHERE SMALL END IS 2" AND SMALLER. USE WELD REDUCER WHERE SMALL END IS 2 1/2" AND LARGER. 3. USE FOR PROCESS DRAIN. 4. EQUIP VALVE WITH LOCKING DEVICE WITH NOT LESS THAN 3/8" DIAMETER HOLE FOR LOCK. 5. PROVIDE VALVE WITH POSITION LIMIT SWITCHES AS FOLLOWS: A. ENCLOSURE SHALL BE NEMA TYPE 4. B. MECHANICAL ARM SHALL BE LEVER TYPE WITH SPRING RETURN. C. OUTPUT CONTACTS SHALL BE "DRY" CONTACTS ISOLATED FROM GROUND AND SHALL BE FORM "C" SPDT RATED 5A CONTINUOUS CURRENT, 120 V AC, 60 HZ.		

PIPING MATERIAL DATA SHEET
MATERIAL CODE A
BRANCH CONNECTION CHART

Run Size

1/2	3/4	1	1 1/2	2	2 1/2	3	4	6	8	10	12	14	16	18	20	24	30	36	
SWT	SRT	SRT	SRT	SRT	SOL	SOL	SOL	SOL	SOL	SOL	SOL	SOL	SOL	SOL	SOL				1/2
	SWT	SRT	SRT	SRT	SOL	SOL	SOL	SOL	SOL	SOL	SOL	SOL	SOL	SOL	SOL				3/4
		SWT	SRT	SRT	SOL	SOL	SOL	SOL	SOL	SOL	SOL	SOL	SOL	SOL	SOL				1
			SWT	SRT	SOL	SOL	SOL	SOL	SOL	SOL	SOL	SOL	SOL	SOL	SOL				1 1/2
				SWT	SOL	SOL	SOL	SOL	SOL	SOL	SOL	SOL	SOL	SOL	SOL				2
					WT	WOL	WOL	WOL	WOL	WOL	WOL	WOL	WOL	WOL	WOL				2 1/2
						WT	WOL	WOL	WOL	WOL	WOL	WOL	WOL	WOL	WOL				3
							WT	WOL	WOL	WOL	WOL	WOL	WOL	WOL	WOL				4
								WT	WOL	WOL	WOL	WOL	WOL	WOL	WOL				6
									WT	WOL	WOL	WOL	WOL	WOL	WOL				8
										WT	WOL	WOL	WOL	WOL	WOL				10
											WT	WOL	WOL	WOL	WOL				12
												WT	WOL	WOL	WOL				14
													WT	WOL	WOL				16
														WT	WOL				18
															WT				20
																			24
																			30
																			36

Branch Size

Legend

SOL = Sockolet
SRT = Socketweld Reducing Tee
STI = Sockolet Tee w/Insert
SWT = Socketweld Tee
WOL = Weldolet
WT = Buttweld Tee

END OF SECTION

ATTACHMENT A

MASTER VALVE LABEL LIST

Master Valve Label List

F=7311

Well House 13

Valve #	Label Line 1	Label Line 2	P&ID Number
V99	GW-SFES-V-99	EW 13 AVV Isolation Valve	95X-5900-N-00191
V100	GW-SFES-V-100	EW 13 Check Valve	95X-5900-N-00191
V101	GW-SFES-V-101	EW 13 Sample Throttling Valve	95X-5900-N-00191
V143	GW-SFES-V-143	EW 13 Sample Isolation Valve	95X-5900-N-00191
V102	GW-SFES-V-102	EW 13 Discharge Header Isolation Valve	95X-5900-N-00191
V103	GW-SFES-V-103	EW 13 Treatment Header Isolation Valve	95X-5900-N-00191
V131	GW-SFES-V-131	EW 13 Discharge Header Cleanout Isolation Valve	95X-5900-N-00191
V132	GW-SFES-V-132	EW 13 Treatment Header Cleanout Isolation Valve	95X-5900-N-00191
IV005	GW-SFES-IV-005	EW 13 PIT Isolation Valve	95X-5900-N-00191
AVV-13	GW-SFES-AVV-13	EW 13 Air Vacuum Valve	95X-5900-N-00191

Well House 14

Valve #	Label Line 1	Label Line 2	P&ID Number
V98	GW-SFES-V-98	EW 14 AVV Isolation Valve	95X-5900-N-00191
V104	GW-SFES-V-104	EW 14 Check Valve	95X-5900-N-00191
V105	GW-SFES-V-105	EW 14 Sample Throttling Valve	95X-5900-N-00191
V144	GW-SFES-V-144	EW 14 Sample Isolation Valve	95X-5900-N-00191
V106	GW-SFES-V-106	EW 14 Discharge Header Isolation Valve	95X-5900-N-00191
V133	GW-SFES-V-133	EW 14 Discharge Header Cleanout Isolation Valve	95X-5900-N-00191
V107	GW-SFES-V-107	EW 14 Treatment Header Isolation Valve	95X-5900-N-00191
V134	GW-SFES-V-134	EW 14 Treatment Header Cleanout Isolation Valve	95X-5900-N-00191
IV006	GW-SFES-IV-006	EW 14 PIT Isolation Valve	95X-5900-N-00191
AVV-14	GW-SFES-AVV-14	EW 14 Air Vacuum Valve	95X-5900-N-00191

Well House 15

Valve #	Label Line 1	Label Line 2	P&ID Number
V96	GW-SFES-V-96	EW 15 AVV Isolation Valve	95X-5900-N-00191
V112	GW-SFES-V-112	EW 15 Check Valve	95X-5900-N-00191
V113	GW-SFES-V-113	EW 15 Sample Throttling Valve	95X-5900-N-00191
V146	GW-SFES-V-146	EW 15 Sample Isolation Valve	95X-5900-N-00191
V114	GW-SFES-V-114	EW 15 Discharge Header Isolation Valve	95X-5900-N-00191
V137	GW-SFES-V-137	EW 15 Discharge Header Cleanout Isolation Valve	95X-5900-N-00191
V115	GW-SFES-V-115	EW 15 Treatment Header Isolation Valve	95X-5900-N-00191
V138	GW-SFES-V-138	EW 15 Treatment Header Cleanout Isolation Valve	95X-5900-N-00191
IV007	GW-SFES-IV-007	EW 15 PIT Isolation Valve	95X-5900-N-00191
AVV-15	GW-SFES-AVV-15	EW 15 Air Vacuum Valve	95X-5900-N-00191

Well House 16

Valve #	Label Line 1	Label Line 2	P&ID Number
V97	GW-SFES-V-97	EW 16 AVV Isolation Valve	95X-5900-N-00191
V108	GW-SFES-V-108	EW 16 Check Valve	95X-5900-N-00191
V109	GW-SFES-V-109	EW 16 Sample Throttling Valve	95X-5900-N-00191
V145	GW-SFES-V-145	EW 16 Sample Isolation Valve	95X-5900-N-00191
V111	GW-SFES-V-111	EW 16 Treatment Header Isolation Valve	95X-5900-N-00191
V110	GW-SFES-V-110	EW 16 Discharge Header Isolation Valve	95X-5900-N-00191
V135	GW-SFES-V-135	EW 16 Discharge Header Cleanout Isolation Valve	95X-5900-N-00191
V136	GW-SFES-V-136	EW 16 Treatment Header Cleanout Isolation Valve	95X-5900-N-00191
IV008	GW-SFES-IV-008	EW 16 PIT Isolation Valve	95X-5900-N-00191
AVV-16	GW-SFES-AVV-16	EW 16 Air Vacuum Valve	95X-5900-N-00191

Master Valve Label List

Well House 17

Valve #	Label Line 1	Label Line 2	P&ID Number
V95	GW-SFES-V-95	EW 17 AVV Isolation Valve	95X-5900-N-00191
V116	GW-SFES-V-116	EW 17 Check Valve	95X-5900-N-00191
V117	GW-SFES-V-117	EW 17 Sample Throttling Valve	95X-5900-N-00191
V147	GW-SFES-V-147	EW 17 Sample Isolation Valve	95X-5900-N-00191
V119	GW-SFES-V-119	EW 17 Discharge Header Isolation Valve	95X-5900-N-00191
V139	GW-SFES-V-139	EW 17 Discharge Header Cleanout Isolation Valve	95X-5900-N-00191
V118	GW-SFES-V-118	EW 17 Treatment Header Isolation Valve	95X-5900-N-00191
V140	GW-SFES-V-140	EW 17 Treatment Header Cleanout Isolation Valve	95X-5900-N-00191
IV009	GW-SFES-IV-009	EW 17 PIT Isolation Valve	95X-5900-N-00191
AVV-17	GW-SFES-AVV-17	EW 17 Air Vacuum Valve	95X-5900-N-00191

Well House 18

Valve #	Label Line 1	Label Line 2	P&ID Number
V186	GW-SFES-V-186	EW 18 AVV Isolation Valve	95X-5900-N-00190
V166	GW-SFES-V-166	EW 18 Check Valve	95X-5900-N-00190
V167	GW-SFES-V-167	EW 18 Sample Throttling Valve	95X-5900-N-00190
V181	GW-SFES-V-181	EW 18 Sample Isolation Valve	95X-5900-N-00190
V168	GW-SFES-V-168	EW 18 Discharge Header Isolation Valve	95X-5900-N-00190
V174	GW-SFES-V-174	EW 18 Discharge Header Cleanout Isolation Valve	95X-5900-N-00190
V169	GW-SFES-V-169	EW 18 Treatment Header Isolation Valve	95X-5900-N-00190
V175	GW-SFES-V-175	EW 18 Treatment Header Cleanout Isolation Valve	95X-5900-N-00190
IV031	GW-SFES-IV-031	EW 18 PIT Isolation Valve	95X-5900-N-00190
AVV-18	GW-SFES-AVV-18	EW 18 Air Vacuum Valve	95X-5900-N-00190

Well House 19

Valve #	Label Line 1	Label Line 2	P&ID Number
V187	GW-SFES-V-187	EW 19 AVV Isolation Valve	95X-5900-N-00190
V162	GW-SFES-V-162	EW 19 Check Valve	95X-5900-N-00190
V163	GW-SFES-V-163	EW 19 Sample Throttling Valve	95X-5900-N-00190
V180	GW-SFES-V-180	EW 19 Sample Isolation Valve	95X-5900-N-00190
V164	GW-SFES-V-164	EW 19 Discharge Header Isolation Valve	95X-5900-N-00190
V176	GW-SFES-V-176	EW 19 Discharge Header Cleanout Isolation Valve	95X-5900-N-00190
V165	GW-SFES-V-165	EW 19 Treatment Header Isolation Valve	95X-5900-N-00190
V177	GW-SFES-V-177	EW 19 Treatment Header Cleanout Isolation Valve	95X-5900-N-00190
IV032	GW-SFES-IV-032	EW 19 PIT Isolation Valve	95X-5900-N-00190
AVV-19	GW-SFES-AVV-19	EW 19 Air Vacuum Valve	95X-5900-N-00190

Well House 20

Valve #	Label Line 1	Label Line 2	P&ID Number
V185	GW-SFES-V-185	EW 20 AVV Isolation Valve	95X-5900-N-00190
V158	GW-SFES-V-158	EW 20 Check Valve	95X-5900-N-00190
V159	GW-SFES-V-159	EW 20 Sample Throttling Valve	95X-5900-N-00190
V179	GW-SFES-V-179	EW 20 Sample Isolation Valve	95X-5900-N-00190
V160	GW-SFES-V-160	EW 20 Discharge Header Isolation Valve	95X-5900-N-00190
V172	GW-SFES-V-172	EW 20 Discharge Header Cleanout Isolation Valve	95X-5900-N-00190
V161	GW-SFES-V-161	EW 20 Treatment Header Isolation Valve	95X-5900-N-00190
V173	GW-SFES-V-173	EW 20 Treatment Header Cleanout Isolation Valve	95X-5900-N-00190
IV033	GW-SFES-IV-033	EW 20 PIT Isolation Valve	95X-5900-N-00190
AVV-20	GW-SFES-AVV-20	EW 20 Air Vacuum Valve	95X-5900-N-00190

Master Valve Label List

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Well House 21

Valve #	Label Line 1	Label Line 2	P&ID Number
V184	GW-SFES-V-184	EW 21 AVV Isolation Valve	95X-5900-N-00190
V150	GW-SFES-V-150	EW 21 Check Valve	95X-5900-N-00190
V151	GW-SFES-V-151	EW 21 Sample Throttling Valve	95X-5900-N-00190
V178	GW-SFES-V-178	EW 21 Sample Isolation Valve	95X-5900-N-00190
V152	GW-SFES-V-152	EW 21 Discharge Header Isolation Valve	95X-5900-N-00190
V170	GW-SFES-V-170	EW 21 Discharge Header Cleanout Isolation Valve	95X-5900-N-00190
V153	GW-SFES-V-153	EW 21 Treatment Header Isolation Valve	95X-5900-N-00190
V171	GW-SFES-V-171	EW 21 Treatment Header Cleanout Isolation Valve	95X-5900-N-00190
IV034	GW-SFES-IV-034	EW 21 PIT Isolation Valve	95X-5900-N-00190
AVV21	GW-SFES-AVV-21	EW 21 Air Vacuum Valve	95X-5900-N-00190

South Field Valve House

Valve #	Label Line 1	Label Line 2	P&ID Number
V122	GW-SFES-V-122	West Treatment Header Isolation Valve	95X-5900-N-00191
V125	GW-SFES-V-125	West Discharge Header Isolation Valve	95X-5900-N-00191
V130	GW-SFES-V-130	North Discharge Header Isolation Valve	95X-5900-N-00191
V123	GW-SFES-V-123	East Treatment Header Isolation Valve	95X-5900-N-00191
V124	GW-SFES-V-124	South Plume Discharge Isolation Valve	95X-5900-N-00191
V127	GW-SFES-V-127	South Plume Treatment Isolation Valve	95X-5900-N-00191
V128	GW-SFES-V-128	South Plume Check Valve	95X-5900-N-00191
V149	GW-SFES-V-149	Treatment Sample Isolation Valve	95X-5900-N-00191
V141	GW-SFES-V-141	Treatment Sample Throttling Valve	95X-5900-N-00191
V148	GW-SFES-V-148	Discharge Sample Isolation Valve	95X-5900-N-00191
V142	GW-SFES-V-142	Discharge Sample Throttling Valve	95X-5900-N-00191
V91	GW-SFES-V-91	South Plume Sample Isolation Valve	95X-5900-N-00191
V92	GW-SFES-V-92	South Plume Sample Throttling Valve	95X-5900-N-00191
IV050	GW-SFES-IV-050	PI-050 Isolation Valve	95X-5900-N-00191
IV051	GW-SFES-IV-051	PI-051 Isolation Valve	95X-5900-N-00191
IV052	GW-SFES-IV-052	PI-052 Isolation Valve	95X-5900-N-00191
IV053	GW-SFES-IV-053	PI-053 Isolation Valve	95X-5900-N-00191
IV054	GW-SFES-IV-054	PI-054 Isolation Valve	95X-5900-N-00191
IV055	GW-SFES-IV-055	PI-055 Isolation Valve	95X-5900-N-00191
IV002	GW-SFES-IV-002	PIT-002 Isolation Valve	95X-5900-N-00191

Master Valve Label List

Underground Valves

Valve #	Label Line 1	Label Line 2	P&ID Number
V182	GW-SFES-V-182	Future Discharge Header	95X-5900-N-00190
V183	GW-SFES-V-183	Future Treatment Header	95X-5900-N-00190
V93	GW-SFES-V-93	Future Discharge Header	95X-5900-N-00191
V154	GW-SFES-V-154	Future Treatment Header	95X-5900-N-00190
V94	GW-SFES-V-94	Future Discharge Header	95X-5900-N-00191
V155	GW-SFES-V-155	Future Discharge Header	95X-5900-N-00190
V83	GW-SFES-V-83	AVV-102 Isolation Valve	95X-5900-N-00191
AVV102	GW-SFES-AVV-102	Discharge Header Air Vacuum Valve	95X-5900-N-00191
V193	GW-SFES-V-193	AVV-100 Isolation Valve	95X-5900-N-00190
V194	GW-SFES-V-194	AVV-101 Isolation Valve	95X-5900-N-00190
AVV100	GW-SFES-AVV-100	Treatment Header Air Vacuum Valve	95X-5900-N-00190
AVV101	GW-SFES-AVV-101	Discharge Header Air Vacuum Valve	95X-5900-N-00190
V88	GW-SFES-V-88	Cleanout Isolation Valve	95X-5900-N-00191
V89	GW-SFES-V-89	Cleanout Isolation Valve	95X-5900-N-00191
V90	GW-SFES-V-90	Cleanout Isolation Valve	95X-5900-N-00191
V84	GW-SFES-V-84	Cleanout Isolation Valve	95X-5900-N-00191
V85	GW-SFES-V-85	Cleanout Isolation Valve	95X-5900-N-00191
V188	GW-SFES-V-188	Cleanout Isolation Valve	95X-5900-N-00190
V189	GW-SFES-V-189	Cleanout Isolation Valve	95X-5900-N-00190
V190	GW-SFES-V-190	Cleanout Isolation Valve	95X-5900-N-00190
V191	GW-SFES-V-191	Cleanout Isolation Valve	95X-5900-N-00190
V192	GW-SFES-V-192	Cleanout Isolation Valve	95X-5900-N-00190
V195	GW-SFES-V-195	Cleanout Isolation Valve	95X-5900-N-00190
V86	GW-SFES-V-86	Cleanout Isolation Valve	95X-5900-N-00191
V87	GW-SFES-V-87	Cleanout Isolation Valve	95X-5900-N-00191
V120	GW-SFES-V-120	Main Discharge Header Isolation Valve	95X-5900-N-00191

SECTION 15090
PIPING SUPPORTS AND ANCHORS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. This section covers the requirements for furnishing and installing all piping support material and anchors.

1.2 RELATED SECTIONS

A. Section 01010 - General Requirements.

B. Section 09900 - Painting.

C. Section 15060 - Pipe, Fittings, Valves, and Accessories.

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 A36/A36M-94 Carbon Structural Steel.

B. American Welding Society (AWS):
   1. AWS A5.1-91 Carbon Steel Electrodes for Shielded Metal Arc Welding.
   2. AWS D1.1-94 Structural Welding Code - Steel.

C. Manufacturers Standardization Society (MSS):
   1. MSS SP-89-91 Pipe Hangers and Supports - Fabrication and Installation Practices.

1.5 SUBMITTALS

A. Product data.

B. Shop drawings.

C. Certificates of compliance certifying that materials supplied meet or exceed the specification requirements.

D. Welder and procedure qualifications, qualification records, and welding procedure specifications.

1.6 QUALITY ASSURANCE

A. All pipe supports and auxiliary steel shall be of bolted or welded construction complying with MSS SP-89. Welded construction shall comply with AWS D1.1.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Storage and Handling

1. Piping support materials and piping hanger systems shall be stored off the ground and handled with care so that physical damage to the materials does not occur.
2. Care shall be taken in the storage and handling of all piping support materials and pipe hanger systems so that corrosion or contamination by grease, moisture, or other foreign matter does not occur.
3. Welding rods and electrodes shall be stored, handled, and identified at all times to ensure the use of the proper welding rod. Electrode ovens for the storage of low-hydrogen welding rods must be used to maintain storage humidity.

PART 2 PRODUCTS

2.1 PRODUCTS/EQUIPMENT

A. Product Shipping Requirements

1. The Subcontractor shall be responsible for the delivery of all job-related materials and/or equipment to the job site. All furnished materials and equipment shall be delivered clean, undamaged, and in good condition.

2.2 MATERIALS

A. ASTM A36 steel shall be used for all plate and structural shape support components.

2.3 FABRICATION

A. Welding
1. All welding shall be in accordance with AWS D1.1.

B. Shop Assembly
1. Any parts made in the supplier's shop shall be completely shop assembled, as far as practical, prior to shipment to the site.

C. Shop/Factory Finish
1. All carbon steel parts shall be painted in accordance with the requirements of Section 09900.

2.4 LABELING

A. Product Marking
1. All welding rods and electrodes shall be identified with at least one imprint per rod showing an AWS classification number in accordance with AWS A5.1. In addition, welding rods 1/8-inch diameter and over shall be marked or stamped with positive identification marks at intervals of not more than 18 inches. Such marks shall be clearly distinguishable and shall include the classification number of the welding rod and the trade designation of the manufacturer. Filler metal requirements shall conform to AWS A5.1.

PART 3 EXECUTION

3.1 EXAMINATION

A. The FERMCO Construction Manager or a designee will perform all quality control visual examinations. The Subcontractor shall give the FERMCO Construction

Manager a minimum of 3 working days written notice before a visual examination can be performed.

3.2 PREPARATION

A. Protection

1. All welding/fabricating activities shall be protected from inclement weather at all times.

B. Primer Application

1. All structural steel pipe support material systems shall be prime coated after fabrication. The items that are painted as standard by the manufacturer do not require prime coating. Primer shall be in accordance with Section 09900.

3.3 ERECTION/INSTALLATION/APPLICATION

A. Installation

1. Support components shall be installed in accordance with details shown on the piping drawings.
2. Supports shall be installed at the locations shown on the piping drawings.

END OF SECTION

SECTION 15160
PUMPS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Vertical motor-driven deep well turbine pumps (Nos. PMP-13 through PMP-21).

1.2 RELATED SECTIONS

A. Section 15171 - Motors.

B. Section 16483 - Variable Frequency Drives.

1.3 REFERENCES, CODES, AND STANDARDS

A. Hydraulic Institute Standards.

1.4 SUBMITTALS

A. Shop drawings specially prepared for the project, including anchor settings, sizes, and locations.

B. Product Data: Certified pump curves for each pump model supplied, showing performance characteristic with pump and system operating point plotted. Include net positive suction head curve.

C. Certificates: Alignment certification, certificates of conformance to specification requirements, and certificates guaranteeing performance at design point.

D. Installation instructions, start-up and troubleshooting instructions, operational and maintenance data, lubrication instructions, and spare parts list.

E. Shop testing procedures.

F. Test reports.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store in a clean, dry place and protect from weather prior to shipment. Provide protection from weather and from damage during transit.

B. Loose items shall be tagged and delivered in a standard commercial package. The package shall be protected from the weather, from climate conditions including temperature and humidity variations, and from dirt, dust, and other contaminants that could adversely affect assembly and operation of the pumps.

1.6 WARRANTY

A. Warranty: Pumps shall be warranted by the manufacturer covering materials and labor.

PART 2 PRODUCTS

2.1 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. It is the offerer's responsibility to propose equipment that is best suited for this project in combined terms of quality and price.

A. Peerless.

B. Johnston.

C. Deming.

2.2 EQUIPMENT

A. General Construction Requirements

1. The balancing of the rotating parts, statically and dynamically, shall be in accordance with the manufacturer's standards.
2. All blades, pulleys, belts, pumps, motors, and other like equipment shall be complete with "guarding" of any possible "nip point." This guarding shall have a maximum of 1/2 inch opening.

B. Pumps

1. See Attachment A, vertical turbine pump data sheet.

2.3 FABRICATION

A. Prior to shipment, the pump/motor assembly shall be cleaned of all dirt, dust, grease, grime, weld spatter, and other foreign material. Pumps shall be primed and painted in accordance with manufacturer's standard finish. Any open end connections shall be sealed to prevent the entrance of foreign material.

2.4 LABELING

A. Equipment Identification: All pumps shall be provided with a permanently attached stainless steel nameplate indicating equipment name, number, model number, and rated capacity. Lettering shall be a minimum of 3/8 inch high and shall be stamped. Nameplates shall be located for unobstructed viewing when equipment is installed.

2.5 SOURCE QUALITY CONTROL

A. Each pump shall be tested in the manufacturer's shop in accordance with Hydraulic Institute Standards.

B. The Subcontractor shall submit shop testing procedures to the FERMCO Construction Manager for approval a minimum of 10 working days prior to the start of testing. Testing shall not start until the testing

procedure has been approved by the FERMCO Construction Manager.

C. Test will be witnessed by FERMCO. The Subcontractor shall provide notice to FERMCO 2 weeks prior to the test.

PART 3 EXECUTION

3.1 SCHEDULES

A. For well data and pump heads, see Attachment A.

3.2 ERECTION/INSTALLATION/APPLICATION

A. The installation of the equipment specified and shown on the drawings shall be in accordance with the manufacturer's instructions.

B. A copy of the manufacturer's installation instructions, start-up and troubleshooting instructions, operation and maintenance data, lubrication instructions, and spare parts list shall be available at the site.

3.3 FIELD QUALITY ASSURANCE

A. Tests: Acceptance operating tests shall be performed by the Subcontractor after installation. If the results are unsatisfactory, the Subcontractor shall adjust or replace the equipment to meet the specification requirements and retest the equipment.

B. Inspection: The Subcontractor shall notify the FERMCO Construction Manager of testing and inspection activities at least 24 hours prior to the start of all tests and/or inspections.

3.4 DEMONSTRATION

A. Demonstrate ability to meet full range of operating flow rates and operating point as shown on pump curves. Vibration shall be within manufacturer's acceptable range.

B. Pump manufacturer shall provide services of Service Engineer during pump installation, start-up, and testing.

END OF SECTION

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ATTACHMENT A

SOUTH FIELD EXTRACTION SYSTEM WELL DATA AND PUMP DATA SHEET

Table A-1 - South Field Extraction System Well Data (Elevation in Feet)

Well Number	Pump Support Elevation	SWL Elevation (see Note 2)	TOS Elevation (see Note 3)	BOS Elevation (see Note 4)	PWL Elevation (see Note 5)	Bottom of Pump Inlet Strainer Elevation	Pump Support to Bottom of Pump Inlet Strainer (ft)	Pumping Head at Discharge Flange (ft) (see Note 6)
13	542.30	519.40	511.40	491.40	513.40	491.30	51	220
14	540.50	518.96	510.96	490.96	512.96	490.50	50	215
15	576.00	518.78	510.78	490.78	512.78	490.00	86	166
16	545.00	518.59	510.59	490.59	512.59	490.00	55	207
17	575.50	518.62	510.62	490.62	512.62	490.50	85	186
18	572.50	518.17	510.17	490.17	512.17	489.50	83	176
19	575.50	518.13	510.13	490.13	512.13	489.50	86	184
20	579.70	518.31	510.31	490.31	512.31	489.70	90	173
21	577.30	518.28	510.28	490.28	512.28	489.30	88	179

Notes:

1. All wells have 12 inch I.D. casings.
2. Static Water Level (SWL) is minimum of 1994 site data for each well location.
3. Top of Screen (TOS) elevation is 8 feet below SWL.
4. Bottom of Screen (BOS) elevation is 20 feet below TOS.
5. Pumping Water Level (PWL) assumes a net drawdown of 6 feet for all wells at 400 gpm rated pump capacity.
6. Total pumping head will be head at discharge flange plus static head in well plus pump column losses.

VERTICAL TURBINE PUMP DATA SHEET

PUMP NAME:	Vertical Deep Well Turbine Pumps	EQUIP. NO.:	PMP-13 to PMP-21	PROJECT ORDER:	126
PROJECT TITLE:	South Field Extraction System			QUANTITY:	9
DRAWING NO.:	95X-5900-N-00189, -00190, -00191				
TYPE PUMP:	Vertical Turbine	TYPE DRIVER:	Electric motor w/var. freq. drive	SUPPLY W/PUMP:	YES

OPERATING CONDITIONS

FLUID PUMPED:	Groundwater	pH Range:	7 to 9	TSS:	3 mg/L
DESIGN CAPACITY:	400 gpm	Range:	100 gpm to 400 gpm		
HEAD AND WELL DATA:	See Table A-1				

PUMP SPECIFICATIONS

TYPE PUMP:	Vertical line shaft turbine pump, aboveground discharge, variable speed (Note 5)		
STAGES:	Multistage	RPM:	Maximum 1,750
EFFICIENCY:	Minimum 70%	TYPE IMPELLER:	Closed

CONNECTIONS

DISCHARGE:	6-inch flanged, aboveground

CONSTRUCTION MATERIALS

DISCHARGE COLUMN:	Carbon steel, 6-inch diameter, threaded sleeve-type connections (Note 1)		
COLUMN LINE SHAFT:	Stainless steel, threaded steel couplings (Note 1)		
COLUMN BEARINGS:	Water lubricated cutless rubber, bronze retainers		
BOWL ASSEMBLY:	Enameled cast iron (Note 2)		
IMPELLER:	Bronze	IMPELLER SHAFT:	Stainless steel
INLET STRAINER:	Corrosion-resistant, 6-inch diameter, 1/4-inch maximum opening (Note 3)		
DISCHARGE HEAD:	Cast iron		
WATER LEVEL INDICATOR:	1/4-inch flexible plastic tube air line (Note 4)		
SOLE PLATE:	Cast iron or steel		

ELECTRIC MOTOR

VOLTS	PHASE	HERTZ	HP	NON-OVERLOAD	CLASS	GROUP	RPM	TYPE
460	3	60	40	YES			1750	TEFC (Note 6)

REMARKS:

Note 1: Discharge column and column line shaft shall each be supplied in maximum 10-foot long interchangeable sections, plus one spare 5-foot-long section for each pump to allow for field adjustment.

Note 2: Bowl assemblies shall be interchangeable for all pumps.

Note 3: Net inlet area of strainer shall be greater than or equal to four times suction pipe area.

Note 4: Water level indicating tube shall have sufficient length to extend from pump discharge head to bowl assembly. Provide easily accessible steel pipe with threaded connection for air hose outside discharge head. Air tube to pump fastener shall be corrosion resistant.

Note 5: There shall be no critical speeds within the normal operating range.

Note 6: Motor shall be vertical hollow shaft induction type controlled by a variable frequency drive.

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SECTION 15170
MOTORS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Low-voltage, three phase induction motors.

B. Low-voltage, single phase induction motors.

1.2 RELATED SECTIONS

A. Section 01010 - General Requirements.

B. Section 15500 - Heating, Ventilating, and Air Conditioning.

C. Section 16050 - Basic Electrical Materials and Methods.

D. Section 16170 - Grounding and Bonding.

E. Section 16483 - Variable Frequency Drive.

1.3 REFERENCE DRAWINGS

A. See Section 01011 for the Schedule of Drawings.

1.4 REFERENCES

A. American Bearing Manufacturers Association (ABMA):

1.	ABMA 9-90	Load Ratings and Fatigue Life for Ball Bearings.
2.	ABMA 11-90	Load Ratings and Fatigue for Roller Bearings.

B. Institute of Electrical and Electronics Engineers (IEEE):

1.	IEEE 112-91	Standard Test Procedure for Polyphase Induction Motors and Generators.

C. National Electrical Manufacturers Association (NEMA):
1. NEMA MG 1-93 Motors and Generators.
2. NEMA MG 13-84 Frame Assignments for AC Integral-Horsepower Induction Motors.

D. National Fire Protection Association (NFPA):
1. NFPA 70-93 National Electrical Code.

E. Underwriters Laboratories, Inc. (UL):
1. Electrical Construction Materials Directory-94.

1.5 SUBMITTALS

A. Provide submittals as required by Section 01010.

B. Product Data: Provide full load amps, impedances, normal and short-circuit current ratings, NEMA frame size, and additional standard nameplate data. Provide efficiency and power factor for each of 1/2, 3/4, and full load. Provide dimensional enclosure details.

C. Test Reports: Indicate satisfactory completion of required tests and inspections. Submit results verifying performance in accordance with IEEE 112.

1.6 QUALITY ASSURANCE

A. Conform to NFPA 70 and NEMA MG1.

B. Motors shall be listed in the UL, Electrical Construction Materials Directory, for the purpose specified and indicated.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers:
1. Reliance Electric.
2. U. S. Motors.
3. General Electric.

000256

2.2 EQUIPMENT

A. General Construction and Requirements

1. Electrical Service: Refer to related sections of the specifications and the drawings for required characteristics. Motors shall be suitable for driven equipment.
2. Motors: Design for continuous operation at a temperature of 40 degrees C ambient, and for temperature rise in accordance with NEMA MG 1 limits for insulation class, service factor, and motor enclosure type. Motors to be controlled by variable frequency drives shall be of a design suitable for this type of operation.
3. Visible Nameplate: Indicating motor horsepower, voltage, phase, frequency, rpm, full load amps, locked rotor amps, frame size, manufacturer's name and model number, service factor, power factor, serial number, and bearing numbers. Nameplate shall be stainless steel, permanently attached to the motor frame.
4. Electrical Connection: Conduit connection boxes, threaded for conduit and designed to allow for 90-degree step rotation of the conduit entrance. Oversize conduit boxes shall be provided.
5. Motor Service Factor: Furnish motors with service factors required herein. Motor size in hp shall be selected to serve the driven equipment over its full performance range as though the service factor were 1.0.
6. Motor voltage shall be 115 V, single-phase for motors 1 hp or less. Other motors shall be 460 V, three phase.
7. Motors drawing less than 250 W that are intended for intermittent service may be germane to equipment manufacturer and need not conform to these specifications.
8. Provide vertical pump motors with non-reverse ratchets. Note that these pumps have hollow shafts.

B. Three Phase - Squirrel Cage Induction Motors

1. Motors shall be 460 V, three phase, 60 Hz.

2. Motors shall have a 1.15 service factor or higher.
3. The motor connection diagram shall be stainless steel, permanently stamped and attached to the motor either inside the conduit box or on the same side as the conduit box.
4. Starting Torque: To be matched to the driven equipment.
5. Starting Current: Not to exceed six times full-load current.
6. Power Output, Locked Rotor Torque, Breakdown or Pullout Torque: NEMA Design B characteristics or as required by the driven equipment.
7. Design, Construction, Testing, and Performance: Conform to NEMA MG 1 for Design B motors or as required by the driven equipment.
8. Insulation System: Non-hygroscopic NEMA Class F or better.
9. Testing Procedure: In accordance with IEEE 112, Test Method B. Load test motors to determine freedom from electrical or mechanical defects and for compliance with performance data.
10. Motor Frames: NEMA MG 13 standard T-frames of steel, or cast iron with end brackets of cast iron.
11. Bearings: Grease lubricated, anti-friction ball bearings with housings equipped with plugged provision for prelubrication, rated for minimum ABMA 9 and 11, L-10 life of 20,000 hours.
12. Sound Power Levels: To NEMA MG 1.
13. Motors shall be high-efficiency type.
14. Motors shall be totally enclosed fan cooled (TEFC).
15. Nominal Efficiency: Meet or exceed values in schedules as given herein at full load and rated voltage when tested in accordance with IEEE 112.
16. Nominal Power Factor: Meet or exceed values in schedules as given herein at full load and rated voltage when tested in accordance with IEEE 112.

C. Performance Schedule: Three Phase - Standard efficiency, TEFC.

HP Factor	RPM (Syn)	NEMA Frame	Minimum Percent Efficiency	Minimum Percent Power Factor
1-1/2	3600	143T	82	85
2	3600	145T	82	87
3	3600	145T	84	85
5	3600	182T	85	86
7-1/2	3600	184T	86	88
10	3600	213T	87	86
15	3600	215T	89	89
20	3600	254T	90	89
25	3600	256T	90	92
30	3600	284T	91	91
40	3600	286T	92	92
50	3600	324T	93	89
60	3600	326T	93	91
75	3600	364T	93	88
100	3600	365T	92	88
1	1800	143T	82	84
1-1/2	1800	145T	84	85
2	1800	145T	84	85
3	1800	182T	86	86
5	1800	184T	87	87
7-1/2	1800	213T	88	86
10	1800	215T	89	85
15	1800	256T	91	85
20	1800	256T	91	86
25	1800	284T	91	85
30	1800	286T	92	88
40	1800	324T	92	83
50	1800	326T	93	85
60	1800	364T	93	88
75	1800	365T	93	88
100	1800	404T	93	83

For motors larger than 100 hp, provide manufacturer's standard high-efficiency motor.

D. Service Factor Schedule

hp	3600 rpm	1800 rpm	1200 rpm	900 rpm
1/6 - 1/3	1.35	1.35	1.35	1.35
1/2	1.25	1.25	1.25	1.15
3/4	1.25	1.25	1.15	1.15
1	1.25	1.15	1.15	1.15
>1	1.15	1.15	1.15	1.15

E. Single phase motors shall conform to the following respective requirements. The driven equipment supplier shall furnish motor starter, motor type, and motor enclosure type suitable for the application.

1. Single Phase Power - Split Phase Motors
   a. Starting Torque: Less than 150 percent of full load torque.
   b. Starting Current: Up to seven times full load current.
   c. Breakdown Torque: Approximately 200 percent of full load torque.
   d. Drip-Proof Enclosure: Class A (50 degrees C temperature rise) insulation, NEMA service factor, prelubricated sleeve or ball bearings.
   e. Enclosed Motors: Class A (50 degrees C temperature rise) insulation, 1.0 service factor, prelubricated ball bearings, TEFC.
2. Single Phase Power - Permanent-Split Capacitor Motors
   a. Starting Torque: Exceeding 1/4 of full load torque.
   b. Starting Current: Up to six times full load current.
   c. Multiple Speed: Through tapped windings.
   d. Open Drip-Proof or Enclosed Air Over Enclosure: Class A (50 degrees C temperature rise) insulation, minimum 1.0 service factor, prelubricated sleeve or ball bearings, automatic reset overload protector.

3. Single Phase Power - Capacitor Start Motors
   a. Starting Torque: Three times full load torque.
   b. Starting Current: Less than five times full load current.
   c. Pull-Up Torque: Up to 350 percent of full load torque.
   d. Breakdown Torque: Approximately 250 percent of full load torque.
   e. Motors: Capacitor in series with starting winding; provide capacitor-start/capacitor-run motors with two capacitors in parallel with run capacitor remaining in circuit at operating speeds.
   f. Drip-Proof Enclosure: Class A (50 degrees C temperature rise) insulation, NEMA service factor, prelubricated bearings.
   g. Enclosed Motors: Class A (50 degrees C temperature rise).

PART 3 EXECUTION

3.1 ERECTION/INSTALLATION/APPLICATION

A. Install motors in accordance with manufacturer's instructions.

B. Motors shall be aligned with the respective driven equipment as specified in related sections.

C. External metal frames of motors and their respective driven equipment shall be connected to ground as specified in Section 16170.

END OF SECTION

SECTION 15171
MOTORS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Low voltage, three phase, induction motors for turbine pumps PMP-13 through PMP-21.

1.2 RELATED SECTIONS

A. Section 15160 - Pumps.

B. Section 16483 - Variable Frequency Drives.

1.3 REFERENCES

A. American Friction Bearing Manufacturers Association (AFBMA):

1.	AFBMA 9-90	Load Ratings and Fatigue Life for Roller Bearings.
2.	AFBMA 11-90	Load Ratings and Fatigue Life for Roller Bearings.

B. Institute of Electrical and Electronics Engineers (IEEE):

1.	IEEE 112-91	Standard Test Procedure for Polyphase Induction Motors and Generators.

C. National Electrical Manufacturers Association (NEMA):

1.	NEMA MG 1-93	Motors and Generators.
2.	NEMA MG 13-84	Frame Assignments for AC Integral Horsepower Induction Motors.

D. National Fire Protection Association (NFPA):

1.	NFPA 70-93	National Electrical Code.

1.4 SYSTEM DESCRIPTION

A. This section covers electrical motors required for the operation of turbine pumps PMP-13 through PMP-21 as described in Section 15160. Each motor shall be served and operated by a Variable Frequency Drive as described in Section 16483. Motor connections from the Variable Frequency Drives shall be accomplished by the installation subcontractor.

1.5 SUBMITTALS

A. Submit manufacturer's installation instructions.

B. Submit operation and maintenance data. Include assembly drawings; bearing data, including replacement sizes; and lubrication instructions.

C. Certificate of Conformance: Provide manufacturer's statement certifying that the product supplied meets or exceeds contract requirements.

D. Product Data: Provide full load amps, impedances, normal and short-circuit current ratings, NEMA frame size, and additional standard nameplate data. Provide efficiency and power factor for each of 1/2, 3/4, and full load. Provide dimensional enclosure details.

E. Test Reports: Indicate satisfactory completion of required tests and inspections. Submit results verifying performance in accordance with IEEE 112.

1.6 QUALITY ASSURANCE

A. Conform to NFPA 70 and NEMA MG 1.

B. Motors shall be listed in the UL, Electrical Construction Materials Directory, for the purpose specified and indicated.

1.7 WARRANTY

A. Warranty: Motors shall be warranted by the manufacturer covering materials and labor.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. 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.
   1. Reliance Electric.
   2. U. S. Motors.
   3. General Electric.

2.2 EQUIPMENT

A. General Construction and Requirements
   1. Electrical Service: Refer to Section 15160 for required characteristics. Motors shall be suitable for driven equipment.
   2. Motors: Design for continuous operation at a temperature of 40 degrees C ambient, and for temperature rise in accordance with NEMA MG 1 limits for insulation class, service factor, and motor enclosure type. Motors to be controlled by variable frequency drives shall be of a design suitable for this type of operation.
   3. Visible Nameplate: Nameplate to indicate motor horsepower, voltage, phase, frequency, rpm, full load amps, locked rotor amps, frame size, manufacturer's name and model number, service factor, power factor, serial number, and bearing

numbers. Nameplate shall be stainless steel, permanently attached to the motor frame.

4. Electrical Connection: Conduit connection boxes, threaded for conduit and designed to allow for 90 degree step rotation of the conduit entrance. Oversize conduit boxes shall be provided.
5. Motor Service Factor: Furnish motors with service factors required herein. Motor size in hp shall be selected to serve the driven equipment over its full performance range as though the service factor were 1.0.
6. Provide vertical pump motors with non-reverse ratchets. Note that these pumps have hollow shafts.

B. Three Phase - Squirrel Cage Induction Motors

1. Motors shall be 460 volt, three phase, 60 Hz.
2. Motors shall have a 1.15 service factor or higher.
3. The motor connection diagram shall be stainless steel, permanently stamped and attached to the motor either inside the conduit box or on the same side as the conduit box.
4. Starting Torque: To be matched to the driven equipment.
5. Starting Current: Not to exceed six times full-load current.
6. Power Output, Locked Rotor Torque, Breakdown or Pullout Torque: NEMA Design B characteristics or as required by the driven equipment.
7. Design, Construction, Testing, and Performance: Conform to NEMA MG 1 for Design B motors or as required by the driven equipment.
8. Insulation System: Non-hygroscopic NEMA Class F or better.
9. Testing Procedure: In accordance with IEEE 112, Test Method B. Load test motors to determine freedom from electrical or mechanical defects and for compliance with performance data.
10. Motor Frames: NEMA MG 13 standard T-frames of steel or cast iron with end brackets of cast iron or aluminum with steel inserts.

11. Bearings: Grease lubricated anti-friction ball bearings with housings equipped with plugged provision for prelubrication, rated for minimum AFBMA 9 and 11, L-10 life of 20,000 hours.
12. Sound Power Levels: In accordance with NEMA MG 1.
13. Motors shall be high-efficiency type.
14. Nominal Efficiency: Meet or exceed values in schedules as given herein at full load and rated voltage when tested in accordance with IEEE 112.
15. Nominal Power Factor: Meet or exceed values in schedules as given herein at full load and rated voltage when tested in accordance with IEEE 112.
16. Motors shall be totally enclosed, fan cooled type.

PART 3 EXECUTION

3.1 ERECTION/INSTALLATION/APPLICATION

A. Install motors in accordance with manufacturer's instructions.

B. Motors shall be aligned with the respective pump as specified in Section 15160.

C. External metal frames of motors and their respective drive equipment shall be connected to ground by the installation Subcontractor.

3.2 QUALITY ASSURANCE

A. Performance Schedule: Three Phase - energy efficient, totally enclosed, fan cooled.

HP	RPM(Syn)	NEMA Frame	Minimum Percent Efficiency	Minimum Percent Power Factor
3	1800	182T	87	83
5	1800	184T	88	83
7-1/2	1800	213T	89	85
10	1800	215T	90	84
15	1800	254T	91	86
20	1800	256T	91	85
25	1800	284T	92	84
30	1800	286T	93	86
40	1800	324T	92	83
50	1800	326T	93	85
60	1800	364T	93	88
75	1800	365T	93	88
100	1800	404T	93	83
3	3600	182T	82	87
5	3600	184T	85	88
7-1/2	3600	213T	86	86
10	3600	215T	86	86
15	3600	254T	88	91
20	3600	256T	89	89
25	3600	284T	90	92
30	3600	286T	91	92
40	3600	286T	92	92
50	3600	324T	93	89
60	3600	326T	93	91
75	3600	364T	93	88
100	3600	365T	92	88

For motors larger than 100 hp, provide manufacturer's standard high-efficiency motor.

B. Tests: Acceptance operating tests shall be performed by the Subcontactor after installation. If the results are unsatisfactory, the Subcontractor shall adjust or replace the equipment to meet the specification requirements and retest the equipment.

C. Inspection: The Subcontractor shall notify the FERMCO Construction Manager of testing and inspection activities at least 24 hours prior to the start of all tests and/or inspections.

END OF SECTION

SECTION 15250
INSULATION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Provide all labor, materials, and equipment required for furnishing and installing pipe and equipment insulation as specified herein.

1.2 RELATED SECTIONS

A. Section 01010 - General Requirements.

B. Section 15060 - Pipe, Fittings, Valves, and Accessories.

C. Section 16885 - Electric Heating Cables.

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 B209-93	Aluminum and Aluminum-Alloy Sheet and Plate.
2.	ASTM C534-94	Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.
3.	ASTM C552-91	Cellular Glass Thermal Insulation.
4.	ASTM D1056-91	Flexible Cellular Materials - Sponge or Expanded Rubber.

1.5 SUBMITTALS

A. Submit product data and installation manuals.

B. Submit certificate of conformance that material meets or exceeds specification requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Insulation Materials

1. Insulation materials shall be identified, inspected, controlled, and protected in a manner that will ensure conformance with the referenced codes and standards.
2. Care shall be taken in the storage and handling of all insulation material so that contamination by grease, moisture, or other foreign matter does not occur. Insulation materials shall be stored off the ground, protected from the weather, and handled so that physical damage to the insulation material does not occur.

PART 2 PRODUCTS

2.1 MATERIALS

A. Anti-condensation flexible cellular elastomeric insulation: Slit pipe or sheet insulation in accordance with ASTM C534 Type 1 - Tubular and ASTM D1056, RE - 41.

B. Cellular glass: Board and molded (rigid) inorganic maximum "k" value of 0.345 Btu-inch per hour per square foot per degree F at 75 degrees F, conforming to ASTM C552.

C. Jacketing - Outdoor Applications: Aluminum, Alloy 3003-H18, tempered, 0.02 inches thick, corrugated, conforming to ASTM B209.

D. Jacketing - Underground Applications: Wrapping consisting of polymer modified bituminous compound with a 4-mil, high-density, cross laminate, polyethylene top film and release paper backing, total thickness of 40 mils and permeability of less than .02 perm inches.

E. Elbow insulation covers: Aluminum, Alloy 1100, tempered.

F. Bedding Compound: Nonvolatile, 0.008 perm inch; service temperature range of -60 degree F to 180 degree F; application temperature 40 degree F to 100 degree F.

2.2 ACCESSORIES

A. Wire: B&S Gage No. 16, annealed, 302 or 304 stainless steel.

B. Insulation Bands:
1. Piping: 1/2-inch wide by 0.015-inch thick, 304 stainless steel bands.
2. Equipment: 3/4-inch by 0.015-inch thick, 304 stainless steel bands.

C. Screws: Number 7, by 3/8 inch, sheet metal type 302 or 304 stainless steel.

D. Adhesives: Fire-resistant adhesive shall be compatible with insulation.

PART 3 EXECUTION

3.1 ERECTION/INSTALLATION/APPLICATION

A. Piping, which includes valves, fittings, and flanges, shall be insulated for all piping containing the suffixes "IC" or "-ET" in the pipe line number as indicated on the drawings.

B. Install materials in accordance with the manufacturer's instructions.

C. Flanges shall have removable insulation and aluminum jacketing to permit servicing of take-down joints. Removable covers may be fabricated from segments of block insulation or from preformed sectional pipe covering and premolded components. A removable cover shall be of the same material as the adjoining pipe insulation.

D. Fill joints and seams with bedding compound to form smooth surface.

E. All insulation shall be stopped at a sufficient distance from flanges to permit ease of bolt removal. Insulation shall be beveled at a 45-degree angle at this point.

F. Install aluminum jacketing with screws on 3-inch centers on all fittings and valves where banding is not possible.

G. Labels indicating "asbestos-free" shall be attached to the outside of all insulation jacketing, adjacent to all piping identification labels.

H. Pipe Insulation

1. All piping and heat tracing shall be tested in accordance with Section 15060 and Section 16885 before installing insulation.
2. Piping, fittings, valves, and flanges shall be insulated and jacketed as follows:

Pipeline Number Suffix	Type	Material	Minimum Thickness (inches)	Jacketing
ET	heat trace	cellular glass	1½	aluminum
ET (below grade)	heat trace	cellular glass	1½	polymer modified bituminous compound
IC	anti-condensation	flexible elastomeric	1	none

3. Insulation shall be applied in a single layer with joints tightly butted and shall be secured in place with wire on 12-inch centers.

4. Corrugated aluminum jacketing shall be applied directly over insulation (except underground applications). Minimum lap for longitudinal joints shall be 1 inch, and minimum lap for circumferential joints shall be 2 inches. The jacketing shall be secured in place with bands on 9-inch centers.
5. Premolded elbow insulation and aluminum elbow covers shall be used with heat tracing insulation. Aluminum jacketing shall be used for all other fittings, valves, and flanges.
6. Lap all seams against weather.
7. Finish insulation at supports, protrusions, and interruptions. At pipe supports, remove only enough insulation to provide a snug fit.
8. Inserts shall be the same thickness, material, and contour as adjoining piping insulation. For intersection at tees or other equipment, use block or curved segments. Miter cut to fit neatly on the surface, with joints tightly butted.
9. Seal jacketing below ground per manufacturer's recommendation.
10. All insulated valves and piping systems shall be labeled in accordance with Section 15060.

END OF SECTION

SECTION 15500
HEATING, VENTILATING, AND AIR CONDITIONING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Furnish all labor, materials, equipment, and services necessary to construct, install, and test the complete and operable heating and ventilation systems as defined in this specification and as shown on the Mechanical Utilities drawing.
1. Propeller fans.
2. Electric unit heater.
3. Controls.

B. Items furnished and installed by others:
1. Electric power supply.

1.2 RELATED SECTIONS

A. Section 01010 - General Requirements.

B. Section 10211 - Metal Wall Louvers.

C. Section 15170 - Motors.

D. Section 16050 - Basic Electrical Material and Methods.

1.3 REFERENCE DRAWINGS

A. See Section 01011 for the Schedule of Drawings.

1.4 REFERENCES

A. Air Movers and Controllers Association (AMCA):
1. AMCA 99-86 Standards Handbook.
2. AMCA 210-85 Laboratory Methods of Testing Fans for Rating.
3. AMCA 300-94 Reverberant Room Method for Sound Testing of Fans.

4.	AMCA 301-90	Methods for Calculating Fan Sound Ratings from Laboratory Test Data.

B. Anti-Friction Bearing Manufacturers Association (AFBMA):

1.	AFBMA 9-90	Load Ratings and Fatigue Life for Ball Bearings.

C. National Fire Protection Association (NFPA):

1.	NFPA 70-93	National Electrical Code (NEC).
2.	NFPA 90A-93	Installation of Air Conditioning and Ventilating System.

D. Underwriters Laboratories, Inc. (UL):

1.	UL 705-94	Standards for Safety Power Ventilators.
2.	UL 1025-80	Electric Air Heaters.

1.5 SYSTEM DESCRIPTION

A. The design basis for ventilation is to provide air for cooling in summer to maintain a maximum of 100 degrees F summer design temperature in the buildings. The design basis for heating is to maintain a minimum of 50 degrees F winter design temperature in the buildings.

1.6 SUBMITTALS

A. Product Data: Provide data including manufacturer's catalog information.

B. Shop Drawings: Indicate manufactured assemblies, system and controls schematic, electrical characteristics, and connection requirements.

C. Operating and Maintenance Instructions: Include instructions, maintenance schedule, spare parts list, motor and drive replacement, and warranty.

D. Certificates of Conformance: Manufacturer shall certify and provide data which indicate that all supplied products meet or exceed this specification.

E. Data on propeller fans and accessories, including fan curves, sound power levels, and electrical characteristics and connection requirements.

F. Wiring diagrams for all electrical systems.

G. Data on electric unit heater and accessories, including electrical characteristics and connection requirements.

1.7 QUALITY ASSURANCE

A. Operation and Maintenance Data: Include spare parts lists, wiring diagrams, and instructions for lubrication, motor, and drive replacement.

B. All equipment operations and testing of materials shall be in compliance with NFPA 70 and UL 705.

C. All internal components shall be labeled with manufacturer's name, serial number, and/or power rating information.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Equipment shall be stored in a clean, dry place and protected from weather prior to shipment. Provide protection from weather and from damage during transit.

B. Loose items shall be tagged and delivered in a standard commercial package. The package shall be protected from the weather; climate conditions including temperature and humidity variations; dirt and dust; and other contaminants that could adversely affect assembly and operation of the fans.

C. Protect motors, shafts, and bearings from weather and construction dust or any other physical damage.

1.9 PROJECT CONDITIONS

A. The design is based on the following outdoor design conditions:
   1. Summer: 92 degrees F Db/73 degrees F Wb.
   2. Winter: 1 degree F Db.

PART 2 PRODUCTS

2.1 EQUIPMENT

A. 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.

B. Sidewall Propeller Fans
   1. General
      a. Performance Ratings: Conform to AMCA 210 and bear the AMCA Certified Rating Seal.
      b. Sound Ratings: AMCA 301, tested to AMCA 300, and bear AMCA Certified Sound Rating Seal.
      c. Fabrication: Conform to AMCA 99.
      d. Performance Base: At 580 feet elevation.
      e. Temperature Limit: Maximum 150 degrees F.
      f. Performance: See attached data sheet.
   2. Wheel and Housing
      a. Heavy-duty stamped steel propeller, consisting of six steel blades securely attached to a heavy-gage spider by means of steel rivets, heavily reinforced on each side. The fan frame and venturi shall be constructed of heavy-gage painted steel with the fan assembly bolted to the venturi for ease of removal and service.
   3. Bearings and Drives
      a. Bearings: AFBMA 9, L-50 life at 100,000 hours, heavy-duty pillow block type, self-aligning, grease-lubricated ball bearings.

b. Shafts: Hot-rolled steel, ground and polished, with key-way, protectively coated with lubricating oil, and shaft guard.

c. V-Belt Drive: Cast iron or steel sheaves, dynamically balanced, keyed, variable pitch. Drives shall be designed for 165 percent of rated horsepower capabilities.

4. Accessories

a. Backdraft Damper: Heavy-duty motor operated. Frame is galvanized steel, and blades are aluminum with felt strips on closing edges. Motor shall be operated from 120-volt source.

b. Damper Guard: Expanded metal screen supported by galvanized steel frame.

c. Wall-Mounted Collar: Heavy-gage steel with thermally fused polyester finish.

d. Motor Guard: Expanded metal screen supported by galvanized steel frame.

5. Electrical Characteristics and Components (see attached data sheet)

a. Motor: Shall conform to Section 15170.

b. Wiring Termination: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized according to NFPA 70.

c. Wiring terminations shall be sized to conform to NFPA 70.

6. Manufacturers

a. Cook, Inc.

b. Hartzell, Inc.

c. Greenheck, Inc.

C. Electric Horizontal Discharge Unit Heaters

1. The unit heaters shall be factory assembled, electric-type complete with built-in thermostat, wall-mounted Hand-Off-Auto (HOA) fan switch, heater contactor, and mounting bracket.

2. Casing shall be fabricated of die-formed heavy-gage steel and finished in high-gloss, baked enamel. Supply air shall be drawn and discharged through an outward venturi. Adjustable discharge

louvers shall be provided to control the direction of air flow.

3. Heating elements shall be high mass, all steel, tubular finned type.
4. Motors shall be TEFC, industrial rated, with sealed bearings to ensure permanent lubrication.
5. Fan blades shall be of the axial type design.
6. Heaters shall be designed for a single circuit, with elements, motor, and control circuits subdivided with fuses to conform to NFPA 70 and UL Standard 1025.
7. The heaters shall be equipped with automatic reset thermal overloads.
8. Controls and control circuit transformers shall be factory installed and wired. Built-in fan override shall be provided to purge unit casing of excess heat after unit shutdown. The heaters shall be listed by UL.
9. Electric Unit Heaters Data Sheet

Tag Number	UH-(13-21)	UH-(1-2)
Heater capacity, kw	3.3	5
Air flow, cfm	400	400
Fan motor, hp	1/125	1/125
Electric power Volts/phase/Hz	480/3/60	208/3/60
Arrangement	Horiz.	Horiz.
Built-in thermostat	yes	yes
Hand-off-auto switch w/heater contactor	yes	yes
Wall mounting bracket	yes	yes

10. Manufacturers:
    a. Trane Company.
    b. Modine Manufacturing Company.
    c. Indeeco Company.

C. Controls and Instrumentation

1. Thermostats (T):
Single-stage room thermostats with temperature operating range 50 degrees F to 100 degrees F shall be provided. Thermostats shall have heavy-duty contacts suitable for 5 amp, 120V, single phase, 60 Hz operation. Contacts shall be dry contact isolated from ground. Units shall include integral thermometer. Enclosure shall be indoor type. Units shall be bellows actuated and shall have removable set point adjust knob.

a. Manufacturers
1) Honeywell, Inc.
2) Johnson Control, Inc.
3) Mercoid Corporation.

2. Motor for dampers:
Two position spring-return motors to operate dampers are normally closed, operate on line voltage (120 V) with internal transformer.

a. Manufacturers
1) Honeywell, Inc.
2) Johnson Control, Inc.
3) Mercoid Corporation.

2.2 EXTRA MATERIALS

A. Provide two sets of belts for each fan, one installed and the other as a spare.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install all equipment as shown on the contract drawings as listed in Article 1.3 and in strict accordance with manufacturer's installation instructions. Ventilation system shall comply with the requirements of NFPA 90A.

B. Unit heaters shall be started by thermostat set at 50 degrees F, or manually. Exhaust fans shall be started by thermostat set at 100 degrees F, or manually, and shall be interlocked with intake air louvers/dampers, specified in Section 10211.

END OF SECTION

ATTACHMENT 1

FAN DATA SHEET

REVS	NO.	DATE	BY	CK	APP	DESCRIPTION	REVS	NO.	DATE	BY	CK	APP	DESCRIPTION

DESIGN OPERATING CONDITIONS

Elevation ASL 580 Installation ☐ Indoors ☒ Outdoors Ambient Temp Min 1 °F _____ Max 92 °F

Application Exhaust

Gas Temp Design 100°F Min 1 °F Max 100 °F Vol 14,829 cfm Static Pressure 0.25 in. WG(1)

Fan Inlet Density _____ lb/cu ft. Design Outlet Vel _____ fpm (± 10%) Allow Noise Level 30 db(2)

Service ☐ Continuous ☒ Intermittent Environment ☒ Rel Clean ☐ Dusty ☐ Corrosive ☐ Other _____

FAN PHYSICAL DATA

Rotation ☐ CW ☐ CCW Inlet ☐ Single ☐ Double Discharge ☐ Single Width ☐ Double Width

Arrangement Sidewall Propeller Fan

Drive ☐ Direct ☒ V-Belt (3)(4)(5) ☐ Other _____ Motor (6) Position _____

CONSTRUCTION AND ACCESSORIES

Fan Housing – ☒ Standard ☐ Other _____

Connection – ☐ Inlet ☐ Flanged ☐ Slip-on

☐ Disch ☐ Flanged ☐ Slip-on

☐ Drain ☐ Flanged ☐ Thd Pipe Cplg

Access Door ☐ Bolted Plate ☐ Quick Release

Wheel(7) Type ☐ Backward Incl ☐ Forward Curved

☒ Other Propeller

Const ☒ Standard ☐ Other _____

Spark Resistant Reqd ☐ Yes ☒ No

Type ☐ A ☐ B ☐ C

Shaft ☒ Standard ☐ Other _____

Seal Required ☐ Yes ☒ No

Heat Slinger Required ☐ Yes ☒ No

Insulation Clips Required ☐ Yes ☒ No

Screen Reqd–Inlet ☐ Yes ☒ No Outlet ☐ Yes ☐ No

Bearings(8) ☒ Pillow Block Roller ☐ Sleeve ☐ Ball

☐ Split Housings ☐ Solid Housings

☐ Grease Lube ☐ Oil Lube ☐ Other _____

Discharge Damper – Opposed Blade Req ☐ Yes ☐ No

Parallel Blade Req ☒ Yes ☐ No

Vaned Inlet Damper Required ☐ Yes ☐ No

Drive ☐ Direct ☐ Rigid Coupling ☐ Direct Coupling

☒ V-Belt ☐ Fixed ☒ Adjustable(4)

Guard(5) Required ☒ Yes ☐ No

Vibration – Isolators Required ☒ Yes ☐ No

Isolation Base Required ☐ Yes ☒ No

Painting – Mfr Standard ☒ Yes ☐ No

Other _____

Motor and Drive Weather Cover Required ☐ Yes ☒ No

(1) At Design Temperature and Elevation.
(2) Performance ratings shall be based on tests made in accordance with the latest AMCA codes.
(3) V-belt drive shall have a minimum of two belts and shall be rated 2.5 times rated motor horsepower.
(4) Adjustable V-belt drive shall be adjustable 10% above and 10% below design fan rpm.
(5) V-Belt Drive guard shall have a 3-inch diameter tachometer test hole at drive and driven shafts.
(6) Refer to Standard Motor Specifications for motor characteristics.
(7) Wheel and shaft shall be statically and dynamically balanced as a unit.
(8) Bearings shall be self-aligning. Grease fittings shall be of the extended hydraulic type.

TO BE COMPLETED BY VENDOR

Fan Mfr _____ Model _____ Size _____ Class _____

Fan rpm @ Design Conditions _____ Mfr Max _____

Brake hp @ Design Conditions _____ Min Temp _____

@10% Above Design rpm _____

Motor hp _____ No. Drive Belts _____ hp/Belt _____

Design Outlet Velocity _____ fpm Tip Speed _____ fpm

WR^2 _____ lb ft^2 Blade Frequency _____ Hz Housing

Sound ☐ (re: 10^{-2} W) ☐ Pressure (db re: 0.0002 Microbar)

Band 1 ___ 2 ___ 3 ___ 4 ___ 5 ___ 6 ___ 7 ___ 8 ___

Weights Fan Wheel _____ lb Shaft _____ lb

Fan Excluding Motor and Drive _____ lb

Fan Including Motor and Drive _____ lb

Material _____ Thickness _____ in

Does the proposed equipment meet all requirements as specified on this Data Sheet? ☐ Yes ☐ No

If not, have all deviations been identified and alternates proposed? ☐ Yes ☐ No

Notes: Motor requirements: 2 hp, 480V, 3-phase, 60Hz, 1750 rpm
Attachment to Specification 15500

Tag No.
EF-(13-24)
(95X-5900-A-00224)

DATA SHEET PARSONS	PROPELLER FAN	Sheet 1 of 2	Job Number PO 126
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REVS	NO.	DATE	BY	CK	APP	DESCRIPTION	REVS	NO.	DATE	BY	CK	APP	DESCRIPTION

DESIGN OPERATING CONDITIONS

Elevation ASL 580 Installation ☐ Indoors ☒ Outdoors Ambient Temp Min 1 °F _____ Max 92 °F

Application Exhaust

Gas Temp Design 100°F Min 1 °F Max 100 °F Vol 1402 cfm Static Pressure 0.25 in. WG(1)

Fan Inlet Density _____ lb/cu ft. Design Outlet Vel _____ fpm (± 10%) Allow Noise Level 30 db(2)

Service ☐ Continuous ☒ Intermittent Environment ☒ Rel Clean ☐ Dusty ☐ Corrosive ☐ Other _____

FAN PHYSICAL DATA

Rotation ☐ CW ☐ CCW Inlet ☐ Single ☐ Double Discharge ☐ Single Width ☐ Double Width

Arrangement Sidewall Propeller Fan

Drive ☐ Direct ☒ V-Belt (3)(4)(5) ☐ Other _____ Motor (6) Position _____

CONSTRUCTION AND ACCESSORIES

Fan Housing – ☒ Standard ☐ Other _____

Connection – ☐ Inlet ☐ Flanged ☐ Slip-on
☐ Disch ☐ Flanged ☐ Slip-on
☐ Drain ☐ Flanged ☐ Thd Pipe Cplg

Access Door ☐ Bolted Plate ☐ Quick Release

Wheel(7) Type ☐ Backward Incl ☐ Forward Curved
☒ Other Propeller

Const ☒ Standard ☐ Other _____

Spark Resistant Reqd ☐ Yes ☒ No
Type ☐ A ☐ B ☐ C

Shaft ☒ Standard ☐ Other _____
Seal Required ☐ Yes ☒ No
Heat Slinger Required ☐ Yes ☒ No

Insulation Clips Required ☐ Yes ☒ No

Screen Reqd – Inlet ☐ Yes ☒ No Outlet ☐ Yes ☐ No

Bearings(8) ☒ Pillow Block Roller ☐ Sleeve ☐ Ball
☐ Split Housings ☐ Solid Housings
☐ Grease Lube ☐ Oil Lube ☐ Other _____

Discharge Damper – Opposed Blade Req ☐ Yes ☐ No
Parallel Blade Req ☒ Yes ☐ No

Vaned Inlet Damper Required ☐ Yes ☐ No

Drive ☐ Direct ☐ Rigid Coupling ☐ Direct Coupling
☒ V-Belt ☐ Fixed ☒ Adjustable(4)

Guard(5) Required ☒ Yes ☐ No

Vibration – Isolators Required ☒ Yes ☐ No

Isolation Base Required ☐ Yes ☒ No

Painting – Mfr Standard ☒ Yes ☐ No

Other _____

Motor and Drive Weather Cover Required ☐ Yes ☒ No

(1) At Design Temperature and Elevation.
(2) Performance ratings shall be based on tests made in accordance with the latest AMCA codes.
(3) V-belt drive shall have a minimum of two belts and shall be rated 2.5 times rated motor horsepower.
(4) Adjustable V-belt drive shall be adjustable 10% above and 10% below design fan rpm.
(5) V-Belt Drive guard shall have a 3-inch diameter tachometer test hole at drive and driven shafts.
(6) Refer to Standard Motor Specifications for motor characteristics.
(7) Wheel and shaft shall be statically and dynamically balanced as a unit.
(8) Bearings shall be self-aligning. Grease fittings shall be of the extended hydraulic type.

TO BE COMPLETED BY VENDOR

Fan Mfr _____ Model _____ Size _____ Class _____

Fan rpm @ Design Conditions _____ Mfr Max _____

Sound ☐ (re: 10^{-2} W) ☐ Pressure (db re: 0.0002 Microbar)

Brake hp @ Design Conditions _____ Min Temp _____

Band 1 ___ 2 ___ 3 ___ 4 ___ 5 ___ 6 ___ 7 ___ 8 ___

@10% Above Design rpm _____

Weights Fan Wheel _____ lb Shaft _____ lb

Motor hp _____ No. Drive Belts _____ hp/Belt ____

Fan Excluding Motor and Drive _____ lb

Design Outlet Velocity _____ fpm Tip Speed _____ fpm

Fan Including Motor and Drive _____ lb

WR^2 _____ lb ft^2 Blade Frequency _____ Hz Housing

Material _____ Thickness _____ in

Does the proposed equipment meet all requirements as specified on this Data Sheet? ☐ Yes ☐ No

If not, have all deviations been identified and alternates proposed? ☐ Yes ☐ No

Notes: Motor requirements: 1/4 hp, 120V, 1-phase, 60Hz, 1750 rpm
Attachment to Specification 15500

Tag No.
EF-(1-2)
(95X-5900-A-00228)

DATA SHEET PARSONS	PROPELLER FAN	Sheet 2 of 2	Job Number PO 126
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U.S DEPARTMENT OF ENERGY

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

FERMCO Subcontract No. 2-21487

SOUTH FIELD EXTRACTION SYSTEM

Division 16 - Electrical

PARSONS

Prepared by: J. Ferrell 9/15/95
Date

Checked by: James L Cooper 15 SEPT 1995
Date

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Date: 09/15/95 16000 WBS No.: 1.1.1.1.5.3.1
Rev.: 0 RE: TH 1 of 1 ERA/CRU No.: 5/PO-126

000285

SECTION 16050
BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Combination magnetic motor starters.

B. Selector switches.

C. Receptacles.

D. Wall switches.

E. Conduit.

F. Wire and cable.

G. Instrument cable.

H. Nameplates.

I. Wire markers and cable tags.

J. Wireway and auxiliary gutters.

K. Splicing and termination components.

L. Boxes.

M. Cabinets.

N. Supporting Devices.

1.2 RELATED SECTIONS

A. Section 01010 - General Requirements.

B. Section 05120 - Structural Steel.

C. Section 13401 - Process Control System.

D. Section 15160 - Pumps.

E. Section 15170 - Motors.

F. Section 15500 - Heating, Ventilating, and Air Conditioning.

G. Section 16118 - Underground Ductbanks and Ducts.

H. Section 16170 - Grounding and Bonding.

I. Section 16311 - Primary Switchgear.

J. Section 16370 - Overhead Power Distribution.

K. Section 16462 - Dry Type Transformers/Panelboards.

L. Section 16483 - Variable Frequency Drive.

M. Section 16500 - Lighting.

N. Section 16855 - Heating Cables.

1.3 REFERENCE DRAWINGS

A. See Section 01011 for the Schedule of Drawings.

1.4 REFERENCES

A. National Fire Protection Association (NFPA):
1. NFPA 70-93 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 360-86 UL Standard for Safety Liquid-Tight Flexible Steel Conduit.
2. UL 486A-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.	UL 870-91	UL Standard for Safety Wireways, Auxiliary Gutters, and Associated Fittings.

D. National Electrical Manufacturers Association (NEMA):

1.	NEMA AB 1-93	Molded Case Circuit Breakers and Molded Case Switches.
2.	NEMA ICS 1-93	Industrial Control and Systems General Requirements.
3.	NEMA ICS 2-93	Industrial Control and System Controllers, Contractors, and Overload Relays Rated Not More Than 2000 Volts AC or 750 Volts DC.
4.	NEMA ICS 4-93	Industrial Control and Systems Terminal Blocks.
5.	NEMA ICS 6-93	Industrial Control and Systems - Enclosures.
6.	NEMA OS 1-89	Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports.
7.	NEMA WD 1-83	General Requirements for Wiring Devices.
8.	NEMA WD 6-88	Wiring Devices - Dimensional Requirements.
9.	NEMA 250-91	Enclosures for Electrical Equipment (1,000 Volts Maximum).

E. Underwriters Laboratories, Inc. (UL):

1. Electrical Construction Materials Directory - 1994

1.5 SUBMITTALS

A. Provide submittals as required by Section 01010.

1.6 QUALITY ASSURANCE

A. All work shall comply with NFPA 70. Use of conduit for equipment ground is prohibited.

B. Products shall be listed in the UL Electrical Construction Materials Directory-94, for the purpose specified and indicated.

PART 2 PRODUCTS

2.1 EQUIPMENT

A. Combination Magnetic Motor Starters

1. Combination Magnetic Motor Starters: NEMA ICS 1, NEMA ICS 2, AC general purpose Class A magnetic starter for induction motors for the rated horsepower combined with a magnetic circuit breaker, NEMA AB 1, with instantaneous magnetic trip in each pole. Starter, circuit breaker, and control power transformer shall be in a common enclosure. Terminals, minimum 75 degrees C rated.
2. Provide externally operable handle interlocked to prevent opening of cover with circuit breaker in the ON position. Allow handle to be lockable in the OFF position.
3. Contactor Coil Operating Voltage: 120 V, 60 Hz.
4. Overload Relay: NEMA ICS 2, bimetal.
5. Control Power Transformer: 120 V secondary, 50 VA minimum. Provide fused primary and secondary of transformer, and ground unfused leg of secondary to enclosure.
6. Enclosure: NEMA ICS 6, Type 3R, outdoor; or Type 12, indoor.
7. Heater elements shall be included, as required, for the described service conditions.
8. Two auxiliary contacts (electrically dry), one each, normally closed and normally open, in addition to the hold-in contact, shall be provided.

B. Selector Switches

1. Enclosure, NEMA ICS 6, Type 3R or 4.

2. Two-position, maintained contact (start/stop).
3. Three-position, maintained contact (hand/off/auto or local/off/remote).

C. Receptacles
1. Convenience Receptacle: 125 V, 15/20 A, NEMA WD 1, heavy-duty, general use with metal cover plate; conforming to NEMA WD 6, Configuration 5-20. 125 V, 30 A, NEMA WD 1, heavy-duty, general use with metal cover plate; conforming to NEMA WD 6, Configuration 5-30. Furnish with weatherproof covers for outdoors, wet or industrial locations.
2. Convenience receptacles in potentially wet environments, in addition to those required by NFPA 70, shall be GFCI type for personnel protection with covers to protect the receptacle from water during usage.

D. Cabinets
1. Boxes: Galvanized steel with removable endwalls.
2. Box Size: As indicated in Section 13401.
3. Fronts: Steel, surface type with concealed trim clamps, door with concealed hinge, and flush lock keyed to match branch circuit panelboard. Finish with gray baked enamel.
4. Knockouts: Provide as required for conduits indicated plus 25 percent spare.
5. Provide metal barriers to form separate compartments wiring of different systems and voltages.
6. Provide accessory feet for free-standing equipment.
7. Terminal Blocks: NEMA ICS 4.
   a. Power Terminals: Unit construction type with closed back and tubular pressure screw connectors, rated 600 volts.
   b. Signal and Control Terminals: Modular construction type, suitable for channel mounting, with tubular pressure screw connectors, rated 300 volts.
8. Provide ground bus and ground terminal block, each connector bonded to enclosure.

9. Provide plastic channel with hinged or snap-on covers for internal wiring raceway.

2.2 MATERIALS

A. Conduit

1. Rigid steel, heavy wall, galvanized conduit conforming to ANSI C80.1. Rigid steel intermediate metal conduit (IMC) shall be acceptable for interior spaces. Conduit shall be 1/2 inch diameter minimum.
2. Liquid-tight flexible metal conduit conforming to UL 360. Conduit shall be 1/2 inch diameter minimum, 5 feet in length (maximum) unless indicated on drawings.
3. 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 not be smaller than No. 12 AWG. Conductors No. 12 AWG and No. 10 AWG shall be solid. Conductors No. 8 AWG and larger shall be stranded. Conductors for control shall not be smaller than No. 14 AWG stranded. Conductors for Class 1 remote-control and signal circuits shall be enclosed in cable and shall comply with NFPA 70. 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 insulation Type XHHW-2 or THW-2.

C. Instrument Cable

1. Instrumentation cable shall be No. 16 AWG stranded tinned copper conductors. Conductors shall be polyethylene insulated and rated 600 volts, 60 degrees C. Conductors shall be twisted with aluminum-polymer shield; No. 18 AWG stranded, tinned copper drain wire. Cable shall have overall-chrome gray FR-PVC jacket.

D. Nameplates (see Attachment A, sheets 1, 2, 3, and 4)
   1. Nameplates shall be engraved, three-layer laminated plastic, 5/16-inch bold style, black letters on white background.

E. 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.

F. Wireway and Auxiliary Gutters
   1. Wireway and Auxiliary Gutters: General purpose, NEMA ICS 6, Type 3R enclosure with knockouts on bottom.
   2. Size: As required.
   3. Cover: Screw cover with full gasketing.
   4. Fittings: UL 870, lay-in type with removable top, bottom, and side; captive screws.
   5. Material: Carbon steel.
   6. Finish: Rust-inhibiting primer coating with gray enamel finish.

G. Splicing and Termination Components
   1. Wire connectors, UL 486A, as applicable.
   2. Insulation tape, UL 510.
   3. Provide solderless terminal lugs, rated 75 degrees C minimum, on stranded conductors.

H. Boxes and Cover Plates
   1. Junction and Pull Boxes
      a. Junction and pull boxes shall be sized as indicated in accordance with NFPA 70, Article 370.
      b. Junction and pull boxes located indoors shall be code-gauge, galvanized sheet steel and shall be of welded construction with conduit knockouts or raceway openings and hinged or

screwed covers as indicated. Type 3R, according to NEMA 250.

c. Junction and pull boxes located outdoors shall have screwed, gasketed covers, and watertight hubs. Type 3R, according to NEMA 250.

2. Device and Outlet Boxes

a. Device and outlet boxes shall be pressed steel, zinc, or cadmium coated in accordance with NEMA OS 1 unless otherwise indicated.

b. Outlet boxes shall not be smaller than 4 inches octagonal by 1-1/2 inches deep and shall be provided with the proper size knockouts for the conduits intended. Unused knockouts shall remain closed or shall be sealed with knockout closures.

c. Device or outlet boxes shall be of unit construction of a size required for the number of switches or outlets called for on the project design drawings. No sectional device boxes shall be permitted.

d. Surface-mounted outlet boxes for receptables, switches, or similar devices shall be cast type.

I. Supporting Devices

1. Support Channel shall be galvanized or painted steel as specified in Section 05120.

2. Support hardware and accessories shall be corrosion resistant.

3. Supports shall be of all-welded construction.

PART 3 EXECUTION

3.1 EXAMINATION

A. Ensure site is ready to receive work before start of construction.

3.2 ERECTION/INSTALLATION/APPLICATION

A. Conduit

1. Route conduit parallel or at right angles to building lines. Provide conduit supports at approximately 8-foot intervals. Route conduit so as not to create a hazard for tripping or to compromise head clearance. Minimum height above floor shall be 7 feet, 6 inches.
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 hydraulic one-shot conduit bender or factory elbows for conduit diameter larger than 1-1/2 inch.
4. Use Form 8 conduit bodies to make sharp changes in direction. Avoid moisture traps, provide junction box with weep hole.
5. Provide cast metal boxes such as FS or FD in damp or wet locations.
6. Provide 1/8-inch nylon pull cord in empty conduits. Cap empty conduits to prevent entry of moisture and foreign objects.
7. Final conduit connections to motors or other vibrating equipment shall be made with approximately 3-foot liquid-tight flexible metal conduit.
8. Conduit and supports are to be field routed. They are not indicated explicitly on drawings.

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
208Y/120V	Phase A	Black
	Phase B	Red
	Phase C	Blue
	Neutral (grounded)	White
	Ground	Green
	Plant Fire	Red and Yellow
	Alarm System	Brown and Yellow

C. Nameplates

1. Clean surfaces prior to installing 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. Disconnect Switches
   1. Mounting supports shall not be fastened to or penetrate wall panels.

F. Receptacles
   1. Install convenience receptacles 48 inches above finished floor. Receptacle mounting supports shall not be fastened to or penetrate wall panels.
   2. Label receptacles with panelboard and circuit number from which they are served.

G. Combination Magnetic Motor Starters
   1. Install motor controllers where indicated on drawings.
   2. Install motor controller with center line of disconnect operator 54 inches above finished floor.
   3. Install overload heater element in motor controller to match motor characteristics.
   4. Provide engraved nameplate identifying motor served.

H. Selector Switches
   1. Mount selector switches at a mounting height of 54 inches above the floor adjacent to the equipment controlled. Provide slotted channel mounting supports where building column or wall is not suitable for support.

I. Clearances
   1. Clearances from points of access to electrical equipment and other devices shall conform to the requirements of NFPA 70.
   2. All equipment control devices and other electrical equipment requiring operation or maintenance shall have a minimum working clearance of 3 feet from the surface of operation or access, unless greater clearance is required by NFPA 70.

J. Boxes

1. Coordination of Box Locations

   a. Provide electrical boxes as indicated and as required for splices, taps, wire pulling, and equipment connections.

   b. Electrical box locations indicated are approximate unless dimensioned.

   c. Locate and install boxes to allow access.

   d. Do not install boxes back to back in walls. Provide 6-inches (minimum) separation in non-acoustic rated walls and 24 inches (minimum) separation in acoustic rated walls.

   e. Coordinate mounting heights of boxes and locations of outlets mounted above counters, benches, and backsplashes to ensure locations are useful.

   f. Align wall-mounted outlet boxes for switches, thermostats, and similar devices.

2. Outlet Box Installation

   a. Firmly secure in place outlet or utility boxes concealed in the construction. Set outlet or utility boxes true, square, and flush with the finish surfaces for the application of the appropriate cover plate.

   b. Provide knockout closures for unused knockout openings.

   c. Support boxes independently of conduit except for cast boxes when connected to two rigid metal conduits, both supported within 12 inches of the box to be supported.

   d. Use multiple gang boxes where more than one device is mounted together. Do not use sectional boxes. Provide barriers to separate wiring of different voltage systems.

3. Pull and Junction Box Installation

   a. Support pull and junction boxes independently of conduit.

K. Cabinets

1. Install cabinet fronts plumb.

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L. Supporting Devices

1. Installation of structural steel framing, concrete pads, etc., shall be complete before installing supporting devices.
2. Fasten hanger rods, conduit clamps, and outlet and junction boxes to building structures in accordance with manufacturer's recommendations as indicated.
3. Use expansion anchors for support on concrete surfaces.
4. Do not fasten supports to piping, ductwork, mechanical equipment, or conduit.
5. Do not drill structural steel members for installing support devices.
6. Fabricate supports from structural steel or steel channel. Rigidly bolt to structural steel to present a neat appearance. Use hexagon head bolts with spring lock washers under nuts.
7. Install freestanding electrical equipment on concrete pads.
8. Install surface mounted cabinets and enclosures with four anchors (minimum). Provide steel channel supports to stand cabinets and enclosures 1 inch from the wall.

3.3 FIELD QUALITY ASSURANCE

A. Power and Control Wire

1. All wires shall be tested for continuity. Wire insulation shall be megger tested between each conductor and ground. A 1,000-volt megger shall be used for insulation rated 600 volts. Minimum resistance shall be 100 megohms.

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.
3. Motor windings shall be checked for continuity.
4. Motor windings rated 460 volts nominal shall be megger tested with a 1,000-volt megger prior to

connection of power leads. Minimum acceptable resistance shall be 50 megohms.

5. Motor and phase rotation shall be checked with a phase rotation tester manufactured by G. Biddle Company (Catalog No. 56060) or equal on equipment which could be damaged by reverse rotation.
   a. Motor and phase rotation shall be verified before energizing motors.
   b. All motors shall be "bumped" to check for proper direction of rotation prior to performing operational tests on the equipment in the presence of the FERMCO Construction Manager or a representative.

3.4 ATTACHMENTS

A. Electrical Equipment Nameplate List (1, 2, 3, and 4).

END OF SECTION

ATTACHMENT A

ELECTRICAL EQUIPMENT NAMEPLATE LIST

ELECTRICAL EQUIPMENT NAMEPLATE LIST

LINE #1 TAG #	LINE #2 ITEM DESCRIPTION	LINE #3 SOURCE ID	LINE #4 MAX VOLTAGE
DSW-1	DISCONNECT SWITCH #1, 15KV, 3 PHASE, 600 AMP, FUSED SWITCHGEAR	FEEDER F1A	13.2 KV
DSW-2	DISCONNECT SWITCH #2, 15KV, 3 PHASE, 600 AMP, FUSED SWITCHGEAR	FEEDER F4A	13.2 KV
DSW-3	DISCONNECT SWITCH #3, 15KV, 3 PHASE, 600 AMP, FUSED SWITCHGEAR	TIE SWITCH	13.2 KV
DP-13	DISTRIBUTION PANELBOARD #13, 600V, 3 PHASE, 4 WIRE, 225AMP	TRANSFORMER T-13	480 V
VSD-13	VARIABLE SPEED DRIVE #13, SERVES EXTRACTION WELL PUMP PMP-13	DP-13, CIRCUIT #3	480 V
PMP-13	EXTRACTION WELL PUMP PMP-13	DP-13, CIRCUIT #3	480 V
DSW-13	DISCONNECT SWITCH -13, 600V, 3 PHASE, 30 AMP, NON-FUSED	DP-13, CIRCUIT #4	480 V
UH-13	UNIT HEATER -13, 480V, 3 PHASE	DP-13, CIRCUIT #4	480 V
MSEF-13	MOTOR STARTER -13, 480V, 3 PHASE, NEMA SIZE 1, FVNR	DP-13, CIRCUIT #9	480 V
EF-13	EXHAUST FAN -13, 480V, 3 PHASE, 3.3KW	DP-13, CIRCUIT #9	480 V
LP-13	COMBINATION XFMR/PNLBD LP-13, 15KVA, 3 PHASE, 480V-208Y/120V TRANSFORMER, W/ 240 V PANELBOARD, 60 AMP, 60 AMP MAIN	DP-13, CIRCUIT #10	480 V (208 V)
RTU-13	INSTRUMENT I/O POWER SUPPLY, 120V, 1 PHASE	LP-13, CIRCUIT #2	120 V
DP-14	DISTRIBUTION PANELBOARD #14, 600V, 3 PHASE, 4 WIRE, 225AMP	TRANSFORMER T-14	480 V
VSD-14	VARIABLE SPEED DRIVE #14, SERVES EXTRACTION WELL PUMP PMP-14	DP-14, CIRCUIT #3	480 V
PMP-14	EXTRACTION WELL PUMP PMP-14	DP-14, CIRCUIT #3	480 V
DSW-14	DISCONNECT SWITCH -14, 600V, 3 PHASE, 30 AMP, NON-FUSED	DP-14, CIRCUIT #4	480 V
UH-14	UNIT HEATER -14, 480V, 3 PHASE	DP-14, CIRCUIT #4	480 V
MSEF-14	MOTOR STARTER -14, 480V, 3 PHASE, NEMA SIZE 1, FVNR	DP-14, CIRCUIT #9	480 V
EF-14	EXHAUST FAN -14, 480V, 3 PHASE, 3.3KW	DP-14, CIRCUIT #9	480 V
LP-14	COMBINATION XFMR/PNLBD LP-14, 15KVA, 3 PHASE, 480V-208Y/120V TRANSFORMER, W/ 240 V PANELBOARD, 60 AMP, 60 AMP MAIN	DP-14, CIRCUIT #10	480 V (208 V)
RTU-14	INSTRUMENT I/O POWER SUPPLY, 120V, 1 PHASE	LP-14, CIRCUIT #2	120 V
DP-15	DISTRIBUTION PANELBOARD #15, 600V, 3 PHASE, 4 WIRE, 225AMP	TRANSFORMER T-15	480 V

ELECTRICAL EQUIPMENT NAMEPLATE LIST

VSD-15	VARIABLE SPEED DRIVE #15, SERVES EXTRACTION WELL PUMP PMP-15	DP-15, CIRCUIT #3	480 V
PMP-15	EXTRACTION WELL PUMP PMP-15	DP-15, CIRCUIT #3	480 V
DSW-15	DISCONNECT SWITCH -15, 600V, 3 PHASE, 30 AMP, NON-FUSED	DP-15, CIRCUIT #4	480 V
UH-15	UNIT HEATER -15, 480V, 3 PHASE	DP-15, CIRCUIT #4	480 V
MSEF-15	MOTOR STARTER -15, 480V, 3 PHASE, NEMA SIZE 1, FVNR	DP-15, CIRCUIT #9	480 V
EF-15	EXHAUST FAN -15, 480V, 3 PHASE, 3.3KW	DP-15, CIRCUIT #9	480 V
LP-15	COMBINATION XFMR/PNLBD LP-15, 15KVA, 3 PHASE, 480V-208Y/120V TRANSFORMER, W/ 240 V PANELBOARD, 60 AMP, 60 AMP MAIN	DP-15, CIRCUIT #10	480 V (208 V)
RTU-15	INSTRUMENT I/O POWER SUPPLY, 120V, 1 PHASE	LP-15, CIRCUIT #2	120 V
DP-16	DISTRIBUTION PANELBOARD #16, 600V, 3 PHASE, 4 WIRE, 225AMP	TRANSFORMER T-16	480 V
VSD-16	VARIABLE SPEED DRIVE #16, SERVES EXTRACTION WELL PUMP PMP-16	DP-16, CIRCUIT #3	480 V
PMP-16	EXTRACTION WELL PUMP PMP-16	DP-16, CIRCUIT #3	480 V
DSW-16	DISCONNECT SWITCH -16, 600V, 3 PHASE, 30 AMP, NON-FUSED	DP-16, CIRCUIT #4	480 V
UH-16	UNIT HEATER -16, 480V, 3 PHASE	DP-16, CIRCUIT #4	480 V
MSEF-16	MOTOR STARTER -16, 480V, 3 PHASE, NEMA SIZE 1, FVNR	DP-16, CIRCUIT #9	480 V
EF-16	EXHAUST FAN -16, 480V, 3 PHASE, 3.3KW	DP-16, CIRCUIT #9	480 V
LP-16	COMBINATION XFMR/PNLBD LP-16, 15KVA, 3 PHASE, 480V-208Y/120V TRANSFORMER, W/ 240 V PANELBOARD, 60 AMP, 60 AMP MAIN	DP-16, CIRCUIT #10	480 V (208 V)
RTU-16	INSTRUMENT I/O POWER SUPPLY, 120V, 1 PHASE	LP-16, CIRCUIT #2	120 V
DP-17	DISTRIBUTION PANELBOARD #17, 600V, 3 PHASE, 4 WIRE, 225AMP	TRANSFORMER T-17	480 V
VSD-17	VARIABLE SPEED DRIVE #17, SERVES EXTRACTION WELL PUMP PMP-17	DP-17, CIRCUIT #3	480 V
PMP-17	EXTRACTION WELL PUMP PMP-17	DP-17, CIRCUIT #3	480 V
DSW-17	DISCONNECT SWITCH -17, 600V, 3 PHASE, 30 AMP, NON-FUSED	DP-17, CIRCUIT #4	480 V
UH-17	UNIT HEATER -17, 480V, 3 PHASE	DP-17, CIRCUIT #4	480 V
MSEF-17	MOTOR STARTER -17, 480V, 3 PHASE, NEMA SIZE 1, FVNR	DP-17, CIRCUIT #9	480 V
EF-17	EXHAUST FAN -17, 480V, 3 PHASE, 3.3KW	DP-17, CIRCUIT #9	480 V

ELECTRICAL EQUIPMENT NAMEPLATE LIST

LP-17	COMBINATION XFMR/PNLBD LP-17, 15KVA, 3 PHASE, 480V-208Y/120V TRANSFORMER, W/ 240 V PANELBOARD, 60 AMP, 60 AMP MAIN	DP-17, CIRCUIT #10	480 V (208 V)
RTU-17	INSTRUMENT I/O POWER SUPPLY, 120V, 1 PHASE	LP-17, CIRCUIT #2	120 V
DP-18	DISTRIBUTION PANELBOARD #18, 600V, 3 PHASE, 4 WIRE, 225AMP	TRANSFORMER T-18	480 V
VSD-18	VARIABLE SPEED DRIVE #"XX", SERVES EXTRACTION WELL PUMP PMP-18	DP-18, CIRCUIT #3	480 V
PMP-18	EXTRACTION WELL PUMP PMP-18	DP-18, CIRCUIT #3	480 V
DSW-18	DISCONNECT SWITCH -18, 600V, 3 PHASE, 30 AMP, NON-FUSED	DP-18, CIRCUIT #4	480 V
UH-18	UNIT HEATER -18, 480V, 3 PHASE	DP-18, CIRCUIT #4	480 V
MSEF-18	MOTOR STARTER -18, 480V, 3 PHASE, NEMA SIZE 1, FVNR	DP-18, CIRCUIT #9	480 V
EF-18	EXHAUST FAN -18, 480V, 3 PHASE, 3.3KW	DP-18, CIRCUIT #9	480 V
LP-18	COMBINATION XFMR/PNLBD LP-18, 15KVA, 3 PHASE, 480V-208Y/120V TRANSFORMER, W/ 240 V PANELBOARD, 60 AMP, 60 AMP MAIN	DP-18, CIRCUIT #10	480 V (208 V)
RTU-18	INSTRUMENT I/O POWER SUPPLY, 120V, 1 PHASE	LP-18, CIRCUIT #2	120 V
DP-19	DISTRIBUTION PANELBOARD #19, 600V, 3 PHASE, 4 WIRE, 225AMP	TRANSFORMER T-19	480 V
VSD-19	VARIABLE SPEED DRIVE #19, SERVES EXTRACTION WELL PUMP PMP-19	DP-19, CIRCUIT #3	480 V
PMP-19	EXTRACTION WELL PUMP PMP-19	DP-19, CIRCUIT #3	480 V
DSW-19	DISCONNECT SWITCH -19, 600V, 3 PHASE, 30 AMP, NON-FUSED	DP-19, CIRCUIT #4	480 V
UH-19	UNIT HEATER -19, 480V, 3 PHASE	DP-19, CIRCUIT #4	480 V
MSEF-19	MOTOR STARTER -19, 480V, 3 PHASE, NEMA SIZE 1, FVNR	DP-19, CIRCUIT #9	480 V
EF-19	EXHAUST FAN -19, 480V, 3 PHASE, 3.3KW	DP-19, CIRCUIT #9	480 V
LP-19	COMBINATION XFMR/PNLBD LP-19, 15KVA, 3 PHASE, 480V-208Y/120V TRANSFORMER, W/ 240 V PANELBOARD, 60 AMP, 60 AMP MAIN	DP-19, CIRCUIT #10	480 V (208 V)
RTU-19	INSTRUMENT I/O POWER SUPPLY, 120V, 1 PHASE	LP-19, CIRCUIT #2	120 V
DP-20	DISTRIBUTION PANELBOARD #20, 600V, 3 PHASE, 4 WIRE, 225AMP	TRANSFORMER T-20	480 V
VSD-20	VARIABLE SPEED DRIVE #20, SERVES EXTRACTION WELL PUMP PMP-20	DP-20, CIRCUIT #3	480 V
PMP-20	EXTRACTION WELL PUMP PMP-20	DP-20, CIRCUIT #3	480 V

ELECTRICAL EQUIPMENT NAMEPLATE LIST

DSW-20	DISCONNECT SWITCH -20, 600V, 3 PHASE, 30 AMP, NON-FUSED	DP-20, CIRCUIT #4	480 V
UH-20	UNIT HEATER -20, 480V, 3 PHASE	DP-20, CIRCUIT #4	480 V
MSEF-20	MOTOR STARTER -20, 480V, 3 PHASE, NEMA SIZE 1, FVNR	DP-20, CIRCUIT #9	480 V
EF-20	EXHAUST FAN -20, 480V, 3 PHASE, 3.3KW	DP-20, CIRCUIT #9	480 V
LP-20	COMBINATION XFMR/PNLBD LP-20, 15KVA, 3 PHASE, 480V-208Y/120V TRANSFORMER, W/ 240 V PANELBOARD, 60 AMP, 60 AMP MAIN	DP-20, CIRCUIT #10	480 V (208 V)
RTU-20	INSTRUMENT I/O POWER SUPPLY, 120V, 1 PHASE	LP-20, CIRCUIT #2	120 V
DP-21	DISTRIBUTION PANELBOARD #21, 600V, 3 PHASE, 4 WIRE, 225AMP	TRANSFORMER T-21	480 V
VSD-21	VARIABLE SPEED DRIVE #21, SERVES EXTRACTION WELL PUMP PMP-21	DP-21, CIRCUIT #3	480 V
PMP-21	EXTRACTION WELL PUMP PMP-21	DP-21, CIRCUIT #3	480 V
DSW-21	DISCONNECT SWITCH -21, 600V, 3 PHASE, 30 AMP, NON-FUSED	DP-21, CIRCUIT #4	480 V
UH-21	UNIT HEATER -21, 480V, 3 PHASE	DP-21, CIRCUIT #4	480 V
MSEF-21	MOTOR STARTER -21, 480V, 3 PHASE, NEMA SIZE 1, FVNR	DP-21, CIRCUIT #9	480 V
EF-21	EXHAUST FAN -21, 480V, 3 PHASE, 3.3KW	DP-21, CIRCUIT #9	480 V
LP-21	COMBINATION XFMR/PNLBD LP-21, 15KVA, 3 PHASE, 480V-208Y/120V TRANSFORMER, W/ 240 V PANELBOARD, 60 AMP, 60 AMP MAIN	DP-21, CIRCUIT #10	480 V (208 V)
RTU-21	INSTRUMENT I/O POWER SUPPLY, 120V, 1 PHASE	LP-21, CIRCUIT #2	120 V
LP-1	COMBINATION XFMR/PNLBD LP-1, 22.5KVA, 3 PHASE, 480V-208Y/120V TRANSFORMER, W/ 240 V PANELBOARD, 100 AMP, 80 AMP MAIN	480 V SERVICE FROM POWER POLE 28	480 V (208 V)
DSW-1	DISCONNECT SWITCH - 1, 600V, 3 PHASE, 30 AMP, NON-FUSED	LP-1, CIRCUIT #4	208 V
UH-1	UNIT HEATER -1, 208 V, 3 PHASE	LP-1, CIRCUIT #4	208 V
DSW-2	DISCONNECT SWITCH - 2, 600V, 3 PHASE, 30 AMP, NON-FUSED	LP-1, CIRCUIT #4	208 V
UH-2	UNIT HEATER -2, 208 V, 3 PHASE	LP-1, CIRCUIT #4	208 V
EF-1	EXHAUST FAN -1, 120 V, 1 PHASE	LP-1, CIRCUIT #7	120 V
HT-1	HEAT TRACE POWER CONNECTION, 120 V, 1 PHASE	LP-1, CIRCUIT #9	120 V
RTU-8	INSTRUMENT I/O POWER SUPPLY, 120V, 1 PHASE	LP-1, CIRCUIT #2	120 V
JB-1	JUNCTION BOX-1	LP-1, CIRCUIT #4	120 V

SECTION 16118
UNDERGROUND DUCTBANKS AND DUCTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Duct and fittings.

1.2 RELATED SECTIONS

A. Section 01010 - General Requirements.

B. Section 02200 - Earthwork.

C. Section 03001 - Concrete.

D. Section 16050 - Basic Electrical Materials and Methods.

E. Section 16170 - Grounding and Bonding.

F. Section 16370 - Overhead Power Distribution.

1.3 REFERENCE DRAWINGS

A. See Section 01011 for the Schedule of Drawings.

1.4 REFERENCES

A. American National Standards Institute (ANSI):

1.	ANSI C2-93	National Electrical Safety Code.
2.	ANSI C80.1-90	Rigid Steel Conduit - Zinc-Coated.

B. National Fire Protection Association (NFPA):

1.	NFPA 70-93	National Electrical Code.

C. National Electrical Manufacturers Association (NEMA):

1.	NEMA TC 3-90	PVC Fittings for Use with Rigid PVC Conduit and Tubing.

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

D. Underwriters Laboratories, Inc. (UL):
1. Electrical Construction Materials Directory-94.

1.5 SYSTEM DESCRIPTION

A. Install underground duct and connect to existing medium voltage switchgear as indicated on the drawings. The terms duct and conduit are used interchangeably.

1.6 SUBMITTALS

A. Provide submittals as required by Section 01010.

B. Furnish the following prior to excavation for underground ductbank:
1. Record of actual locations of each proposed conduit stub-up determined by field survey.

C. Furnish the following submittals after completion of underground ductbank, but prior to backfill:
1. Record of actual installed location of ductbank determined by field survey. See Section 02200 for survey requirements.

1.7 QUALITY ASSURANCE

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

B. Conform to requirements of NFPA 70 and ANSI C2.

C. Furnish products listed in the UL Electrical Construction Materials Directory for the purpose specified and indicated.

000307

1.8 DELIVERY, STORAGE, AND HANDLING

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

B. Accept conduit on site. Inspect for damage.

C. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering. Protect PVC conduit from sunlight.

PART 2 PRODUCTS

2.1 MATERIALS

A. Rigid Steel Conduit and Fittings: ANSI C80.1.

B. Plastic Utilities Duct: NEMA TC 6; PVC, Schedule 40.

C. Plastic Utilities Duct Fittings: NEMA TC 3.

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 preliminary excavation, base material installation, and compaction are completed.

B. Verify routing and termination locations of ductbank prior to excavation for rough-in. Verify locations of medium voltage switchgear and conduit stub-ups prior to excavating for installation.

C. No less than 10 days prior to excavation for underground ductbank, record actual location of each manhole and proposed conduit stub-up determined by field survey, and submit for approval.

3.2 ERECTION/INSTALLATION/APPLICATION

A. Underground Duct

1. Install power duct to locate top of ductbank minimum 30 inches below finished grade.
2. Cut duct square using saw or pipe cutter; de-burr cut ends.
3. Insert duct to shoulder of fittings; fasten securely.
4. Join nonmetallic duct using adhesive as recommended by manufacturer.
5. 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.
6. Install no more than the equivalent of three 90-degree bends between pull points.
7. Provide suitable fittings to accommodate expansion and deflection where required.
8. Stagger duct joints vertically in concrete encasement, 6 inches minimum.
9. Use suitable separators and chairs installed not greater than 4 feet on centers.
10. Band ducts together before placing concrete.
11. Securely anchor duct to prevent movement during concrete placement.
12. Place concrete under provisions of Section 03001. Use mineral pigment to color concrete red.
13. Provide minimum 3-inch concrete cover at bottom, top, and sides of ductbank. Provide minimum 5-inch separation between ducts.
14. Provide pull rope in each duct except sleeves and nipples. Minimum 1/2-inch, 4,000 psi tensile strength polypropylene.
15. Swab duct. Use suitable caps to protect installed duct against entrance of dirt and moisture.
16. Perform excavations and backfill trenches under provisions of Section 02200.
17. Coordinate installation of underground warning tape with backfilling. Install tape 6 inches below finished grade (or surface).
18. All exposed portions (stub-ups) of duct above grade shall be rigid galvanized steel. All final 90-degree bends from underground to stub-ups shall

be rigid steel. Stub-ups shall be 3 inches above grade or floor.

19. Direct-buried duct, not encased in concrete, shall conform to the above requirements, except those pertaining to concrete, and to the following requirements:
    a. Excavate trenches for the duct, depths as indicated, not less than 12 inches wide. Bends in trenches shall have a radius of not less than 36 inches.
    b. When rock is encountered, remove to a depth of at least 3 inches below the duct and fill the space with sand or clean earth free from particles larger than 1/4 inch.
    c. Use PVC conduit under concrete slabs; use rigid galvanized steel conduit for portions not covered by slabs.

B. Subsequent to completion of underground ductbank, but prior to backfill, record actual installed location of ductbank determined by field survey, and submit for approval.

END OF SECTION

SECTION 16121
MEDIUM-VOLTAGE CABLE

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Medium-voltage cable.

B. Cable terminations.

1.2 RELATED SECTIONS

A. Section 01010 - General Requirements.

B. Section 16118 - Underground Ductbanks and Ducts.

1.3 REFERENCE DRAWINGS

A. See Section 01011 for the Schedule of Drawings.

1.4 REFERENCES

A. American National Standards Institute (ANSI):
1. ANSI C2-93 National Electrical Safety Code.

B. National Fire Protection Association (NFPA):
1. NFPA 70-93 National Electrical Code.

C. Institute of Electrical and Electronic Engineers, Inc. (IEEE):
1. IEEE 48-90 Standard Test Procedures and Requirements for High-Voltage Alternating-Current Cable Terminations.

D. National Electrical Manufacturers Association (NEMA):
1. NEMA WC 8-88 Ethylene-Propylene-Rubber-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.

E. InterNational Electrical Testing Association (NETA):
1. NETA ATS-95 Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

F. Underwriters Laboratories, Inc. (UL):
1. Electrical Construction Materials Directory-94.

1.5 SUBMITTALS

A. Provide submittals as required by Section 01010.

B. Provide factory test reports.

C. Provide field test reports.

1.6 QUALITY ASSURANCE

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

B. Installer: Company specializing in installing the products specified in this section, with minimum 3 years experience.

C. Conform to requirements of NFPA 70 and ANSI C2.

D. Furnish products listed in the UL Electrical Construction Materials Directory as suitable for purpose specified and indicated.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Accept cable and accessories on site in manufacturer's packaging. Inspect for damage.

B. Store and protect in accordance with manufacturer's instructions.

C. Protect from weather. Provide adequate ventilation to prevent condensation.

PART 2 PRODUCTS

The listing of equipment suppliers below in no way precludes the Subcontractor 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 Subcontractor's proposal.

2.1 MANUFACTURERS

A. Medium-Voltage Cable
   1. Okonite.
   2. South Wire.
   3. Kerite.
   4. Northern Wire and Cable.

B. Cable Terminations and Cable Splices
   1. 3M.
   2. Raychem.
   3. RTE.

2.2 MATERIALS

A. Medium-Voltage Cable
   1. Description: NEMA WC 8; ethylene propylene rubber insulated cable.
   2. Voltage: 15 kV, ungrounded.
   3. Conductor: Copper, concentric, stranded with foil conductor shield.
   4. Construction: Single conductor with metal tape insulation shielding.
   5. Insulation Level: 133 percent.
   6. Insulation Jacket: PVC, 80 mils minimum thickness.
   7. Cable shall be factory tested according to NEMA WC 8.

B. Cable Terminations and Cable Splices
   1. Description: IEEE 48; Class 1, cable termination in kit form with stress cone, shield ground connection, and accessories and molds required for proper application.

C. Tape Termination and Splices

1. Description: IEEE 48; Class 1, tape termination kit with semiconductive tape, stress control tape, splicing tape, vinyl plastic tape, stress cone, mechanical ground straps, and cable preparation kit.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing cable conditions prior to beginning splicing. Notify FERMCO Construction Manager if conditions affect the work specified or indicated on drawings.

3.2 PREPARATION

A. Use swab to clean ducts before pulling cables.

B. Run mandrel through duct to confirm absence of pinch points or obstructions.

3.3 ERECTION/INSTALLATION/APPLICATION

A. Install cable and accessories in accordance with manufacturer's instructions.

B. Avoid abrasion and other damage to cables during installation.

C. Use suitable lubricants and pulling equipment.

D. Do not exceed manufacturer's recommended maximum cable pulling tensions and minimum bending radius.

E. Ground cable shield at each termination and splice.

3.4 FIELD QUALITY ASSURANCE

A. Inspect exposed cable sections for physical damage.

B. Inspect cable for proper connections as shown on the contract drawings.

C. Inspect shield grounding, cable supports, and terminations for proper installation.

D. Perform field tests, both before and after installation, according to NETA ATS.

E. Test Reports: Indicate results of cable test in tabular form, in plots of current versus voltage for incremental voltage steps, and current versus time at 30-second intervals at maximum voltage. Submit to the FERMCO Construction Manager for approval.

END OF SECTION

SECTION 16129
FIBER OPTIC CABLE AND ACCESSORIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Loose-tube fiber optic cable and accessories (multimode).

1.2 RELATED SECTIONS

A. Section 01010 - General Requirements.

B. Section 13401 - Process Control System.

C. Section 16370 - Overhead Power Distribution.

1.3 REFERENCE DRAWINGS

A. See Section 01011 for the Schedule of Drawings.

1.4 REFERENCES

A. Electronic Industries Association/Telecommunications Industry Association (EIA/TIA):

1.	EIA/TIA 455-60-89 FOTP-60	Measurement of Fiber or Cable Length Using an OTDR.
2.	EIA/TIA 455-61-89 FOTP-61	Measurement of Fiber or Cable Attenuation Using an OTDR.
3.	EIA/TIA 526-14-90 OFSTP-14	Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant.

B. Institute of Electrical and Electronics Engineers (IEEE):

1.	IEEE 812-84	Standard Definition of Terms Relating to Fiber Optics.

1.5 SUBMITTALS

A. Provide submittals as required by Section 01010.

B. Submit product data for information with each reel of cable. Include the customer purchase order number, cable part number, weight of cable and reel length of cable, beginning and ending length markings, and manufacturer's certified inspection and test report.

1.6 DEFINITIONS

A. Terms shall be as defined by IEEE 812.

PART 2 PRODUCTS

The listing of equipment suppliers below in no way precludes the Subcontractor 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 Subcontractor's proposal.

2.1 ACCEPTABLE MANUFACTURERS

A. Siecor Corporation.

B. Chromatic Technologies.

C. Belden Wire and Cable.

2.2 MATERIALS

A. General

1. One hundred percent all-dielectric, loose-tube fiber optic cable assembly suitable for use in aerial applications. Assembly shall consist of two multimedia fibers cabled into a single multifiber cable.
2. Each fiber shall have a glass optical core, a core cladding of low-density glass concentric about the optical core, and a protective acrylate buffer coating to protect the outer surface of the fiber.

3. The core assembly of the cable shall consist of a single layer of the gel-filled loose buffer tubes stranded around an all-dielectric, antibuckling central member. The core assembly shall be wrapped with a binder tape to maintain the alignment of the buffer tubes. An aramid fiber tensile strength member shall be applied over the binder tape, followed by an outer jacket of black polyethylene. The outer jacket shall be medium- or high-density polyethylene (MDPE or HDPE).
4. The interstices in the cable core shall be filled with a water-blocking compound to prevent water penetration and migration. The filling compound shall be electrically nonconductive, homogeneous, and free from dirt and other foreign matter.
5. A dielectric rip cord shall be provided under the outer jacket to permit jacket removal without damage to the optical fibers. The rip cord shall be continuous in any length of cable.
6. Individual fibers shall be enclosed in color-coded, plastic buffer tubes (loose buffer construction) which are filled with a stable viscosity gel throughout the entire cable length.
7. The cable shall contain individual buffer tubes with each buffer tube containing no more than six multimode fibers. Both the buffer tubes and the individual fibers within a single buffer tube shall be color coded in accordance with the following table.

Fiber or Buffer Tube No.	Color
1	Blue
2	Orange
3	Green
4	Brown
5	Slate
6	White

8. Splices are not permitted within the cable. The fiber optic cable shall be shipped on reels from the manufacturer in continuous lengths without splices.

B. Multimode Optical Fiber

1. Fiber Type: Graded-index, dual window, multimode fiber.
2. Core Diameter: 62.5 ± 3.0 microns.
3. Core Noncircularity: < 6.0 percent.
4. Cladding Outside Diameter: 125 ± 2.0 microns.
5. Cladding Noncircularity: ± 2.0 percent.
6. Concentricity Error: < 6.0 percent.
7. Protective Coating Diameter: 250 ± 15 microns.
8. Numerical Aperture: 0.27 - 0.29.
9. Maximum Attenuation: 3.75 dB/km @ 850 nm, 1.5 dB/km @ 1,300 nm.
10. Minimum Bandwidth: 160 MHz-km @ 850 nm, 500 MHz-km @ 1,300 nm.

C. Cable Mechanical Specifications

1. Nominal Jacket Wall Thickness: 0.055 in.
2. Maximum Tensile Loading - Installation: > 600 lbs.
3. Maximum Tensile Loading - Maintained: > 100 lbs.
4. Minimum Bending Radius - Installation: < 20 x Cable OD.
5. Minimum Bending Radius - Maintained: < 12 x Cable OD.

D. The attenuation of the multimode fibers shall not vary more than 0.50 dB/km at 1,300 nm, and the attenuation of the single-mode fibers shall not vary more than 0.20 dB/km at 1,550 nm for the following environmental conditions:

1. Operation: -40 degrees C to +65 degrees C.
2. Installation: -30 degrees C to +60 degrees C.
3. Storage: -50 degrees C to +70 degrees C.

E. Cable Markings

1. Cable markings shall be imprinted with white characters on the outer cable jacket.
2. The cable markings shall be permanent, insoluble in water, and legible for the cable life.
3. The following identification markings shall be imprinted on the cable jacket at intervals of not more than 1 meter:
   a. Manufacturer.
   b. Year of manufacture.

c. "OPTICAL CABLE."
d. Manufacturer's part number.

4. All cables shall have sequentially numbered feet or meter length markings imprinted on the jacket.
   a. The length markings shall not be reset to zero along the length of the cable.
   b. Actual cable length shall be within ±1 percent of the length as indicated by the length markings.

F. Approximately 2 meters of cable on the inboard of each cable shall be accessible for optical time domain reflectometer (OTDR) testing of the cable.

G. Cable Termination
1. Fiber optic cable shall be terminated with a ST-style physical contact (PC) 2.5 mm bayonet connector with a strain relief boot.
2. The ferrule material shall be zirconia ceramic, and the connector housing shall be nickel-plated zinc.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that new and existing conduit is suitable for use.

B. Verify that new and existing aerial messenger cable is suitable for use.

3.2 INSTALLATION

A. Install in new and existing conduit where indicated.

B. Install wall-mounted and pole-mounted fiber optic cable pull boxes.

C. Install fiber optic cables in accordance with manufacturer's installation instructions.

D. Spin fiber optic cables to existing aerial messengers in accordance with manufacturer's installation instructions.

3.3 FIELD QUALITY CONTROL

A. Provide all test equipment, including the OTDR, power meters, LED sources, laser sources, connector adapters, launch and receive cable, attenuators, and other devices necessary for these tests. All sources and OTDRs shall operate within the range of 850 ± 30 nm and 1,300 ± 20 nm. A high-resolution OTDR shall be used for providing signature traces.

B. Before installation, use an OTDR to test the fiber optic cable after it is delivered to the site and while it is still on the reel. Each fiber in each reel of cable shall be tested; fibers shall be tested at the 1,300 nm wavelength. A hard copy and an electronic copy of the OTDR trace shall be provided as part of the overall testing documentation; the OTDR trace shall show the placement of measurement cursors and shall include the measured fiber length, the measured attenuation (dB/km), the operating wavelength, the cable reel number, and the specific fiber in the cable being tested. Test as required by EIA/TIA FOTP-60 and -61.

C. After installation/before splicing, a second OTDR test shall be performed for each installed length of cable to ensure that no damage was done to the fibers during installation. Perform the test on each single fiber in each buffer tube for each link of cable. OTDR traces of these tests are not required.

D. After splicing, a third OTDR test shall be performed for each completed fiber optic link. Every fiber in each cable, including spares, shall be tested, and a hard copy and an electronic copy of the OTDR trace shall be provided as part of the overall testing documentation. The OTDR trace shall show the placement of measurement cursors and shall include the measured fiber length, the measured attenuation (dB/km), the

operating wavelength, the cable identification numbers, and the specific fiber in the cable being tested. Test as required by EIA/TIA FOTP-60 and -61.

E. Insertion loss tests conforming to EIA/TIA Standard 526-14-90 (Method B) shall be performed for each installed fiber optic link (i.e., after the pigtails are spliced to the trunk cable fibers). Multimode fibers shall be tested with an LED source at the 850 nm and 1,300 nm wavelengths. The effects of modal distribution on connector and fiber loss shall be minimized. Each fiber will be tested in both directions. Launch and receive cables, which match the fiber type being tested, shall be used to connect the test instrumentation to the fiber link. The launch and receive cables shall be 3 meters in length. The test procedure is described below. Replace all dust caps after testing is completed.

1. Attach one end of the launch cable to the sources and the other end to the fiber optic power meter. Adjust the source power to a convenient value such as 0 dBu (-30 dBm); this is the reference power level ($P_{ref.}$).
2. Disconnect the launch cable from the power meter and reconnect it to a test connector coupling. Do not disconnect the launch cable from the source after recording P_{ref}. Connect one end of the receive cable to the other side of the test connector coupling, and attach the other end to the fiber optic power meter. Verify that the attenuation added by the receive cable is not greater than 1.0 dB.
3. Remove the test connector coupling. Attach the launch cable to the fiber link to be tested by connecting it to the appropriate connector coupling in the local distribution frame. Attach the receive cable to the opposite end of the fiber link under test by connecting it to the appropriate connector coupling in the remote distribution frame. Record the link loss (i.e., the measured power level, P_{test}, minus P_{ref}, in dB) on the accompanying form (Attachment B).

4. Compare the measured values to the maximum losses specified. If a fiber fails to meet these specifications, the connectors shall be cleaned, inspected with a microscope, and retested. If the fiber still fails the insertion loss test, an OTDR test will be performed to determine the corrective action necessary.

F. Prepare a separate Fiber Optic Test Report (Attachment A) for each type of test performed (i.e., the before installation OTDR test, the after installation/before splicing OTDR test, the after splicing OTDR test, and the insertion loss test). Refer to Attachment B for the insertion loss test report (Link Loss Certification Test Report). Assemble test reports and OTDR traces, including electronic traces, in a complete, bound manual.

END OF SECTION

ATTACHMENT A

FIBER OPTIC TEST REPORT

ATTACHMENT A

FIBER OPTIC TEST REPORT

Project Title: _____ Page __ of __

Date: _____

Type of Test: _____

Section of 16129 Defining Test: _____

Test Instrument: _____

Model No.: _____ Serial No.: _____ Calibration Date: _____

Test Instrument: _____

Model No.: _____ Serial No.: _____ Calibration Date: _____

Source (Type): _____ Wavelength: _____

Model No.: _____ Serial No.: _____ Calibration Date: _____

Source (Type): _____ Wavelength: _____

Model No.: _____ Serial No.: _____ Calibration Date: _____

Source (Type): _____ Wavelength: _____

Model No.: _____ Serial No.: _____ Calibration Date: _____

Test Performed By: _____ Organization: _____
Test Supervised By: _____ Organization: _____
Test Witnessed By: _____ Organization: _____

Construction Engineer: _____

ATTACHMENT B

LINK LOSS CERTIFICATION TEST REPORT

ATTACHMENT B

LINK LOSS CERTIFICATION TEST REPORT

PROJECT: _____

TEST PERFORMED BY: _____ DATE: _____

PAGE: __ OF __

CABLE NO.: _____

FROM (TRANSMIT): _____

TO (RECEIVE): _____

		CALCULATED LOSS VALUE		MEASURED LOSS VALUE		DIFFERENCE	
FIBER NO.	TYPE (MM/SM)	850 nm	1300 nm	850 nm	1300 nm	850 nm	1300 nm
1	mm						
2	mm						
3	mm						
4	mm						
5	mm						
6	mm						

SECTION 16170
GROUNDING AND BONDING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Grounding electrodes and conductors.

B. Equipment grounding conductors.

C. Bonding.

D. Grounding test well.

E. Fence grounding.

1.2 RELATED SECTIONS

A. Section 01010 - General Requirements.

B. Section 02831 - Chain Link Fences and Gates.

C. Section 03001 - Concrete.

D. Section 05120 - Structural Steel.

E. Section 13123 - Pre-Engineered Building.

F. Section 15170 - Motors.

G. Section 16050 - Basic Electrical Materials and Methods.

H. Section 16118 - Underground Ductbanks and Ducts.

I. Section 16370 - Overhead Power Distribution.

J. Section 16462 - Panelboards.

1.3 REFERENCE DRAWINGS

A. See Section 01011 for the Schedule of Drawings.

1.4 REFERENCES

A. InterNational Electrical Testing Association (NETA):
   1. NETA ATS-95 Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

B. National Fire Protection Association (NFPA):
   1. NFPA 70-93 National Electrical Code.

C. Underwriters Laboratories, Inc. (UL):
   1. UL 467-93 UL Standard for Safety Grounding and Bonding Equipment.
   2. Electrical Construction Materials Directory-94.

1.5 SYSTEM DESCRIPTION

A. Rod electrode and test well rod electrode.

B. Grounding System Resistance: 25 ohms maximum.

1.6 SUBMITTALS

A. Provide submittals as required by Section 01010.

B. Provide certification of ground testing instrumentation.

C. Provide record of as-built locations of grounding electrodes, if different from or not indicated on drawings.

1.7 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.

C. Furnish products listed in the UL Electrical Construction Materials Directory as suitable for the purpose specified and indicated.

D. Provide certification of ground testing instrumentation according to NETA ATS.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers
1. Mechanical Connectors
   a. Burndy.
   b. Ideal.
   c. Ilsco.
2. Exothermic Connections
   a. Cadweld.
   b. Thermoweld.

2.2 MATERIALS

A. Rod Electrode
1. Copper-clad steel, 3/4-inch diameter, 10-foot length.

B. Mechanical Connectors
1. Bronze.

C. Wire
1. Stranded copper.
   a. Grounding Conductor: Size to meet NFPA 70 requirements.

D. Grounding Test Well
1. Well Pipe: Clay tile pipe with belled end, 12-inch I.D. by 24 inches long.
2. Well Cover: Cast iron with legend "GROUND" embossed on cover, with recessed lifting handle.

E. Grounding and bonding materials shall conform to UL 467.

PART 3 EXECUTION

3.1 EXAMINATION

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

B. Verify that underground utilities will not interfere with the proposed rod locations prior to driving rod electrodes.

3.2 ERECTION/INSTALLATION/APPLICATION

A. Install products in accordance with manufacturer's instructions.

B. Install rod electrodes at locations indicated on the drawings. Install additional rod electrodes as required to achieve specified resistance to ground.

C. Equipment Grounding Conductor: Provide separate, insulated conductor with each feeder and branch circuit raceway. Terminate each end on suitable lug, bus, or bushing.

D. Install grounding test well pipe with cover at a location outside each building, as indicated on the drawings. Install well pipe top flush with finished grade.

E. Connect ground conductors to reinforcing bars in foundation before pouring concrete. Tie to structural steel members when they are installed, by exothermic connection.

F. Ground all metal equipment enclosures by attachment to ground rod system or to the building steel.

G. Ground pole-mounted equipment and static line conductors as indicated on the drawings.

E. Fence Grounding: Fences shall be grounded with a ground rod at each fixed gate post and at each corner post:

1. Drive ground rods until the top is 12 inches below grade.
2. Attach a No. 4 AWG copper conductor, by fusion weld process, to the ground rods and extend it underground to the immediate vicinity of the fence post.
3. Lace the conductor vertically into 12 inches of fence mesh and fasten it by two approved bronze compression fittings, one to bond the wire to the post and the other to bond the wire to the fence. Each gate section shall be bonded to its gatepost by a 1/8-inch by 1-inch flexible braided copper strap and ground post clamps. Clamps shall be of the anti-electrolysis type.

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. Accurately record as-built locations of grounding electrodes where different from drawings, and submit to the FERMCO Construction Manager. Test instrumentation shall conform to NETA ATS. Provide certification for instrumentation.

B. Measure the system's resistance to the ground; perform testing in accordance with instrument manufacturer's recommendations using the fall-of-potential method. Provide written test reports indicating overall resistance to ground and resistance of each electrode to ground.

END OF SECTION

SECTION 16311
PRIMARY SWITCHGEAR

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Provision, installation, and testing of outdoor primary switchgear containing:
   1. 15 kV fused switches (two).
   2. 15 kV nonfused tie switch.

1.2 RELATED SECTIONS

A. Section 01010 - General Requirements.

B. Section 16118 - Underground Ductbanks and Ducts.

C. Section 16121 - Medium-Voltage Cable.

D. Section 16170 - Grounding and Bonding.

1.3 REFERENCE DRAWINGS

A. See Section 01011 for the Schedule of Drawings.

1.4 REFERENCES

A. American National Standards Institute (ANSI):

1.	ANSI C37.20.3-87 (Rev. 1992)	Metal-Enclosed Interrupter Switchgear.

B. Institute of Electrical and Electronics Engineers (IEEE):

1.	IEEE C12.1-88	Code for Electricity Metering.
2.	IEEE C57.13-93	Standard Requirements for Instrument Transformers.
3.	IEEE C62.1-89	Standard for Gapped Silicon-Carbide Surge Arresters for AC Power Circuits.
4.	IEEE 48-90	Standard Test Procedures and Requirements for High-Voltage AC Cable Terminations.

C. National Electrical Testing Association (NETA):

1. NETA ATS-95 Acceptance Testing Specification for Electrical Power Distribution Equipment.

D. National Fire Protection Association (NFPA):

1. NFPA 70-93 National Electrical Code.

1.5 SYSTEM DESCRIPTION

A. Three phase, 60 Hz outdoor primary switchgear shall be provided, installed, and tested as indicated on drawings. The substation shall consist of primary fused switches and a primary tie switch. All ratings and capacities shall be as indicated on drawings.

B. Continuous power monitoring shall be provided for each of the primary fused switches.

C. Final field testing shall be provided upon completion of the primary switchgear installation. Testing will be performed by a testing firm as a subcontractor to the installation subcontractor. The testing firm shall be certified according to NETA ATS.

1.6 SUBMITTALS

A. Provide submittals as required by Section 01010.

B. Provide product data for all equipment and materials specified. Include catalog sheets and drawings showing voltage, ratings, impedances, normal and short-circuit current ratings, dimensions, enclosure, and other relevant details.

1.7 QUALITY ASSURANCE

A. Manufacturer: Company specializing in manufacturing the products specified in this section, with minimum 5 years documented experience.

B. Conform to requirements of NFPA 70.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Protect switchgear from moisture and debris. Provide auxiliary heating in switchgear.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Square D.

B. General Electric.

C. ABB Power Distribution.

D. Siemens Energy & Automation, Inc.

2.2 PRODUCTS/EQUIPMENT

A. Primary Switchgear

1. Description: Two fused air interrupter load break switches and a nonfused air interrupter load break switch, key interlocked to prevent closing of tie switch when both fused switches are closed, conforming to ANSI C37.20.3.
2. Construction: Outdoor.
3. Finish: Manufacturer's standard acrylic enamel over external surfaces. Coat internal surfaces with minimum one coat corrosion-resisting paint, or plate with cadmium or zinc.
4. Main Buses: Copper.
5. Incoming cable terminals: For two incoming underground lines; 15 kV, 133 percent insulation, shielded, copper 1/c 350 kcmil cables per phase. Provide insulated or grounded, physical isolation for cable terminals from load side of switch.
6. Voltage: 13.2 kV, three phase, 60 Hz.
7. Maximum Design Voltage: 15 kV.
8. Basic Impulse Level: 95 kV.
9. Continuous and short-circuit current ratings: As indicated on drawings.
10. Furnish 12 fuses for switches.

11. Provide spring-charged stored energy mechanism, manually charged.
12. Enclosure: Weatherproof for outdoor use, ventilated and gasketed with padlocking features.
13. Surge Arresters: IEEE C62.1, distribution class for ungrounded system, factory connected to incoming cable terminals.

B. Power Monitoring and Instrumentation
1. Power Monitor: Provide power monitor(s) conforming to IEEE C12.1. Monitoring equipment shall indicate, for each fused switch feeder circuit, as a minimum: amperes, voltage, watts, watt-hour, total demand, kVA, kVAR, and power factor. Indications of each parameter shall be for each phase and for totals, as applicable.
2. Power Monitor Communications: Power monitor shall include an RS-485 communications port.
3. Power Monitor Software: Provide Microsoft Windows™ compatible power monitoring communications software. In addition to indicating the power monitor data provided at the substation, the software shall provide continuous on-line data in bar chart, trend time plots, and waveform plots.
4. Current Transformers (as required): IEEE C57.13; 5 ampere secondary, with single secondary winding and secondary shorting device, burden and accuracy consistent with connected metering devices, 60 Hz.
5. Potential Transformers (as required): IEEE C57.13; 120 volt single secondary, disconnecting type with integral fuse mountings, primary/secondary ratio as shown on drawings, burden and accuracy consistent with connected metering devices, 60 Hz.

2.3 ACCESSORIES

A. Incoming Cable Terminations: Conform to IEEE 48.

B. Nameplates: White with black lettering, fastened with screws.

C. Space Heaters: Serve from 120 volt internal source; sized by manufacturer.

2.4 SOURCE QUALITY CONTROL

A. Testing: Perform factory acceptance tests for each section of the switchgear as required by relevant national standards cited in Article 2.2. Tests may be witnessed by the FERMCO Construction Manager or a representative.

PART 3 EXECUTION

3.1 EXAMINATION

A. Coordinate construction of foundation anchors and embedments with the specific requirements of the equipment.

3.2 ERECTION/INSTALLATION/APPLICATION

A. Install in accordance with manufacturer's instructions.

B. Install line and ground connecting conductors associated with surge arresters according to NFPA 70.

C. Provide new engraved plastic nameplates, white lamicoid with black core mounted on outside of each cubicle, identifying equipment served, as indicated on the single-line diagrams. Letters shall be 5/16 inch high.

3.3 FIELD QUALITY ASSURANCE

A. Perform operational and final acceptance testing on switchgear to verify operation and field wiring connections after installation. Testing will be performed by a testing firm as a subcontractor to the installation subcontractor. Testing firm shall be certified according

to NETA ATS. Testing shall conform to applicable sections of NETA ATS. The FERMCO Construction Manager or a designated representative may choose to witness these tests.

END OF SECTION

SECTION 16370
OVERHEAD POWER DISTRIBUTION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Poles.

B. Crossarms.

C. Pole hardware.

D. Insulators.

E. Line conductors.

F. Arresters and cut-outs.

G. Pole mounted distribution transformers.

H. Anchors.

1.2 RELATED SECTIONS

A. Section 01010 - General Requirements.

B. Section 02200 - Earthwork.

C. Section 16170 - Grounding and Bonding.

1.3 REFERENCE DRAWINGS

A. See Section 01011 for the Schedule of Drawings.

1.4 REFERENCES

A. National Fire Protection Association (NFPA):
1. NFPA 70-93 National Electrical Code.

B. American National Standards Institute (ANSI):

1.	ANSI C2-93	National Electrical Safety Code.
2.	ANSI C29.2-92	Insulators - Wet-Process Porcelain and Toughened Glass - Suspension Type.
3.	ANSI C29.4-89	Wet-Process Porcelain Insulators - Strain Type.
4.	ANSI C29.5-84	Wet-Process Porcelain Insulators - Low and Medium Voltage Types.
5.	ANSI C29.7-83	Wet-Process Porcelain Insulators - High Voltage Line-Post Type.
6.	ANSI C37.42-89	Switchgear - Distribution Cutouts and Fuse Links - Specification.
7.	ANSI C57.12.20-88	Transformers - Overhead-Type Distribution Transformers, 500 kVA and Smaller: High-Voltage, 34,500 Volts and Below; Low-Voltage, 7970/13 800Y Volts and Below.
8.	ANSI C135.1-79	Galvanized Steel Bolts and Nuts for Overhead Line Construction.
9.	ANSI C135.22-88	Galvanized Ferrous Pole-Top Insulator Pins with Lead Threads for Overhead Line Construction.
10.	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 A675/A675M Rev. A-90	Steel Bars, Carbon, Hot-Wrought, Special Quality, Mechanical Properties.

4.	ASTM B232-92	Standard Specification for Concentric-Lay-Stranded Aluminum Conductors, Coated-Steel Reinforced (ACSR).
5.	ASTM D698-91	Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3).

D. American Wood-Preservers Association (AWPA):

1.	AWPA C4-89	Poles - Pressure Process.
2.	AWPA C25-89	Standard for the Preservative Treatment of Crossarms by the Pressure Process.

E. National Electrical Manufacturers Association (NEMA):

1.	NEMA LA 1-92	Surge Arresters.
2.	NEMA WC 7-88	Cross-Linked-Thermosetting-Polyethylene-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.

F. Underwriters Laboratories, Inc. (UL):

1.	UL 96-94	UL Standard for Lightning Protection Components.
2.	Electrical Construction Materials Directory-94.	

1.5 SYSTEM DESCRIPTION

A. Overhead distribution consisting of 13.2 kV circuits, 13.2 kV - 480 V transformers, secondary services, and fiber optic cables, as indicated on drawings.

1.6 SUBMITTALS

A. Provide submittals as required by Section 01010.

B. Provide pole construction shop drawings with all hardware, conductors, and equipment shown.

C. Provide as-built survey of poles by field survey.

1.7 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 in the UL Electrical Construction Materials Directory as suitable for the purpose specified and indicated.

D. Installation shall comply with ANSI C2, heavy loading district, Grade B construction.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Protect poles from damage and decay by stacking to provide free circulation of air. Maintain 1 foot (300 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 05.1; 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 poles as required by AWPA C4 with minimum net retention of 12 lbs/ft^3 (285 kg/m^3). Obtain complete sapwood penetration.

B. Crossarms
1. Crossarms: Straight-grained southern pine, free of twists to within 0.1 inch per foot of length, with bends and twists in only one direction.
2. Apply preservative to crossarms as required by AWPA C25 with minimum net retention of 8 lbs/cu ft (190 kg/cu m).
3. Crossarm Dimensions: as indicated.

C. Pole Hardware
1. Miscellaneous Pole Hardware: Hot-dipped galvanized after fabrication.
2. Crossarm Braces: Structural steel zinc coated to ASTM A675.
3. Angle Braces: 60 inch span by 18 inches drop-formed in one piece from 1-3/4 by 1-3/4 inch angle.
4. Flat Braces: 1/4 by 1-1/4 inch.
5. Eye Bolts and Nuts: ANSI C135.1.
6. Ground Rods: Copperweld 3/4 inch O.D. by 10 foot - 0 inches long.
7. Butt Plate: Copper.
8. Pole-top Insulator Pins: ANSI C135.22.
9. Hot-line Clamps: Screw type with concealed threads. Fill thread chamber with corrosion-resistant compound.
10. Guy Strand: High strength, seven-strand steel cable galvanized to ASTM A475, Class A or B.
11. Guy Termination: Preformed wire type.
12. Guy Guards: 8-foot (2 m) long plastic, colored yellow.
13. Ground Wire: Soft drawn solid copper conductors, 4 AWG minimum size.
14. Air Terminal: UL 96; 18-inch copper air terminal.
15. Guy Adapter: Tripleye.

D. Insulators

1. Insulators: Radio interference free wet process porcelain insulators with minimum wet flashover rating of 80 kV.
2. Line Post Insulators: ANSI C29.7; Class 57.1.
3. Suspension Insulators: ANSI C29.2; Class 52.9.
4. Pin Insulators: ANSI C29.5; Class 55.5.
5. Guy Strain Insulators: ANSI C29.4; Class 54.1.

E. Line Conductors

1. Medium-voltage Line Conductors: Bare aluminum conductor steel reinforced, size as indicated: ASTM B232.
2. Secondary Conductors: Copper, quadraplex, three insulated conductors and one bare neutral cable, with 600 volt cross-linked polyethylene insulation for phase conductors conforming to NEMA WC 7.

F. Arresters and Cutouts

1. Surge Arresters: NEMA LA 1; valve type, arranged for crossarm mounting, and rated 15 kV.
2. Fused Cutouts: ANSI C37.42; drop-out fused cutouts rated 200 A at 15 kV ungrounded.
3. Fuses: Type K, rated as indicated.

G. Pole Mounted Distribution Transformers

1. Transformers: ANSI C57.12.20, single phase, oil filled, self-cooled with primary bushings and secondary terminations, Basic Impulse Level of 125 kV, temperature rise of 65 degrees C above 30 degrees C ambient, ratings as indicated. Provide primary standard primary taps with externally-operated tap changer and standard accessories with dial type thermometer.

H. Anchors

1. Helical Screw Anchors: Galvanized steel, ASTM A36/36M.

PART 3 EXECUTION

3.1 EXAMINATION

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

B. Verify that there are no underground utilities located below the poles prior to installation.

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.

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 the FERMCO Construction Manager.

I. Minimum depths in normal firm ground, measured from lower side of pole:

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"

J. Set crossarms at right angles to line for straight runs; and to bisect the angle of turns in line direction.

K. Provide two braces for each crossarm.

L. Install conductors to ANSI C2.

M. Install guys and anchors according to ANSI C2 requirements.

N. Use small diameter steel probe to verify area is free of underground obstructions prior to installation of anchors.

O. Perform a field run survey to determine the as-built location of the poles. The survey shall be performed by a Professional Land Surveyor licensed in the State of Ohio.

END OF SECTION

SECTION 16462
DRY TYPE TRANSFORMER/PANELBOARDS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Dry type two winding transformers integrated with primary and secondary main breakers and feeder breakers.

1.2 RELATED SECTIONS

A. Section 01010 - General Requirements.

B. Section 16050 - Basic Electrical Materials and Methods.

C. Section 16170 - Grounding and Bonding.

1.3 REFERENCE DRAWINGS

A. See Section 01011 for the Schedule of Drawings.

1.4 REFERENCES

A. 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	Instructions for Safe Installation, Operation, and Maintenance of Panelboards Rated 600 Volts or Less.
4.	NEMA ST 20-92	Dry Type Transformers for General Applications.
5.	NEMA 250-91	Enclosures for Electrical Equipment (1000 Volts Maximum).

B. National Fire Protection Association (NFPA):
1. NFPA 70-93 National Electrical Code.

C. Underwriters Laboratories, Inc. (UL):
1. Electrical Construction Materials Directory-94.

1.5 SUBMITTALS

A. Provide submittals as required by Section 01010.

B. Product Data: Include outline and support point dimensions of enclosures and accessories; unit weight; voltage; kVA, number of phases, impedance ratings, and characteristics; X/R ratio; tap configurations; insulation system type; rated temperature rise; main bus ampacity, integrated short circuit ampere rating, circuit breaker, arrangement, and sizes.

C. Transformer Test Reports:
1. Factory Test: NEMA ST 20. Indicate loss data, efficiency at 25, 50, 75, and 100 percent rated loads, and sound level.
2. Field Test: Indicate primary and secondary voltages as measured.

1.6 QUALITY ASSURANCE

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

B. Conform to requirements of NFPA 70.

C. Furnish products listed in the UL Electrical Construction Materials Directory for the purpose specified and indicated.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver transformers individually wrapped for protection and mounted on shipping skids.

B. Accept transformers on site. Inspect for damage.

C. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

D. Handle in accordance with manufacturer's written instructions. Lift only with lugs provided for the purpose. Handle carefully to avoid damage to transformer's internal components, enclosure, and finish.

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. Siemens.

B. Westinghouse.

C. Square D.

2.2 EQUIPMENT

A. Two-winding transformers
   1. Description: NEMA ST 20, factory assembled, air-cooled dry type transformers, ratings as indicated on contract drawings.
   2. Insulation system and average winding temperature rise for rated kVA as follows:
      a. 1-30 kVA: Class 185 with 115 degrees C rise.
      b. 16-500 kVA: Class 220 with 115 degrees C rise.

3. Case Temperature: Do not exceed 40 degrees C rise above ambient at warmest point.
4. Winding Taps:
   a. Transformers: NEMA ST 20. Transformers shall have four full current taps, two at 2-1/2 percent each above and two at 2-1/2 percent each below normal voltage.
5. Sound Levels: NEMA ST 20, not to exceed 85 dBA at 3 feet.
6. Basic Impulse Level: 10 kV.
7. Ground core and coil assembly to enclosure by means of a visible, flexible copper grounding strap.
8. Mounting: Suitable for wall or floor mounting.
9. Coil Conductors: Continuous windings with terminations brazed or welded.
10. Enclosure: NEMA ST 20. Provide lifting eyes or brackets.
11. Isolate core and coil from enclosure using vibration-absorbing mounts.
12. Nameplate: Include connection data and overload capacity based on rated allowable temperature rise.

B. Branch Circuit Panelboards
1. Lighting and Appliance Branch Circuit Panelboards: NEMA PB 1; circuit breaker type.
2. Enclosure NEMA PB 1; Type 3R conforming to NEMA 250.
3. Cabinet Size: As shown on manufacturer's drawings.
4. Cabinet Front: Hinged cover with paddle lock hinge.
5. Provide an integrated unit with transformer. Finish in manufacturer's standard gray enamel.
6. Provide panelboards with copper bus, ratings as scheduled on drawings. Provide copper ground bus in each panelboard.
7. Minimum Integrated Short Circuit Rating: 10,000 amperes rms symmetrical.
8. Molded Case Circuit Breakers: NEMA AB 1; plug-on type thermal magnetic trip circuit breakers, with common trip handle for all poles, rated for 75

degrees C copper conductors. Provide circuit breakers UL listed as Type SWD for lighting circuits. Provide UL Class A ground fault interrupter circuit breakers where required. Provide 20 percent spare breakers installed in the panelboard.

PART 3 EXECUTION

3.1 ERECTION/INSTALLATION/APPLICATION

A. Install transformer/panelboards in accordance with NEMA PB 1.1.

B. Install plumb, and in accordance with manufacturer's instructions, and as indicated on contract drawings.

C. Height: 6 feet to top of transformer section.

D. Provide grounding connections in accordance with Section 16170.

E. Provide filler plates for unused spaces in panelboards.

F. Provide typed circuit directory for each branch circuit panelboard. Revise directory to reflect circuiting changes required to balance phase loads.

G. Provide engraved plastic nameplates identifying transformer/panelboard equipment number.

3.2 FIELD QUALITY ASSURANCE

A. Visual and Mechanical Inspection: Inspect for physical damage, proper alignment, anchorage, grounding, and conformance of installation to contract documents and manufacturer's instructions. Check tightness of wiring and mounting connections for circuit breakers and transformer prior to energizing.

B. Record primary and secondary voltages; submit to the FERMCO Construction Manager.

C. 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 multi-wire branch circuits.

END OF SECTION

SECTION 16483
VARIABLE FREQUENCY DRIVES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Variable Frequency Drives (VFDs) compatible with turbine pump motors (PMP-13 through PMP-21).

1.2 RELATED SECTIONS

A. Section 15160 - Pumps.

B. Section 15171 - Motors.

1.3 REFERENCES

A. National Fire Protection Association (NFPA):
1. NFPA 70-93 National Electrical Code.

B. National Electrical Manufacturers Association (NEMA):
1. NEMA ICS 3.1-90 Safety Standards for Construction and Guide for Selection, Installation and Operation of Adjustable Speed Drive Systems.
2. NEMA 250 - 91 Enclosures for Electrical Equipment (1000 Volts Maximum).

1.4 SYSTEM DESCRIPTION

A. Design Requirements: Provide VFDs suitable for operating the turbine pump motor loads (PMP-13 through PMP-21) indicated in Section 15160 and in accordance with the motor requirements defined in Section 15171. The VFDs shall be supplied with the turbine pumps and motors, however, electrical connections for incoming service and between the VFDs and the motors shall be accomplished by the installation Subcontractor.

B. Variable Speed Drive shall be complete with components, software, and other features to perform as specified in this section. Installation and testing requires a supplier-trained field service engineer.

1.5 SUBMITTALS

A. Product Data: Provide catalog sheets showing voltage, controller size, ratings and size of switching and overcurrent protective devices, short circuit ratings, dimensions, and enclosure details.

B. Shop drawings include:
1. Name of drive manufacturer.
2. Assembly drawing and nomenclature.
3. System schematic and interconnection diagrams.
4. Temperature rise and class of insulation.
5. Maximum heat dissipation capacity, in horsepower.
6. Normal field excitation of full load.
7. Percent slip of unit at maximum output speed when transmitting a load equal to nameplate rating of driving motor with normal field excitation applied to unit, as well as guaranteed overall efficiency for same load condition.

C. Test Reports: Indicate factory and field test and inspection procedures and results.

D. Certification of Conformance: Provide manufacturer's statement certifying that the equipment supplied meets or exceeds the specified requirements.

E. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by the product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Variable Frequency Drives.

F. Operation and Maintenance Data: Include instructions for starting, operating, and maintaining drives, and describe operating limits that may result in hazardous or unsafe conditions.

G. Spare Parts List: List shall include name, address, and telephone number of distributor for each item.

1.6 QUALITY ASSURANCE

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

B. Conform to requirements of NFPA 70 and NEMA ICS 3.1.

C. Furnish products listed in the UL Electrical Construction Materials Directory as suitable for the purpose intended.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Handle in accordance with manufacturer's written instructions. Lift only with lugs provided for the purpose. Handle carefully to avoid damage to components, enclosure, and finish.

1.8 WARRANTY

A. Warranty: Motors shall be warranted by the manufacturer covering materials and labor.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. 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.

1. Allen Bradley.
2. Cutler Hammer.
3. Westinghouse.

2.2 EQUIPMENT

A. Components:

1. Converter: Three phase, full wave, phase controlled rectifier to convert incoming AC power to variable voltage DC.
2. Inverter: Shall construct an AC wave from minimum harmonic content at any frequency between 0 and 60 Hz to control speed. Inverter shall be pulse width modulated type. Motor terminal voltage shall be controlled in proportion to output frequency such that the voltage to frequency ratio remains essentially constant.
3. Main Circuit Breaker: NEMA AB 1 **NOT IN REFERENCES**. Rated 35,000 amperes, symmetrical at 480 V, three phase. Mechanically interlock breaker with enclosure door.
4. Filtering devices: DC bus capacitors and/or inductors necessary to filter rectification ripple.
5. Enclosure: Type 4X, NEMA 250, with digital display (minimum seven segment) for programming, operation, fault codes, and diagnostic information. Provide a local-off-remote switch on panel. Cabinet shall include internal air conditioning for any drive of 60 hp or greater capacity.
6. Programmable Logic: Internal to the unit, capable of providing logic and programming control of the drive.

B. Performance:

1. The VFD shall vary both AC voltage and frequency simultaneously to provide the constant volts/Hz ratio necessary to operate the motor at the desired variable speed.

000356

2. The VFD shall be designed for use with variable torque equipment (pumping loads).
3. Speed range: 10-to-1 infinitely adjustable speed range.
4. Control frequency range: 0 to 60 Hz.
5. Soft start: VFD shall limit starting inrush current to 100 percent of motor full load current under all conditions or modes of operation.
6. Efficiency, minimum: 95 percent at 100 percent speed and 85 percent at 50 percent speed.
7. Power Factor: Minimum 95 percent at 100 percent speed without correction capacitors.
8. VFD shall be designed for continuous operation of the driven equipment at 15 percent above rated load.

C. Protection: VFD controller shall provide protection as noted or as required against the following conditions. All conditions shutting down the drive or motor shall be in an orderly manner that minimizes damage to the equipment. Each condition shall trigger a common amber light on cabinet face.

1. Single phasing.
2. Reverse phase rotation.
3. Undervoltage or overvoltage - Restart upon restoration of normal voltage.
4. Loss of power - Shut down in an orderly fashion. Upon restoration of normal power, the motor shall automatically restart sequentially and operate at a rate defined by external interface parameters.
5. Motor overvoltage.
6. Short Circuit Protection - Provide fault protection including phase to ground without using isolation transformer for current limiting impedance.
7. Internal inverter fault.
8. Thermal overload protection for motor.
9. VFD internal power supply failure.
10. Overtemperature of VFD components - Shut down upon detection.
11. Overfrequency.

D. Interface requirements:
   1. Remote start-stop via Local-Off-Remote switch.
   2. 4-20 milliamp DC signal input from remote digital control system.
   3. Common alarm output for all VFD or motor malfunctions.
   4. Motor running status output contact.

E. The microprocessor based controls of the VFD shall include the following features with function/access keyboard.
   1. Motor rpm.
   2. Minimum/maximum speed.
   3. Acceleration/deceleration rate.
   4. Overcurrent/overvoltage protection.
   5. Signal span/gain adjustment.
   6. Volts.
   7. Hertz.
   8. LED/LCD display.

2.3 FABRICATION

A. Fabrication Requirements
   1. Wiring Terminations: Match conductor materials, sizes, and ratings.
   2. Enclosure: NEMA 250, Type 4X.
   3. Finish: Manufacturer's standard.

B. VFD shall be programmed and operated at Supplier's factory for the interface and motor parameters specific to this application.

PART 3 EXECUTION

3.1 EXAMINATION

A. Inspect completed installation for physical damage, proper alignment, anchorage, and grounding.

3.2 PREPARATION

A. Obtain performance requirements for driven loads as defined in the sections listed in Article 1.2.

B. Verify that surfaces and arrangements are suitable for drive installation.

C. Provide typed label inside each motor drive door, identifying motor served, nameplate horsepower, full load amperes, code letter, service factor, and voltage/phase rating.

3.3 ERECTION/INSTALLATION/APPLICATION

A. Installation shall be accomplished under direction of a field service engineer trained by the VFD supplier.

B. Select and install overload heater elements in motor drive to match installed motor characteristics.

3.4 FIELD QUALITY ASSURANCE

A. Perform operational testing on drive control systems to verify operation and field wiring connections.

3.5 ADJUSTING

A. Tighten accessible connections and mechanical fasteners after placing drive.

B. Make final adjustments to installed drive to ensure proper operation of associated driven equipment.

3.6 CLEANING

A. Touch up scratched or marred surfaces to match the original finish.

3.7 DEMONSTRATION

A. Demonstrate operation of drive.

END OF SECTION

SECTION 16500
LIGHTING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Luminaires and lampholders.

B. Ballasts.

C. Lamps.

D. Exit signs.

E. Emergency lighting units.

1.2 RELATED SECTIONS

A. Section 01010 - General Requirements.

B. Section 16050 - Basic Electrical Materials and Methods.

1.3 REFERENCE DRAWINGS

A. See Section 01011 for the Schedule of Drawings.

1.4 REFERENCES

A. National Fire Protection Association (NFPA):

1.	NFPA 70-93	National Electrical Code.
2.	NFPA 101-94	Code for Safety to Life from Fire in Buildings and Structures.

B. National Electrical Manufacturers Association (NEMA):

1.	NEMA WD 6-88	Wiring Devices - Dimensional Requirements.

C. American National Standards Institute (ANSI):

1.	ANSI C82.1-85	Ballasts for Fluorescent Lamps - Specifications.

D. Underwriters Laboratories, Inc. (UL):
   1. Electrical Construction Materials Directory-94.

1.5 SUBMITTALS

A. Provide submittals as required by Section 01010.

B. Product Data: Provide dimensions, ratings, and performance data including photometric and beamspread plots.

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.

C. Conform to requirements of NFPA 101.

D. Furnish products listed in the UL Electrical Construction Materials Directory as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.1 EQUIPMENT

A. Luminaires
   1. Furnish fixtures as indicated on drawings.
   2. Factory install ballasts, lamps, and accessories.
   3. Pendant luminaires: Provide swivel hangers, pendant rods, tubes, and chains as required to install luminaires at appropriate height.

B. Exit Signs
   1. Description: LED type exit sign fixture suitable for use as emergency lighting unit.
   2. Housing: Extruded aluminum.
   3. Face: Translucent face with red letters on white background.

4. Directional Arrows: Universal type for field adjustment.
5. Mounting: Universal for field selection.
6. Battery: 6 volt, nickel-cadmium type, with 1.5 hour capacity.
7. Battery Charger: Dual-rate type, with sufficient capacity to recharge discharged battery to full charge within 12 hours.
8. Input Voltage: 120 volts, 60 Hz.

C. Emergency Lighting Units
1. Description: Self-contained emergency lighting unit with rechargeable battery.
2. Input voltage: 120 volts.
3. Battery: Nickel-cadmium type with 1.5 hour capacity.
4. Battery Charger: Dual rate type capable of recharging discharged battery to full charge within 12 hours.
5. Lamps: 12 watt, sealed-beam type.
6. Electrical connection: 6-foot cord with NEMA WD 6-type 5-15 plug cap.

2.2 ACCESSORIES

A. Ballasts
1. Fluorescent Ballast:
   a. Description: ANSI C82.1, high-efficiency electronic ballast with low harmonic distortion.
   b. Provide ballast suitable for lamps specified.
   c. Voltage: 120 volts.
   d. Source Quality Control: Certify ballast design and construction by Certified Ballast Manufacturers, Inc.
   e. Outdoor Ballasts: Provide ballast suitable for temperatures above -20 degrees F.

B. Lamps
1. Indoor Fluorescent Lamps: 48-inch, 32 watt T-8 cool white.
2. Outdoor Fluorescent Lamps: quad tube, cool white.

C. Photoelectric Control
   1. Control above maximum footcandles: Provide with adjustable cutoff point.
   2. Load control: Sized for fixture, 120 volts.
   3. Provide photoelectric controls for exterior lighting.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrate and supporting grids for luminaires.

B. Examine each luminaire to determine suitability for lamps specified.

3.2 ERECTION/INSTALLATION/APPLICATION

A. Install in accordance with manufacturer's instructions.

B. Install suspended luminaires and exit signs using pendants supported from swivel hangers. Provide pendant length required to suspend luminaire at height indicated on drawings.

C. Support luminaires independent of ceiling framing.

D. Install surface-mounted luminaires and exit signs plumb and adjust to align with building lines and with each other. Secure to prohibit movement.

3.3 FIELD QUALITY ASSURANCE

A. Operate each luminaire after installation and connection. Inspect for proper connection and operation.

3.4 ADJUSTING

A. Adjust exit sign directional arrows.

B. Relamp luminaires that have failed lamps at substantial completion.

3.5 CLEANING

A. Clean electrical parts to remove conductive and deleterious materials.

B. Remove dirt and debris from enclosure.

C. Clean photometric control surfaces as recommended by manufacturer.

D. Clean finishes and touch up damage.

3.6 DEMONSTRATION

A. Provide minimum of 2 hours demonstration of luminaire operation.

B. Record actual footcandles at 3-1/2 feet above grade or floor on 10-foot grid submitted earlier.

END OF SECTION

SECTION 16855
HEATING CABLES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Heating cable and accessories.

1.2 RELATED SECTIONS

A. Section 01010 - General Requirements.

B. Section 15060 - Pipe, Fittings, Valves, and Accessories.

C. Section 15250 - Insulation.

D. Section 16050 - Basic Electrical Materials and Methods.

E. Section 16170 - Grounding and Bonding.

1.3 REFERENCE DRAWINGS

A. See Section 01011 for the Schedule of Drawings.

1.4 REFERENCES

A. National Fire Protection Association (NFPA):
1. NFPA 70-93 National Electrical Code.

B. National Electrical Manufacturers Association (NEMA):
1. NEMA ICS 6-93 Industrial Controls and Systems Enclosures.

1.5 SUBMITTALS

A. Provide submittals as per Section 01010.

1.6 SYSTEM DESCRIPTION

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

1.7 QUALITY ASSURANCE

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

1.8 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.

000366

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 that required utilities are available, in proper locations, and ready for use.

3.2 ERECTION/INSTALLATION/APPLICATION

A. Install heat trace material on piping system as indicated on drawings. 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.

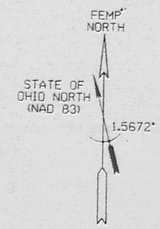
END OF SECTION

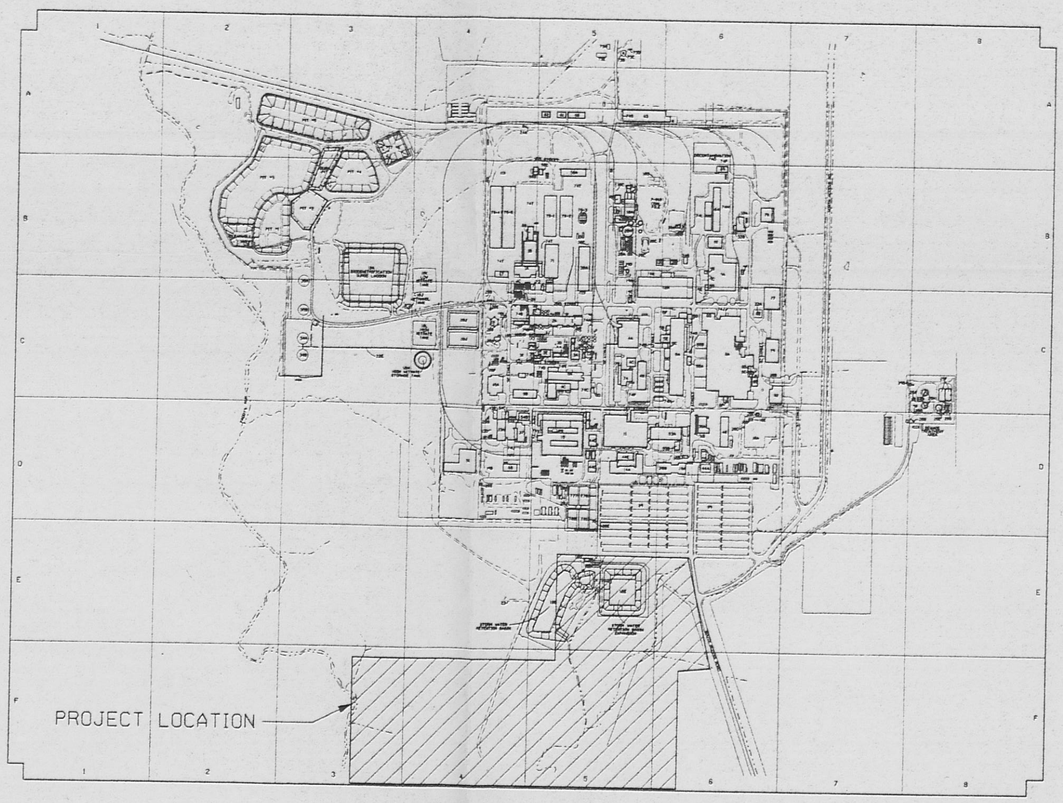
F-7311

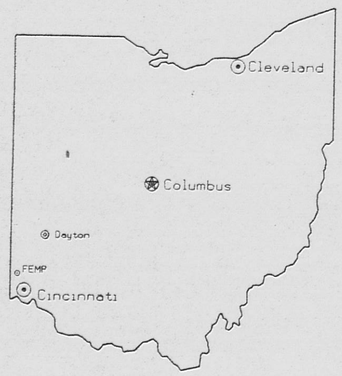
UNITED STATES
DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

SOUTH FIELD EXTRACTION SYSTEM

OPERABLE UNIT 5 - PROJECT ORDER 126







PARSONS

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

ARCHITECTS - ENGINEERS
CINCINNATI, OHIO

NOTES

000369

REF DWG NO.	DRAWING TITLE
95X-5900-X-00203	DRAWING INDEX
95X-5900-X-00204	LEGEND AND SYMBOLS

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E INITIALS AND DATE	FERNCO INITIALS AND DATE
0	CERTIFIED FOR CONSTRUCTION	NA	9-15-95

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
SOUTH FIELD EXTRACTION SYSTEM

DRAWING TITLE
PROJECT TITLE SHEET

DRAWN BY	DATE	LEAD ENGINEER	DATE	CHECKED BY	DATE
K.L. RABBITT	8/18/95		9/14/95	A.W. SCHATZ	8/2/95

PLANT/BLDG. NO.	FLOOR	SCALE	CLASS
		NONE	

SUBMITTED FOR APPROVAL	FERNCO CRU APPROVAL
A-E DATE 9-15-95	NA DATE

PREPARED UNDER PARSONS PROJECT ORDER NUMBER	DOE PROJECT NO.	FEMP PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
CRU5/P0126		WBS 1.1.1.1.5.3 00-90701	95X-5900-X-00202	X0001	0

2311

INDEX OF DRAWINGS

INDEX CODE NO.	DRAWING NO.	SHEET NO.	REVISION NO.	DRAWING TITLE	REMARKS
	95X-5900-X-00202	X0001	0	PROJECT TITLE SHEET	
	95X-5900-X-00203	X0002	0	DRAWING INDEX	
	95X-5900-X-00204	X0003	0	LEGEND AND SYMBOLS	
	95X-5900-G-00266	G0001	0	CIVIL - INDEX MAP AND OVERALL SITE PLAN	
	95X-5900-G-00251	G0002	0	CIVIL - GRADING/SITE/UTILITY PLAN - SHEET 1 OF 5	
	95X-5900-G-00252	G0003	0	CIVIL - GRADING/SITE/UTILITY PLAN - SHEET 2 OF 5	
	95X-5900-G-00253	G0004	0	CIVIL - GRADING/SITE/UTILITY PLAN - SHEET 3 OF 5	
	95X-5900-G-00254	G0005	0	CIVIL - GRADING/SITE/UTILITY PLAN - SHEET 4 OF 5	
	95X-5900-G-00269	G0006	0	CIVIL - GRADING/SITE/UTILITY PLAN - SHEET 5 OF 5	
	95X-5900-G-00265	G0007	0	CIVIL - ENLARGED GRADING/SITE/UTILITY PLANS	
	95X-5900-P-00255	G0008	0	CIVIL - PIPE PROFILE - SHEET 1 OF 4	
	95X-5900-P-00256	G0009	0	CIVIL - PIPE PROFILE - SHEET 2 OF 4	
	95X-5900-P-00257	G0010	0	CIVIL - PIPE PROFILES - SHEET 3 OF 4	
	95X-5900-P-00258	G0011	0	CIVIL - PIPE PROFILES - SHEET 4 OF 4	
	95X-5900-G-00260	G0012	0	CIVIL - ROAD 18 PROFILE - SHEET 1 OF 3	
	95X-5900-G-00261	G0013	0	CIVIL - ROAD 19 AND ROAD 20 PROFILES - SHEET 2 OF 3	
	95X-5900-G-00262	G0014	0	CIVIL - ROAD 15, ROAD 16 AND ROAD 17 PROFILES - SHEET 3 OF 3	
	95X-5900-G-00219	G0015	0	CIVIL - DETAILS - SHEET 1 OF 3	
	95X-5900-G-00220	G0016	0	CIVIL - DETAILS - SHEET 2 OF 3	
	95X-5900-G-00221	G0017	0	CIVIL - DETAILS - SHEET 3 OF 3	
	95X-5900-A-00224	A0001	0	ARCHITECTURAL - PLAN AND ELEVATIONS - WELL HOUSE NO. 15, 16, 17, 18, 19, 20, AND 21	
	95X-5900-A-00225	A0002	0	ARCHITECTURAL - SECTIONS AND DETAILS - WELL HOUSE NO. 15, 16, 17, 18, 19, 20, AND 21	
	95X-5900-A-00226	A0003	0	ARCHITECTURAL - PLANS - WELL HOUSE NO. 13 AND 14	
	95X-5900-A-00227	A0004	0	ARCHITECTURAL - ELEVATIONS AND SECTION - WELL HOUSE NO. 13 AND 14	
	95X-5900-A-00231	A0005	0	ARCHITECTURAL - SECTIONS AND DETAILS - WELL HOUSE NO. 13 AND 14 AND SWITCHGEAR SLAB	
	95X-5900-A-00228	A0006	0	ARCHITECTURAL - PLAN - VALVE HOUSE	
	95X-5900-A-00229	A0007	0	ARCHITECTURAL - ELEVATIONS - VALVE HOUSE	
	95X-5900-A-00230	A0008	0	ARCHITECTURAL - SECTIONS AND DETAILS - VALVE HOUSE	
	95X-5900-P-00207	P0001	0	PIPING / PLANT DESIGN - WELL HOUSE PIPING PLAN	
	95X-5900-P-00208	P0002	0	PIPING / PLANT DESIGN - WELL HOUSE PIPING SECTION	
	95X-5900-P-00223	P0003	0	PIPING / PLANT DESIGN - PIPING PLAN - SOUTH FIELD VALVE HOUSE	
	95X-5900-P-00233	P0004	0	PIPING / PLANT DESIGN - PIPING SECTION - SOUTH FIELD VALVE HOUSE	
	95X-5900-P-00250	P0005	0	PIPING / PLANT DESIGN - PIPE SUPPORT DETAILS	
	95X-5900-E-00248	E0001	0	ELECTRICAL - SYMBOLS AND LEGEND - SHEET 1	
	95X-5900-E-00249	E0002	0	ELECTRICAL - SYMBOLS AND LEGEND - SHEET 2	
	95X-5900-E-00235	E0003	0	ELECTRICAL - SINGLE LINE DIAGRAM	
	95X-5900-E-00244	E0004	0	ELECTRICAL - 13.2KV DISTRIBUTION & COMMUNICATIONS PLAN	
	95X-5900-E-00245	E0005	0	ELECTRICAL - WELL HOUSE AND VALVE HOUSE - POWER AND 120V DISTRIBUTION PLANS	
	95X-5900-E-00246	E0006	0	ELECTRICAL - SECTIONS AND DETAILS - POLE DETAILS, SHEET 2	
	95X-5900-E-00238	E0007	0	ELECTRICAL - ELEMENTARY AND INTERCONNECTION DIAGRAM	
	95X-5900-E-00239	E0008	0	ELECTRICAL - PANEL SCHEDULES	
	95X-5900-E-00240	E0009	0	ELECTRICAL - SECTIONS AND DETAILS - 15KV SWITCHGEAR AND DETAILS	
	95X-5900-E-00241	E0010	0	ELECTRICAL - SECTIONS AND DETAILS - POLE DETAILS, SHEET 1	
	95X-5900-E-00242	E0011	0	ELECTRICAL - CABLE SCHEDULE - SHEET 1	
	95X-5900-E-00270	E0012	0	ELECTRICAL - CABLE SCHEDULE - SHEET 2	
	95X-5900-E-00243	E0013	0	ELECTRICAL - CONDUIT SCHEDULE	
	95X-5900-E-00276	E0014	0	ELECTRICAL - SECTIONS AND DETAILS - POLE & MISCELLANEOUS, SHEET 3	
	95X-5900-E-00277	E0015	0	ELECTRICAL - SECTIONS AND DETAILS, MISCELLANEOUS DETAILS - SHEET 4	
	95X-5900-N-00189	N0001	0	MECHANICAL PROCESS - PIPING AND INSTRUMENTATION DIAGRAM - SYMBOLS AND LEGEND	
	95X-5900-N-00190	N0002	0	MECHANICAL PROCESS - PIPING AND INSTRUMENTATION DIAGRAM - SHEET 1 OF 2	
	95X-5900-N-00191	N0003	0	MECHANICAL PROCESS - PIPING AND INSTRUMENTATION DIAGRAM - SHEET 2 OF 2	
	95X-5900-N-00273	N0004	0	INSTRUMENTATION - CONTROL SYSTEM ARCHITECTURE	
	95X-5900-N-00271	N0005	0	INSTRUMENTATION - INTERCONNECTION DIAGRAM - WELL HOUSE DCS RTU	
	95X-5900-N-00272	N0006	0	INSTRUMENTATION - INTERCONNECTION DIAGRAM - VALVE HOUSE DCS RTU	

NOTES

000370

REF DWG NO.	DRAWING TITLE

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	FERNCO	DATE
		INITIALS AND DATE		
0	CERTIFIED FOR CONSTRUCTION		NA	5-5-95

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
SOUTH FIELD EXTRACTION SYSTEM

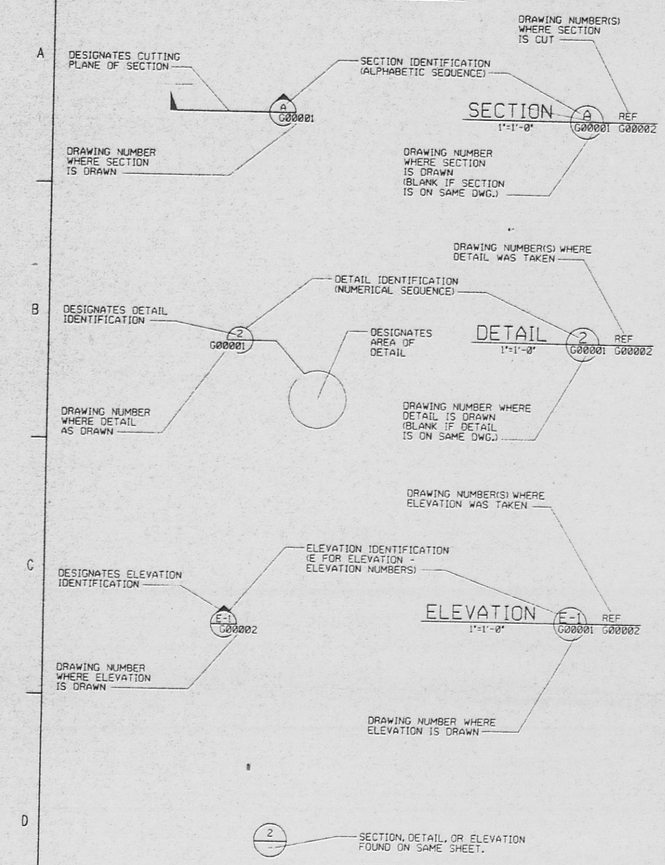
DRAWING TITLE
DRAWING INDEX

DRAWN BY	DATE	LEAD ENGINEER	DATE	CHECKED BY	DATE
K.L. RABBITT	05/18/95		5/15/95	A.W. SCHATZ	08/02/95
PLANT/BLDG NO.		FLOOR		SCALE	CLASS
				NONE	
SUBMITTED FOR APPROVAL		FERNCO CRU APPROVAL			
A-E 5-15-95	DATE	NA	DATE		

PREPARED UNDER PARSONS PROJECT ORDER NUMBER	DOE PROJECT NO.	FEMP PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
CRU5/P0126		WBS 1.1.1.1.5.3 00-90701	95X-5900-X-00203	X0002	0

7311

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 (+/-) 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
----- FQ1 -----	FIRE PROTECTION	FQ1
----- LS -----	LIVE STEAM	LS
----- WS -----	WATER SUPPLY	WS
----- WR -----	COOLING WATER RETURN	WR
----- TW -----	PROCESS WATER	TW
----- CE -----	CONTAMINATE 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	
----- T -----	TELEPHONE	T
----- G -----	ELECTRIC GROUND	G
----- PA -----	PLANT AIR	PA
----- SA -----	INSTRUMENT AIR SUPPLY	SA
	ABANDONED	
	DISCHARGE	
	TREATMENT	
	GW1 - 28'	

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

GRADING SYMBOLS

EXISTING		PROPOSED
	SPOT ELEVATION	X 589.4
584	CONTOUR - MINOR	584
585	CONTOUR - MAJOR	585
(TOE)	SLOPE INDICATOR	(TOE)

ARCHITECTURAL LEGEND

EXISTING		PROPOSED
	DOOR NUMBER	103
	ROOM NUMBER	101

SYMBOLS LEGEND

EXISTING		PROPOSED
	POST INDICATOR VALVE (PIV)	
	FIRE HYDRANT (FH)	
	MANHOLE (MH)	S OR D
	CATCH BASIN (CB)	D
	LIGHT POLE	
	PIPE SUPPORT	
	ELECTRICAL MANHOLE	E
	TELEPHONE MANHOLE	T
	STREET WASHERS	
	VALVE BOX	
[31]	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	
	TO BE REMOVED	
	SILT FENCE	
	ELECTRICAL TRANSFORMER	T
	TRANSMISSION TOWER	
	HEADWALL	OR
BM	BENCH MARK	
XX XX	CONSTRUCTION/WIND BARRIER FENCE	XX XX
	SIGN SINGLE/DOUBLE POST	
	BOLLARD/GUARD POST	
PB	ELECTRICAL PULL BOX	
	SURVEY CONTROL POINT	
	ROAD CENTERLINE OR BASELINE	
	BEND	OR
	TEE	
	THRUST BLOCK	
	REDUCER	
W OR U	UNKNOWN	
	STRAW BALE SILT BARRIER	
	GRAVEL EROSION CONTROL BARRIER	
	FENCE GATE	
	CONCRETE ENCASEMENT	
	EXTRACTION WELL (** IS NUMBER)	EW-**

NOTES

1. ITEMS SHOWN AS EXISTING MAY BE UNDER CONSTRUCTION OR PROPOSED TO BE CONSTRUCTED UNDER ANOTHER CONTRACT.

000371

REF DWG NO.	DRAWING TITLE
95X-5900-X-00203	DRAWING INDEX

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E INITIALS AND DATE	FERNCO DATE
0	CERTIFIED FOR CONSTRUCTION	RabB	NA 9-15-95

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
SOUTH FIELD EXTRACTION SYSTEM

DRAWING TITLE
LEGEND AND SYMBOLS

DRAWN BY	DATE	LEAD ENGINEER	DATE	CHECKED BY	DATE
K.L. RABBITT	05/18/95	[signature]	9/18/95	K. GERARD	07/31/95

PLANT/BLDG. NO.	FLOOR	SCALE	CLASS
		NONE	

SUBMITTED FOR APPROVAL	FERNCO CRU APPROVAL
[signature] 9-15-95	NA
A-E DATE	DATE

PREPARED UNDER PARSONS PROJECT ORDER NUMBER	DOE PROJECT NO.	TEMP PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
CRU5/P0126		WBS 1.1.1.1.5.3 00-90701	95X-5900-X-00204	X0003	0

NOTES

1. EXISTING CONDITIONS SHOWN ON THIS DRAWING WERE PREPARED FROM FEMP SITE PROVIDED DATA FROM THE DOCUMENTS LISTED BELOW.

   PARSONS TOPOGRAPHY 1992
   FEMP CADD GRID/UTILITY DRAWINGS
   FEMP CONTRACTOR OF PROJECT DESIGN DOCUMENTS
   FERMCO FIELD SURVEY 6/95

2. 6" PUBLIC WATER SUPPLY LINE IDENTIFIED IN FIELD BY POSTED SIGNS AND MAGNETIC TRACE WIRE.

3. LOCATION AND DEPTH OF UNDERGROUND FEATURES AND UTILITIES ARE APPROXIMATE. CONTRACTOR IS TO LOCATE FEATURES AND UTILITIES PRIOR TO EXCAVATION FOR CONSTRUCTION. IF LOCATION AND DEPTH ARE DIFFERENT, OR UNKNOWN UNCHARTED UTILITIES ARE DISCOVERED, CONTRACTOR IS TO INFORM FERMCO CONSTRUCTION MANAGER BEFORE PROCEEDING.

4. UNLESS OTHERWISE NOTED ALL MATERIALS SHALL CONFORM TO THE STATE OF OHIO DEPARTMENT OF TRANSPORTATION (ODOT) CONSTRUCTION AND MATERIAL SPECIFICATIONS DATED JANUARY 1, 1995.

5. COORDINATES FOR UTILITY POLES ARE SHOWN ON DRAWING 95X-5900-E-00244.

6. ALL DISTURBED SURFACES SHALL BE SEEDED AT PROJECT COMPLETION UNLESS OTHERWISE NOTED.

7. WELL HOUSES SHALL BE ORIENTATED BY THE LOCATION OF THE WELL AND DISCHARGE LINE. SEE DRAWING 95X-5900-A-00224 AND 95X-5900-A-00227 FOR DIMENSIONS, AND DRAWING 95X-5900-P-00207 FOR PIPING.

8. RECTANGULAR SHAPES INDICATE SHEET LIMITS WITH DRAWING NUMBER.

000372

REF DWG NO.	DRAWING TITLE
95X-5900-X-00203	DRAWING INDEX
95X-5900-X-00204	LEGEND AND SYMBOLS
95X-5900-E-00244	POWER PLAN-13.2KV DISTRIBUTION
95X-5900-G-00251	GRADING/SITE/UTILITY PLAN - SHEET 1 OF 5
95X-5900-G-00252	GRADING/SITE/UTILITY PLAN - SHEET 2 OF 5
95X-5900-G-00253	GRADING/SITE/UTILITY PLAN - SHEET 3 OF 5
95X-5900-G-00254	GRADING/SITE/UTILITY PLAN - SHEET 4 OF 5
95X-5900-G-00269	GRADING/SITE/UTILITY PLAN - SHEET 5 OF 5
95X-5900-G-00265	ENLARGED GRADING/SITE/UTILITY PLANS
95X-5900-P-00207	WELL HOUSE PIPING PLAN
95X-5900-A-00224	PLAN AND ELEVATIONS
95X-5900-A-00227	ELEVACTIONS AND SECTION

REV. NO.	ISSUE OR REVISION PURPOSE DESCRIPTION	A-E INITIALS	FERMCO INITIALS	DATE
Ø	CERTIFIED FOR CONSTRUCTION		NA	9-15-95

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
SOUTH FIELD EXTRACTION SYSTEM

DRAWING TITLE
CIVIL
INDEX MAP AND OVERALL SITE PLAN

DRAWN BY	DATE	LEAD ENGINEER	DATE	CHECKED BY	DATE
R. ESPARZA	07/21/95	E. Kubrin	9/14/95	E. KUBRIN	07/29/95
PLANT/BLDG NO.		FLOOR		SCALE 1"=100'	CLASS

SUBMITTED FOR APPROVAL — A-E — DATE
FERMCO CRU APPROVAL — NA — DATE

PREPARED UNDER PARSONS PROJECT ORDER NUMBER	DOE PROJECT NO.	FEMP PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
CRU5/P0126		WBS 1.1.1.1.5.3 00-90701	95X-5900-G-00266	G0001	Ø

NOTES

1. EXISTING CONDITIONS SHOWN ON THIS DRAWING WERE PREPARED FROM FEMP SITE PROVIDED DATA FROM THE DOCUMENTS LISTED BELOW.

   PARSONS TOPOGRAPHY 1992
   FEMP CADD GRID/UTILITY DRAWINGS
   FEMP CONTRACTOR PROJECT DESIGN DOCUMENTS
   FERMCO FIELD SURVEY 6/95

2. LOCATION AND DEPTH OF UNDERGROUND FEATURES AND UTILITIES ARE APPROXIMATE. CONTRACTOR IS TO LOCATE FEATURES AND UTILITIES PRIOR TO EXCAVATION FOR CONSTRUCTION. IF LOCATION AND DEPTH ARE DIFFERENT, OR UNKNOWN UNCHARTED UTILITIES ARE DISCOVERED, CONTRACTOR IS TO INFORM FERMCO CONSTRUCTION MANAGER BEFORE PROCEEDING.

3. UNLESS OTHERWISE NOTED ALL MATERIALS SHALL CONFORM TO THE STATE OF OHIO DEPARTMENT OF TRANSPORTATION (ODOT) CONSTRUCTION AND MATERIAL SPECIFICATIONS DATED JANUARY 1, 1995.

4. COORDINATES FOR UTILITY POLES ARE SHOWN ON DRAWING 95X-5900-E-00244.

5. ALL DISTURBED SURFACES SHALL BE SEEDED AT PROJECT COMPLETION UNLESS OTHERWISE NOTED.

DISCHARGE PIPE CURVE DATA

CURVE NO.	Δ	R	T	PI	
				NORTHING	EASTING
P1	46°46'40"	100.00'	43.25'	N 478270.14	E 1349673.91
P2	24°36'49"	250.00'	54.55'	N 478102.27	E 1349448.71

000373

REF DWG NO.	DRAWING TITLE
95X-5900-X-00203	DRAWING INDEX
95X-5900-X-00204	LEGEND AND SYMBOLS
95X-5900-E-00244	POWER PLAN-13.2KV DISTRIBUTION
95X-5900-G-00219	DETAILS SHEET 1 OF 3
95X-5900-G-00220	DETAILS SHEET 2 OF 3
95X-5900-G-00221	DETAILS SHEET 3 OF 3
95X-5900-G-00252	GRADING/SITE/UTILITY PLAN - SHEET 2 OF 5
95X-5900-G-00265	ENLARGED GRADING/SITE/UTILITY PLAN
95X-5900-P-00255	PIPE PROFILES - SHEET 1 OF 4

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E INITIALS AND DATE	FERMCO INITIALS AND DATE
0	CERTIFIED FOR CONSTRUCTION		NA 6-5-95

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
SOUTH FIELD EXTRACTION SYSTEM

DRAWING TITLE
CIVIL
GRADING/SITE/UTILITY PLAN
SHEET 1 OF 5

DRAWN BY	DATE	LEAD ENGINEER	DATE	CHECKED BY	DATE
R. ESPARZA	05/28/95	[signature]	9/14/95	E. KUBRIN	07/31/95

PLANT/BLDG NO.	FLOOR	SCALE	CLASS
		1" = 40'	

SUBMITTED FOR APPROVAL	FERMCO CRU APPROVAL
[signature] 6-5-95	NA
A-E DATE	DATE

PREPARED UNDER PARSONS PROJECT ORDER NUMBER	DOE PROJECT NO.	TEMP PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
CRU5/P0126		WBS 1.1.1.1.5.3 00-90701	95X-5900-G-00251	G0002	0

STATE OF OHIO NORTH (NAD 83)

FEMP NORTH ∠=1.5672°

EW-17 SEE DWG G00253

TIE-IN STA 9+82 N 478013.38 E 1349407.84 (12 G00219)

(MATCH LINE STA 9+70 SEE DWG G00225)

GW-8"-B4-2920

GW-6"-B4-2920

10+00

4 GUARD POST (TYP) SEE DWG G00220

DISCHARGE LINE GW-20"-B4-2907

TREATMENT LINE GW-8"-B4-2918

P#48

GW-6"-B4-2906

N 477967.68 E 1349528.38

INSTALL "ROAD CLOSED" SIGN AND 2 CONC WHEEL STOPS

PIPE CURVE (TYP) SEE TABLE THIS DWG (P3)

N 477970.41 E 1349499.14

GW-6"-B4-2920

EW-21 N 477953.84 E 1349496.65 FF EL 575.8

P#49

CONC ENCASEMENT (10 G00221) LIMITS OF CONC ENCASEMENT ARE SHOWN ON PIPE PROFILE, SEE DWG P00256

TIE-IN STA 13+22 N 477688.31 E 1349351.50 (12 G00219)

INSTALL (7) CONC WHEELSTOPS

N 477666.71 E 1349267.23 GW-6"-B4-2918

GW-12"-B4-2906

EW-23 N 477659.09 E 1349252.80 FF EL 578.2

P#50

CULVERT PIPE 3 SEE NOTE 8 (TYP)

ROAD 20

℄ ROAD 18 STA 3+62.5
℄ ROAD 20 STA 0+00
N 477612.02
E 1349457.93

STRAW BALE EROSION CONTROL SEE DETAIL DWG G00220 (TYP)

AREA TO BE PROTECTED, DO NOT DISTURB, NO EXCAVATION

TREATMENT LINE GW-6"-B4-2919

CONSTRUCTION FENCE

CULVERT PIPE 4

INSTALL ROAD CLOSED SIGN AND 2 CONC WHEEL STOPS

N 477397.75 E 1349046.88 GW-6"-B4-2916

EW-19 N 477018.07 E 1348979.81 FF EL 574.0

CULVERT PIPE 2

P#52

SEE DWG G00219 FOR CRUSHED AGGREGATE PAVING DETAIL, TYP. TO ALL NEW GRAVEL ROADS

GW-6"-B4-2916 P#54

P#55

GW-6"-B4-2917

℄ ROAD 18 STA 6+29.1
℄ ROAD 19 STA 0+00
N 477350.49
E 1349406.12

P#53

TIE-IN STA 17+17 N 477588.31 E 1349351.50 (12 G00219)

GRAVEL EROSION CONTROL SEE DETAIL DWG G00221 (TYP)

STA 6+60 TO 7+85 L & R INSTALL GUARDRAIL SEE DETAIL DETAIL DWG G00220

CULVERT PIPE 1

P#56

TIE-IN STA 23+87 N 477688.31 E 1349351.50 (12 G00219)

EW-18 N 477018.07 E 1348979.81 FF EL 571.0

℄ ROAD 18 STA 11+50
℄ GRAVEL ROAD STA 0+00
N 476995.39
E 1349125.09

INSTALL (3) CONC WHEELSTOPS

ROAD CURVE (TYP) SEE TABLE THIS DWG (R2)

P#57

GW-12"-B4-2906

TIE-IN TREATMENT LINE TO BE CONSTRUCTED LOWER THAN DISCHARGE LINE AT TIE-IN (12 G00219) (12 G00219)

N 477700.55 E 1348978.91 GW-8"-B4-2914

P#59

GW-8"-B4-2915

P#58

DISCHARGE LINE GW-20"-B4-2907

TREATMENT LINE GW-16"-B4-2906

AIR-RELIEF MANHOLE STA 20+60 (9 G00220)

CLEANOUT SEE DETAIL 7 DWG G00220 (TYP)

MATCH LINE STA 25+50 SEE DWG G00253

MATCH LINE STA 0+50 SEE DWG G00259

P#37 P#38 P#39

EXIST RUBBLE PILE

1065 2065 2049 1406 2387 3387 2286

ROAD CURVE DATA

CURVE NO.	Δ	R	T	PI NORTHING	PI EASTING
R1	13°19'14.3"	100.00'	11.68'	N 477639.62	E 1349318.61
R2	81°48'58.2"	200.00'	173.30'	N 476984.39	E 1349333.61

NOTES

1. EXISTING CONDITIONS SHOWN ON THIS DRAWING WERE PREPARED FROM FEMP SITE PROVIDED DATA FROM THE DOCUMENTS LISTED BELOW.

   PARSONS TOPOGRAPHY 1992
   FEMP CADD GRID/UTILITY DRAWINGS
   FEMP CONTRACTOR PROJECT DESIGN DOCUMENTS
   FERMCO FIELD SURVEY 6/95

2. LOCATION AND DEPTH OF UNDERGROUND FEATURES AND UTILITIES ARE APPROXIMATE. CONTRACTOR IS TO LOCATE FEATURES AND UTILITIES PRIOR TO EXCAVATION FOR CONSTRUCTION. IF LOCATION AND DEPTH ARE DIFFERENT, OR UNKNOWN UNCHARTED UTILITIES ARE DISCOVERED, CONTRACTOR IS TO INFORM FERMCO CONSTRUCTION MANAGER BEFORE PROCEEDING.

3. UNLESS OTHERWISE NOTED ALL MATERIALS SHALL CONFORM TO THE STATE OF OHIO DEPARTMENT OF TRANSPORTATION (ODOT) CONSTRUCTION AND MATERIAL SPECIFICATIONS DATED JANUARY 1, 1995.

4. COORDINATES FOR UTILITY POLES ARE SHOWN ON DRAWING 95X-5900-E-00244.

5. ALL DISTURBED SURFACES SHALL BE SEEDED AT PROJECT COMPLETION UNLESS OTHERWISE NOTED.

6. WELL HOUSES SHALL BE ORIENTATED BY THE LOCATION OF THE WELL AND DISCHARGE LINE. SEE DRAWING 95X-5900-A-00224 FOR DIMENSIONS AND DWG 95X-5900-P-00207 FOR PIPING.

7. DISCHARGE AND TREATMENT PIPES SHALL BE INSTALLED IN A COMMON TRENCH. LOCATION INFORMATION SHOWN IS THE CENTERLINE OF THE DISCHARGE PIPE. SEE TYPICAL SECTION ON DRAWING 95X-5900-G-00221.

8. FOR LENGTH, SIZE, AND COORDINATES OF CULVERT PIPE SEE PIPE DETAIL 15 ON DWG 95X-5900-G-00221.

DISCHARGE PIPE CURVE DATA

CURVE NO.	Δ	R	T	PI NORTHING	PI EASTING
P3	27°20'50"	150.00'	36.49'	N 477869.36	E 1349341.63
P4	48°52'43"	150.00'	55.89'	N 477653.30	E 1349351.66
P5	54°44'17"	150.00'	77.65'	N 477535.86	E 1349463.24
P6	81°49'07"	220.00'	190.63'	N 476963.49	E 1349349.86

REF DWG NO.	DRAWING TITLE
95X-5900-X-00203	DRAWING INDEX
95X-5900-X-00204	LEGEND AND SYMBOLS
95X-5900-E-00244	POWER PLAN-13.2KV DISTRIBUTION
95X-5900-A-00224	PLAN AND ELEVATIONS
95X-5900-G-00251	GRADING/SITE/UTILITY PLAN - SHEET 1 OF 5
95X-5900-G-00253	GRADING/SITE/UTILITY PLAN - SHEET 3 OF 5
95X5900-G-00269	GRADING/SITE/UTILITY PLAN - SHEET 5 OF 5
95X-5900-G-00219	DETAILS - SHEET 1 OF 3
95X-5900-G-00220	DETAILS - SHEET 2 OF 3
95X-5900-G-00221	DETAILS - SHEET 3 OF 3
95X-5900-P-00256	PIPE PROFILES - SHEET 2 OF 4
95X-5900-P-00207	WELL HOUSE PIPING PLAN

000374

REV NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	FERMCO	DATE
			INITIALS AND DATE	
0	CERTIFIED FOR CONSTRUCTION	Ralph	NA	9-15-95

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
SOUTH FIELD EXTRACTION SYSTEM

DRAWING TITLE
CIVIL
GRADING/SITE/UTILITY PLAN
SHEET 2 OF 5

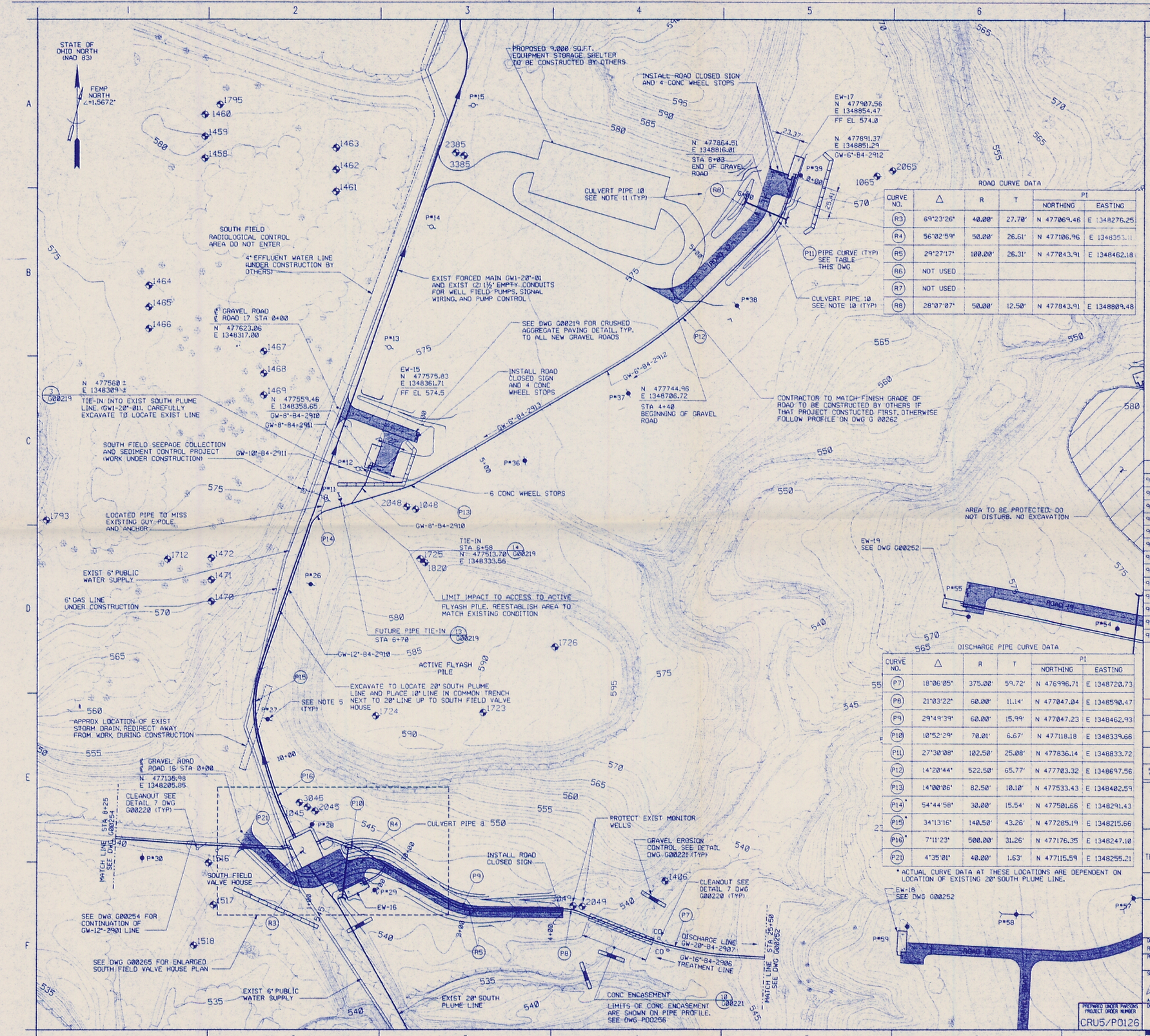
DRAWN BY	DATE	LEAD ENGINEER	DATE	CHECKED BY	DATE
R. ESPARZA	05/28/95	Ed Kubrin	9/14/95	E. KUBRIN	07/31/95

PLANT/BLDG. NO.	FLOOR	SCALE	CLASS
		1" = 40'	

SUBMITTED FOR APPROVAL	FERMCO CRU APPROVAL
Ralph 9-15-95	NA
A-E DATE	DATE

PREPARED UNDER PARSONS PROJECT ORDER NUMBER	DOE PROJECT NO.	FEMP PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
CRU5/P0126		WBS 1.1.1.1.5.3 00-90701	95X-5900-G-00252	G0003	0

7311



ROAD CURVE DATA

CURVE NO.	Δ	R	T	PI NORTHING	PI EASTING
R3	69°23'26"	40.00'	27.70'	N 477069.46	E 1348276.25
R4	56°02'59"	50.00'	26.61'	N 477106.96	E 1348353.11
R5	29°27'17"	100.00'	26.31'	N 477043.91	E 1348462.18
R6	NOT USED				
R7	NOT USED				
R8	28°07'07"	50.00'	12.50'	N 477843.91	E 1348809.48

DISCHARGE PIPE CURVE DATA

CURVE NO.	Δ	R	T	PI NORTHING	PI EASTING
P7	18°06'05"	375.00'	59.72'	N 476996.71	E 1348720.73
P8	21°03'22"	60.00'	11.14'	N 477047.04	E 1348590.47
P9	29°49'39"	60.00'	15.99'	N 477047.23	E 1348462.93
P10	10°52'29"	70.01'	6.67'	N 477118.18	E 1348339.66
P11	27°30'08"	102.50'	25.08'	N 477836.14	E 1348833.72
P12	14°20'44"	522.50'	65.77'	N 477703.32	E 1348697.56
P13	14°00'06"	82.50'	10.10'	N 477533.43	E 1348402.59
P14*	54°44'58"	30.00'	15.54'	N 477501.66	E 1348291.43
P15*	34°13'16"	140.50'	43.26'	N 477285.19	E 1348215.66
P16*	7°11'23"	500.00'	31.26'	N 477176.35	E 1348247.10
P21	4°35'01"	40.00'	1.63'	N 477115.59	E 1348255.21

* ACTUAL CURVE DATA AT THESE LOCATIONS ARE DEPENDENT ON LOCATION OF EXISTING 20" SOUTH PLUME LINE.

NOTES

1. EXISTING CONDITIONS SHOWN ON THIS DRAWING WERE PREPARED FROM FEMP SITE PROVIDED DATA FROM THE DOCUMENTS LISTED BELOW.

   PARSONS TOPOGRAPHY 1992
   FEMP CADD GRID/UTILITY DRAWINGS
   FEMP CONTRACTOR PROJECT DESIGN DOCUMENTS
   FERMCO FIELD SURVEY 6/95

2. 6" PUBLIC WATER SUPPLY LINE IDENTIFIED IN FIELD BY POSTED SIGNS AND MAGNETIC TRACE WIRE.

3. LOCATION AND DEPTH OF UNDERGROUND FEATURES AND UTILITIES ARE APPROXIMATE. CONTRACTOR IS TO LOCATE FEATURES AND UTILITIES PRIOR TO EXCAVATION FOR CONSTRUCTION. IF LOCATION AND DEPTH ARE DIFFERENT, OR UNKNOWN UNCHARTED UTILITIES ARE DISCOVERED, CONTRACTOR IS TO INFORM FERMCO CONSTRUCTION MANAGER BEFORE PROCEEDING.

4. UNLESS NOTED OTHERWISE ALL MATERIALS SHALL CONFORM TO THE STATE OF OHIO DEPARTMENT OF TRANSPORTATION (ODOT) CONSTRUCTION AND MATERIAL SPECIFICATIONS DATED JANUARY 1, 1995.

5. COORDINATES FOR UTILITY POLES ARE SHOWN ON DRAWING 95X-5900-E-00244.

6. ALL DISTURBED SURFACES SHALL BE SEEDED AT PROJECT COMPLETION UNLESS OTHERWISE NOTED.

7. WELL HOUSES SHALL BE ORIENTATED BY THE LOCATION OF THE WELL AND DISCHARGE LINE. SEE DRAWING 95X-5900-A-00224 FOR DIMENSIONS AND DWG 95X-5900-P-00207 FOR PIPING.

8. DISCHARGE AND TREATMENT PIPES SHALL BE INSTALLED IN A COMMON TRENCH. LOCATION INFORMATION SHOWN IS THE CENTERLINE OF THE DISCHARGE PIPE. SEE TYPICAL SECTION ON DRAWING 95X-5900-G-00221.

9. COORDINATE WORK WITH OTHER CONSTRUCTION ACTIVITY IN THE AREA THROUGH THE FERMCO CONSTRUCTION MANAGER.

10. FOR LENGTH, SIZE, AND COORDINATES OF CULVERT PIPE SEE PIPE DETAIL 15 ON DWG 95X-5900-G-00221.

REF DWG NO.	DRAWING TITLE
95X-5900-X-00203	DRAWING INDEX
95X-5900-X-00204	LEGEND AND SYMBOLS
95X-5900-E-00244	POWER PLAN-13.2KV DISTRIBUTION
95X-5900-A-00224	PLAN AND ELEVATIONS
95X-5900-G-00252	GRADING/SITE/UTILITY PLAN - SHEET 2 OF 5
95X-5900-G-00254	GRADING/SITE/UTILITY PLAN - SHEET 4 OF 5
95X-5900-G-00219	DETAILS - SHEET 1 OF 3
95X-5900-G-00220	DETAILS - SHEET 2 OF 3
95X-5900-G-00221	DETAILS - SHEET 3 OF 3
95X-5900-G-00265	ENLARGED GRADING/SITE/UTILITY PLAN
95X-5900-G-00262	ROAD 15, ROAD 16 AND ROAD 17 PROFILE
95X-5900-P-00256	PIPE PROFILE - SHEET 2 OF 4
95X-5900-P-00207	WELL HOUSE PIPING PLAN

000375

REV NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	FERMCO	DATE
0	CERTIFIED FOR CONSTRUCTION		NA	6-15-95

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
SOUTH FIELD EXTRACTION SYSTEM

DRAWING TITLE
CIVIL
GRADING/SITE/UTILITY PLAN
SHEET 3 OF 5

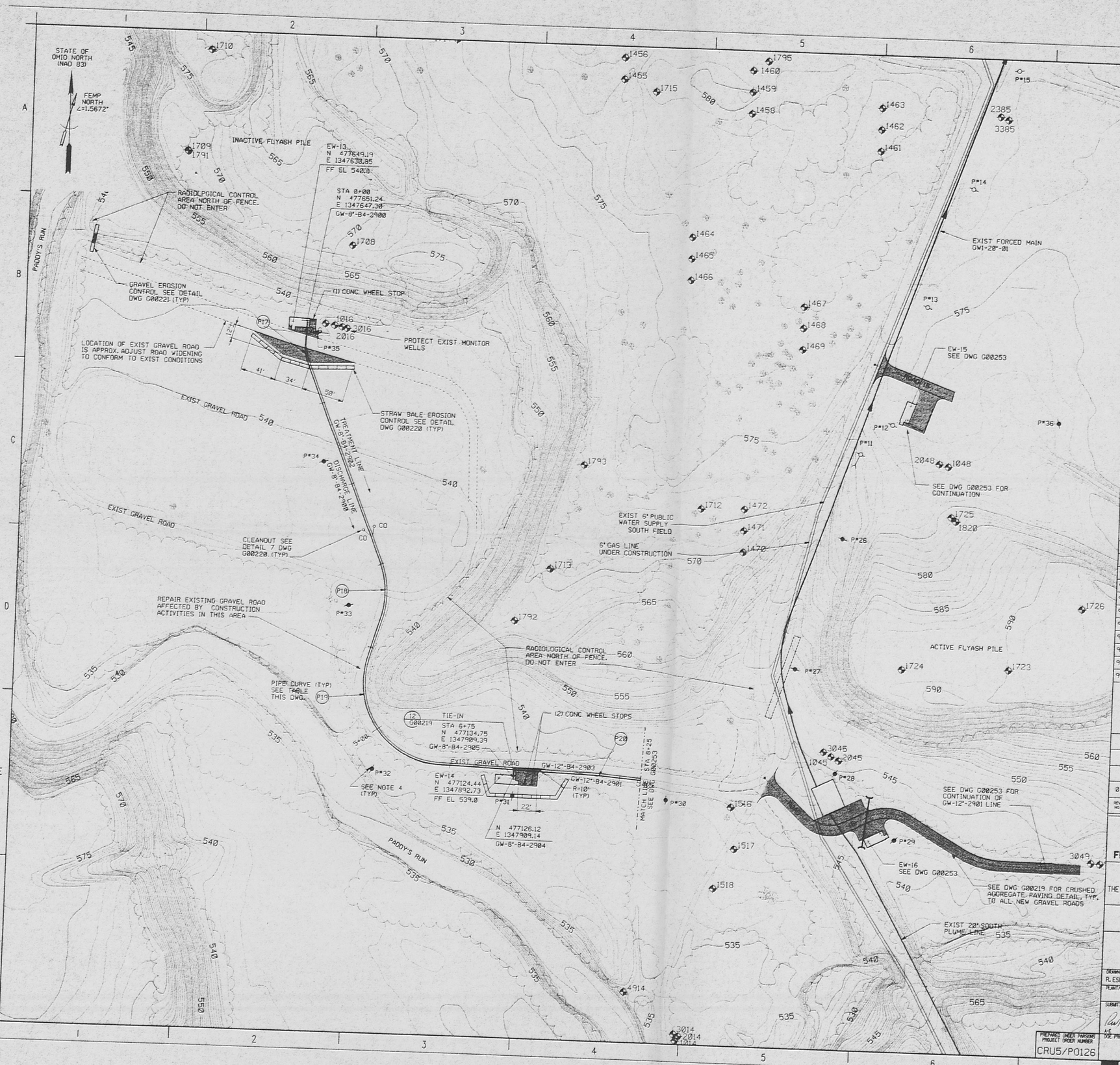
DRAWN BY	DATE	LEAD ENGINEER	DATE	CHECKED BY	DATE
R. ESPARZA	05/28/95	E. Kubrin	6/15/95	E. KUBRIN	07/31/95

PLANT/BLDG. NO.	FLOOR	SCALE	CLASS
		1" = 40'	

SUBMITTED FOR APPROVAL	FERMCO CRU APPROVAL
A-E DATE	DATE
6-15-95	NA

PREPARED UNDER PARSONS PROJECT ORDER NUMBER	DOE PROJECT NO.	FEMP PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
CRU5/P0126		WBS 1.1.1.1.5.3 00-90701	95X-5900-G-00253	G0004	0

7311



NOTES

1. EXISTING CONDITIONS SHOWN ON THIS DRAWING WERE PREPARED FROM FEMP SITE PROVIDED DATA FROM THE DOCUMENTS LISTED BELOW.

   PARSONS TOPOGRAPHY 1992
   FEMP CADD GRID/UTILITY DRAWINGS
   FEMP CONTRACTOR PROJECT DESIGN DOCUMENTS
   FERMCO FIELD SURVEY 6/95

2. LOCATION AND DEPTH OF UNDERGROUND FEATURES AND UTILITIES ARE APPROXIMATE. CONTRACTOR IS TO LOCATE FEATURES AND UTILITIES PRIOR TO EXCAVATION FOR CONSTRUCTION. IF LOCATION AND DEPTH ARE DIFFERENT, OR UNKNOWN UNCHARTED UTILITIES ARE DISCOVERED, CONTRACTOR IS TO INFORM FERMCO CONSTRUCTION MANAGER BEFORE PROCEEDING.

3. UNLESS OTHERWISE NOTED ALL MATERIALS SHALL CONFORM TO THE STATE OF OHIO DEPARTMENT OF TRANSPORTATION (ODOT) CONSTRUCTION AND MATERIAL SPECIFICATIONS DATED JANUARY 1, 1995.

4. COORDINATES FOR UTILITY POLES ARE SHOWN ON DRAWING 95X-5900-E-00244.

5. ALL DISTURBED SURFACES SHALL BE SEEDED AT PROJECT COMPLETION UNLESS OTHERWISE NOTED.

6. WELL HOUSES SHALL BE ORIENTATED BY THE LOCATION OF THE WELL AND DISCHARGE LINE. SEE DRAWING 95X-5900-A-00224 AND 95X-5900-A-00227 FOR DIMENSIONS AND DWG 95X-5900-P-00223 FOR PIPING.

7. DISCHARGE AND TREATMENT PIPES SHALL BE INSTALLED IN A COMMON TRENCH. LOCATION INFORMATION SHOWN IS THE CENTERLINE OF THE DISCHARGE PIPE. SEE TYPICAL SECTION ON DRAWING 95X-5900-G-00221.

8. COORDINATE WORK WITH OTHER CONSTRUCTION ACTIVITY IN THE AREA THROUGH THE FERMCO CONSTRUCTION MANAGER.

DISCHARGE PIPE CURVE DATA

CURVE NO.	Δ	R	T	PI	
				NORTHING	EASTING
P17	24°38'07"	50.00'	10.86'	N 477611.82	E 1347645.62
P18	38°15'58"	97.50'	33.81'	N 477340.36	E 1347755.69
P19	104°29'57"	96.50'	124.63'	N 477140.98	E 1347697.82
P20	2°29'57"	97.50'	2.24'	N 477131.67	E 1348018.68

REF DWG NO.	DRAWING TITLE
95X-5900-X-00203	DRAWING INDEX
95X-5900-X-00204	LEGEND AND SYMBOLS
95X-5900-E-00244	POWER PLAN-13.2KV DISTRIBUTION
95X-5900-A-00224	PLAN AND ELEVATIONS
95X-5900-A-00227	ELEVATIONS AND SECTION
95X-5900-G-00253	GRADING/SITE/UTILITY PLAN - SHEET 3 OF 5
95X-5900-G-00219	DETAILS - SHEET 1 OF 3
95X-5900-G-00220	DETAILS - SHEET 2 OF 3
95X-5900-G-00221	DETAILS - SHEET 3 OF 3
95X-5900-P-00223	VALVE HOUSE PIPING PLAN

000376

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A/E	FERMCO	DATE
		INITIALS AND DATE		
0	CERTIFIED FOR CONSTRUCTION	NA		9-15-95

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
SOUTH FIELD EXTRACTION SYSTEM

DRAWING TITLE
CIVIL
GRADING/SITE/UTILITY PLAN
SHEET 4 OF 5

DRAWN BY	DATE	LEAD ENGINEER	DATE	CHECKED BY	DATE
R. ESPARZA	05/28/95	E. Kubrin	9/12/95	E. KUBRIN	07/31/95
PLANT/BLDG. NO.		FLOOR		SCALE: 1" = 40'	CLASS
SUBMITTED FOR APPROVAL		FERMCO CRU APPROVAL			
A/E DATE		NA DATE			
DOE PROJECT NO.	FEMP PROJECT NO.	DRAWING INDEX CODE NO.		SHEET NO.	REV. NO.
	WBS 1.1.1.1.5.3 00-90701	95X-5900-G-00254		G0005	0

PREPARED UNDER PARSONS PROJECT ORDER NUMBER
CRU5/P0126

-7311

STATE OF OHIO NORTH (NAD 83)

FEMP NORTH ∠=1.5672°

℄ ROAD 18 STA 11+50
℄ GRAVEL ROAD STA 0+00
N 476995.39
E 1349125.09

EW-18 SEE DWG G00252

MATCH LINE STA 20+50 SEE DWG G00252

SEE DWG G00252 FOR CONTINUATION

GRAVEL EROSION CONTROL SEE DETAIL DWG G00221 (TYP)

SEE DWG G00219 FOR CRUSHED AGGREGATE PAVING DETAIL, TYP. TO ALL NEW GRAVEL ROADS

ROAD CURVE (TYP) SEE TABLE THIS DWG (R9)

STRAW BALE EROSION CONTROL SEE DETAIL DWG G00220 (TYP)

CULVERT PIPE 6

TEMPORARY TOPSOIL STOCKPILE AREA

CULVERT PIPE 7 SEE NOTE 6 (TYP)

APPROX LOCATION OF EXIST GRAVEL ROAD (NOT LOCATED BY SURVEY)

SEE NOTE 2

TO SOUTH ACCESS ROAD

EXIST GRAVEL ROAD

WILLEY ROAD

HOUSE

HOUSE

POOL

2398

2069

NOTES

1. EXISTING CONDITIONS SHOWN ON THIS DRAWING WERE PREPARED FROM FEMP SITE PROVIDED DATA FROM THE DOCUMENTS LISTED BELOW.

   PARSONS TOPOGRAPHY 1992
   FEMP CADD GRID/UTILITY DRAWINGS
   FEMP CONTRACTOR PROJECT DESIGN DOCUMENTS
   FERMCO FIELD SURVEY 6/95

2. TIE PROPOSED ROAD INTO EXISTING GRAVEL ROAD. ADJUST HORIZONTAL AND VERTICAL ALIGNMENT TO MATCH FIELD CONDITIONS.

3. LOCATION AND DEPTH OF UNDERGROUND FEATURES AND UTILITIES ARE APPROXIMATE. CONTRACTOR IS TO LOCATE FEATURES AND UTILITIES PRIOR TO EXCAVATION FOR CONSTRUCTION. IF LOCATION AND DEPTH ARE DIFFERENT, OR UNKNOWN UNCHARTED UTILITIES ARE DISCOVERED, CONTRACTOR IS TO INFORM FERMCO CONSTRUCTION MANAGER BEFORE PROCEEDING.

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5. ALL DISTURBED SURFACES SHALL BE SEEDED AT PROJECT COMPLETION UNLESS OTHERWISE NOTED.

6. FOR LENGTH, SIZE, AND COORDINATES OF CULVERT PIPE SEE PIPE DETAIL 15 ON DWG 95X-5900-G-00221.

ROAD CURVE DATA (SEE NOTE 2)

CURVE NO.	Δ	R	T	PI NORTHING	PI EASTING
(R9)	27°49'16"	200.00'	49.53'	N 476827.64	E 1349116.21

REF DWG NO.	DRAWING TITLE
95X-5900-X-00203	DRAWING INDEX
95X-5900-X-00204	LEGEND AND SYMBOLS
95X-5900-G-00252	GRADING/SITE/UTILITY PLAN - SHEET 2 OF 5
95X-5900-G-00219	DETAILS - SHEET 1 OF 3
95X-5900-G-00220	DETAILS - SHEET 2 OF 3
95X-5900-G-00221	DETAILS - SHEET 3 OF 3

000377

REV NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	FERMCO	DATE
0	CERTIFIED FOR CONSTRUCTION		NA	5-15-95

DETAILS 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
SOUTH FIELD EXTRACTION SYSTEM

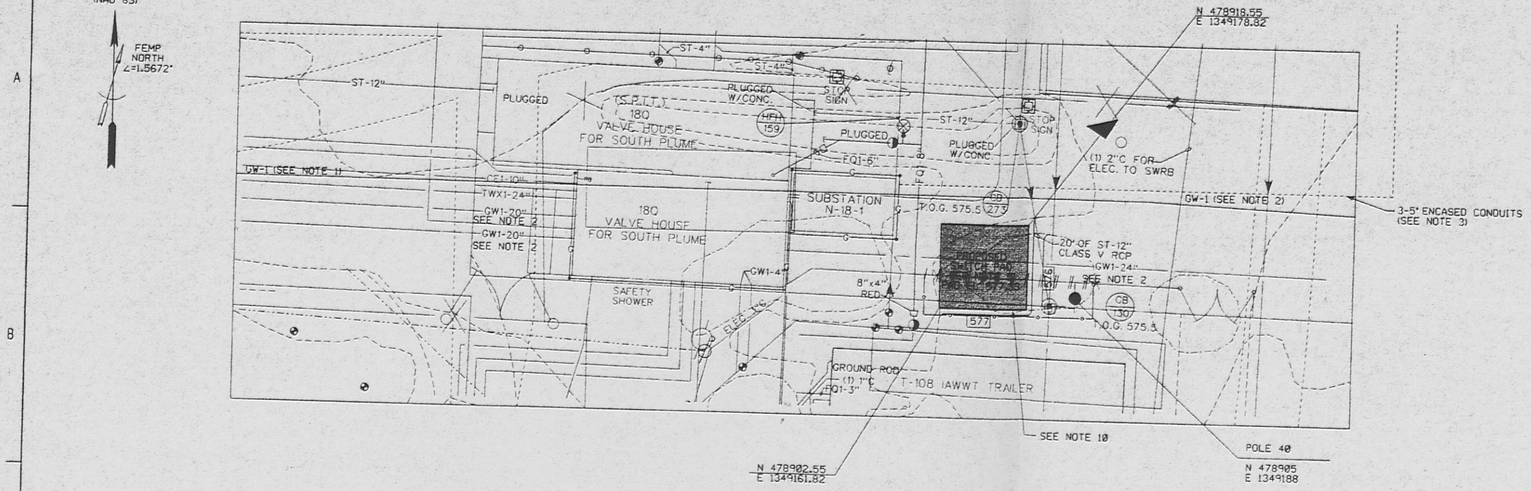
DRAWING TITLE
CIVIL
GRADING/SITE/UTILITY PLAN
SHEET 5 OF 5

DRAWN BY	DATE	LEAD ENGINEER	DATE	CHECKED BY	DATE
R. ESPARZA	06/26/95	Ed Kubsin	9/9/95	K. GERARD	07/31/95

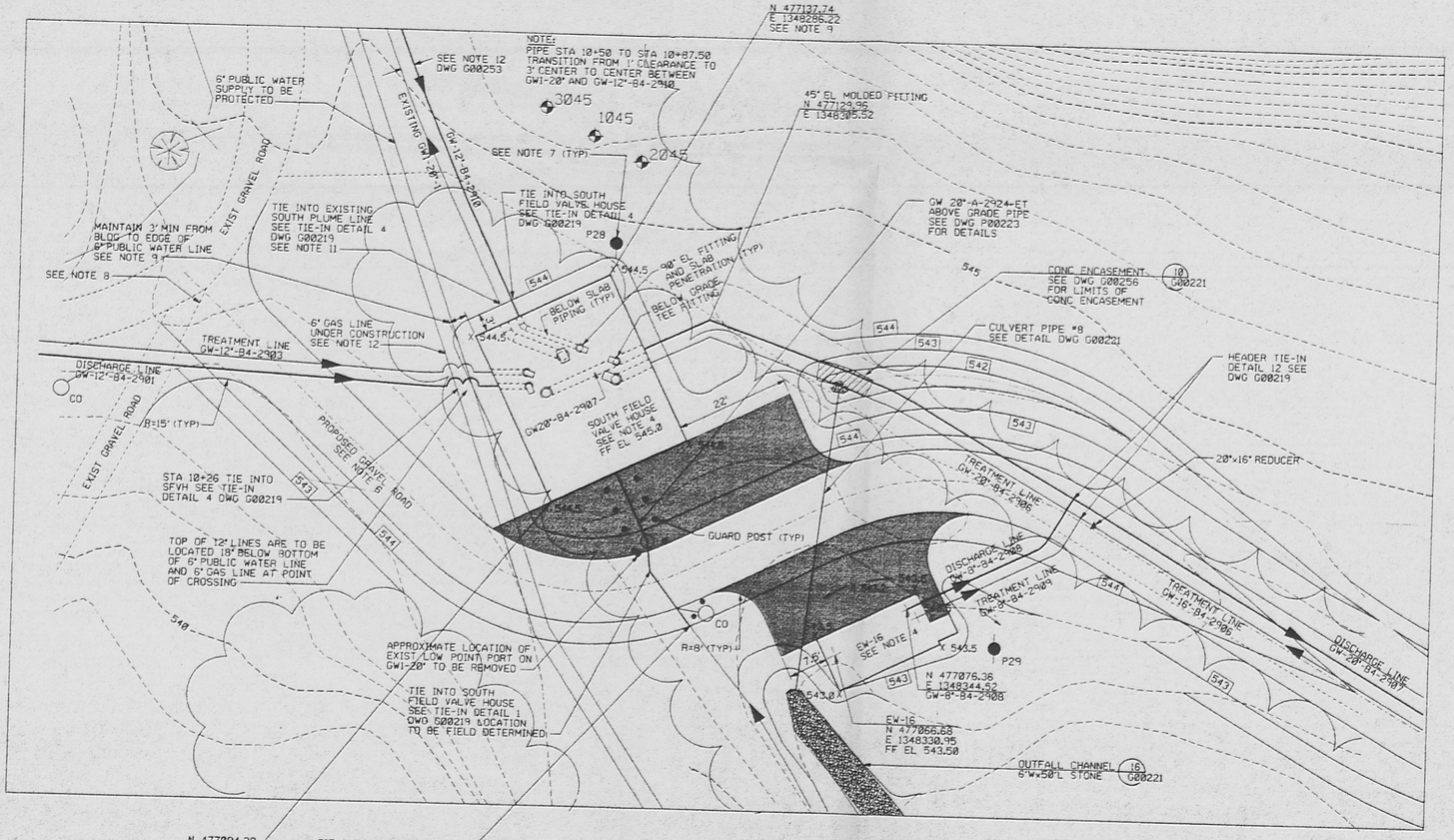
PLANT/BLDG NO.	FLOOR	SCALE	CLASS
		1"=40'	

SUBMITTED FOR APPROVAL — A-E — DATE 5-15-95
FERMCO GRU APPROVAL — NA — DATE

PREPARED UNDER PARSONS PROJECT ORDER NUMBER	DOE PROJECT NO.	TEMP PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV NO.
CRU5/P0126		WBS 1.1.1.1.5.3 00-90701	95X-5900-G-00269	G0006	0



ENLARGED SWITCH PAD PLAN



ENLARGED SOUTH FIELD VALVE HOUSE PLAN

NOTES

1. 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)
   FEMP CADD GRID/UTILITY DRAWINGS
   FEMP CONTRACTOR PROJECT DESIGN DOCUMENTS

2. LOCATION AND DEPTH OF UNDERGROUND FEATURES AND UTILITIES ARE APPROXIMATE. CONTRACTOR IS TO LOCATE FEATURES AND UTILITIES PRIOR TO EXCAVATION FOR CONSTRUCTION. IF LOCATION AND DEPTH ARE DIFFERENT, OR UNKNOWN UNCHARTED UTILITIES ARE DISCOVERED, CONTRACTOR IS TO INFORM FERMCO CONSTRUCTION MANANGER BEFORE PROCEEDING.

3. LOCATION OF 3-5" ELECTRICAL CONDUITS ARE APPROXIMATE.

4. SEE DWG 95X-5900-A-00223 FOR SOUTH FIELD VALVE HOUSE, DWG 95X-5900-A-00224 FOR TYPICAL WELL HOUSE, AND DWG 95X-5900-P-00223 FOR PIPING LOCATIONS.

5. SEE DWG 95X-5900-E-00240 FOR DETAILS OF PROPOSED ELECTRICAL ROUTES TO THIS PAD FROM EXISTING SUBSTATION N-18-1.

6. SEE DWG 95X-5900-G-00253 FOR ROAD 16, AND PIPE LAYOUT CURVE DATA.

7. SEE DWG 95X-5900-E-00244 FOR UTILITY POLE COORDINATES.

8. ADJUST PROPOSED ROAD TIE-IN TO MEET EXISTING CONDITIONS.

9. SOUTH FIELD VALVE HOUSE TO BE LOCATED 3'-0" MINIMUM EAST OF 6" PUBLIC WATERLINE. VALVE HOUSE MUST BE SQUARE WITH LINE GW-20"-A-2924.

10. SEE DRAWING 95X-5900-A-00231 FOR SWITHGEAR SLAB PLAN.

11. REMOVE 20" SOUTH PLUME HOPE PIPE AND RELOCATE THE ELECTRIC CONDUIT AS NECESSARY IN THE AREA AROUND THE SOUTH FIELD VALVE HOUSE IN ORDER TO CONSTRUCT THE PROPOSED PIPES AND VALVE HOUSE.

12. 6" GAS LINE UNDER CONSTRUCTION BY OTHERS IS TO BE PLACED 3' FROM 6" PUBLIC WATER SUPPLY LINE. CONTRACTOR TO FIELD VERIFY LOCATION OF 6" PUBLIC WATER SUPPLY LINE AND 6" GAS LINE PRIOR TO CONSTRUCTION IN THIS AREA.

REF DWG NO.	DRAWING TITLE
95X-5900-X-00203	DRAWING INDEX
95X-5900-X-00204	LEGENDS AND SYMBOLS
95X-5900-E-00240	SECTION AND DETAILS
95X-5900-E-00244	POWER PLAN - 13.2KV DISTRIBUTION
95X-5900-G-00253	GRADING/SITE/UTILITY PLAN - SHEET 3 OF 5
95X-5900-G-00219	DETAILS - SHEET 1 OF 3
95X-5900-G-00221	DETAILS - SHEET 3 OF 3
95X-5900-A-00223	PLANS AND ELEVATIONS
95X-5900-A-00224	PLANS AND ELEVATIONS
95X-5900-P-00223	VALVE HOUSE PIPING PLAN
95X-5900-A-00231	SECTIONS AND DETAILS
95X-5900-G-00256	PIPE PROFILE - SHEET 2 OF 4

000378

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A/E INITIALS	FERMCO INITIALS	DATE
0	CERTIFIED FOR CONSTRUCTION	RWB	NA	9.15.95

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
SOUTH FIELD EXTRACTION SYSTEM

DRAWING TITLE
CIVIL
ENLARGED GRADING/SITE/UTILITY PLANS

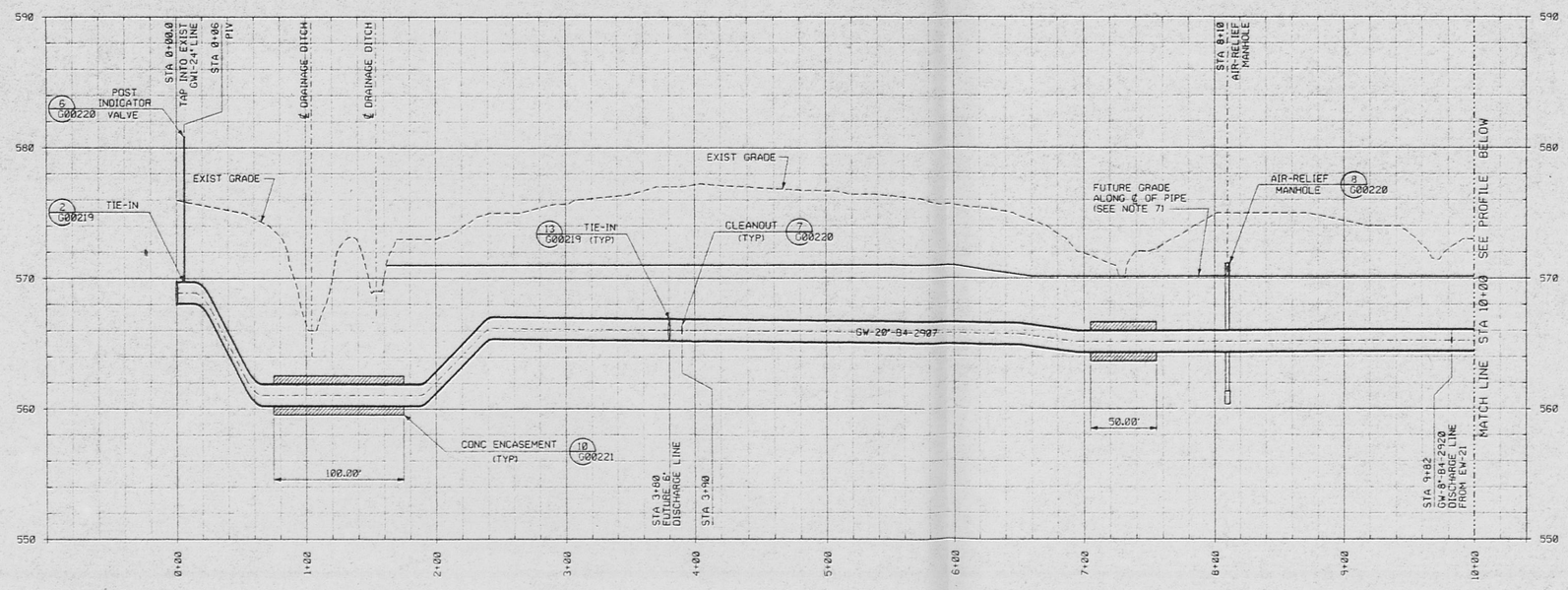
DRAWN BY	DATE	LEAD ENGINEER	DATE	CHECKED BY	DATE
D. REED	07/18/95	Ed Robinson	9/12/95	K. GERARD	07/31/95

PLANT/BLDG. NO.	FLOOR	SCALE	CLASS
		1"=10'	

SUBMITTED FOR APPROVAL	FERMCO CRU APPROVAL
RWB 9.15.95	NA
A/E DATE	DATE

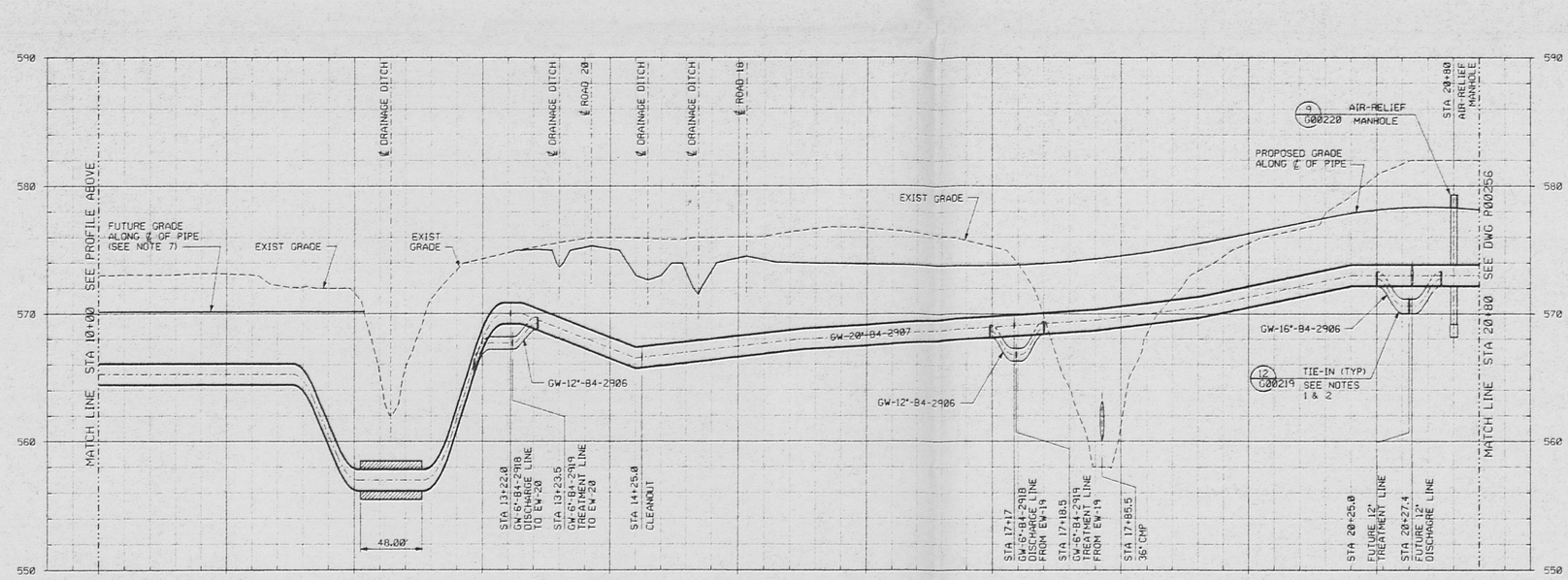
PREPARED UNDER PARSONS PROJECT ORDER NUMBER	A/E PROJECT NO.	FEMP PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
CRU5/P0126		WBS 1.1.1.1.5.3 00-90701	95X-5900-G-00265	G0007	0

E-7311



GW1-24" TO SFVH PIPE PROFILE

VERT: 1"= 4'
HORIZ: 1"=40'



GW1-24" TO SFVH PIPE PROFILE

VERT: 1"= 4'
HORIZ: 1"=40'

NOTES

1. THE DISCHARGE PIPE AND TREATMENT PIPE ARE TYPICALLY IN A COMMON TRENCH. SEE DRAWING 95X-5900-G-00221 FOR TYPICAL PIPE BEDDING DETAILS.
2. THE PROFILES SHOWN ARE BASED ON THE DISCHARGE PIPE LINE ALIGNMENT. REFER TO GRADING/SITE/UTILITY PLANS 95X-5900-P-00251 AND 95X-5900-P-00252 FOR LOCATION AND TREATMENT PIPE SIZES.
3. MINIMUM COVER IS 3.50'. MINIMUM BENDING RADIUS OF HDPE IS 40 DIAMETERS OR AS SPECIFIED BY THE MANUFACTURER.
4. CONTRACTOR SHALL DETERMINE THE ACTUAL DEPTH OF THE EXIST SOUTH PLUME LINE, GW1-20" AND ADJUST THE PROPOSED DISCHARGE PIPELINE ELEVATION TO MATCH. SOUTH PLUME CONSTRUCTION DRAWINGS SPECIFIED 4' MINIMUM COVER.
5. LOCATION AND DEPTH OF UNDERGROUND FEATURES AND UTILITIES ARE APPROXIMATE. CONTRACTOR IS TO LOCATE FEATURES AND UTILITIES PRIOR TO EXCAVATION FOR CONSTRUCTION. IF LOCATION AND DEPTH ARE DIFFERENT, OR UNKNOWN UNCHARTED UTILITIES ARE DISCOVERED, CONTRACTOR IS TO INFORM FERMCO CONSTRUCTION MANAGER BEFORE PROCEEDING.
6. UNLESS OTHERWISE NOTED ALL MATERIALS SHALL CONFORM TO THE STATE OF OHIO DEPARTMENT OF TRANSPORTATION (ODOT) CONSTRUCTION AND MATERIAL SPECIFICATIONS DATED JANUARY 1, 1995.
7. FUTURE GRADE INDICATED HERE IS A RESULT OF THE OTHER WORK NOT IN THE SCOPE OF THIS PROJECT. EXCAVATE FOR PIPE AS INDICATED AND BACKFILL TO EXISTING GRADE.
8. FROM STA 10+50 TO STA 10+87.5, TRANSITION FROM 1' CLEARENCE TO 3' C/C BETWEEN GW1-20" AND GW-12"-B4-2910.
9. MAY REQUIRE BACK TO BACK REDUCERS, SUCH FITTINGS SHALL BE SHOP FABRICATED.
10. FOR PIPE LINE ABBREVIATIONS SEE DRAWING 95X-5900-P-00255.

ABBREVIATIONS

℄	= CENTERLINE
CO	= CLEANOUT
EL	= ELEVATION
HDPE	= HIGH DENSITY POLYETHYLENE
SFVH	= SOUTH FIELD VALVE HOUSE
STA	= STATION

REF DWG NO.	DRAWING TITLE
95X-5900-X-00203	DRAWING INDEX
95X-5900-X-00204	LEGEND AND SYMBOLS
95X-5900-G-00266	INDEX MAP AND OVERALL SITE PLAN
95X-5900-G-00251	GRADING/SITE/UTILITY PLAN - SHEET 1 OF 5
95X-5900-G-00252	GRADING/SITE/UTILITY PLAN - SHEET 2 OF 5
95X-5900-G-00219	DETAILS - SHEET 1 OF 3
95X-5900-G-00220	DETAILS - SHEET 2 OF 3
95X-5900-G-00221	DETAILS - SHEET 3 OF 3
95X-5900-P-00255	PIPE PROFILES - SHEET 1 OF 4
95X-5900-P-00256	PIPE PROFILES - SHEET 2 OF 4

000379

REV NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E INITIALS AND DATE	FERMCO	DATE
0	CERTIFIED FOR CONSTRUCTION		NA	8-15-95

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
SOUTH FIELD EXTRACTION SYSTEM

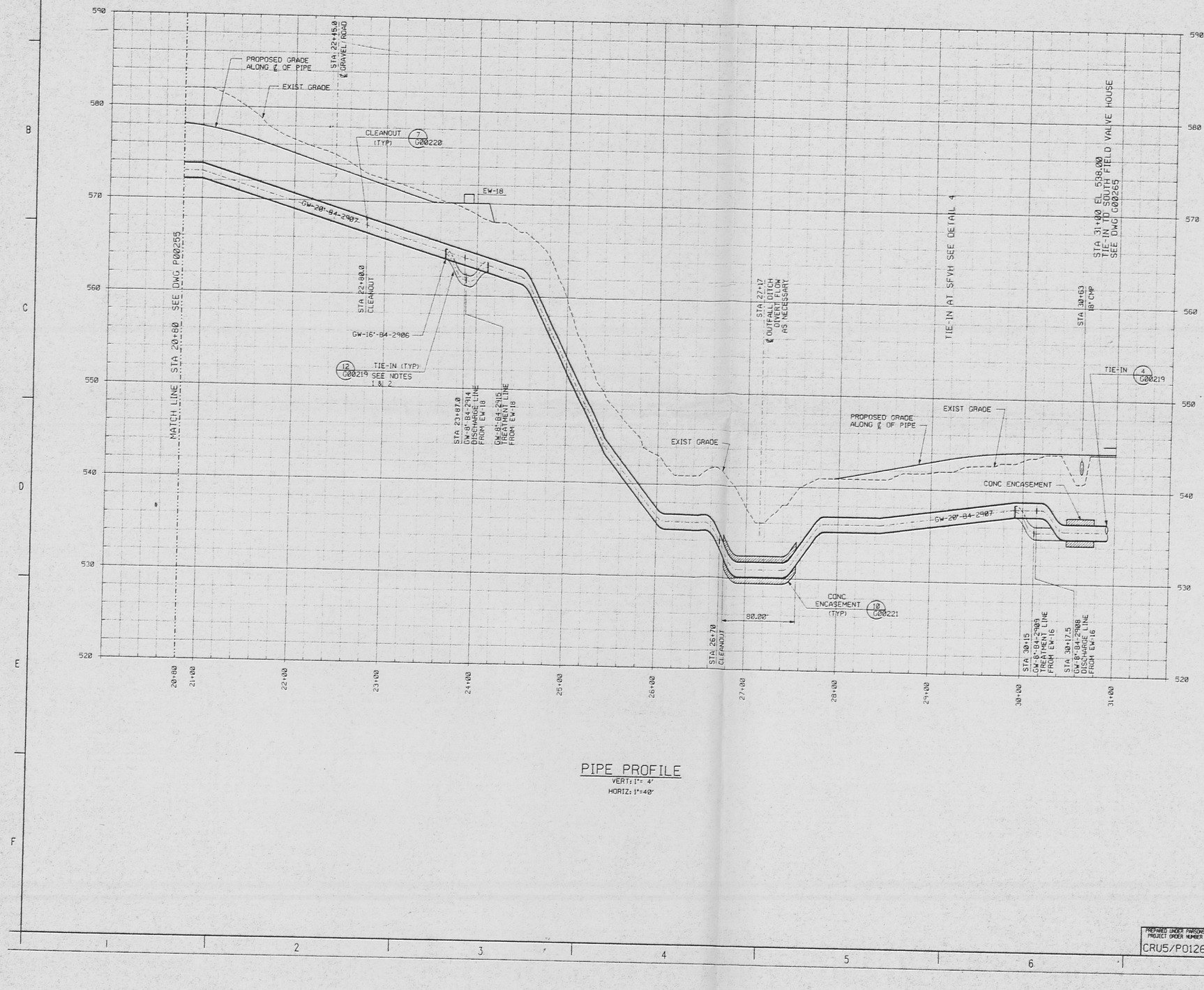
DRAWING TITLE
CIVIL
PIPE PROFILE
SHEET 1 OF 4

DRAWN BY	DATE	LEAD ENGINEER	DATE	CHECKED BY	DATE
R. ESPARZA	05/28/95		8/4/95	K. GERARD	07/31/95

PLANT/BLDG NO.	FLOOR	SCALE	CLASS
		AS SHOWN	

SUBMITTED FOR APPROVAL	FERMCO CRU APPROVAL
8-15-95	NA
A-E DATE	DATE

PREPARED UNDER PARSONS PROJECT ORDER NUMBER	DOE PROJECT NO.	FERMCO PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
CRU5/P0126		WBS 1.1.1.1.5.3 00-90701	95X-5900-P-00255	G0008	0



PIPE PROFILE
VERT: 1"= 4'
HORIZ: 1"=40'

NOTES

1. THE DISCHARGE PIPE AND TREATMENT PIPE ARE TYPICALLY IN A COMMON TRENCH. SEE DRAWING 95X-5900-G-00221 FOR TYPICAL PIPE BEDDING DETAILS.
2. THE PROFILES SHOWN ARE BASED ON THE DISCHARGE PIPE LINE ALIGNMENT. REFER TO GRADING/SITE/UTILITY PLANS 95X-5900-G-00252 AND 95X-5900-G-00253 FOR LOCATION AND TREATMENT PIPE SIZES.
3. MINIMUM COVER IS 3.50'. MINIMUM BENDING RADIUS OF HDPE IS 40 DIAMETERS OR AS SPECIFIED BY THE MANUFACTURER.
4. FOR PIPE LINE ABBREVIATIONS SEE DRAWING 95X-5900-P-00255.

REF DWG NO.	DRAWING TITLE
95X-5900-X-00203	DRAWING INDEX
95X-5900-X-00204	LEGEND AND SYMBOLS
95X-5900-G-00266	INDEX MAP AND OVERALL SITE PLAN
95X-5900-G-00252	GRADING/SITE/UTILITY PLAN - SHEET 2 OF 5
95X-5900-G-00253	GRADING/SITE/UTILITY PLAN - SHEET 3 OF 5
95X-5900-G-00265	ENLARGED GRADING/SITE/UTILITY PLANS
95X-5900-P-00255	PIPE PROFILE - SHEET 1 OF 4
95X-5900-G-00219	DETAILS - SHEET 1 OF 3
95X-5900-G-00220	DETAILS - SHEET 2 OF 3
95X-5900-G-00221	DETAILS - SHEET 3 OF 3

000380

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A/E INITIALS AND DATE	FERNCO	DATE
0	CERTIFIED FOR CONSTRUCTION		NA	6-19-95

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
SOUTH FIELD EXTRACTION SYSTEM

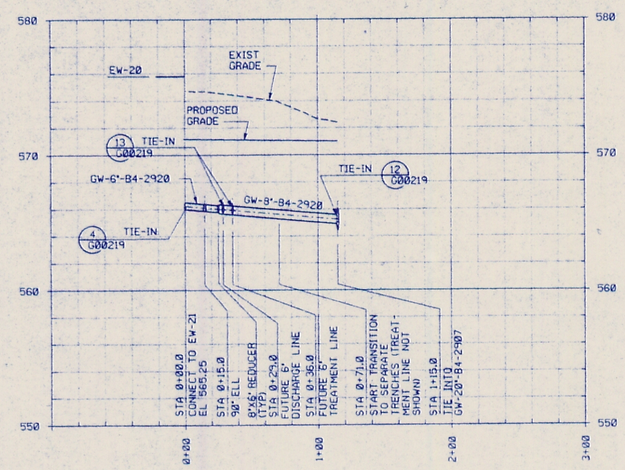
DRAWING TITLE
CIVIL
PIPE PROFILE
SHEET 2 OF 4

DRAWN BY	DATE	LEAD ENGINEER	DATE	CHECKED BY	DATE
R. ESPARZA	05/28/95	Ed Kuhlman	6/19/95	K. GERARD	07/31/95

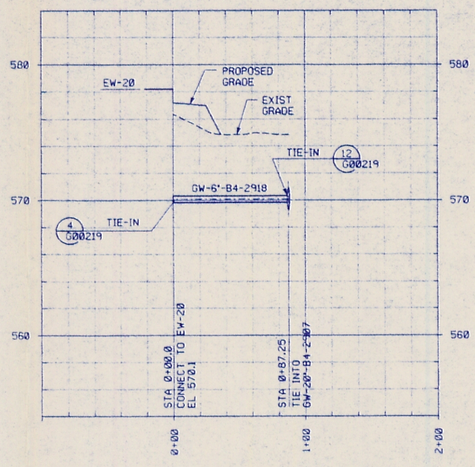
PLANT/BLDG. NO.	FLOOR	SCALE	CLASS
		AS SHOWN	

SUBMITTED FOR APPROVAL A-E	DATE	FERNCO CRU APPROVAL	DATE
Rob Buttin 6-19-95		NA	

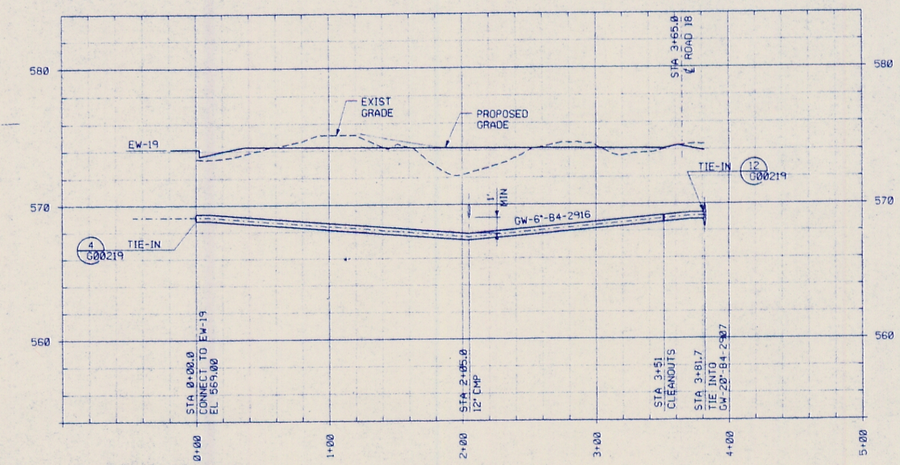
PREPARED UNDER PARSONS PROJECT ORDER NUMBER	DOE PROJECT NO.	FEMP PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
CRU5/P0126		WBS 1.1.1.1.5.3 00-90701	95X-5900-P-00256	G0009	0



EW-21 PIPE PROFILE
VERT: 1"= 4'
HORIZ: 1"=40'



EW-20 PIPE PROFILE
VERT: 1"= 4'
HORIZ: 1"=40'



EW-19 PIPE PROFILE
VERT: 1"= 4'
HORIZ: 1"=40'

NOTES

1. THE DISCHARGE PIPE AND TREATMENT PIPE ARE TYPICALLY IN A COMMON TRENCH. SEE DRAWING 95X-5900-G-00221 FOR TYPICAL PIPE BEDDING DETAILS.
2. THE PROFILES SHOWN ARE BASED ON THE DISCHARGE PIPE LINE ALIGNMENT. REFER TO GRADING/SITE/UTILITY PLAN 95X-5900-G-00252 FOR LOCATION AND TREATMENT PIPE SIZE.
3. MINIMUM COVER IS 3.50'. MINIMUM BENDING RADIUS OF HDPE IS 40 DIAMETERS OR AS SPECIFIED BY THE MANUFACTURER.
4. FOR PIPE LINE ABBREVIATIONS SEE DRAWING 95X-5900-P-00255.

REF DWG NO.	DRAWING TITLE
95X-5900-X-00204	LEGEND AND SYMBOLS
95X-5900-X-00203	DRAWING INDEX
95X-5900-G-00266	INDEX MAP AND OVERALL SITE PLAN
95X-5900-G-00252	GRADING/SITE/UTILITY PLAN - SHEET 2 OF 5
95X-5900-G-00219	DETAILS - SHEET 1 OF 3
95X-5900-G-00221	DETAILS - SHEET 3 OF 3
95X-5900-P-00255	PIPE PROFILE - SHEET 1 OF 4

000381

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E INITIALS AND DATE	FERNCO INITIALS AND DATE
0	CERTIFIED FOR CONSTRUCTION		NA 4-15-95

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
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CINCINNATI, OHIO

PROJECT NAME
SOUTH FIELD EXTRACTION SYSTEM

DRAWING TITLE
CIVIL
PIPE PROFILES
SHEET 3 OF 4

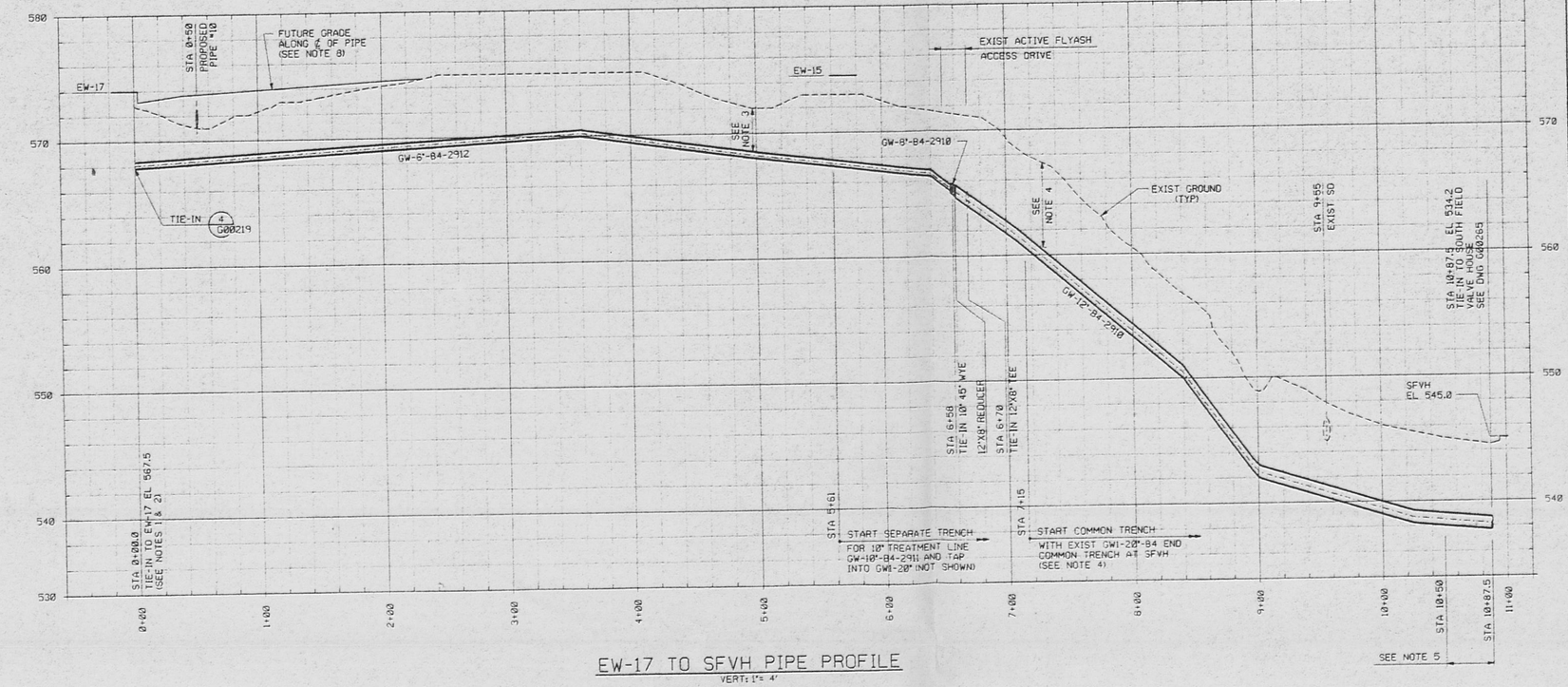
DRAWN BY	DATE	LEAD ENGINEER	DATE	CHECKED BY	DATE
R. ESPARZA	05/28/95	Ed Rubin	9/12/95	K. GERARD	07/31/95

PLANT/BLDG NO.	FLOOR	SCALE	CLASS
		AS SHOWN	

SUBMITTED FOR APPROVAL A-E / DATE	FERNCO CRU APPROVAL / DATE
Ed Rubin 4-15-95	NA

PREPARED UNDER PARSONS PROJECT ORDER NUMBER	DOE PROJECT NO.	FEMP PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
CRU5/P0126		WBS 1.1.1.1.5.3 00-90701	95X-5900-P-00257	G0010	0

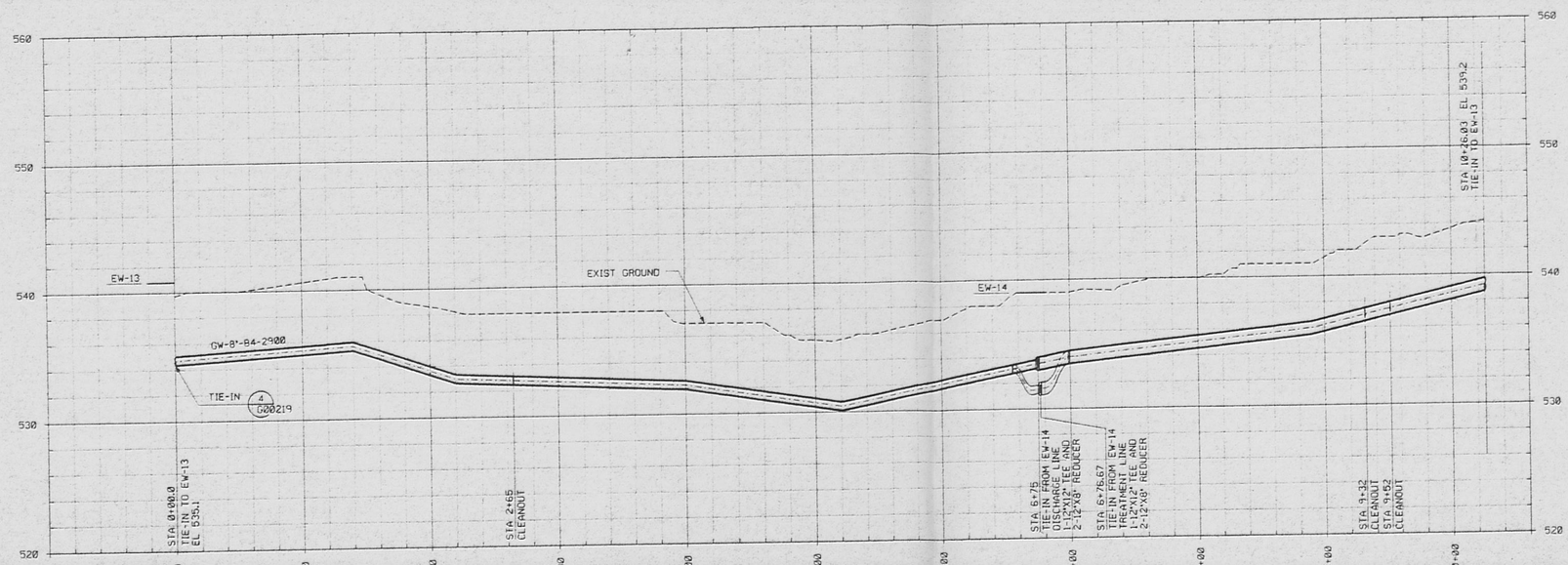
7311



EW-17 TO SFVH PIPE PROFILE

VERT: 1"= 4'

HORIZ: 1"=40'



EW-13 TO SFVH PIPE PROFILE

VERT: 1"= 4'

HORIZ: 1"=40'

NOTES

1. THE DISCHARGE PIPE AND TREATMENT PIPE ARE TYPICALLY IN A COMMON TRENCH. SEE DRAWING 95X-5900-G-00221 FOR TYPICAL PIPE BEDDING DETAILS.
2. THE PROFILES SHOWN ARE BASED ON THE DISCHARGE PIPE LINE ALIGNMENT. REFER TO GRADING/SITE/UTILITY PLAN 95X-5900-G-00252 FOR LOCATION AND TREATMENT PIPE SIZE.
3. MINIMUM COVER IS 3.50'. MINIMUM BENDING RADIUS OF HDPE IS 40 DIAMETERS OR AS SPECIFIED BY THE MANUFACTURER.
4. CONTRACTOR SHALL DETERMINE THE ACTUAL DEPTH OF THE EXIST SOUTH PLUME LINE, GW1-20" AND ADJUST THE PROPOSED DISCHARGE PIPELINE ELEVATION TO MATCH. SOUTH PLUME CONSTRUCTION DRAWINGS SPECIFIED 4' MINIMUM COVER.
5. LOCATION AND DEPTH OF UNDERGROUND FEATURES AND UTILITIES ARE APPROXIMATE. CONTRACTOR IS TO LOCATE FEATURES AND UTILITIES PRIOR TO EXCAVATION FOR CONSTRUCTION. IF LOCATION AND DEPTH ARE DIFFERENT, OR UNKNOWN UNCHARTED UTILITIES ARE DISCOVERED, CONTRACTOR IS TO INFORM FERMCO CONSTRUCTION MANAGER BEFORE PROCEEDING.
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7. FUTURE GRADE INDICATED HERE IS A RESULT OF THE OTHER WORK NOT IN THE SCOPE OF THIS PROJECT. EXCAVATE FOR PIPE AS INDICATED AND BACKFILL TO EXISTING GRADE.
8. FROM STA 10+50 TO STA 10+87.5, TRANSITION FROM 1' CLEARANCE TO 3' C/C BETWEEN GW1-20" AND GW-12"-B4-2910.
9. MAY REQUIRE BACK TO BACK REDUCERS. SUCH FITTINGS SHALL BE SHOP FABRICATED.
10. FOR PIPE LINE ABBREVIATIONS SEE DRAWING 95X-5900-P-00255.

REF DWG NO.	DRAWING TITLE
95X-5900-G-00203	DRAWING INDEX
95X-5900-X-00204	LEGEND AND SYMBOLS
95X-5900-G-00266	INDEX MAP AND OVERALL SITE PLAN
95X-5900-G-00252	GRADING/SITE/UTILITY PLAN - SHEET 2 OF 5
95X-5900-G-00265	ENLARGED GRADING/SITE/UTILITY PLAN
95X-5900-G-00219	DETAILS - SHEET 1 OF 3
95X-5900-G-00221	DETAILS - SHEET 3 OF 3
95X-5900-P-00255	PIPE PROFILES - SHEET 1 OF 4

000382

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E INITIALS	FERMCO INITIALS AND DATE
0	CERTIFIED FOR CONSTRUCTION	NA	4-15-95

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

SOUTH FIELD EXTRACTION SYSTEM

DRAWING TITLE

CIVIL

PIPE PROFILES

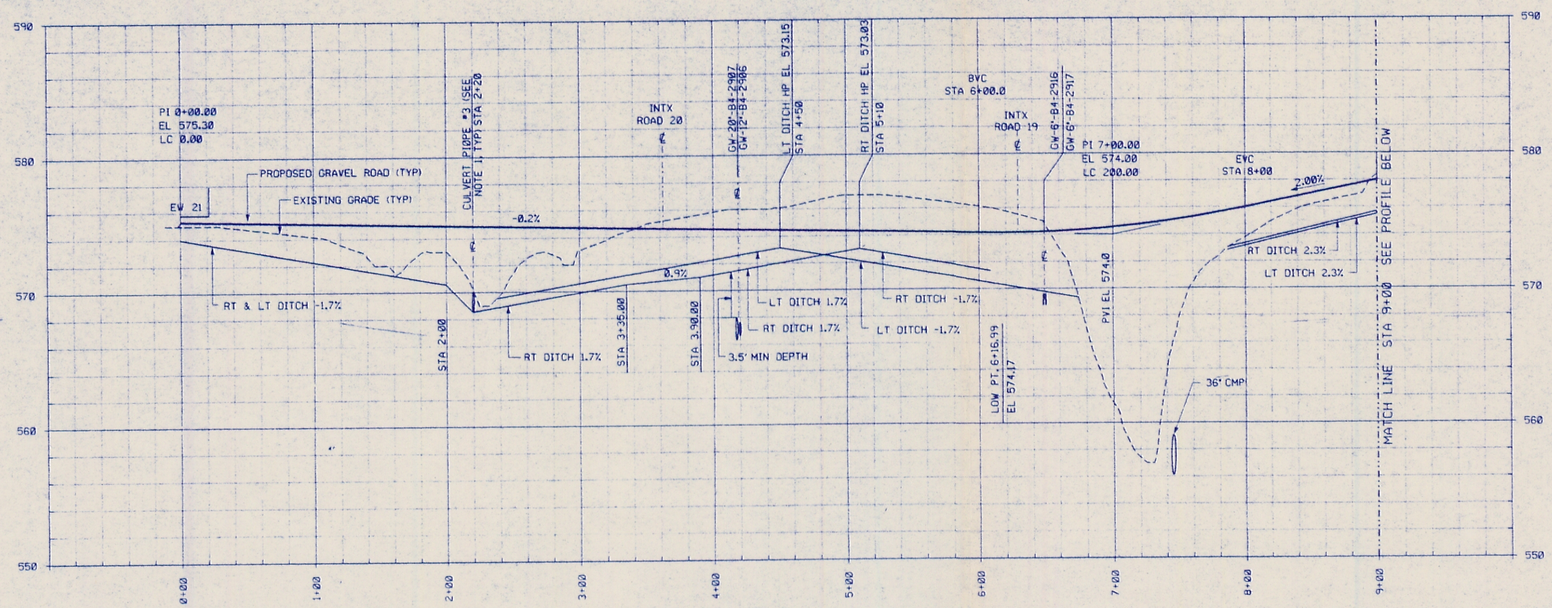
SHEET 4 OF 4

DRAWN BY	DATE	LEAD ENGINEER	DATE	CHECKED BY	DATE
R. ESPARZA	05/28/95		4/4/95	K. GERARD	07/31/95

PLANT/BLDG. NO.	FLOOR	SCALE	CLASS
		AS SHOWN	

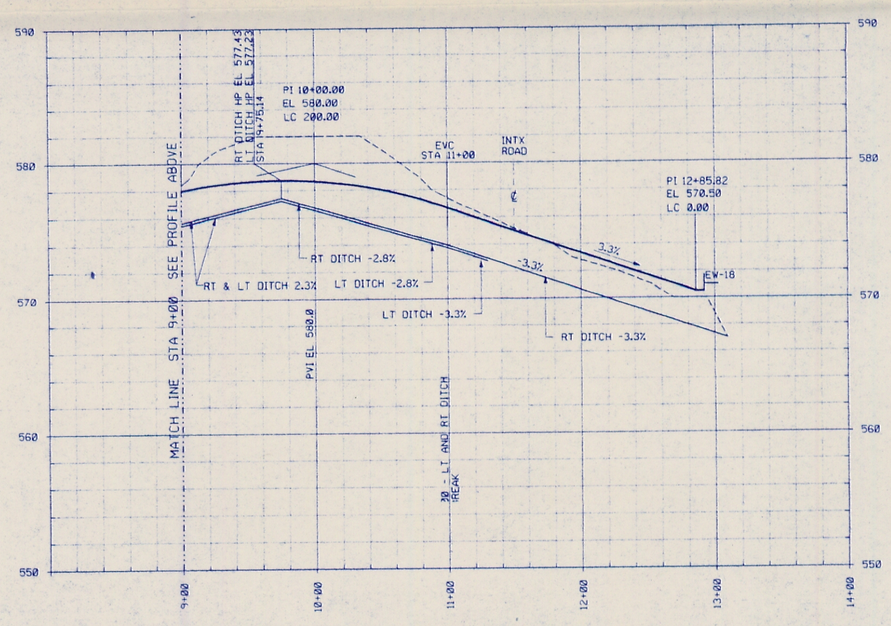
SUBMITTED FOR APPROVAL	FERMCO CRJ APPROVAL
4-15-95	NA
A-E DATE	DATE

PREPARED UNDER PARSONS PROJECT ORDER NUMBER	DOE PROJECT NO.	FERMCO PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
CRU5/P0126		WBS 1.1.11.5.3 00-90701	95X-5900-P-00258	G0011	0



ROAD 18 PROFILE

VERT: 1"= 4'
HORIZ: 1"=40'



ROAD 18 PROFILE

VERT: 1"= 4'
HORIZ: 1"=40'

NOTES

1. FOR LOCATION OF ROAD SEE PLAN 95X-5900-G00252.
2. LOCATION AND DEPTH OF UNDERGROUND FEATURES AND UTILITIES ARE APPROXIMATE. CONTRACTOR IS TO LOCATE FEATURES AND UTILITIES PRIOR TO EXCAVATION FOR CONSTRUCTION. IF LOCATION AND DEPTH ARE DIFFERENT, OR UNKNOWN UNCHARTED UTILITIES ARE DISCOVERED, CONTRACTOR IS TO INFORM FERMCO CONSTRUCTION MANAGER BEFORE PROCEEDING.
3. UNLESS OTHERWISE NOTED ALL MATERIALS SHALL CONFORM TO THE STATE OF OHIO DEPARTMENT OF TRANSPORTATION (ODOT) CONSTRUCTION AND MATERIAL SPECIFICATIONS DATED JANUARY 1, 1995.
4. FOR LENGTH, SIZE, AND COORDINATES OF CULVERT PIPE SEE PIPE DETAIL 15 ON DRAWING 95X-5900-G-00221.
5. PROFILE IS FOR CENTERLINE OF ROAD. SEE PIPELINE PROFILES FOR INFORMATION ON EXTRACTION WELL PIPELINES.
6. SEE DRAWING 95X-5900-G-00252 FOR GRADING AND LOCATION, TYPICAL.

ABBREVIATIONS

℄	= CENTERLINE
LT	= LEFT
RT	= RIGHT
INTX	= INTERSECTION
STA	= STATION
EL	= ELEVATION
LC	= LENGTH OF VERTICAL CURVE
BVC	= BEGIN VERTICAL CURVE
EVC	= END VERTICAL CURVE
PI	= POINT OF INTERSECTION
HP	= HIGH POINT
LP	= LOW POINT

REF DWG NO.	DRAWING TITLE
95X-5900-X-00203	DRAWING INDEX
95X-5900-X-00204	LEGEND AND SYMBOLS
95X-5902-G-00266	INDEX MAP AND OVERALL SITE PLAN
95X-5900-G-00252	GRADING/SITE/UTILITY PLAN - SHEET 2 OF 5
95X-5900-G-00221	DETAILS - SHEET 3 OF 3

000383

REV NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	INITIALS AND DATE		
		A-E	FERMCO	DATE
0	CERTIFIED FOR CONSTRUCTION		NA	9-15-95

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
SOUTH FIELD EXTRACTION SYSTEM

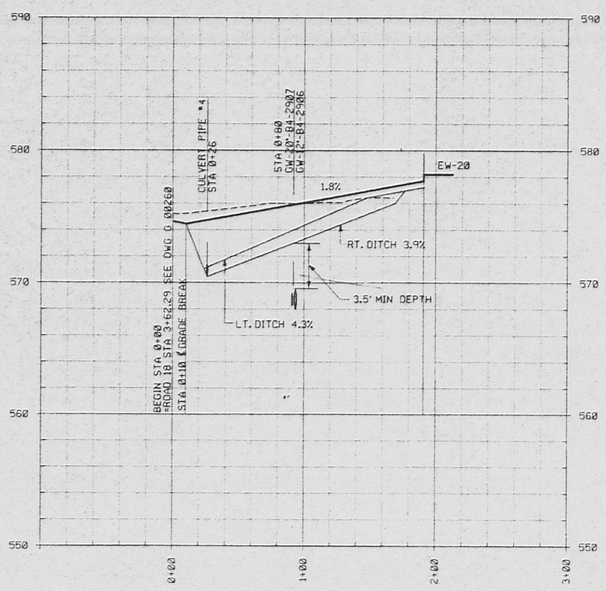
DRAWING TITLE
CIVIL
ROAD 18 PROFILE
SHEET 1 OF 3

DRAWN BY	DATE	LEAD ENGINEER	DATE	CHECKED BY	DATE
W. LIU	05/28/95		9/15/95	K. GERARD	07/31/95

PLANT/BLDG. NO.	FLOOR	SCALE	CLASS
		AS NOTED	

SUBMITTED FOR APPROVAL	FERMCO CRU APPROVAL
A.E. DATE 9-15-95	NA DATE

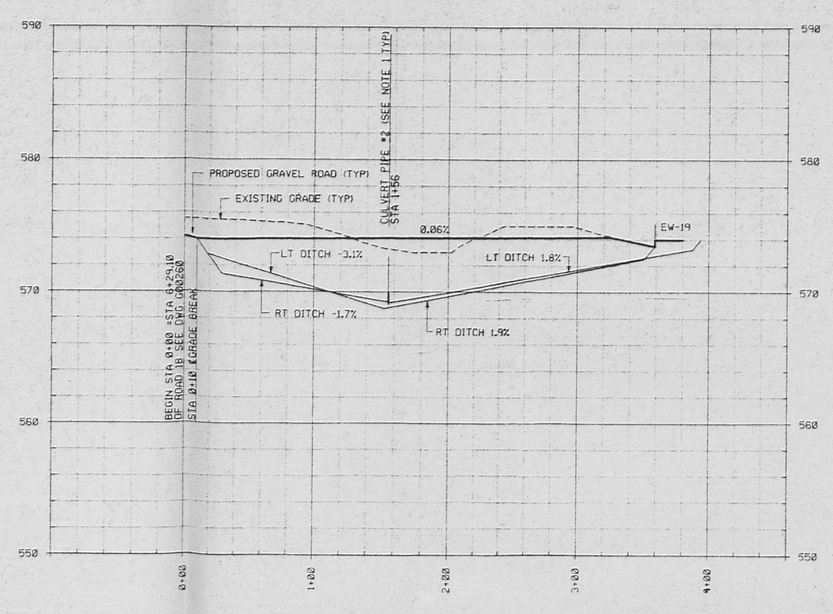
PREPARED UNDER PARSONS PROJECT UNDER NUMBER	DOE PROJECT NO.	FEMP PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
CRU5/P0126		WBS 1.1.1.1.5.3 00-90701	95X-5900-G-00260	G0012	0



ROAD 20 PROFILE

VERT: 1"= 4'

HORIZ: 1"=40'



ROAD 19 PROFILE

VERT: 1"= 4'

HORIZ: 1"=40'

GRAVEL ROAD PROFILE

VERT: 1"= 4'

HORIZ: 1"=40'

NOTES

1. FOR LENGTH, SIZE, AND COORDINATES OF CULVERT PIPE SEE PIPE DETAIL 15 ON DRAWING 95X-5900-G-00221.
2. PROFILE IS FOR CENTERLINE OF ROAD. SEE PIPELINE PROFILE FOR INFORMATION ON EXTRACTION WELL PIPELINE.
3. SEE DRAWINGS 95X-5900-G-00252 AND 95X-5900-G-00269 FOR GRADING AND LOCATION, TYPICAL.
4. SEE DRAWING 95X-5900-G-00260 FOR ABBREVIATIONS.

REF DWG NO.	DRAWING TITLE
95X-5900-X-00203	DRAWING INDEX
95X-5900-X-00204	LEGEND AND SYMBOLS
95X-5900-G-00266	INDEX MAP AND OVERALL SITE PLAN
95X-5900-G-00260	ROAD 18 PROFILE - SHEET 1 OF 3
95X-5900-G-00221	DETAILS - SHEET 3 OF 3
95X-5900-G-00252	GRADING/SITE/UTILITY PLAN - SHEET 2 OF 5
95X-5900-G-00269	GRADING/SITE/UTILITY PLAN - SHEET 5 OF 5

000384

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E INITIALS AND DATE	FERNCO INITIALS AND DATE
0	CERTIFIED FOR CONSTRUCTION	Ralph	NA 9-5-95

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

SOUTH FIELD EXTRACTION SYSTEM

DRAWING TITLE

CIVIL

ROAD 19 AND ROAD 20 PROFILES

SHEET 2 OF 3

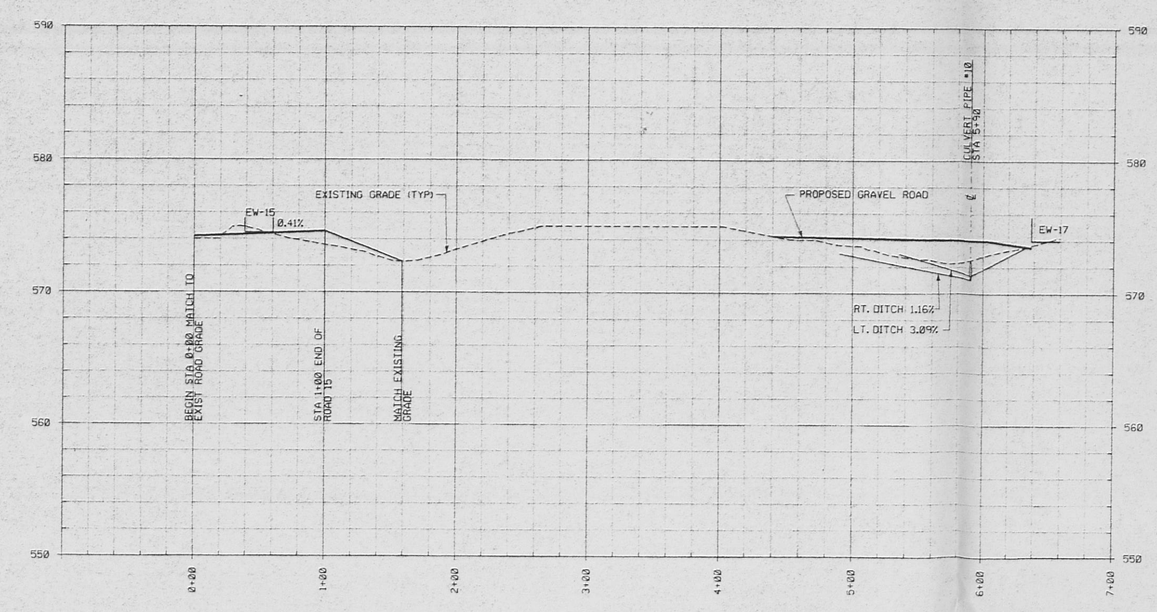
DRAWN BY	DATE	LEAD ENGINEER	DATE	CHECKED BY	DATE
W. LIU	05/28/95	Ed Schmidt	7/9/95	K. GERARD	07/31/95

PLANT/BLDG NO.	FLOOR	SCALE	CLASS
		AS SHOWN	

SUBMITTED FOR APPROVAL	FERNCO CRU APPROVAL
Ralph Parsons 9-5-95	NA
A-E DATE	DATE

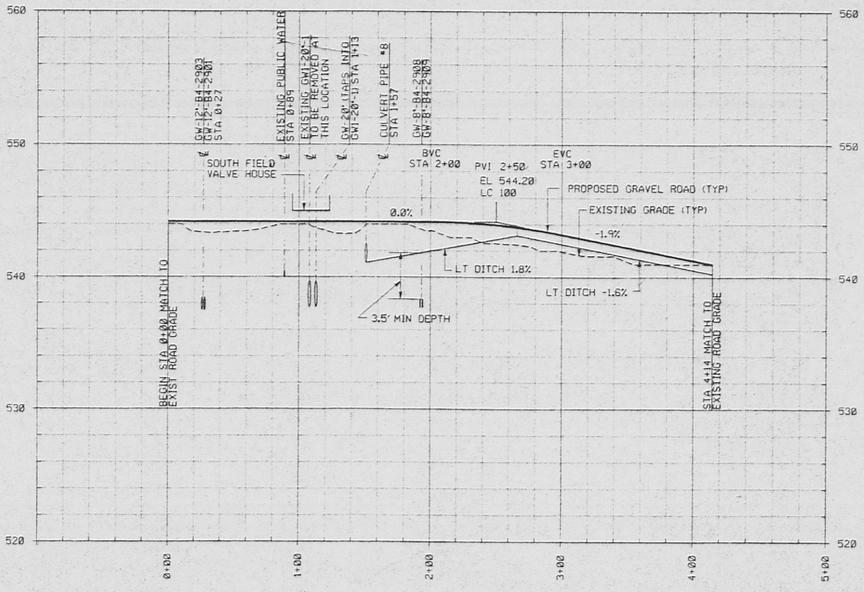
PREPARED UNDER PARSONS PROJECT ORDER NUMBER	DOE PROJECT NO.	TEMP PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
CRU5/P0126		WBS 1.1.1.1.5.3 00-90701	95X-5900-G-00261	G0013	0

7311



ROAD 15 PROFILE
VERT: 1"= 4'
HORIZ: 1"=40'

ROAD 17 PROFILE
VERT: 1"= 4'
HORIZ: 1"=40'



ROAD 16 PROFILE
VERT: 1"= 4'
HORIZ: 1"=40'

NOTES

1. FOR LENGTH, SIZE, AND COORDINATES OF CULVERT PIPE SEE PIPE DETAIL 15 ON DRAWING 95X-5900-G-00221.
2. PROFILE IS FOR CENTERLINE OF ROAD. SEE PIPELINE PROFILES FOR INFORMATION ON EXTRACTION WELL PIPELINES.
3. LOCATION AND DEPTH OF UNDERGROUND FEATURES AND UTILITIES ARE APPROXIMATE. CONTRACTOR IS TO LOCATE FEATURES AND UTILITIES PRIOR TO EXCAVATION FOR CONSTRUCTION. IF LOCATION AND DEPTH ARE DIFFERENT, OR UNKNOWN UNCHARTED UTILITIES ARE DISCOVERED, CONTRACTOR IS TO INFORM FERMCO CONSTRUCTION MANAGER BEFORE PROCEEDING.
4. SEE DRAWING 95X-5900-G-00253 FOR GRADING, TYPICAL.
5. SEE DRAWING 95X-5900-G-00260 FOR ABBREVIATIONS.

REF DWG NO.	DRAWING TITLE
95X-5900-X-00203	DRAWING INDEX
95X-5900-X-00204	LEGEND AND SYMBOLS
95X-5900-G-00266	INDEX MAP AND OVERALL SITE PLAN
95X-5900-G-00253	GRADING/SITE/UTILITY PLAN SHEET 3 OF 5
95X-5900-G-00221	DETAILS - SHEET 3 OF 3
95X-5900-G-00260	ROAD 18 PROFILE - SHEET 1 OF 3

000385

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	FERMCO	DATE
		INITIALS AND DATE		
0	CERTIFIED FOR CONSTRUCTION		NA	9-15-95

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
SOUTH FIELD EXTRACTION SYSTEM

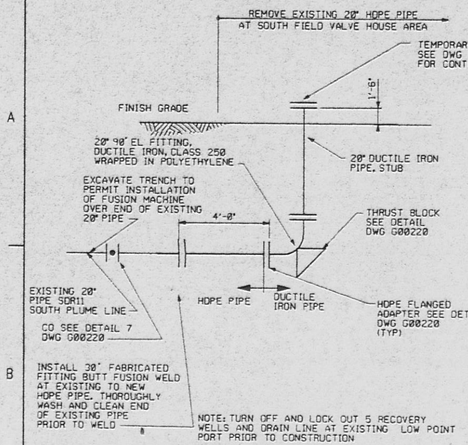
DRAWING TITLE
CIVIL
ROAD 15, ROAD 16 AND ROAD 17 PROFILES
SHEET 3 OF 3

DRAWN BY	DATE	LEAD ENGINEER	DATE	CHECKED BY	DATE
W. LIU	05/28/95		9/14/95	K. GERARD	07/31/95

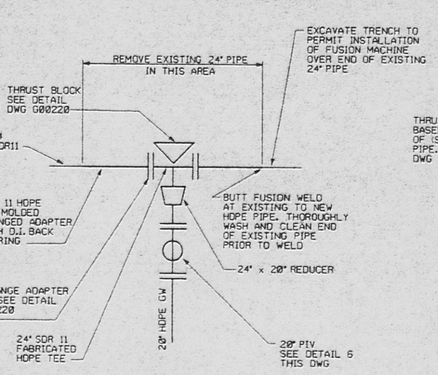
PLANT/BLDG. NO.	FLOOR	SCALE	CLASS
		AS SHOWN	

SUBMITTED FOR APPROVAL	FERMCO CRU APPROVAL
9-15-95	NA
A-E DATE	DATE

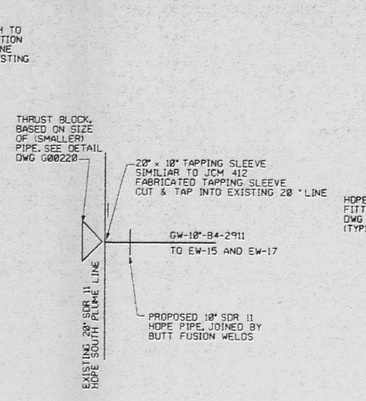
PREPARED UNDER PARSONS PROJECT ORDER NUMBER	DOE PROJECT NO.	FEMP PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
CRU5/P0126		WBS 1.1.1.1.5.3 00-90701	95X-5900-G-00262	G0014	0



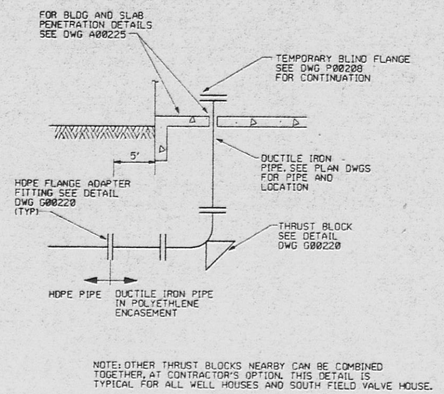
TIE-IN DETAIL 1 NTS REF G00219 G00265



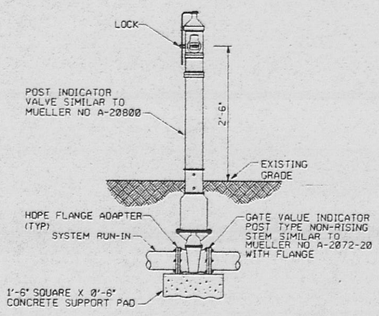
TIE-IN DETAIL 2 NTS REF G00219 G00251



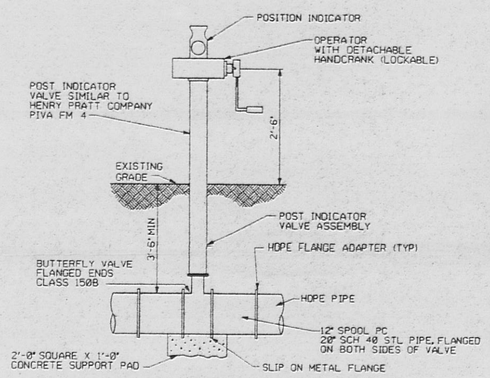
TIE-IN DETAIL 3 NTS REF G00219 G00253



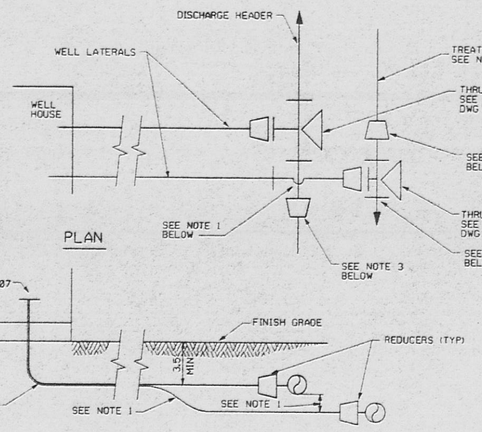
TIE-IN DETAIL 4 NTS REF G00219



POST INDICATOR VALVE DETAIL 5 NTS
LINES SIZES 12" AND LESS

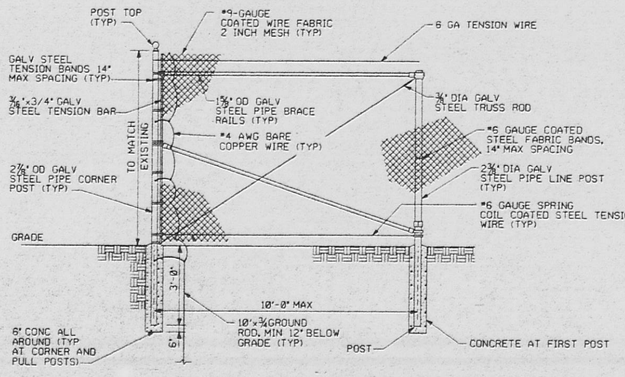


POST INDICATOR VALVE DETAIL 6 NTS
LINES SIZES 16" TO 24"

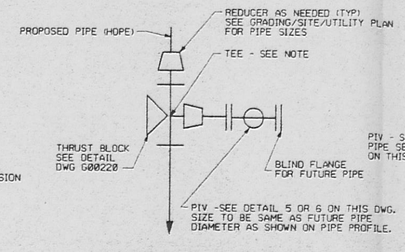


NOTE:
1. BEND TREATMENT LATERAL AND HEADER TO PROVIDE 8' CLEARANCE. MINIMUM BEND RADIUS IS 40 DIAMETERS OR AS SPECIFIED BY PIPE MANUFACTURER.
2. THE DISCHARGE HEADER IS NOT ALWAYS CLOSER TO WELL HOUSE. REFER TO SITE/GRADING/UTILITY PLAN FOR EACH TIE-IN.
3. REDUCERS MAY BE REQUIRED UPSTREAM OF TEE. TEE SIZE SHALL MATCH DOWNSTREAM PIPE SIZE. SEE P&ID DWGS N00190 AND N00191.
4. FOR EW-13 AND EW-14, THE DIRECTION OF THE DISCHARGE AND TREATMENT FLOWS ARE THE SAME.

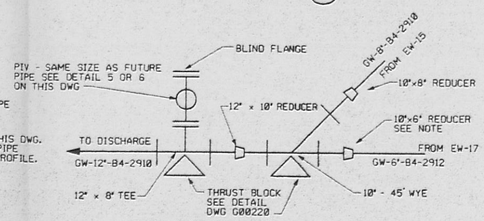
TIE-IN DETAIL 12 NTS G00219



PULL POST FENCE DETAIL
NTS



TIE-IN DETAIL 13 NTS REF G00219 G00251



TIE-IN DETAIL 14 NTS REF G00219 G00253

NOTES

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 3000 PSI AS STATED IN SPECIFICATION SECTION 03001.

ABBREVIATIONS

HDPE	HIGH DENSITY POLYETHYLENE
DI	DUCTILE IRON
PIV	POST INDICATOR VALVE
CO	CLEANOUT

REF DWG NO.	DRAWING TITLE
95X-5900-X-00203	DRAWING INDEX
95X-5900-X-00204	LEGEND AND SYMBOLS
95X-5900-A-00225	ARCHITECTURAL - SECTIONS AND DETAILS
95X-5900-G-00251	GRADING/SITE/UTILITY PLAN - SHEET 1 OF 5
95X-5900-G-00253	GRADING/SITE/UTILITY PLAN - SHEET 3 OF 5
95X-5900-G-00265	ENLARGED GRADING/SITE/UTILITY PLAN
95X-5900-G-00220	DETAILS SHEET 2 OF 3
95X-5900-P-00208	WELL HOUSE PIPING PLAN
95X-5900P-00233	PIPING SECTION
95X-5900-N-00190	PIPING AND INSTRUMENTATION DIAGRAM SHEET 1 OF 2
95X-5900-N-00191	PIPING AND INSTRUMENTATION DIAGRAM SHEET 2 OF 2

000386

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E INITIALS	FERNCO INITIALS	DATE
0	CERTIFIED FOR CONSTRUCTION		NA	9-15-95

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

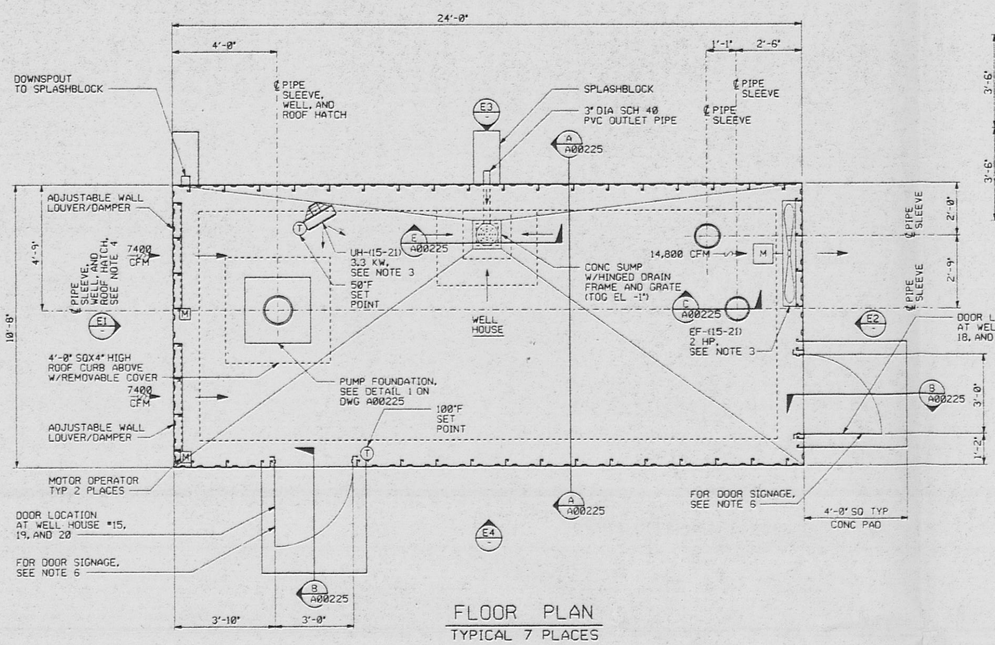
THIS DRAWING PREPARED BY
PARSONS
THE RALPH M. PARSONS CO. - PARSONS MAIN, INC. - ENGINEERING-SCIENCE, INC.
CINCINNATI, OHIO

PROJECT NAME
SOUTH FIELD EXTRACTION SYSTEM

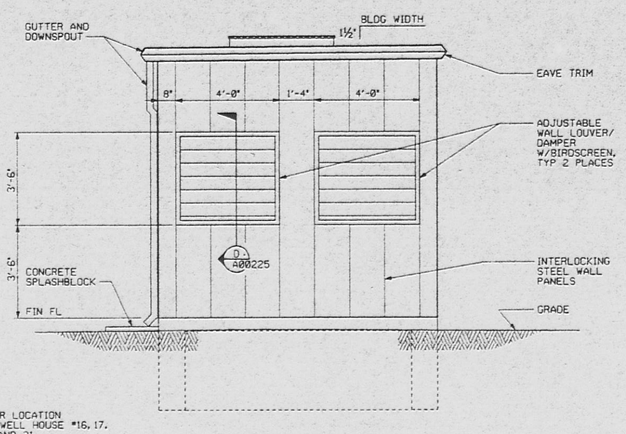
DRAWING TITLE
CIVIL DETAILS SHEET 1 OF 3

DRAWN BY	DATE	LEAD ENGINEER	DATE	CHECKED BY	DATE
D. REED	05-24-95	Ed Kuhnert	9/12/95	K. GERARD	07-29-95
PLANT/BLDG. NO.		FLOOR		SCALE: NONE	CLASS
SUBMITTED FOR APPROVAL: Paul Bratton 9-15-95		FERNCO CRU APPROVAL: NA			
A-E	DATE				

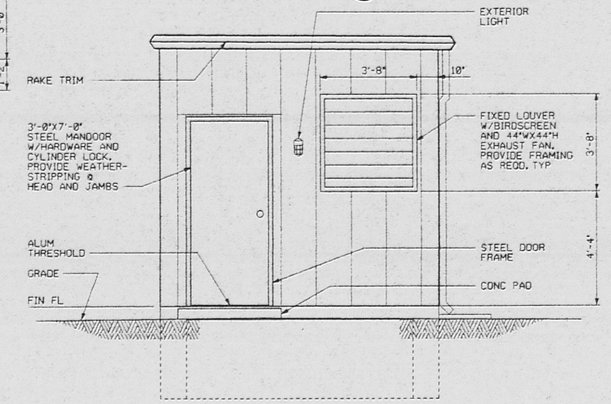
PREPARED UNDER PARSONS PROJECT ORDER NUMBER	DOE PROJECT NO.	TEMP PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
CRU5/P0126		WBS 1.1.1.5.3 00-90701	95X-5900-G-00219	G0015	0



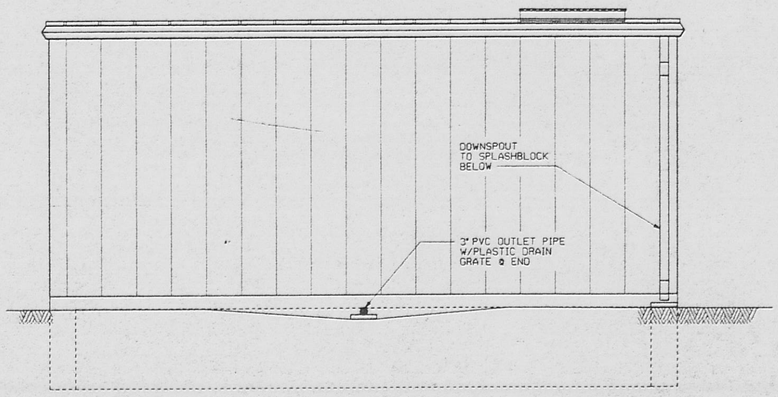
FLOOR PLAN
TYPICAL 7 PLACES



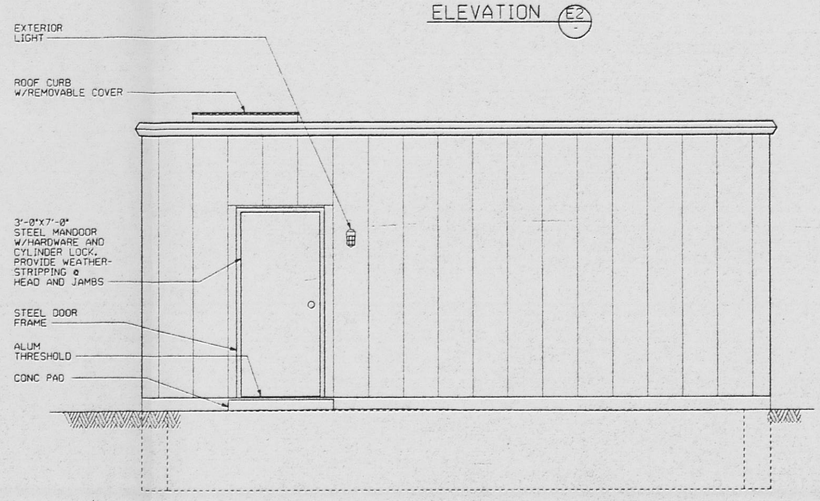
ELEVATION E1



ELEVATION E2



ELEVATION E3



ELEVATION E4

NOTES

1. SEE SPECIFICATION SECTION 15500 FOR EXHAUST FAN AND UNIT HEATER.
2. THE ADJUSTABLE LOUVER/DAMPER MOTOR OPERATORS SHALL BE INTERLOCKED WITH THE EXHAUST FAN.
3. THE EXHAUST FAN AND UNIT HEATER SHALL HAVE THE SAME EQUIPMENT TAG NUMBER AS THE WELL HOUSE NUMBER. ALL UNIT HEATERS SHALL BE INSTALLED A MINIMUM OF 6'-8" CLEAR ABOVE FINISH FLOOR.
4. SEE CIVIL DRAWINGS 95X-5900-G-00252, 95X-5900-G-00253, AND 95X-5900-G-00265 FOR CENTERLINE OF WELL COORDINATES. LOCATE WELL HOUSE BASED ON THESE COORDINATES.
5. ARCHITECTURAL LAYOUT BASED ON PARKLINE PRE-ENGINEERED BUILDING. FOUNDATION MAY BE MODIFIED FOR OTHER SELECTED VENDOR.
6. PROVIDE DOOR SIGNAGE AS REQUIRED BY FERMCO SITE PROCEDURE ED-12-4016, EQUIPMENT AND PIPING LABELING, DATED AUGUST 10, 1995. SIGNAGE ON EACH BUILDING TO INDICATE NAME AND NUMBER OF WELL.

REF DWG NO.	DRAWING TITLE
95X-5900-X-00203	DRAWING INDEX
95X-5900-X-00204	LEGEND AND SYMBOLS
95X-5900-G-00252	GRADING/SITE/UTILITY PLAN - SHEET 2 OF 5
95X-5900-G-00253	GRADING/SITE/UTILITY PLAN - SHEET 3 OF 5
95X-5900-G-00265	ENLARGED GRADING/SITE/UTILITY PLANS
95X-5900-A-00225	SECTIONS AND DETAILS

000389

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	FERMCO	DATE
		INITIALS AND DATE		
0	CERTIFIED FOR CONSTRUCTION		N/A	5-15-95

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

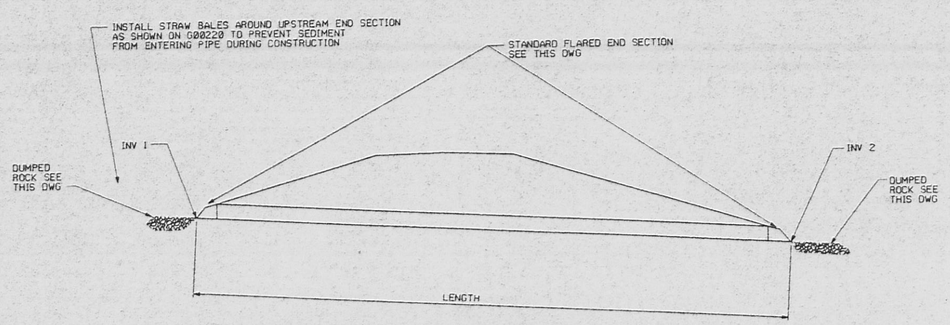
PROJECT NAME
SOUTH FIELD EXTRACTION SYSTEM

DRAWING TITLE
ARCHITECTURAL
PLAN AND ELEVATIONS
WELL HOUSE NO. 15, 16, 17, 18, 19, 20, AND 21

DRAWN BY	DATE	LEAD ENGINEER	DATE	CHECKED BY	DATE
K.L. RABBITT	05/24/95		7/11/95	A.W. SCHATZ	08/01/95
PLANT/BLDG. NO.		FLOOR		SCALE	CLASS
				1/2"=1'-0"	

SUBMITTED FOR APPROVAL	FERMCO CRU APPROVAL
A-E DATE 5-15-95	N/A DATE

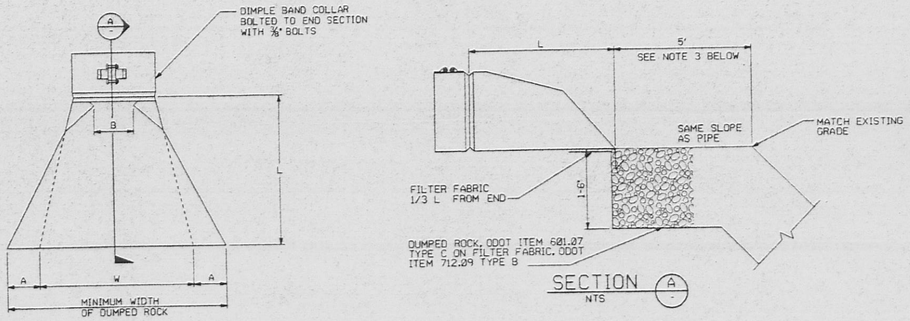
PREPARED UNDER PARSONS PROJECT ORDER NUMBER	A-E DATE	FEMP PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
CRU5/P0126		WBS 1.1.1.1.5.3 00-90701	95X-5900-A-00224	A0001	0



NOTE: ALL STORM DRAIN PIPE TO BE CORRUGATED METAL PIPE WITH ANNULAR CORRUGATION, 14 GAUGE PER ODOT ITEM 707.04 UNLESS STATED OTHERWISE.

	SIZE (IN)	LENGTH (FT)	INV 1 COORDINATE	INV 1 ELEV.	INV 2 COORDINATE	INV 2 ELEV.
PIPE 1	36	168	N 477244.6, E 1349466.3,	569.5	N 477228.6, E 1349298.7,	553.5
PIPE 2	12	69	N 477407.5, E 1349255.3,	569.2	N 477338.4, E 1349248.5,	568.7
PIPE 3	18	61	N 477748.8, E 1349514.6,	569.2	N 477755.5, E 1349454.1,	566.0
PIPE 4	12	56	N 477588.2, E 1349429.3,	570.9	N 477643.1, E 1349437.6,	570.7
PIPE 5	12	NOT USED	----------		----------	
PIPE 6	12	59	N 476748.3, E 1349175.8,	572.5	N 476716.8 E 1349126.5,	568.9
PIPE 7	12	59	N 476484.6, E 1349297.0,	574.5	N 476475.1, E 1349239.2,	570.8
PIPE 8	18	58	N 477117.5, E 1348330.3,	541.3	N 477059.9, E 1348323.5,	540.8
PIPE 9	15	NOT USED	----------		----------	
PIPE 10	18	53	N 477859.9, E 1348792.2,	571.4	N 477839.9, E 1348840.7,	571.0

PIPE DETAIL (15) G00221 — REF G00252 G00253 G00269



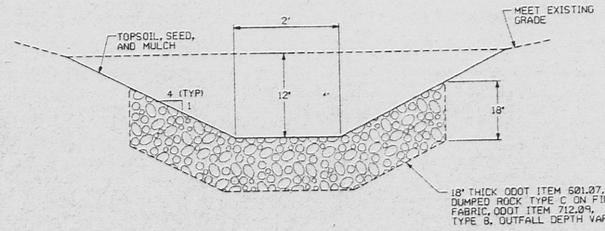
PLAN
NTS

SECTION (A)
NTS

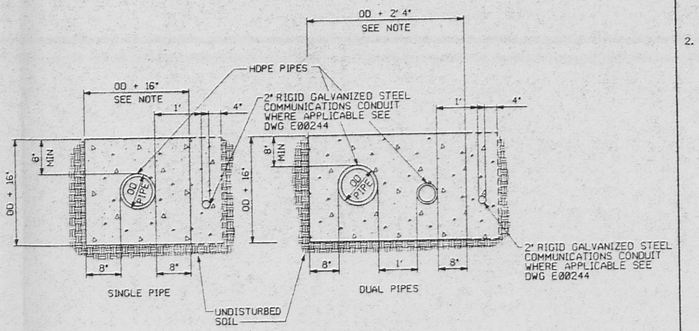
STANDARD FLARED END SECTION DETAIL (11) G00221 — REF G00252 G00253 G00269

1. INSTALL PER MANUFACTURER'S INSTRUCTIONS.
2. MATERIAL TO BE GALVANIZED STEEL.
3. LENGTH OF DUMPED ROCK IS 5' UNLESS NOTED OTHERWISE ON SITE/GRADING/UTILITY PLAN
4. DIMENSIONS, IN INCHES, ARE AS FOLLOWS:

12" DIA	15" DIA	18" DIA	36" DIA
A=6.5 (1'±)	A=7.5 (1'±)	A=8 (1'±)	A=14.5 (1'±)
L=21 (1.5'±)	L=26 (1.5'±)	L=31 (1.5'±)	L=60 (1.5'±)
W=24 (2'±)	W=30 (2'±)	W=36 (2'±)	W=72 (2'±)
B=6.5 MAX	B=8 MAX	B= 8 MAX	B= 12 MAX

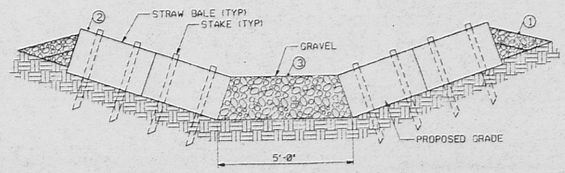


OUTFALL CHANNEL SECTION DETAIL (16) G00221 — REF G00252 G00253 G00269



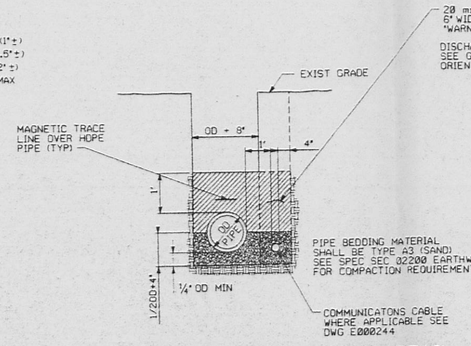
NOTE: WITHOUT COMMUNICATION CONDUITS

CONCRETE ENCASEMENT DETAIL (10) G00221 — REF G00251 thru G00253
NTS

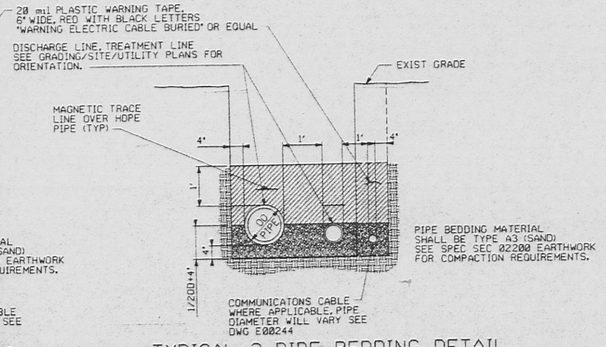


① ODOT ITEM 304 STABILIZED CRUSHED AGGREGATE (2-6" COURSES) ON FILTER FABRIC, ODOT ITEM 712. TYPE D.
② INSTALL STRAW BALE AS SHOWN ON G00220.
③ GRAVEL TO BE ODOT ITEM 601.07, TYPE C TOP WIDTH TO BE SAME AS STRAW BALES.

GRAVEL EROSION CONTROL DETAIL
NTS



TYPICAL PIPE BEDDING DETAIL
NTS



TYPICAL 2 PIPE BEDDING DETAIL
NTS

NOTES

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 3000 PSI AS SPECIFIED IN THE SPECIFICATIONS.

REF DWG NO.	DRAWING TITLE
95X-5900-X-00203	DRAWING INDEX
95X-5900-X-00204	LEGEND AND SYMBOLS
95X-5900-G-00220	DETAILS SHEET 2 OF 3
95X-5900-G-00251	GRADING/SITE/UTILITY PLAN - SHEET 1 OF 5
95X-5900-G-00252	GRADING/SITE/UTILITY PLAN - SHEET 2 OF 5
95X-5900-G-00253	GRADING/SITE/UTILITY PLAN - SHEET 3 OF 5
95X-5900-G-00269	ENLARGED GRADING/SITE/UTILITY PLANS
95X-5900-E-00244	POWER PLAN - 13.2KV DISTRIBUTION

000388

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A/E INITIALS	FERNCO INITIALS	DATE
0	CERTIFIED FOR CONSTRUCTION		NA	9-15-95

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
SOUTH FIELD EXTRACTION SYSTEM

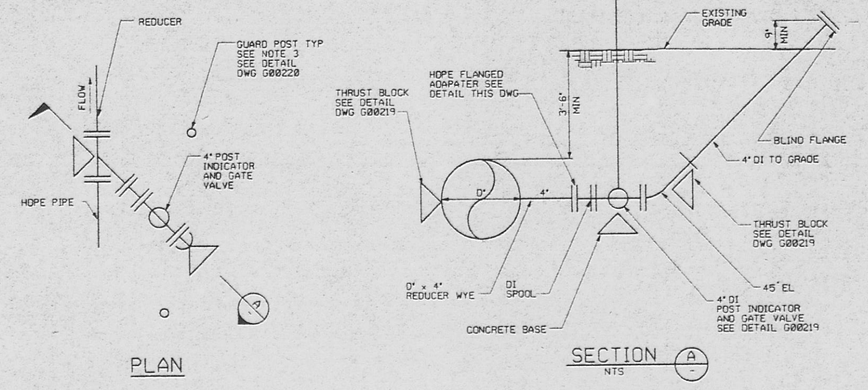
DRAWING TITLE
CIVIL
DETAILS
SHEET 3 OF 3

DRAWN BY	DATE	LEAD ENGINEER	DATE	CHECKED BY	DATE
DJREED	05-24-95	Ed Richards	9/15/95	K. GERARD	08-01-95

PLANT/BLDG NO.	FLOOR	SCALE	CLASS
		NONE	

SUBMITTED FOR APPROVAL	FERNCO CRU APPROVAL	
A/E DATE	NA DATE	

PREPARED UNDER PARSONS PROJECT ORDER NUMBER	DOE PROJECT NO.	ITEM PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
CRU5/P0126		WBS 1.1.1.1.5.3 00-90701	95X-5900-G-00221	G0017	0

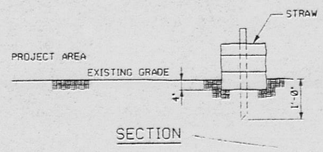


PLAN

SECTION (A) NTS

TYPICAL CLEANOUT DETAIL

NTS (7) REF G00220 G00251 thru G00254, and G00265

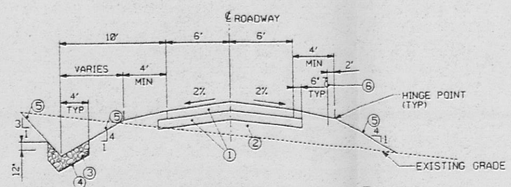


SECTION

NOTE:
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.

STRAW BALE EROSION CONTROL DETAIL

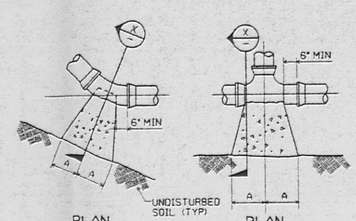
NTS



CRUSHED AGGREGATE PAVING DETAIL

NTS

① ODOT ITEM 304 STABILIZED CRUSHED AGGREGATE (2-6" COURSES) ON FILTER FABRIC, ODOT ITEM 712, TYPE D.
② COMPACT SUBGRADE AND EMBANKMENT AS PER THE SPECIFICATIONS.
③ ODOT ITEM 703, AASHTO M43 SIZE NO.1 AGGREGATE UNLESS SHOWN OTHERWISE
④ FILTER FABRIC, ODOT ITEM 712.09, TYPE B
⑤ TOPSOIL, SEED AND MULCH ALL NON-AGGREGATE SURFACES.
⑥ FOR GUARD RAIL SEE DETAIL THIS DRAWING. BACK OF POST SHALL BE 2' FROM HINGE POINT.

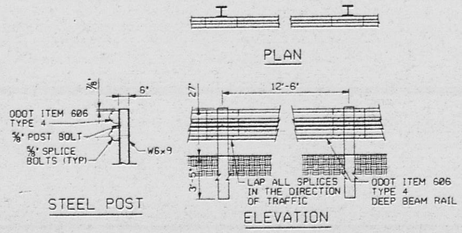


TYPE	SIZE	⅛ BENDS A	⅛ BENDS B	¼ BENDS A	¼ BENDS B	½ BENDS A	½ BENDS B	TEES A	TEES B	PLUGS C	PLUGS D
2000 PSF SOIL	6"	15"	10"	9"	10"	5"	8"	10"	12"	10"	21"
	8"	22"	13"	12"	13"	8"	10"	13"	16"	12"	29"
	10"	26"	17"	14"	17"	10"	13"	16"	20"	14"	36"
	12"	29"	21"	16"	21"	11"	16"	18"	24"	15"	41"
	16"	38"	27"	-	-	-	-	24"	30"	-	-
	20"	42"	30"	-	-	-	-	27"	30"	-	-
	24"	48"	30"	-	-	-	-	36"	30"	-	-

NOTE: BASED ON 150 PSI STATIC PRESSURE PLUS A.W.W.A. WATER HAMMER, ALL BEARING SURFACES TO BE CARRIED TO UNDISTURBED GROUND.

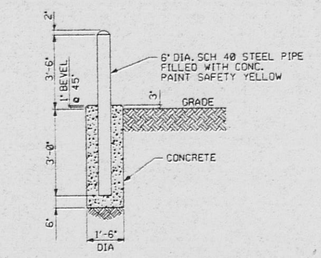
THRUST BLOCK DETAILS

NTS



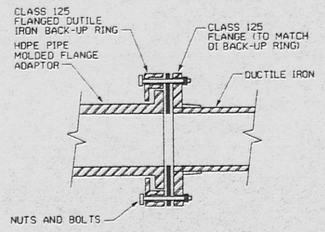
GUARD RAIL DETAIL

NTS



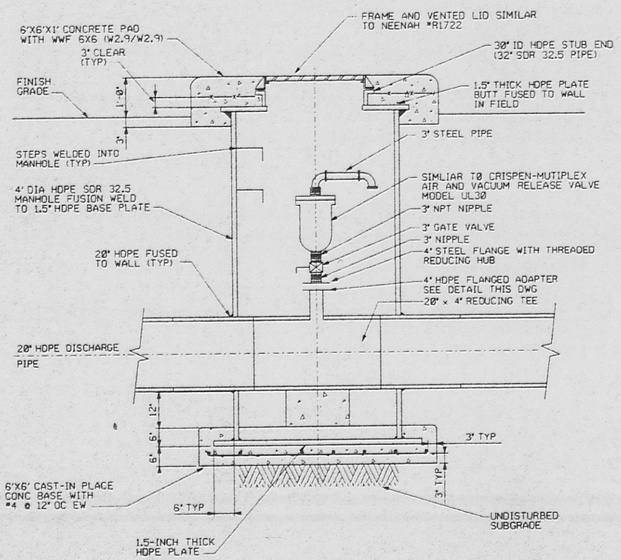
TYPICAL EXTERIOR GUARD POST DETAIL

NTS



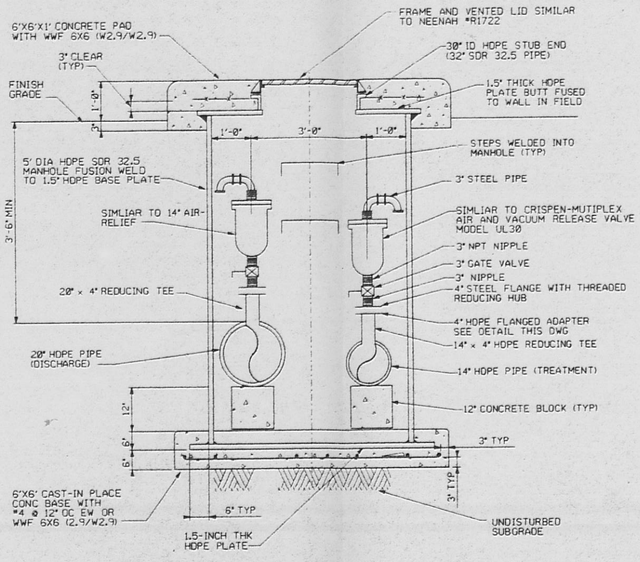
HDPE FLANGE ADAPTER DETAIL

NTS



AIR-RELIEF MANHOLE DETAIL

NTS (8) REF G00220 G00251



AIR-RELIEF MANHOLE DETAIL

NTS (9) REF G00220 G00252

NOTES

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 3000 PSI AS SPECIFIED IN THE SPECIFICATIONS.
3. GUARD POST SHALL BE 2' FROM POST INDICATOR VALVE BUT NOT OVER THE PIPE. LOCATION SHALL BE FIELD DETERMINE.

REF DWG NO.	DRAWING TITLE
95X-5900-X-00203	DRAWING INDEX
95X-5900-X-00204	LEGEND AND SYMBOLS
95X-5900-G-00251	GRADING/SITE/UTILITY PLAN - SHEET 1 OF 5
95X-5900-G-00252	GRADING/SITE/UTILITY PLAN - SHEET 2 OF 5
95X-5900-G-00253	GRADING/SITE/UTILITY PLAN - SHEET 3 OF 5
95X-5900-G-00254	GRADING/SITE/UTILITY PLAN - SHEET 4 OF 5
95X-5900-G-00265	ENLARGED GRADING/SITE/UTILITY PLANS
95X-5900-G-00219	DETAILS - SHEET 1 OF 3
95X-5900-G-00220	DETAILS - SHEET 2 OF 3

000387

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E INITIALS AND DATE	FERNCO	DATE
0	CERTIFIED FOR CONSTRUCTION		NA	9-15-95

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
SOUTH FIELD EXTRACTION SYSTEM

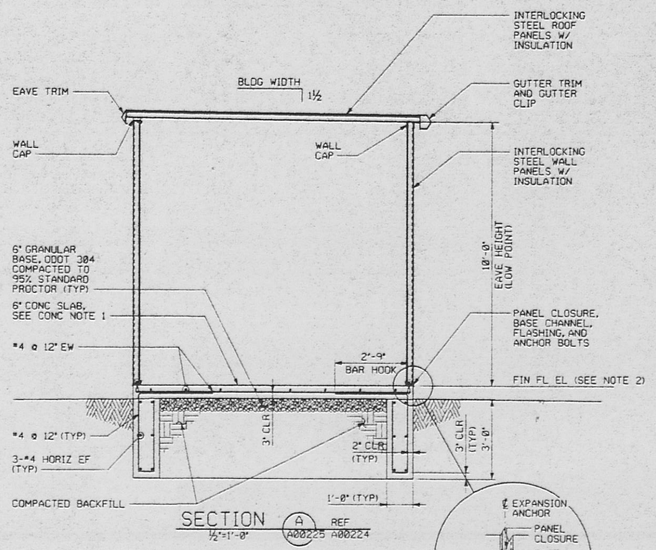
DRAWING TITLE
CIVIL
DETAILS
SHEET 2 OF 3

DRAWN BY	DATE	LEAD CHECKER	DATE	CHECKED BY	DATE
D.REED	05-24-95	[signature]	9/14/95	K. GERARD	07-29-95

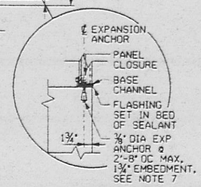
PLANT/BLDG NO.	FLOOR	SCALE	CLASS
		NONE	

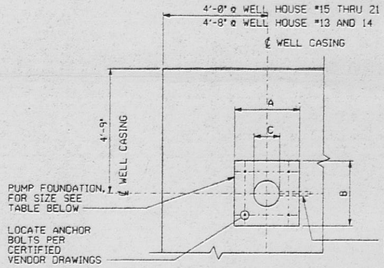
SUBMITTED FOR APPROVAL [signature] 9-15-95 (A-E DATE)
FERNCO CRU APPROVAL NA (DATE)

PREPARED UNDER PARSONS PROJECT ORDER NUMBER	DOE PROJECT NO.	FEMP PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
CRU5/P0126		WBS 1.1.1.1.5.3 00-90701	95X-5900-G-00220	G0016	0

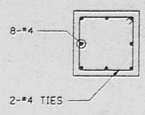


SECTION A REF A00225 A00224
1/2"=1'-0"

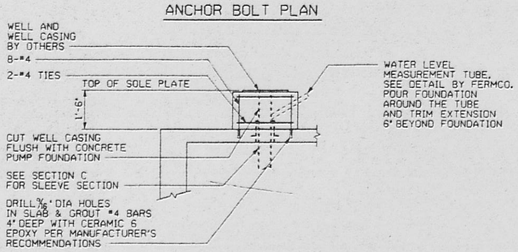




ANCHOR BOLT PLAN



REINFORCING PLAN



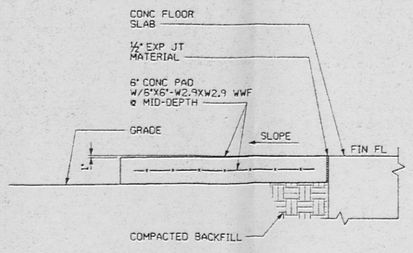
SECTION

DETAIL 1 REF A00225 A00224 A00226
½"=1'-0"

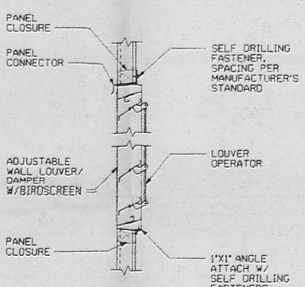
PUMP FOUNDATION TABLE

WELL HOUSE NUMBER	A	B	C (WELL CASING ID)	PUMP DISCHARGE	EXPANSION BOLT SIZE	SOLE PLATE SIZE
13 THRU 21	2'-5"	2'-5"	12"	6" DIA	⅝" DIA	1'-9"X1'-9"X⅜"

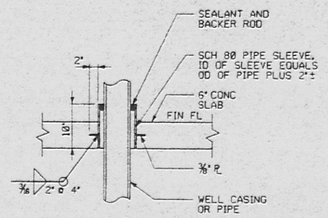
MOLD FOR CERTIFIED VENDOR DRAWINGS



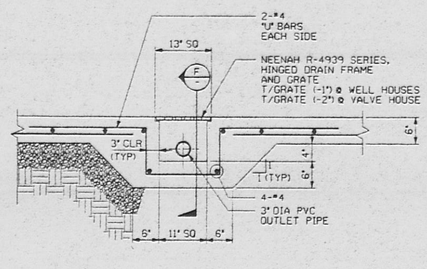
SECTION B REF A00225 A00224
1"=1'-0"



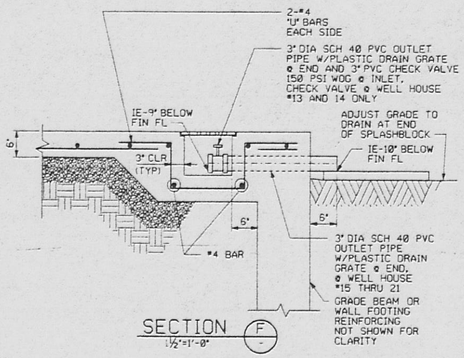
SECTION D REF A00225 A00224
1½"=1'-0"



TYP PIPE SLEEVE SECTION C REF A00225 A00224
1"=1'-0"



SECTION E REF A00225 A00224 A00226 A00228
1½"=1'-0"



SECTION F
1½"=1'-0"

NOTES

1. FOR GROUNDING SYSTEM CONNECTION TO REINFORCEMENT, SEE DRAWING 95X-5900-E-00245.
2. SEE CIVIL DRAWINGS 95X-5900-G-00252, 95X-5900-G-00253, AND 95X-5900-G-00255 FOR FINISH FLOOR ELEVATION OF WELL HOUSES.

GENERAL CONCRETE NOTES

1. DESIGN, MATERIAL AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH SPECIFICATION SECTION 03001.
2. CONCRETE FOR SLAB ON GRADE SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 4000 PSI AT 28 DAYS. CONCRETE FOR FOUNDATIONS AND MISCELLANEOUS PADS SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 3000 PSI AT 28 DAYS.
3. REINFORCING STEEL SHALL CONFORM TO ASTM SPECIFICATION A-615, GRADE 60.
4. FOUNDATION DESIGN IS BASED ON ASSUMED NET SOIL BEARING PRESSURE ALLOWABLE OF 2000 PSF. SITE SPECIFIC GEOLOGICAL INVESTIGATION WAS NOT PERFORMED. IF ANY SOFT, WET, ORGANIC OR LOOSE SOIL OR ANY OLD FILL IS ENCOUNTERED, THE FERMCO CONSTRUCTION MANAGER SHALL BE INFORMED AND THE CONDITIONS RESOLVED BEFORE CONTINUATION OF CONCRETE WORK.
5. ANCHOR BOLTS FOR PRE-ENGINEERED BUILDING COLUMNS AS SHOWN WERE DETERMINED USING PARKLINE BUILDING CATALOG INFORMATION. FOUNDATION SIZES, PIER SIZES AND ANCHOR BOLT LOCATIONS SHALL BE CONFIRMED BY SELECTED PRE-ENGINEERED BUILDING VENDOR'S CERTIFIED DRAWINGS, BEFORE CONSTRUCTION OF THE FOUNDATION.
6. PAD SIZES AND ANCHOR BOLT REQUIREMENTS FOR PUMPS WILL BE CONFIRMED WITH CERTIFIED VENDOR DRAWINGS BEFORE CONSTRUCTION.
7. HOLD PLAN DIMENSION OF CONCRETE FOUNDATION +¼", -0" FOR ANCHOR BOLT EDGE DISTANCE REQUIREMENTS.

REF DWG NO.	DRAWING TITLE
95X-5900-X-00203	DRAWING INDEX
95X-5900-X-00204	LEGEND AND SYMBOLS
95X-5900-G-00252	GRADING/SITE/UTILITY PLAN
95X-5900-G-00253	GRADING/SITE/UTILITY PLAN
95X-5900-G-00265	ENLARGED GRADING/SITE/UTILITY PLANS
95X-5900-A-00224	PLAN AND ELEVATIONS
95X-5900-A-00226	PLANS
95X-5900-E-00245	WELL HOUSE AND VALVE HOUSE POWER AND 120V DISTRIBUTION PLANS

0C0390

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E INITIALS AND DATE	FERMCO INITIALS AND DATE
0	CERTIFIED FOR CONSTRUCTION		N/A 9-15-95

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
SOUTH FIELD EXTRACTION SYSTEM

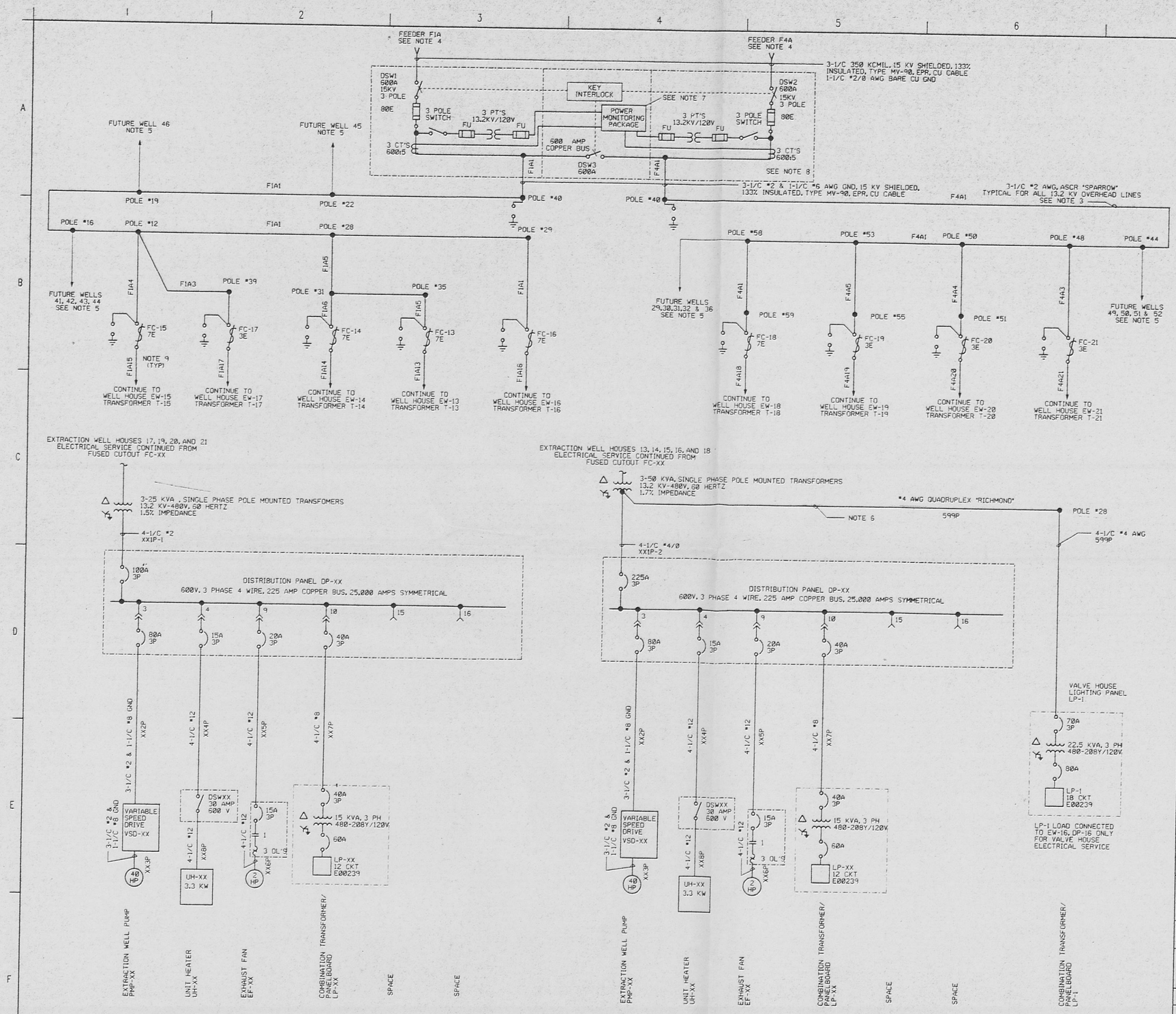
DRAWING TITLE
ARCHITECTURAL
SECTIONS AND DETAILS
WELL HOUSE NO. 15, 16, 17, 18, 19, 20, AND 21

DRAWN BY	DATE	LEAD ENGINEER	DATE	CHECKED BY	DATE
K.L. RABBITT	06/06/95		9/14/95	A.W. SCHATZ	08/01/95

PLANT/BLDG. NO.	FLOOR	SCALE	CLASS
		AS SHOWN	

SUBMITTED FOR APPROVAL 9-15-95
FERMCO GRU APPROVAL N/A
A-E DATE

DOE PROJECT NO.	TEMP PROJECT NO.	DRAWING ORDER CODE NO.	SHEET NO.	REV. NO.
PREPARED UNDER PARSONS PROJECT ORDER NUMBER CRU5/P0126	WBS 1.1.1.1.5.3 00-90701	95X-5900-A-00225	A0002	0



SINGLE LINE CONFIGURATION FOR EXTRACTION WELL HOUSES 17, 19, 20, AND 21

SINGLE LINE CONFIGURATION FOR EXTRACTION WELL HOUSES 13, 14, 15, 16, AND 18

NOTES

1. "XX" REPRESENTS THE CORRESPONDING EXTRACTION WELL HOUSE NUMBER.
2. SEE DRAWING 95X-5900-E-00244 FOR 13.2 KV POWER PLAN AND DRAWING 95X-5900-E-00245 FOR EXTRACTION WELL HOUSE POWER PLANS.
3. SEE DRAWING 95X-5900-E-00242 FOR CABLE SCHEDULE.
4. DOUBLE LUG SOUTHFIELD EXTRACTION SYSTEM FEEDERS WITH EXISTING LINE SIDE INCOMING FEEDERS TO SUBSTATION N18-1 PRIMARY BUS. SEE SECTION F, DRAWING. 95X-5900-E-00240.
5. SOUTH FIELD SWITCHGEAR AND CABLES F1A1 AND F4A1 HAVE BEEN SIZED TO INCLUDE FUTURE WELL HOUSE LOADS.
6. 480 VOLT FEED FOR THE VALVE HOUSE SHALL BE OBTAINED FROM THE SECONDARY OF TRANSFORMER T-16, WHICH PROVIDES POWER TO THE WELL HOUSE, EW-16.
7. PROVIDE POWER MONITOR PACKAGE WITH CT'S AND PT'S AS REQUIRED.
8. FAULT DUTY FOR DSW1, DSW2, AND DSW3 IS 25,000 AMPS SYMMETRICAL, 3 PHASE, MINIMUM.
9. FAULT DUTY IS 10,000 AMPS SYMMETRICAL, 3 PHASE, MINIMUM.

REF DWG NO.	DRAWING TITLE
95X-5900-X-00203	DRAWING INDEX
95X-5900-E-00244	13.2KV DISTRIBUTION & COMMUNICATIONS PLAN
95X-5900-E-00245	WELL HOUSE AND VALVE HOUSE POWER AND 120V DISTRIBUTION PLANS
95X-5900-E-00239	PANEL SCHEDULES
95X-5900-E-00242	CABLE SCHEDULE - SHEET 1
95X-5900-E-00240	15KV SWITCHGEAR AND DETAILS

000404

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	FERNCO	DATE
Ø	CERTIFIED FOR CONSTRUCTION	INITIALS AND DATE	NA	9-15-95

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
SOUTH FIELD EXTRACTION SYSTEM

DRAWING TITLE
ELECTRICAL
SINGLE LINE DIAGRAM

DRAWN BY	DATE	LEAD ENGINEER	DATE	CHECKED BY	DATE
B. JASPER	06/21/95		9/15/95	J.L. COOPER	08/02/95

PLANT/BLDG NO.	FLOOR	SCALE	CLASS
		NONE	

SUBMITTED FOR APPROVAL	FERNCO CRU APPROVAL
A-E DATE 9-15-95	NA

PREPARED UNDER PARSONS PROJECT ORDER NUMBER	DOE PROJECT NO.	TEMP PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
CRU5/P0126		WBS 1.1.1.1.5.3.1 00-90701	95X-5900-E-00235	E0003	Ø

E-7311

ELECTRICAL PLAN SYMBOLS

SWITCH AND RECEPTACLE SYMBOLS

- SWITCH, SINGLE POLE, WALL MOUNTED FLUSH
- SWITCH, THREE-WAY
- SWITCH, FOUR-WAY
- INDICATES DISTRIBUTION PANEL AND CIRCUIT BREAKER NUMBER FROM WHICH POWER IS SUPPLIED (TYPICAL)
- SINGLE RECEPTACLE
- SINGLE RECEPTACLE, WP = WEATHER PROOF
- DUPLEX RECEPTACLE, G = GROUND FAULT TYPE (GFCI)
- WELDING OR POWER RECEPTACLE
- DISCONNECT SWITCH WITH AMP RATING
- TRANSFORMER WITH KVA RATING
- THERMOSTAT

LIGHTING SYMBOLS

- FLUORESCENT FIXTURE
- WALL MOUNTED FLUORESCENT LIGHT FIXTURE, WITH INDIVIDUAL PHOTOCELL CONTROL, SUITABLE FOR OUTDOOR AND WET LOCATIONS, LAMP WATTAGE AS SHOWN
- TWO-LAMP EMERGENCY EGRESS LIGHT FIXTURE WITH RECHARGEABLE BATTERIES
- EXIT LIGHT
- CEILING OR PENDANT MOUNTED HIGH PRESSURE SODIUM LIGHT, WITH WIDE BEAM SPREAD, LOWBAY TYPE, FULLY ENCLOSED, LAMP WATTAGE AS SHOWN
- POLE MOUNTED, WITH PHOTO CONTROL HIGH PRESSURE SODIUM FLOOD LIGHT, WITH LAMP WATTAGE AS SHOWN
- STANCHION MOUNTED INCANDESCENT LIGHT WITH LAMP WATTAGE AS SHOWN
- WALL MOUNTED INCANDESCENT LIGHT WITH LAMP WATTAGE SHOWN

COMMUNICATIONS SYMBOLS

- PUBLIC ADDRESS SPEAKER WITH SINGLE HORN.
- PUBLIC ADDRESS SPEAKER WITH DUAL HORN.
- PUBLIC ADDRESS SPEAKER FLUSH CEILING MOUNTED
- TELEPHONE OUTLET
- BELL
- HORN
- EVACUATION SYSTEM HORN/SPEAKER

FIRE ALARM SYMBOLS

- SD — SMOKE DETECTOR
- HD — HEAT DETECTOR
- MS — MANUAL PULL STATION
- LP — LIGHTNING PROTECTOR
- H — HORN
- TS — TAMPER SWITCH
- FS — FLOW SWITCH

GROUNDING SYMBOLS

- GROUNDING CABLE EXPOSED
- GROUNDING CABLE EMBEDDED OR DIRECT BURIED
- GROUNDING CONNECTION
- GROUNDING ROD CONNECTION TO GROUNDING CABLE
- GROUNDING ROD TEST WELL, BOLTED CONNECTIONS TO GROUNDING CABLE
- GROUNDING CABLE WITH PARALLEL TAP TO TO STUB-UP WITH PIGTAIL

CABLE TRAY SYMBOLS

- COVER
- CABLE TRAY - END VIEW
- CABLE TRAY - SIDE VIEW
- CABLE TRAY - VERTICAL CURVE (TURNING DOWN)
- CABLE TRAY - VERTICAL CURVE (TURNING UP)
- TRAY SECTION DESIGNATION: I = INSTRUMENTATION (ANALOG), P = POWER, C = CONTROL (DIGITAL)
- TRAY WIDTH

CONDUIT, LINE AND DUCTBANK SYMBOLS

- CONDUIT, EXPOSED
- CONDUIT, ROUTED BELOW PLAN ELEVATION, EMBEDDED OR DIRECT BURIED
- CONDUIT TURNING TOWARDS
- CONDUIT TURNING AWAY
- CONDUIT AND CABLE HOMERUN TO LOCATION INDICATED
- DISCONNECT AND REMOVE CONDUIT (D&R)
- FLEXIBLE CONDUIT AND CONNECTOR AT END OF RIGID CONDUIT RUN
- SEALED CONDUIT CONNECTOR FOR FIRE PROTECTION, VAPOR BARRIER
- CONDUIT GROUPINGS ALONG FLOOR OR WALL
- 3-1/C#10 ,¾"C — CONDUIT AND CABLE RUNS NOT LISTED IN CONDUIT AND CABLE SCHEDULE
- WEATHERHEAD AT END OF RIGID CONDUIT RUN
- CONDUIT NUMBER AS IDENTIFIED ON CONDUIT SCHEDULE
- CONDUIT IDENTIFICATION BUBBLE
- CONDUIT SIZE AS IDENTIFIED ON CONDUIT SCHEDULE

PUSHBUTTON AND PANEL SYMBOLS

- PUSH BUTTON OR SELECTOR SWITCH, REMOTE MOUNTED, SINGLE
- PUSH BUTTON OR SELECTOR SWITCH, REMOTE MOUNTED, TWO OR MORE
- LP(X) — LIGHTING PANEL, SURFACE MOUNTED AND I.D. NUMBER
- PP(X) — POWER PANEL, FLUSH MOUNTED AND I.D. NUMBER
- TEL(X) — TELEPHONE PANEL
- ANNUN — ANNUNCIATOR

MONITOR SYMBOLS

- CM — CRITICALITY MONITOR WITH EMERGENCY POWER CIRCUIT
- RM — RADIATION MONITOR
- AM — AIR MONITOR STATION
- CO — CARBON MONOXIDE MONITOR PANEL
- INSTRUMENT, XXXX — XXXX - DEVICE NUMBER

MISCELLANEOUS SYMBOLS

- M — HORIZONTAL MOTOR
- M — VERTICAL MOTOR
- EXISTING POWER POLE
- EXISTING CG&E POWER POLE
- PROPOSED NEW POLE
- NEW LIGHT POLE
- EXISTING LIGHT POLE
- POLE DOWN-GUY AND ANCHOR
- HT — HEAT TRACING POWER CONNECTION
- D — OVERHEAD DOOR MOTOR CONNECTION

NOTES

1. SEE DRAWINGS 95X-5900-E-00244 FOR 13.2 KV DISTRIBUTION POWER PLAN.
2. SEE DRAWINGS 95X-5900-E-00245 FOR WELL HOUSE AND VALVE HOUSE POWER AND 120 V DISTRIBUTION PLAN.

REF DWG NO.	DRAWING TITLE
95X-5900-X-00203	DRAWING INDEX
95X-5900-E-00244	13.2KV DISTRIBUTION & COMMUNICATIONS PLAN
95X-5900-E-00245	WELL HOUSE AND VALVE HOUSE POWER AND 120V DISTRIBUTION PLAN

000403

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E INITIALS AND DATE	FERNCO	DATE
Ø	CERTIFIED FOR CONSTRUCTION	[signature]	NA	4-15-95

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: SOUTH FIELD EXTRACTION SYSTEM

DRAWING TITLE: ELECTRICAL SYMBOLS AND LEGEND - SHEET 2

DRAWN BY	DATE	LEAD ENGINEER	DATE	CHECKED BY	DATE
B. JASPER	06/14/95	J. Feuell	4/15/95	J. L. COOPER	06/02/95

PLANT/BLDG NO.	FLOOR	SCALE	CLASS
		NONE	

SUBMITTED FOR APPROVAL	FERNCO CRU APPROVAL
[signature] 4-15-95	NA

PREPARED UNDER PARSONS PROJECT ORDER NUMBER	A-E DOE PROJECT NO.	DATE	TEMP PROJECT NO.	DRAWING INDEX CODE NO.	DATE	SHEET NO.	REV. NO.
CRU5/P0126			WBS 1.1.1.1.5.3.1 00-90701	95X-5900-E-00249		E0002	Ø

E-7311

SINGLE LINE DIAGRAM SYMBOLS

ARRESTER	YY-XXXX	'YY' INDICATES SPECIAL IDENTIFIER 'XXXX' INDICATES ID NO.
CIRCUIT BREAKER, LOW VOLTAGE	FFFF TTTT	'FFFF' INDICATES FRAME RATING AMPS (SHOWN ON SWITCHGEAR ONLY) 'TTTT' INDICATES TRIP RATING AMPS
CIRCUIT BREAKER, MEDIUM VOLTAGE	FFFF TTTT	'FFFF' INDICATES FRAME RATING AMPS 'TTTT' INDICATES TRIP RATING AMPS
COMBINATION STARTER, NON-REVERSING	TTTT ZZZZ	'TTTT' INDICATES TRIP RATING AMPS 'ZZZZ' INDICATES NEMA SIZE EQUIPMENT OUTLINE (TYP)
FUSED SWITCH	FFFF	'FFFF' INDICATES FUSE SIZE
CURRENT TRANSFORMER	YY ZZZZ	'YY' INDICATES NO. OF CT(S) 'ZZZZ' INDICATES CT RATIO(S)
DISCONNECT SWITCH	FFFF	'FFFF' INDICATES FRAME RATING AMPS
DRAW-OUT DEVICE/ RECEPTACLE		
FUSED DISCONNECT SWITCH	FFFF TTTT	'FFFF' INDICATES FRAME RATING AMPS 'TTTT' INDICATES TRIP RATING AMPS
FUSE	XXXX YY TTTT	'XXXX' INDICATES ID NO. 'YY' INDICATES SPECIAL IDENTIFIER 'TTTT' INDICATES TRIP RATING AMPS
GENERATOR		
INDICATING METER	XXXX (YY)	'XXXX' INDICATES ID NO. 'YYY' INDICATES SPECIAL INDICATOR
LOAD, NON-MOTOR	ZZZ ZZZ	'ZZZ' INDICATES EQUIPMENT SIZE IN KVA OR KW
MOTOR	(ZZZ HP)	'ZZZ' INDICATES HORSEPOWER SIZE
MOTOR OVERLOAD RELAY		
MOTOR STARTER CONTACT	ZZ	'ZZ' INDICATES NEMA SIZE
PANEL MOUNTED SWITCH	XXXX (YY)	'YY' INDICATES SPECIAL IDENTIFIER 'XXXX' INDICATES ID NO.
POTENTIAL TRANSFORMER	ZZZZ	'ZZZZ' INDICATES VOLTAGE RATIO (TYP. 14.4K/120)
SYMBOL 3 PHASE DELTA		
SYMBOL, 3 PHASE WYE GROUNDED		
TRANSFER SWITCH	YY-XXXX	'YY' INDICATES SPECIAL IDENTIFIER 'XXXX' INDICATES ID NO.
WELDING/POWER RECEPTACLE		
TRANSFORMER	XXXX ZZZZ	'XXXX' INDICATES ID NO. 'ZZZZ' INDICATES TRANSFORMER RATINGS - KVA, 1 OR 3 PHASE, VOLTAGE RATIO, IMPEDANCE

ELEMENTARY DIAGRAM SYMBOLS

CIRCUIT BREAKER	TTTT	'TTTT' INDICATES TRIP RATING AMPS
CONTACT	YY-XXXX	NORMALLY OPEN, CLOSES WHEN COIL IS ENERGIZED, 'XXXX' INDICATES ID NO., 'YY' INDICATES SPECIAL IDENTIFIER
CONTACT	YY-XXXX	NORMALLY CLOSED, OPENS WHEN COIL IS ENERGIZED, 'XXXX' INDICATES ID NO., 'YY' INDICATES SPECIAL IDENTIFIER
CONTROL POWER XFMR	H1 480V H2, CPT, X1 120V X2	
DISCONNECT SWITCH	FFFF	'FFFF' INDICATES FRAME RATING AMPS
DISCONNECT SWITCH, 3 PHASE	DSWXXXX FFFF	'XXXX' INDICATES ID NO., 'FFFF' INDICATES FRAME RATING AMPS
EQUIPMENT LOAD, 1 PHASE	H1 H2 ZZZZ ZZZZ	'ZZZZ' INDICATES EQUIPMENT SIZE IN 'KVA' OR 'KW'
EQUIPMENT LOAD, 1 PHASE	H1 H2 ZZZZ ZZZZ	'ZZZZ' INDICATES EQUIPMENT SIZE IN 'KVA' OR 'KW'
EQUIPMENT LOAD, 3 PHASE	H1 H2 H3 ZZZZ ZZZZ	'ZZZZ' INDICATES EQUIPMENT SIZE IN 'KVA' OR 'KW'
FUSE	XXXX TTTT (Y)	'XXXX' INDICATES ID NO., 'TTTT' INDICATES TRIP RATING AMPS, 'Y' INDICATES SPECIAL IDENTIFIER
GROUND		
MOTOR, 1 PHASE	T1 T2 (ZZZ HP)	'ZZZ' INDICATES HP SIZE
MOTOR, 1 PHASE	T1 (ZZZ HP) T2	'ZZZ' INDICATES HP SIZE
MOTOR, 3 PHASE	T1 T2 T3 (ZZZ HP)	'ZZZ' INDICATES HP SIZE
OVERLOAD ELEMENT	OL	
PILOT LIGHT	XXXX (YY)	'XXXX' INDICATES ID NO., 'YY' INDICATES SPECIAL IDENTIFIER
PUSH-TO-TEST LIGHT	XXXX (YY)	'XXXX' INDICATES ID NO., 'YY' INDICATES SPECIAL IDENTIFIER
RELAY	XXXX (YY)	'XXXX' INDICATES ID NO., 'YY' INDICATES SPECIAL IDENTIFIER
RELAY, TIME DELAY	TDR-XXXX (TDAE) TTTT	TIME DELAY AFTER ENERGIZED, 'XXXX' INDICATES ID NO. 'TTTT' INDICATES TIMING SET POINT
RELAY, TIME DELAY	TDR-XXXX (TDAD) TTTT	TIME DELAY AFTER DE-ENERGIZED, 'XXXX' INDICATES ID NO. 'TTTT' INDICATES TIMING SET POINT
RESISTOR	XXXX ZZZZ	'XXXX' INDICATES ID NO. 'ZZZZ' INDICATES SIZE IN OHMS
SOLENOID VALVE COIL	XXXX	'XXXX' INDICATES ID NO.
THERMAL OVERLOAD CONTACT	OL	NORMALLY CLOSED, OPENS WHEN OVERLOAD RELAY(S) TRIP

WIRING BY SUBCONTRACTOR

WIRING BY CONSTRUCTION

SWITCHES

FLOW SWITCH	NORMALLY CLOSED, OPENS ABOVE SET FLOW
FLOW SWITCH	NORMALLY OPEN, CLOSES ABOVE SET FLOW
FOOT SWITCH	NORMALLY OPEN, CLOSES WHEN ACTUATED
FOOT SWITCH	NORMALLY CLOSED, OPENS WHEN ACTUATED
LEVEL SWITCH	NORMALLY CLOSED, OPENS ABOVE SET LEVEL
LEVEL SWITCH	NORMALLY OPEN, CLOSES ABOVE SET LEVEL
LIMIT SWITCH	NORMALLY CLOSED, OPENS BY MECHANICAL OPERATION
LIMIT SWITCH	NORMALLY OPEN, CLOSES BY MECHANICAL OPERATION
VACUUM SWITCH	NORMALLY OPEN, CLOSES BELOW SET PRESSURE
VACUUM SWITCH	NORMALLY CLOSED, OPENS BELOW SET PRESSURE
PRESSURE SWITCH	NORMALLY CLOSED, OPENS ABOVE SET PRESSURE
PRESSURE SWITCH	NORMALLY OPEN, CLOSES ABOVE SET PRESSURE
PUSHBUTTON	MOMENTARY OR MAINTAIN CONTACT (XX = MC), NORMALLY OPEN CONTACT
PUSHBUTTON	MOMENTARY OR MAINTAIN CONTACT (XX = MC), NORMALLY CLOSED CONTACT
PUSHBUTTON, MUSHROOM HEAD	MOMENTARY OR MAINTAIN CONTACT (XX = MC), NORMALLY OPEN CONTACT
PUSHBUTTON, MUSHROOM HEAD	MOMENTARY OR MAINTAIN CONTACT (XX = MC), NORMALLY CLOSED CONTACT
SELECTOR SWITCH (GENERAL)	XXXX, YY ZZ, (XO), (OX) 'XXXX' INDICATES ID NO. 'YY' INDICATES NAME OF CURRENT SWITCH POSITION, 'ZZ' INDICATES NAME OF OTHER SWITCH POSITION(S) 'X' INDICATES CLOSED CIRCUIT POSITION 'O' INDICATES OPEN CIRCUIT POSITION (CONTACTS DIAGRAMMATICALLY SHOWN CLOSED)
TEMPERATURE SWITCH	NORMALLY CLOSED, OPENS ABOVE SET TEMPERATURE
TEMPERATURE SWITCH	NORMALLY OPEN, CLOSES ABOVE SET TEMPERATURE
TIMER SWITCH	NORMALLY CLOSED, OPENS ON TIME DELAY AFTER COIL IS ENERGIZED
TIMER SWITCH	NORMALLY OPEN, CLOSES ON TIME DELAY AFTER COIL IS ENERGIZED
TIMER SWITCH	NORMALLY CLOSED, CLOSES ON TIME DELAY AFTER COIL IS DE-ENERGIZED
TIMER SWITCH	NORMALLY OPEN, OPENS ON TIME DELAY AFTER COIL IS DE-ENERGIZED
TORQUE SWITCH	NORMALLY OPEN, CLOSES BELOW SET POINT
TORQUE SWITCH	NORMALLY CLOSED, OPENS ABOVE SET POINT

NOTES

1. SEE DRAWINGS 95X-5900-E-00235 FOR SINGLE LINE DIAGRAM.
2. SEE DRAWINGS 95X-5900-E-00238 FOR ELEMENTARY AND INTERCONNECTION DIAGRAM.

SPECIAL IDENTIFIERS

A	AMBER LIGHT OR AMMETER
AS	AMMETER SWITCH
ATS	AUTOMATIC TRANSFER SWITCH
C	CLEAR LIGHT
CB	CIRCUIT BREAKER
CL	CURRENT LIMITING FUSE
CR	CONTROL RELAY
CS	CONTROL SWITCH
E	HIGH SPEED, MEDIUM VOLTAGE FUSE
G	GREEN LIGHT
LA	LIGHTNING ARRESTER
LR	LATCHING RELAY
M	MOTOR RELAY
MTS	MANUAL TRANSFER SWITCH
PF	POWER FACTOR METER
R	RED LIGHT
SA	SURGE ARRESTER
SP	SPARE
T	TIME DELAY FUSE
V	VOLTMETER
VS	VOLTMETER SWITCH
W	WATTMETER
WH	WATTHOUR METER
WHD	WATTHOUR DEMAND METER

REF DWG NO.	DRAWING TITLE
95X-5900-X-00203	DRAWING INDEX
95X-5900-E-00235	SINGLE LINE DIAGRAM
95X-5900-E-00238	ELEMENTARY AND INTERCONNECTION DIAGRAM

000402

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	FERNCO	DATE
		INITIALS AND DATE		
0	CERTIFIED FOR CONSTRUCTION		NA	9-15-95

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
SOUTH FIELD EXTRACTION SYSTEM

DRAWING TITLE
ELECTRICAL
SYMBOLS AND LEGEND - SHEET 1

DRAWN BY	DATE	LEAD ENGINEER	DATE	CHECKED BY	DATE
B. JASPER	06-14-95	J. Tenell	9/5/95	J.L. COOPER	08/02/95
PLANT/BLDG NO.		FLOOR		SCALE	CLASS
				NONE	
SUBMITTED FOR APPROVAL		FERNCO CRU APPROVAL			
Paul Detta 9-15-95		NA			
A-E	DATE		DATE		

PREPARED UNDER PARSONS PROJECT ORDER NUMBER	DOE PROJECT NO.	FERNCO PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
CRU5/P0126		WBS 1.1.1.1.5.3.1 00-90701	95X-5900-E-00248	E0001	0

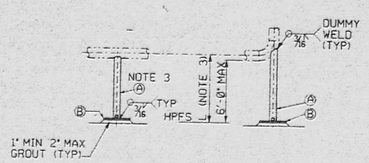


FIG 1, 1A, & 1G (SEE DETAIL 1A)

FIG 2, 2A, & 2G (SEE DETAIL 1)

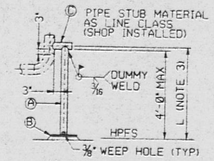
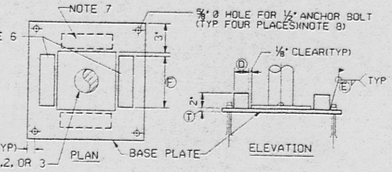


FIG 3, 3A, & 3G (SEE DETAIL 1A)

NOTES:
1. ALL SUPPORT MATERIAL SHALL BE CARBON STEEL.
2. SPOOL FABRICATOR SHALL FURNISH SUPPORT COMPLETE AS SHOWN AND BAND SUPPORT PARTS TO SPOOL FOR SHIPMENT. STUB (A) SHALL HAVE BEVELED END.
3. DIMENSION L IS SHOWN ON PIPING DRAWING. FABRICATOR SHALL INCLUDE AN EXTRA 6 INCHES IN ITEM (A) FOR FIELD FIT-UP AT INSTALLED LOCATION.
4. DO NOT USE FIGURE 3 FOR SIZE 18 INCHES AND LARGER.
5. PAINT PER SPECIFICATION.
6. INSTALL GUIDE BARS ON TWO SIDES ONLY FOR FIGURES WITH G DESIGNATION. GUIDES TO BE ORIENTED PER THE PIPING DRAWING.
7. INSTALL GUIDE BARS ON ALL SIDES FOR FIGURES WITH A DESIGNATION WHERE INDICATED ON THE PIPING DRAWING.
8. USE HILTI ½" x 3½" MINIMUM EMBEDMENT ANCHOR BOLT OR APPROVED EQUAL FOR BASE PLATE.
9. ALL DIMENSIONS ARE IN INCHES, UNLESS NOTED OTHERWISE.

LINE SIZE	(A) SUPPORTING PIPE SIZE	(B) BASE PLATE	(C) PIPE STUB SIZE	(D)	(E)	(F)	(T)
1 1/2, 2	1-1/2 XS	6X 6X 1/2	1-1/2 XS	1/2	1/4	4	1/2
3,4	2 XS	8X 8X 1/2	3 STD WT	1/2	1/4	4	1/2
6,8	3 STD WT	16X 9X 1/2	4 STD WT	1/2	3/8	6	3/4
10,12	4 STD WT	20X10 X 1/2	6 STD WT	1/2	3/8	8	1
14,16	6 STD WT	32X12 X 3/4	8 STD WT	3/4	3/8	8	1
18,20	10 STD WT	35 X 15 X 1	SEE NOTE 4	3/4	1/2	8	1-1/4
24	12 STD WT	36 X 16 X 1		3/4	1/2	8	1-1/4



DETAIL 1A FOR GUIDED SUPPORTS

DETAIL 1 NTS REF P00250 P00207 P00223

FIXED BASE SUPPORT

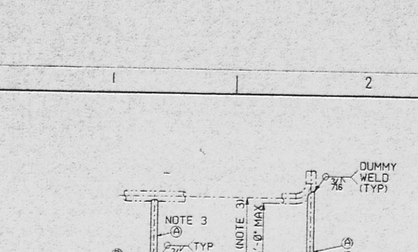
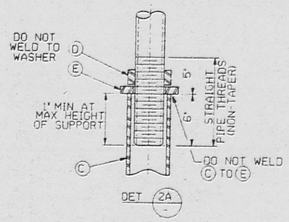


FIG 1.1A,& 1G (SEE NOTE 7)

FIG 2.2A,& 2G (SEE NOTE 7)

•THIS SUPPORT IS DESIGNED FOR TOP OF GROUT ELEVATION OF 1" ABOVE HPFS THRU 4" BELOW HPFS AND STILL ALLOW FOR 1" OF ADJUSTMENT AT EXTREMES.

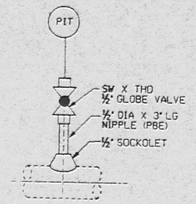
NOTES:
1. ALL SUPPORT MATERIAL IS CARBON STEEL.
2. SPOOL FABRICATOR SHALL FURNISH SUPPORT COMPLETE AS SHOWN AND BAND SUPPORT PARTS TO SPOOL FOR SHIPMENT.
3. DIMENSION L IS SHOWN ON PIPING DRAWING (M=L-1/2 LINE Ø0-9 INCH).
4. COUPLING (D) SHALL HAVE STRAIGHT PIPE THREADS (NON-TAPER) PER ANSI B2.1. MAXIMUM COUPLING LENGTH TO BE 3 INCHES (TRIM TO SUIT).
5. HOLE DIAMETER IN ITEM (E) SHALL BE 1/16 INCH LARGER THAN OD OF ITEM (A).
6. PAINT PER SPECIFICATION.
7. FOR DETAILS OF GUIDES, SEE DETAIL 1.
8. DIMENSIONS IN TABLE ARE IN INCHES, UNLESS NOTED OTHERWISE.



LINE SIZE (NOTE 4)	(A) SUPPORTING PIPE SIZE	(B) BASE PLATE	(C) PIPE SLEEVE	(D) API LINE 1/2 CPLG	(E) STEEL WASHER (THK) (NOTE 9)
2,3,4	2 XS	6X6 X 1/2	2.5 STD WT	2	3-1/2 X 3-1/2 X 1/4
6,8	3 XS	8X8 X 1/2	4 STD WT	3	5-1/2 X 5-1/2 X 1/4

DETAIL 2 NTS REF P00250 P00207

ADJUSTABLE BASE SUPPORT



DETAIL 3 NTS REF P00250 P00207 P00223

SCREWED INSTRUMENT INSTALLATION

NOTES

REF DWG NO.	DRAWING TITLE
95X-5900-X-00203	DRAWING INDEX
95X-5900-P-00207	PUMP HOUSE PIPING PLAN
95X-5900-P-00223	PIPING PLAN SOUTH FIELD VALVE HOUSE

000401

REV NO.	ISSUE OR REVISON PURPOSE - DESCRIPTION	A/E	FERNCO	DATE
		INITIALS AND DATE		
Ø	CERTIFIED FOR CONSTRUCTION	Paul	N/A	9-15-95

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
SOUTH FIELD EXTRACTION SYSTEM

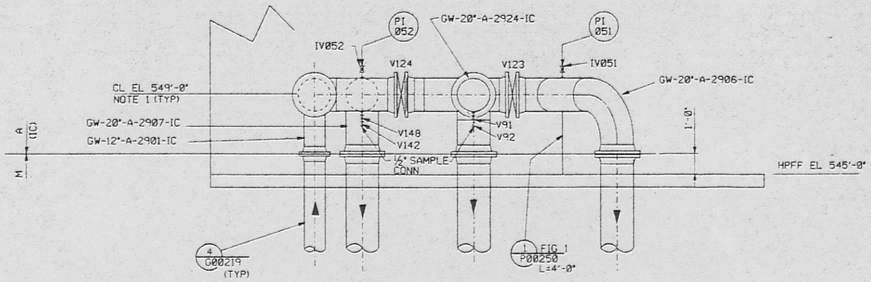
DRAWING TITLE
PIPING / PLANT DESIGN
PIPE SUPPORT DETAILS

DRAWN BY	DATE	LEAD ENGINEER	DATE	CHECKED BY	DATE
D.ROSENE	06-16-95		9-14-95	J. LAWSON	7-28-95

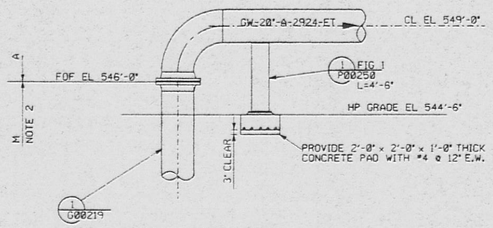
PLANT/BLDG NO.	FLOOR	SCALE	CLASS

SUBMITTED FOR APPROVAL	FERNCO CRU APPROVAL
A-E DATE	DATE
Paul 9-15-95	N/A

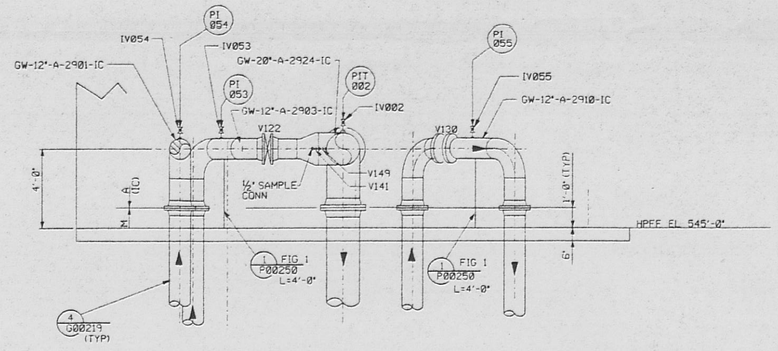
PREPARED UNDER PARSONS PROJECT ORDER NUMBER	CODE PROJECT NO.	TEMP PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
CRU5/P0126		WBS 1.1.1.5.3 00-90701	95X-5900-P-00250	P0005	0



SECTION (A) REF P00233 P00223
3/8"=1'-0"



SECTION (C) REF P00233 P00223
3/8"=1'-0"



SECTION (B) REF P00233 P00223
3/8"=1'-0"

NOTES

1. ALL ELEVATIONS SHALL BE FIELD VERIFIED PRIOR TO FABRICATION AND INSTALLATION.
2. ELECTRIC TRACE AND INSULATE TO A MINIMUM DEPTH OF 2'-0" BELOW GRADE.

REF DWG NO.	DRAWING TITLE
95X-5900-X-00203	DRAWING INDEX
95X-5900-P-00223	PIPING PLAN SOUTH FIELD VALVE HOUSE
95X-5900-P-00250	PIPE SUPPORT DETAILS
95X-5900-G-00219	CIVIL- DETAILS SHEET 1 OF 3

000400

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E INITIALS AND DATE	FERNCO INITIALS AND DATE
0	CERTIFIED FOR CONSTRUCTION	N/A	9-15-95

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
SOUTH FIELD EXTRACTION SYSTEM

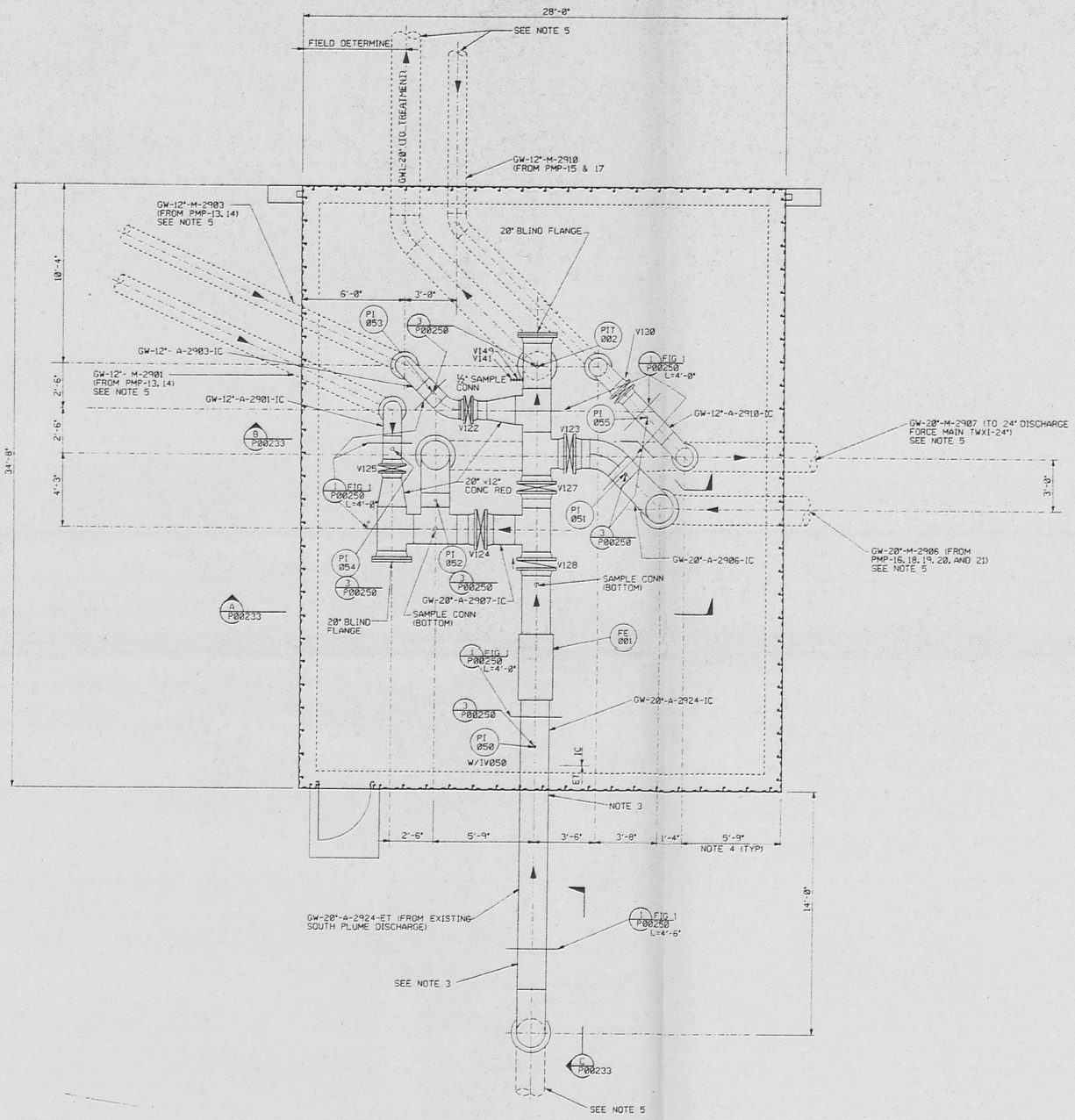
DRAWING TITLE
PIPING / PLANT DESIGN
PIPING SECTION
SOUTH FIELD VALVE HOUSE

DRAWN BY	DATE	LEAD ENGINEER	DATE	CHECKED BY	DATE
D.ADSENE	05-25-95		9-14-95	J. LAWSON	8-1-95

PLANT/BLDG. NO.	FLOOR	SCALE	CLASS
		3/8"=1'-0"	

SUBMITTED FOR APPROVAL (A-E)	DATE	FERNCO CRU APPROVAL	DATE
	9-15-95	N/A	

PREPARED UNDER PARSONS PROJECT ORDER NUMBER	CODE PROJECT NO.	TEMP PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
CRU5/P0126		WBS 1.1.1.1.5.3 00-90701	95X-5900-P-00233	P0004	0



VALVE HOUSE PLAN

NOTES

1. FOR PIPING AND INSTRUMENTATION DIAGRAM SEE DRAWING 95X-5900-N-00191.
2. SEE CIVIL SITE PLAN DRAWING 95X-5900-G-00265 FOR TRUE VALVE HOUSE ORIENTATION.
3. GW-20"-A-2924-ET WHICH IS LOCATED OUTSIDE OF VALVE HOUSE AND ABOVE GRADE SHALL BE ELECTRIC HEAT TRACED AND INSULATED.
4. ALL DIMENSIONS SHALL BE FIELD VERIFIED PRIOR TO FABRICATION AND INSTALLATION OF PIPING.
5. SEE CIVIL SITE PLAN DRAWING 95X-5900-G-00265 FOR TIE-IN TO DISCHARGE AND TREATMENT PIPES AND EXISTING SOUTH PLUME (GW1-20") LINE.

REF DWG NO.	DRAWING TITLE
95X-5900-X-00203	DRAWING INDEX
95X-5900-G-00265	CIVIL- ENLARGED GRADING/SITE/UTILITY PLANS
95X-5900-N-00191	PIPING AND INSTRUMENTATION DIAGRAM SOUTH FIELD EXTRACTION SYSTEM SHEET 2 OF 2
95X-5900-P-00233	PIPING SECTIONS SOUTH FIELD VALVE HOUSE
95X-5900-P-00250	PIPE SUPPORT DETAILS

000399

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E INITIALS AND DATE	FERNCO INITIALS AND DATE
0	CERTIFIED FOR CONSTRUCTION		N/A 9-15-95

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
SOUTH FIELD EXTRACTION SYSTEM

DRAWING TITLE
PIPING / PLANT DESIGN
PIPING PLAN
SOUTH FIELD VALVE HOUSE

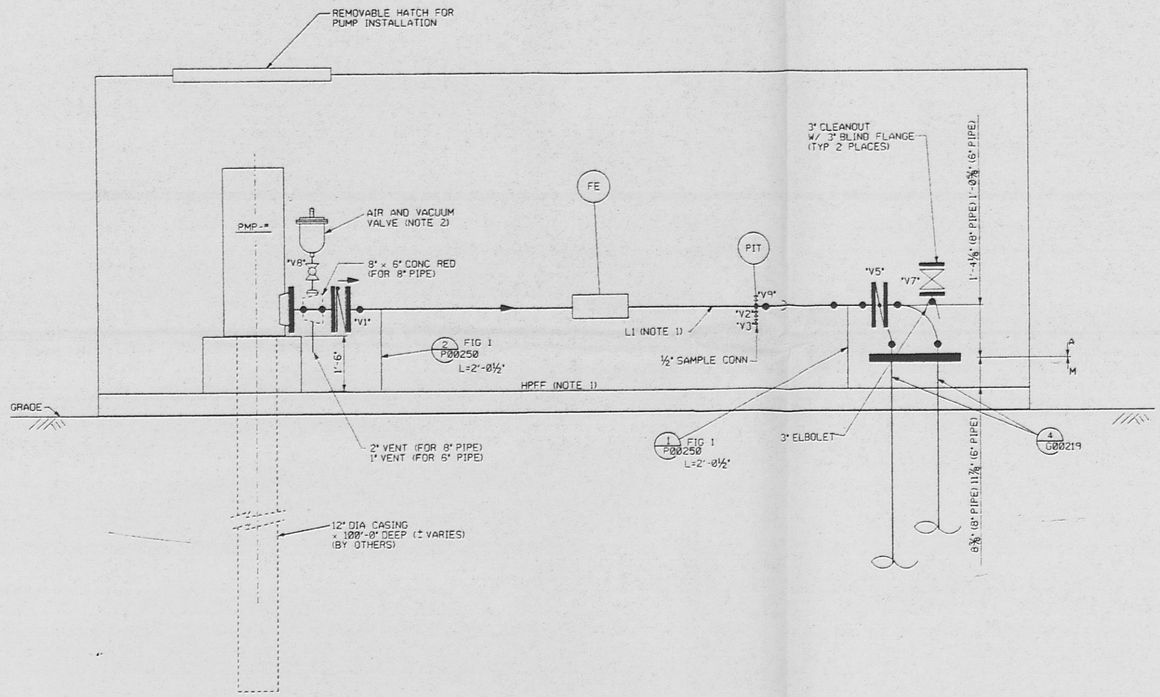
DRAWN BY	DATE	LEAD ENGINEER	DATE	CHECKED BY	DATE
D.ROSENE	05-24-95		9-14-95	J. LAWSON	8-1-95
PLANT/BLDG. NO.		FLOOR		SCALE 3/16"=1'-0"	CLASS

SUBMITTED FOR APPROVAL
A-E 9-15-95 DATE

FERNCO CRU APPROVAL
N/A
DATE

PREPARED UNDER PARSONS PROJECT ORDER NUMBER	CDE PROJECT NO.	FEMP PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
CRU5/P0126		WBS 1.1.1.1.5.3 00-90701	95X-5900-P-00223	P0003	0

F-7311



SECTION A REF P00208 P00207
¾"=1'-0"

NOTES

1. SEE "TABLE A" ON DRAWING 95P-5900-P-00207 FOR PUMP, LINE, INSTRUMENT, VALVE NUMBERS AND HIGH POINT OF FINISHED FLOOR.
2. FOR THE 8" PUMP DISCHARGE USE A 2" SOCKOLET WITH A 2" BALL VALVE AND 2" NPT AIR AND VACUUM VALVE; FOR THE 6" PUMP DISCHARGE USE A 1" SOCKOLET WITH A 1" BALL VALVE AND A 1" AIR AND VACUUM VALVE.

REF DWG NO.	DRAWING TITLE
95X-5900-X-00203	DRAWING INDEX
95X-5900-P-00207	WELL HOUSE PIPING PLAN
95X-5900-P-00250	PIPE SUPPORT DETAILS
95X-5900-G-00219	CIVIL- DETAILS SHEET 1 OF 3

000398

REV NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	FERNCO	DATE
0	CERTIFIED FOR CONSTRUCTION		N/A	9-15-95

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
SOUTH FIELD EXTRACTION SYSTEM

DRAWING TITLE
PIPING/PLANT DESIGN
WELL HOUSE PIPING SECTION

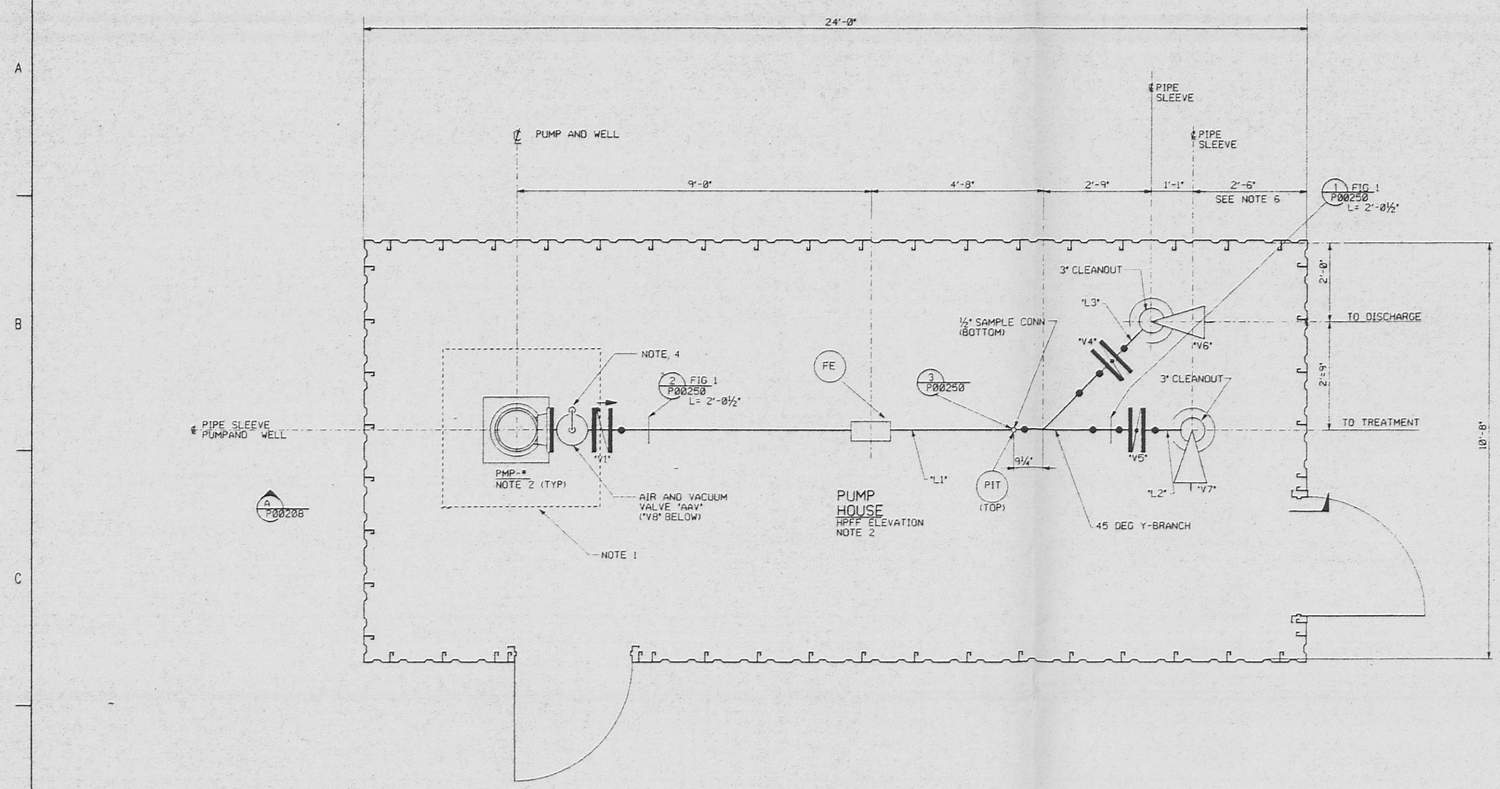
DRAWN BY	DATE	LEAD ENGINEER	DATE	CHECKED BY	DATE
D. ROSENE	05-23-95		9-15-95	J. LAWSON	7-28-95

PLANT/BLDG. NO.	FLOOR	SCALE	CLASS
		¾"=1'-0"	

SUBMITTED FOR APPROVAL	FERNCO CRU APPROVAL
	N/A

A-E DOE PROJECT NO.	DATE	FERNCO PROJECT NO.	DRAWING INDEX CODE NO.	DATE	SHEET NO.	REV. NO.
		WBS 1.1.1.1.5.3 00-90701	95X-5900-P-00208		P0002	0

PREPARED UNDER PARSONS PROJECT ORDER NUMBER: CRU5/P0126



WELL HOUSE PLAN
(SEE NOTE 5)

TABLE "A"

PMP#	"L1"	"L2"	"L3"	"FE"	"PIT"	"V1"	"V2"	"V3"	"V4"	"V5"	"V6"	"V7"	"V8"	"V9"	"AAV"	HPFF ELEVATION
13	GW-8"-A-2900-IC	GW-8"-A-2902-IC	GW-8"-A-2900-IC	005	005	V100	V143	V101	V102	V103	V131	V132	V99	IV005	13	540.80
14	GW-8"-A-2904-IC	GW-8"-A-2905-IC	GW-8"-A-2904-IC	006	006	V104	V144	V105	V106	V107	V133	V134	V98	IV006	14	539.00
15	GW-8"-A-2910-IC	GW-8"-A-2911-IC	GW-8"-A-2910-IC	007	007	V112	V146	V113	V114	V115	V137	V138	V96	IV007	15	574.50
16	GW-8"-A-2908-IC	GW-8"-A-2909-IC	GW-8"-A-2908-IC	008	008	V108	V145	V109	V110	V111	V135	V136	V97	IV008	16	543.50
17	GW-6"-A-2912-IC	GW-6"-A-2913-IC	GW-6"-A-2912-IC	009	009	V116	V147	V117	V119	V118	V139	V140	V95	IV009	17	574.00
18	GW-8"-A-2914-IC	GW-8"-A-2915-IC	GW-8"-A-2914-IC	031	031	V166	V181	V167	V168	V169	V174	V175	V186	IV031	18	571.00
19	GW-6"-A-2916-IC	GW-6"-A-2917-IC	GW-6"-A-2916-IC	032	032	V162	V180	V163	V164	V165	V176	V177	V187	IV032	19	574.00
20	GW-6"-A-2918-IC	GW-6"-A-2919-IC	GW-6"-A-2918-IC	033	033	V158	V179	V159	V160	V161	V172	V173	V185	IV033	20	578.20
21	GW-6"-A-2920-IC	GW-6"-A-2906-IC	GW-6"-A-2920-IC	034	034	V150	V170	V151	V152	V153	V170	V171	V184	IV034	21	575.80

NOTES

1. SEE 95X-5900-A-00224 FOR REMOVABLE HATCH IN ROOF FOR PUMP INSTALLATION AND REMOVAL.
2. SEE "TABLE A" FOR PUMP, LINE, INSTRUMENT, VALVE NUMBERS AND HIGH POINT FINISHED FLOOR ELEVATION.
3. SEE CIVIL GRADING/SITE/UTILITY PLAN DRAWINGS 95X-5900-G-00252, 95X-5900-G-00253, 95X-5900-G-00254 AND 95X-5900-G-00265 FOR ACTUAL WELL HOUSE ORIENTATIONS.
4. VENT LINE SHALL BE 1" FOR 6" PIPE AND 2" FOR 8" PIPE. FIELD ROUTE LINE TO 1'-0" ABOVE FLOOR AND PROVIDE PIPE SUPPORT.
5. SEE DRAWING 95X-5900-A-00224 FOR PMP-15, 16, 17, 18, 19, 20 AND 21. SEE DRAWING 95X-5900-A-00226 FOR PMP-13 AND 14.
6. DIMENSION SHOWN ABOVE IS FOR PMP-15, 16, 17, 18, 19, 20 AND 21. FOR PMP-13 AND 14 THIS DIMENSION IS 1'-10".
7. FOR P&IDS SEE DRAWINGS 95X-5900-N-00190 AND 95X-5900-N-00191.

REF DWG NO.	DRAWING TITLE
95X-5900-X-00203	DRAWING INDEX
95X-5900-N-00190	PIPING AND INSTRUMENTATION DIAGRAM SOUTH FIELD EXTRACTION SYSTEM SHEET 1 OF 2
95X-5900-N-00191	PIPING AND INSTRUMENTATION DIAGRAM SOUTH FIELD EXTRACTION SYSTEM SHEET 2 OF 2
95X-5900-P-00208	WELL HOUSE PIPING SECTION
95X-5900-A-00224	ARCHITECTUAL PLAN AND ELEVATIONS PUMP HOUSE NO. 15, 16, 17, 18, 19, 20 AND 21
95X-5900-G-00252	CIVIL GRADING/SITE/UTILITY PLAN SHT 2 OF 5
95X-5900-G-00253	CIVIL GRADING/SITE/UTILITY PLAN SHT 3 OF 5
95X-5900-G-00254	CIVIL GRADING/SITE/UTILITY PLAN SHT 4 OF 5 ,
95X-5900-A-00226	ARCHITECTUAL PLAN AND ELEVATIONS PUMP HOUSE NO. 13 AND 14
95X-5900-P-00250	PIPE SUPPORT DETAILS

000397

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A/E INITIALS AND DATE	FERNCO INITIALS AND DATE
0	CERTIFIED FOR CONSTRUCTION	N/A	9-15-95

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
SOUTH FIELD EXTRACTION SYSTEM

DRAWING TITLE
PIPING / PLANT DESIGN
WELL HOUSE PIPING PLAN

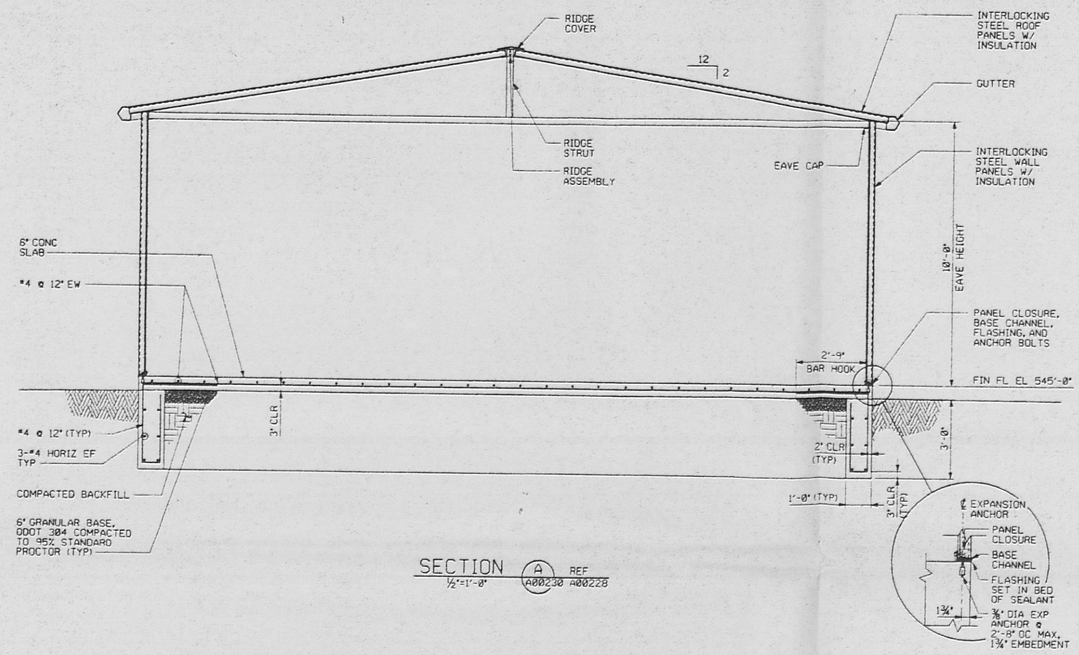
DRAWN BY	DATE	LEAD ENGINEER	DATE	CHECKED BY	DATE
D.ROSENE	05-19-95		9-14-95	J. LAWSON	7-28-95

PLANT/BLDG. NO.	FLOOR	SCALE	CLASS
		3/4"=1'-0"	

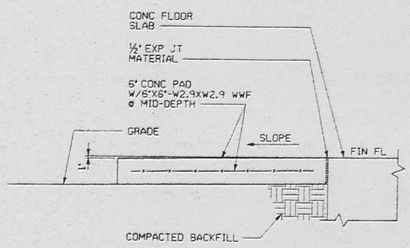
SUBMITTED FOR APPROVAL	FERNCO CRU APPROVAL
A/E DATE 9-15-95	N/A DATE

PREPARED UNDER PARSONS PROJECT ORDER NUMBER	DOE PROJECT NO.	TEMP PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
CRU5/P0126		WBS 1.1.1.1.5.3 00-90701	95X-5900-P-00207	P0001	0

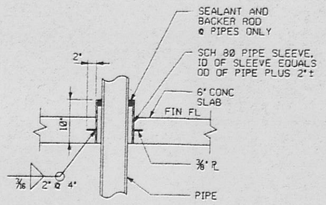
E-7311



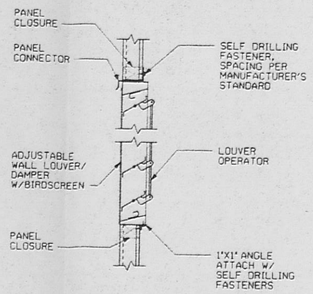
SECTION (A) REF A00230 A00228
½"=1'-0"



SECTION (B) REF A00230 A00228
1"=1'-0"



SECTION (C) REF A00230 A00228
1"=1'-0"



SECTION (D) REF A00230 A00224
1½"=1'-0"

NOTES

REF DWG NO.	DRAWING TITLE
95X-5900-X-00203	DRAWING INDEX
95X-5900-X-00204	LEGEND AND SYMBOLS
95X-5900-A-00228	PLAN
95X-5900-A-00229	ELEVATIONS

0C0396

REV NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E INITIALS	FERNCO INITIALS	DATE
0	CERTIFIED FOR CONSTRUCTION		N/A	5-15-95

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

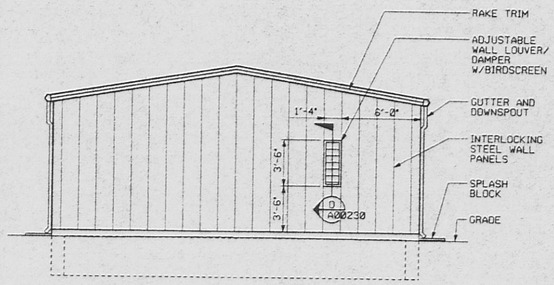
PROJECT NAME
SOUTH FIELD EXTRACTION SYSTEM

DRAWING TITLE
ARCHITECTURAL
SECTIONS AND DETAILS
VALVE HOUSE

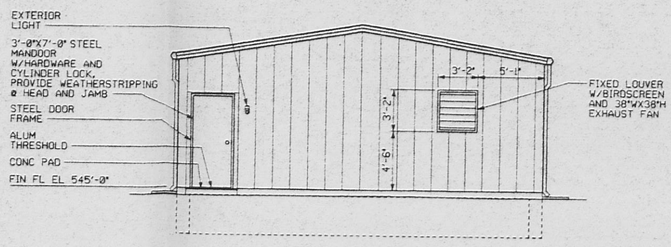
DRAWN BY	DATE	LEAD ENGINEER	DATE	CHECKED BY	DATE
K.L. RABBITT	05/14/95		9/1/95	A.W. SCHATZ	05/01/95
PLANT/BLDG. NO.		FLOOR		SCALE: AS SHOWN	CLASS

SUBMITTED FOR APPROVAL — A-E — DATE 5-15-95
FERNCO CRU APPROVAL: N/A — DATE

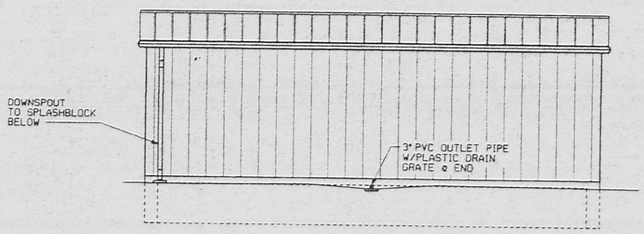
PREPARED UNDER PARSONS PROJECT ORDER NUMBER	DOE PROJECT NO.	TEMP PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
CRU5/P0126		WBS 1.1.1.1.5.3 00-90701	95X-5900-A-00230	A0008	0



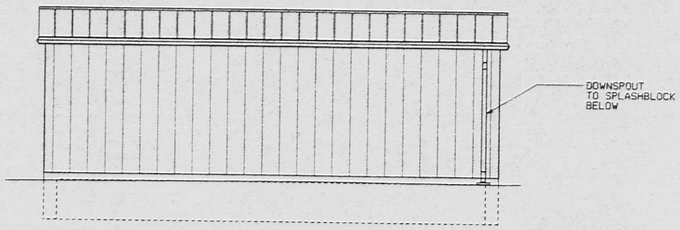
ELEVATION E1 REF A00229 A00228



ELEVATION E2 REF A00229 A00228



ELEVATION E3 REF A00229 A00228



ELEVATION E4 REF A00229 A00228

NOTES

REF DWG NO.	DRAWING TITLE
95X-5900-X-00203	DRAWING INDEX
95X-5900-X-00204	LEGEND AND SYMBOLS
95X-5900-A-00226	PLAN
95X-5900-A-00230	SECTIONS AND DETAILS

OC0395

REV NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E INITIALS AND DATE	FERNCO DATE
0	CERTIFIED FOR CONSTRUCTION		N/A 7-15-95

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

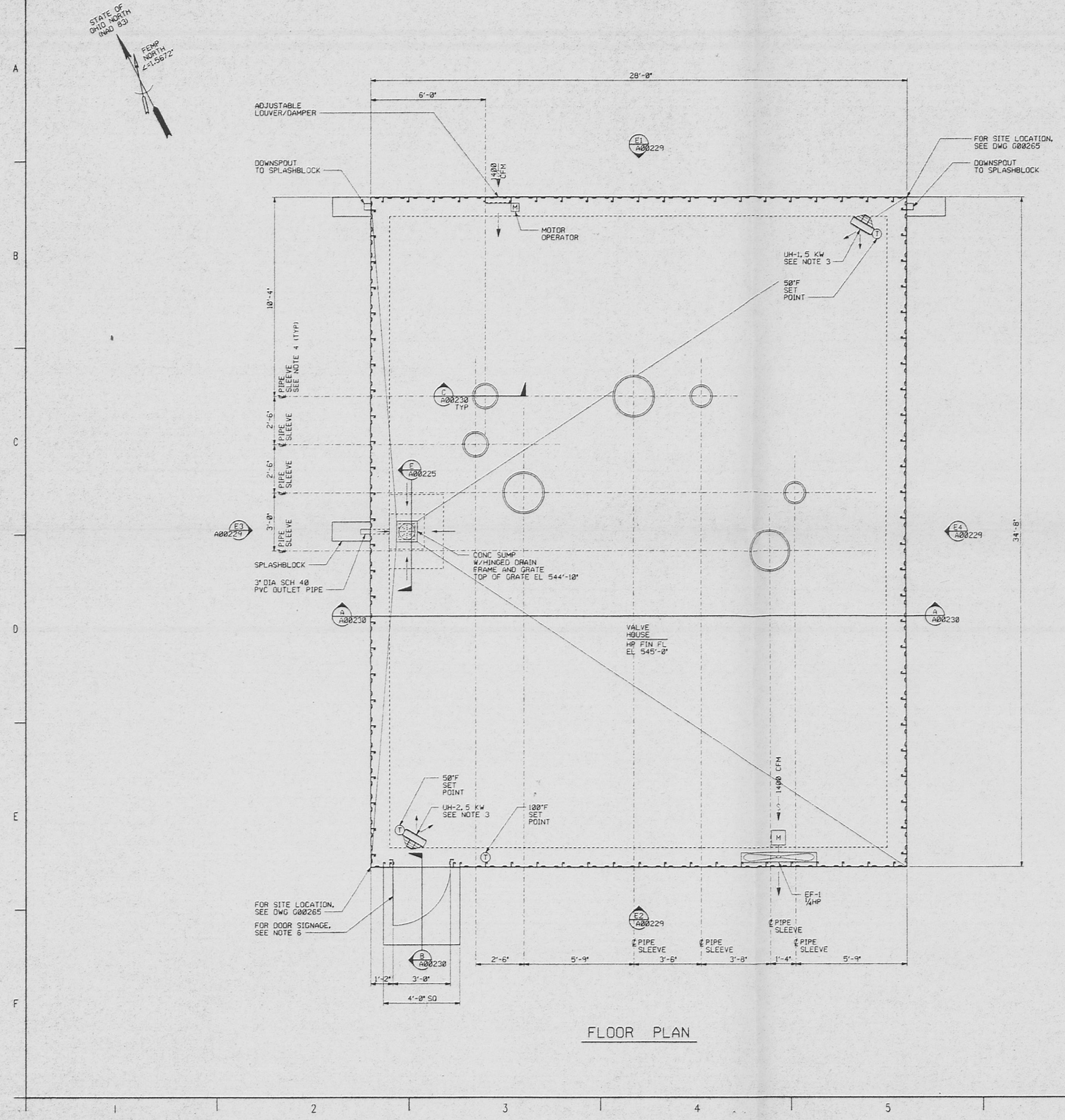
THIS DRAWING PREPARED BY
PARSONS
THE RALPH M. PARSONS CO. - PARSONS MAIN, INC. - ENGINEERING-SCIENCE, INC.
CINCINNATI, OHIO

PROJECT NAME
SOUTH FIELD EXTRACTION SYSTEM

DRAWING TITLE
ARCHITECTURAL
ELEVATIONS
VALVE HOUSE

DRAWN BY	DATE	LEAD ENGINEER	DATE	CHECKED BY	DATE
K.L. RABBITT	06/12/95		7/11/95	A.W. SCHATZ	06/01/95
PLANT/BLDG NO.		FLOOR		SCALE	CLASS
				1/4"=1'-0"	
SUBMITTED FOR APPROVAL		FERNCO CRU APPROVAL			
A-E 7-15-95 DATE		N/A			

PREPARED UNDER PARSONS PROJECT ORDER NUMBER	DOE PROJECT NO.	TEMP PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
CRU5/P0126		WBS 1.1.1.1.5.3 00-90701	95X-5900-A-00229	A0007	0



FLOOR PLAN

NOTES

1. SEE SPECIFICATION SECTION 15500 FOR EXHAUST FAN AND UNIT HEATERS.
2. THE ADJUSTABLE LOUVER/DAMPER MOTOR OPERATORS SHALL BE INTERLOCKED WITH THE EXHAUST FAN.
3. ALL UNIT HEATERS SHALL BE INSTALLED A MINIMUM OF 6'-8" CLEAR ABOVE FINISH FLOOR.
4. FOR PIPE DIAMETER, REFER TO PIPING DRAWING 95X-5900-P-00223.
5. ARCHITECTURAL LAYOUT BASED ON PARKLINE PRE-ENGINEERED BUILDING. FOUNDATION MAY BE MODIFIED FOR OTHER SELECTED VENDOR.
6. PROVIDE DOOR SIGNAGE AS REQUIRED BY FERMCO SITE PROCEDURE ED-12-4016, EQUIPMENT AND PIPING LABELING, DATED AUGUST 10, 1995. SIGNAGE ON EACH BUILDING TO INDICATE NAME AND NUMBER OF THE VALVE HOUSE.

REF DWG NO.	DRAWING TITLE
95X-5900-X-00203	DRAWING INDEX
95X-5900-X-00204	LEGEND AND SYMBOLS
95X-5900-G-00265	ENLARGED GRADING/SITE/UTILITY PLANS
95X-5900-A-00229	ELEVATIONS
95X-5900-A-00230	SECTIONS AND DETAILS
95X-5900-P-00223	VALVE HOUSE PIPING PLAN

000394

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E INITIALS AND DATE	FERMCO INITIALS AND DATE
0	CERTIFIED FOR CONSTRUCTION		N/A 9-15-95

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

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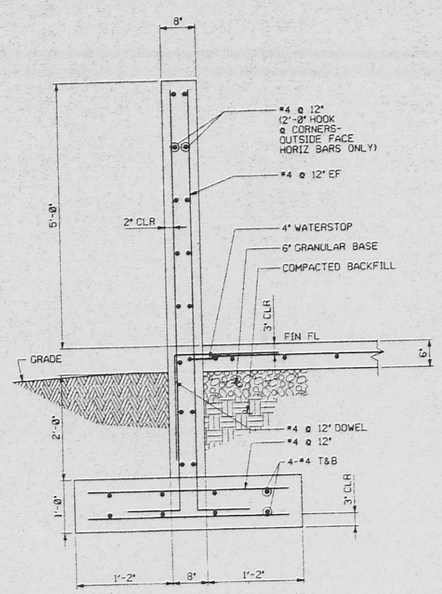
THE RALPH M. PARSONS CO. - PARSONS MAIN, INC. - ENGINEERING-SCIENCE, INC.
CINCINNATI, OHIO

PROJECT NAME
SOUTH FIELD EXTRACTION SYSTEM

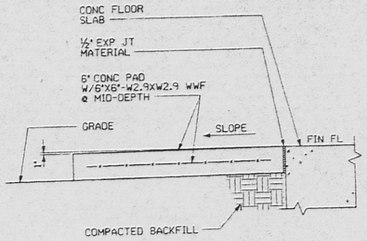
DRAWING TITLE
ARCHITECTURAL
PLAN
VALVE HOUSE

DRAWN BY	DATE	LEAD ENGINEER	DATE	CHECKED BY	DATE
K.L. RABBITT	06/08/95			A.W. SCHATZ	08/01/95
PLANT/BLDG NO.		FLOOR		SCALE	CLASS
				1/2"=1'-0"	
SUBMITTED FOR APPROVAL		FERMCO CRU APPROVAL			
9-15-95		N/A			

PREPARED UNDER PARSONS PROJECT ORDER NUMBER	A-E DOE PROJECT NO.	FEMP PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
CRU5/P0126		WBS 1.1.1.1.5.3 00-90701	95X-5900-A-00228	A0006	0



SECTION (B) REF A00231 A00226
1"=1'-0"



SECTION (C) REF A00231 A00226
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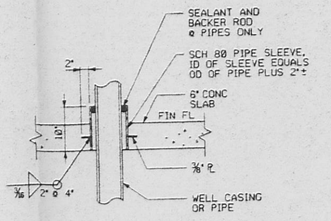
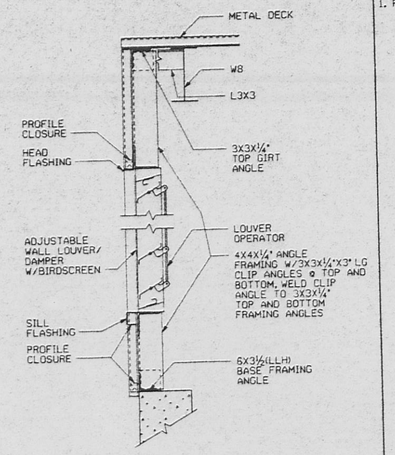
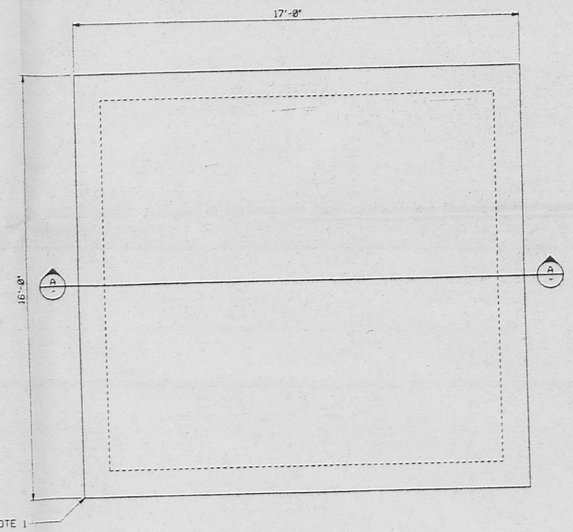


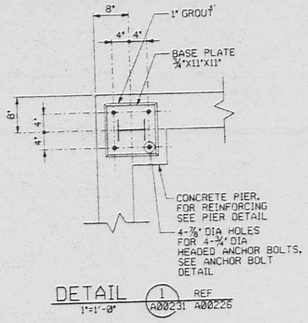
TYP PIPE SLEEVE SECTION (D) REF A00231 A00226
1"=1'-0"



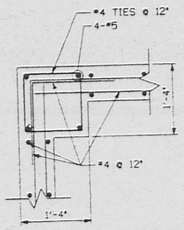
SECTION (E) REF A00231 A00227
1½"=1'-0"



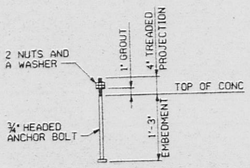
SWITCHGEAR SLAB PLAN
½"=1'-0"



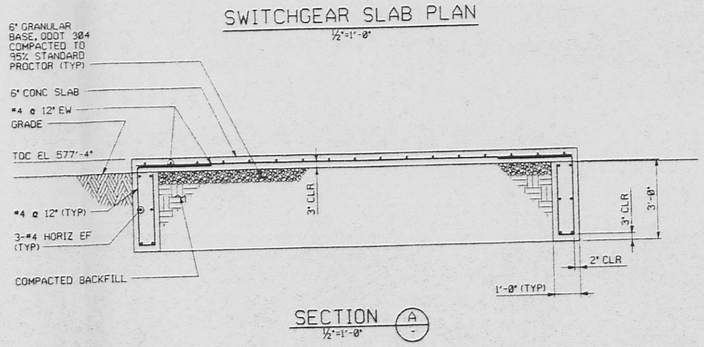
DETAIL (1) REF A00231 A00226
1"=1'-0"



PIER DETAIL
1"=1'-0"



ANCHOR BOLT DETAIL
NTS



SECTION (A) ½"=1'-0"

NOTES

1. FOR LOCATION OF SWITCHGEAR SLAB, SEE DRAWING 95X-5900-G-00265.

REF DWG NO.	DRAWING TITLE
95X-5900-X-00203	DRAWING INDEX
95X-5900-X-00204	LEGEND AND SYMBOLS
95X-5900-G-00265	ENLARGED GRADING/SITE/UTILITY PLANS
95X-5900-A-00226	PLANS
95X-5900-A-00227	ELEVATIONS AND SECTION

000393

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A/E INITIALS	FERNCO INITIALS	DATE
0	CERTIFIED FOR CONSTRUCTION		NA	6-15-95

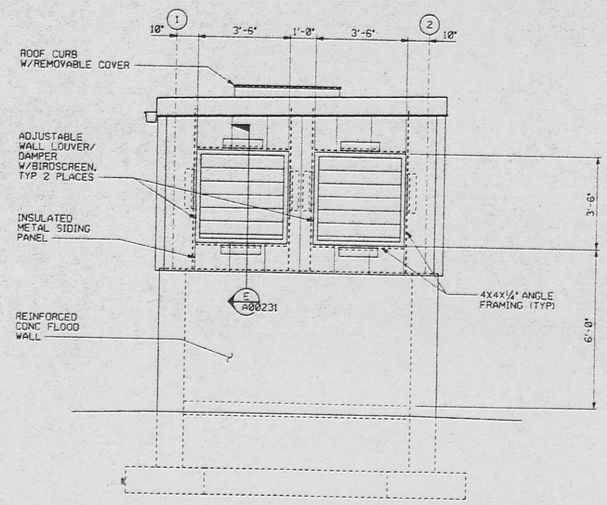
UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

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

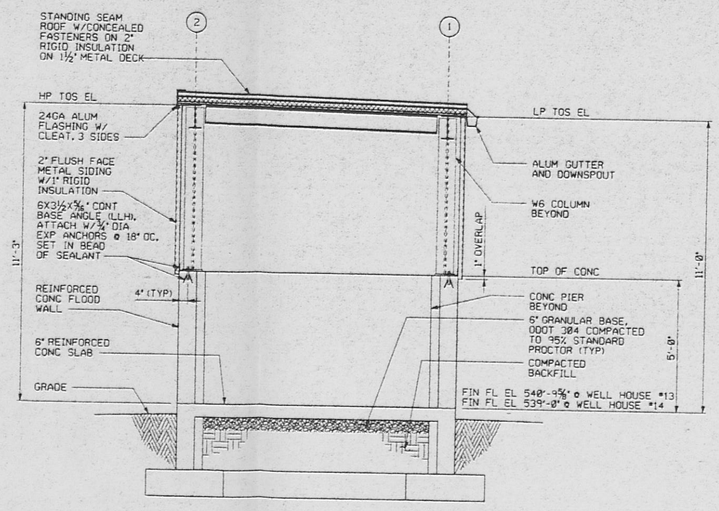
PROJECT NAME
SOUTH FIELD EXTRACTION SYSTEM

DRAWING TITLE
ARCHITECTURAL
SECTIONS AND DETAILS
WELL HOUSE NO. 13 AND 14 AND SWITCHGEAR SLAB

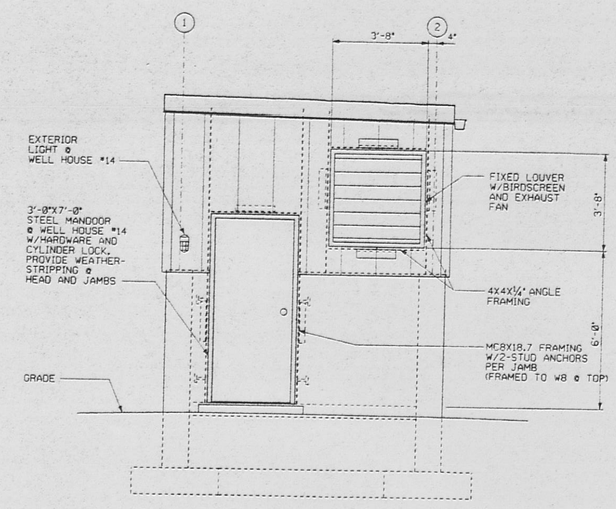
DRAWN BY K.L. RABBITT	DATE 06/28/95	LEAD ENGINEER	DATE 9/12/95	CHECKED BY A.W. SCHATZ	DATE 08/01/95
PLANT/BLDG NO.	FLOOR			SCALE AS SHOWN	CLASS
SUBMITTED FOR APPROVAL A/E 6-15-95	FERNCO CRU APPROVAL NA DATE				
PREPARED UNDER PARSONS PROJECT ORDER NUMBER CRU5/P0126	DOE PROJECT NO.	FEMP PROJECT NO. WBS 1.1.1.1.5.3 00-90701	DRAWING INDEX CODE NO. 95X-5900-A-00231	SHEET NO. A0005	REV. NO. 0



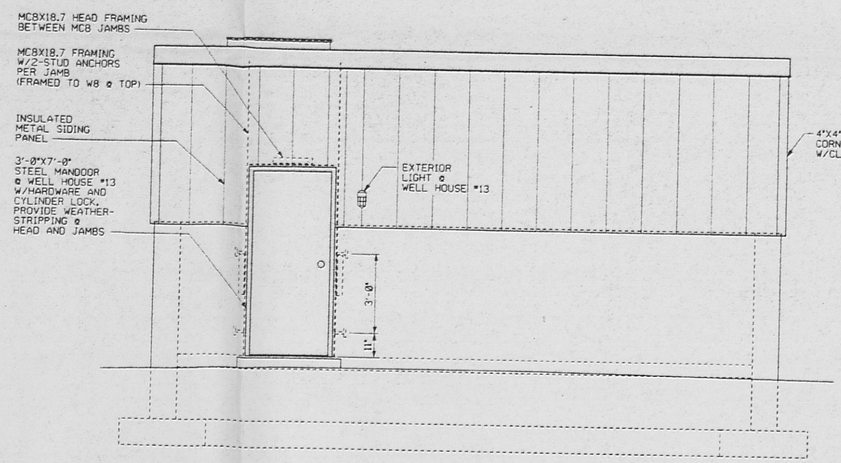
ELEVATION E1 REF A00227 A00226



SECTION A REF A00227 A00226



ELEVATION E2 REF A00227 A00226
NTS



ELEVATION E3 REF A00227 A00226

NOTES

REF DWG NO.	DRAWING TITLE
95X-5900-X-00203	DRAWING INDEX
95X-5900-X-00204	LEGEND AND SYMBOLS
95X-5900-A-00226	PLANS
95X-5900-A-00231	SECTIONS AND DETAILS

000392

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E INITIALS	FERNCO INITIALS	DATE
0	CERTIFIED FOR CONSTRUCTION	RMB	N/A	9-15-95

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
SOUTH FIELD EXTRACTION SYSTEM

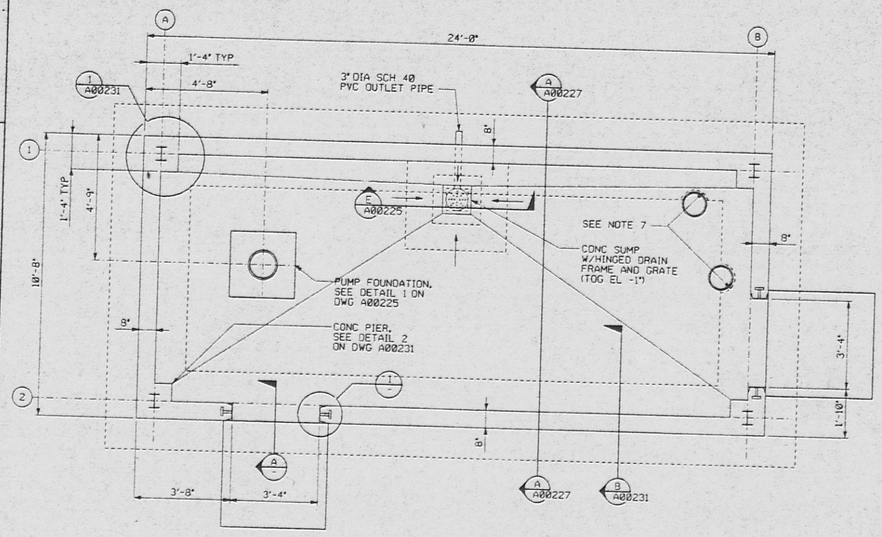
DRAWING TITLE
ARCHITECTURAL
ELEVATIONS AND SECTION
WELL HOUSE NO. 13 AND 14

DRAWN BY	DATE	LEAD ENGINEER	DATE	CHECKED BY	DATE
K.L. RABBITT	06/28/95		9/12/95	A.W. SCHATZ	08/31/95

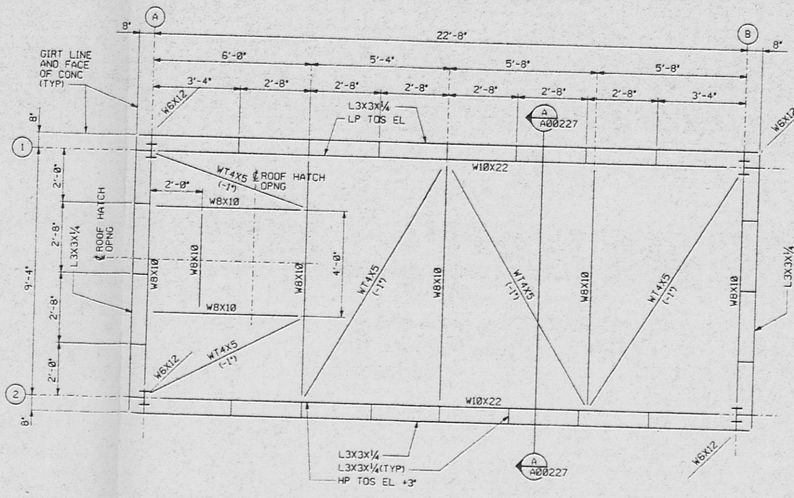
PLANT/BLDG. NO.	FLOOR	SCALE	CLASS
		½"=1'-0"	

SUBMITTED FOR APPROVAL	FERNCO CRU APPROVAL
A-E DATE	DATE
	N/A

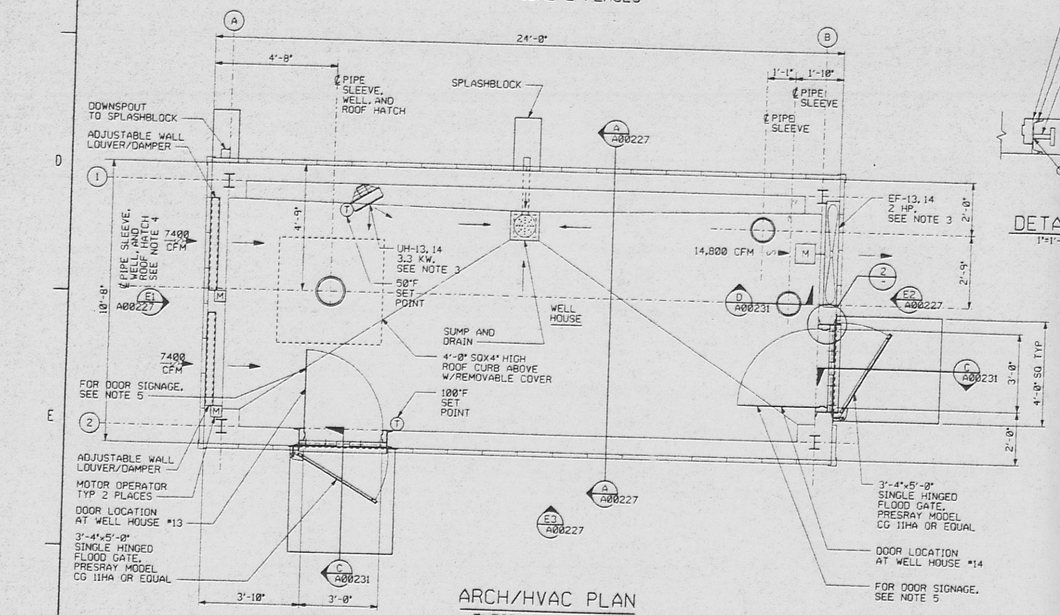
PREPARED UNDER PARSONS PROJECT ORDER NUMBER	DOE PROJECT NO.	TEMP PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
CRU5/P0126		WBS 1.1.1.1.5.3 00-90701	95X-5900-A-00227	A0004	0



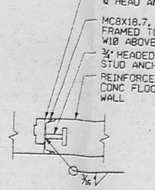
CONCRETE PLAN
TYPICAL 2 PLACES



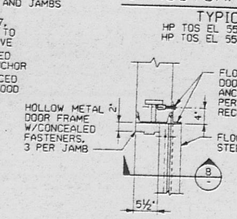
STRUCTURAL FRAMING PLAN
TYPICAL 2 PLACES
HP TOS EL 552'-1" FOR WELL HOUSE #13
HP TOS EL 550'-3" FOR WELL HOUSE #14



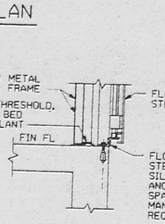
ARCH/HVAC PLAN
TYPICAL 2 PLACES



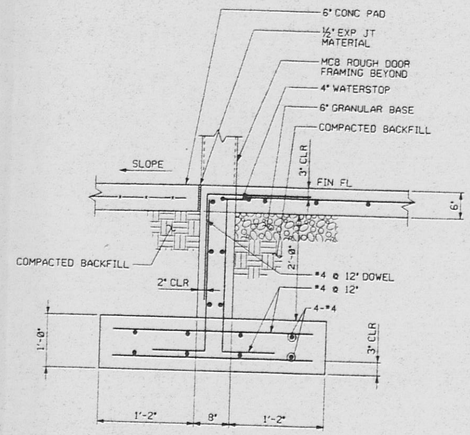
DETAIL 1
1"=1'-0"



DETAIL 2
1"=1'-0"



SECTION B
1"=1'-0"



SECTION A
1"=1'-0"

NOTES

1. SEE SPECIFICATION SECTION 15500 FOR EXHAUST FAN AND UNIT HEATER.
2. THE ADJUSTABLE LOUVER/DAMPER MOTOR OPERATORS SHALL BE INTERLOCKED WITH THE EXHAUST FAN.
3. THE EXHAUST FAN AND UNIT HEATER SHALL HAVE THE SAME EQUIPMENT TAG NUMBER AS THE WELL HOUSE NUMBER. ALL UNIT HEATERS SHALL BE INSTALLED A MINIMUM OF 6'-8" CLEAR ABOVE FINISH FLOOR.
4. SEE CIVIL DRAWINGS 95X-5900-G-00254 FOR CENTERLINE OF WELL COORDINATES. LOCATE WELL HOUSE BASED ON THESE COORDINATES.
5. PROVIDE DOOR SIGNAGE AS REQUIRED BY FERMCO SITE PROCEDURE ED-12-4016, EQUIPMENT AND PIPING LABELING, DATED AUGUST 10, 1995. SIGNAGE ON EACH BUILDING TO INDICATE NAME AND NUMBER OF WELL.

GENERAL STEEL NOTES

1. DESIGN, FABRICATION AND ERECTION OF STRUCTURAL STEEL SHALL BE IN ACCORDANCE WITH AISC MANUAL OF STEEL CONSTRUCTION, (ASD) NINTH EDITION, AND SPECIFICATIONS, SECTION 05120.
2. MATERIAL SHALL MEET THE REQUIREMENTS OF THE FOLLOWING SPECIFICATIONS:
   STRUCTURAL STEEL - ASTM A36
   HIGH STRENGTH BOLTS - ASTM A325N, ¾" DIAMETER
   ANCHOR BOLTS - ASTM A36 WITH HEAVY HEX NUTS AND WASHERS
   WELDING - AWS D1.1 CLASS E70XX (ELECTRODES)
3. DESIGN LOADS FOR BUILDINGS ARE AS FOLLOWS:
   A) GOVERNING CODES: UNIFORM BUILDING CODE (UBC), 1994 EDITION; OHIO BASIC BUILDING CODE (OBBC), 1995
   ASCE STANDARD, 7-93 "MINIMUM DESIGN LOADS FOR BUILDINGS AND OTHER STRUCTURES"
   B) LIVE LOADS: MINIMUM ROOF LIVE LOAD = 20 PSF
   C) COLLATER LOADS: STATIC LIVE LOAD OF 5 PSF ON PURLINS AND FRAMES.
   D) WIND LOADS: BASIC WIND SPEED=80 MPH (PER OBBC), EXPOSURE C
   WIND PRESSURE=PER COEFFICIENTS AND PROCEDURES OF ASCE 7-93
   E) EARTHQUAKE LOADS: SEISMIC ZONE FACTOR, Z = 0.10 g
   SITE COEFFICIENT, C = 2.75
   SEISMIC FORCES = PER COEFFICIENTS AND PROCEDURES OF UBC-94
   F) SNOW LOADS: GROUND SNOW LOAD = 25 PSF (PER OBBC)
   ROOF SNOW LOADS = PER COEFFICIENTS AND PROCEDURES OF ASCE 7-93
4. MINIMUM METAL THICKNESS FOR ALL CONNECTIONS, STIFFENER PLATES, ETC., IS ⅜".
5. SHOP AND FIELD PAINTING AS PER SPECIFICATION SECTION 09900.
6. STANDARD FRAMED CONNECTIONS SHALL BE USED UNLESS INDICATED OTHERWISE. THESE CONNECTIONS SHALL HAVE THE MAXIMUM NUMBER OF BOLTS (OR EQUIVALENT WELDS) AS SHOWN IN APPROPRIATE TABLE, PART 4 OF AISC MANUAL OF STEEL CONSTRUCTION.
7. NOTCH FOOTING AS REQUIRED FOR WELL CASING. USE ½" EXPANSION JOINT MATERIAL TO SEPARATE CONCRETE FOOTING FROM WELL CASING.

REF DWG NO.	DRAWING TITLE
95X-5900-X-00203	DRAWING INDEX
95X-5900-X-00204	LEGEND AND SYMBOLS
95X-5900-G-00254	GRADING/SITE/UTILITY PLAN - SHEET 4 OF 5
95X-5900-A-00225	SECTIONS AND DETAILS
95X-5900-A-00227	ELEVATIONS AND SECTION
95X-5900-A-00231	SECTIONS AND DETAILS

0C0391

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A/E	FERMCO	DATE
			INITIALS AND DATE	
0	CERTIFIED FOR CONSTRUCTION	N/A		9-15-95

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
SOUTH FIELD EXTRACTION SYSTEM

DRAWING TITLE
ARCHITECTURAL PLANS
WELL HOUSE NO. 13 AND 14

DRAWN BY	DATE	LEAD ENGINEER	DATE	CHECKED BY	DATE
K.L. RABBITT	06/02/95		9/6/95	A.W. SCHATZ	08/01/95
PLANT/BLDG NO.		FLOOR		SCALE	CLASS
				½"=1'-0"	
SUBMITTED FOR APPROVAL		FERMCO CRU APPROVAL			
A/E DATE		N/A			

PREPARED UNDER PARSONS PROJECT ORDER NUMBER	DOE PROJECT NO.	TEMP PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
CRU5/P0126		WBS 1.1.1.1.5.3 00-90701	95X-5900-A-00226	A0003	0

E-7311

POWER POLE COORDINATES (NAD83)

POLE NO.	NORTH	EAST	DETAIL NO.	DETAIL DWG. NO 95X-5900-
1 #	478,142.00	1,347,382.00	NOT IN CONTRACT	
2 #	478,294.00	1,347,387.00	NOT IN CONTRACT	
3 #	478,398.00	1,347,477.00	NOT IN CONTRACT	
4 #	478,298.00	1,347,567.00	NOT IN CONTRACT	
5 #	478,248.00	1,347,679.00	NOT IN CONTRACT	
6 #	478,198.00	1,347,794.00	NOT IN CONTRACT	
7 #	478,153.00	1,347,922.00	NOT IN CONTRACT	
8 #	478,109.00	1,348,053.00	NOT IN CONTRACT	
9 #	478,098.00	1,348,186.00	NOT IN CONTRACT	
10 #	478,098.00	1,348,322.00	NOT IN CONTRACT	
* 11 #	477,518.00	1,348,304.00	15	E-00246
* 12 #	477,553.00	1,348,341.00	20	E-00276
13 #	477,692.00	1,348,377.00	4	E-00241
14 #	477,831.00	1,348,426.00	4	E-00241
* 15 #	477,970.00	1,348,474.00	3	E-00241
* 16 #	478,103.00	1,348,442.00	3	E-00241
17 #	478,203.00	1,348,480.00	4	E-00241
18 #	478,320.00	1,348,526.00	4	E-00241
19 #	478,441.00	1,348,573.00	4	E-00241
20 #	478,555.00	1,348,618.00	4	E-00241
21 #	478,681.00	1,348,653.00	4	E-00241
* 22 #	478,797.00	1,348,708.00	3	E-00241
23 #	478,876.00	1,348,809.00	4	E-00241
* 24 #	478,935.00	1,348,902.00	3	E-00241
* 25 #	478,906.62	1,349,085.56	4	E-00241
26	477,419.00	1,348,286.00	21	E-00276
* 27	477,265.00	1,348,236.00	2	E-00241
* 28	477,144.00	1,348,288.00	19	E-00276
* 29	477,069.00	1,348,361.00	1	E-00241
* 30	477,106.00	1,348,090.00	21	E-00276
31	477,104.00	1,347,989.00	11	E-00246
* 32	477,130.00	1,347,743.00	2	E-00241
33	477,321.00	1,347,708.00	21	E-00276
34	477,487.00	1,347,673.00	21	E-00276
* 35	477,637.00	1,347,660.00	16	E-00276
* 36	477,562.00	1,348,535.00	2	E-00241
37	477,639.00	1,348,656.00	21	E-00276
* 38	477,740.00	1,348,783.00	2	E-00241
* 39	477,890.00	1,348,857.00	16	E-00276
40	478,905.00	1,349,188.00	9A 9B	E-00246
41	478,925.00	1,349,333.00	18	E-00276
* 42	478,923.00	1,349,483.00	17	E-00276
* 43	478,822.00	1,349,594.00	17	E-00276
44	478,647.00	1,349,581.00	18	E-00276
* 45	478,448.00	1,349,566.00	17	E-00276
46	478,317.00	1,349,518.00	18	E-00276
* 47	478,152.00	1,349,460.00	17	E-00276
* 48	477,954.00	1,349,488.00	11	E-00246
49	477,832.00	1,349,457.00	21	E-00276
* 50	477,670.00	1,349,412.00	13	E-00246
* 51	477,671.00	1,349,262.00	16	E-00276
52	477,494.00	1,349,389.00	21	E-00276
* 53	477,341.00	1,349,377.00	13	E-00246
54	477,369.00	1,349,230.00	21	E-00276
* 55	477,382.00	1,349,056.00	16	E-00276
* 56	477,161.00	1,349,333.00	2	E-00241
* 57	477,060.00	1,349,250.00	2	E-00241
58	477,041.00	1,349,113.00	21	E-00276
* 59	477,027.00	1,348985.00	16	E-00276

* -INDICATES POLE GUY WIRE SUPPORT REQUIRED. SEE DETAIL 8, DWG NO. 95X-5900-E-00246

-INDICATES EXISTING POLES, PROVIDED BY SEEPAGE COLLECTION SYSTEM PROJECT. SEE DRAWING NO. 92X-5900-E-00120 FOR PLAN.

ALL OTHER POLES INSTALLED UNDER THIS PROJECT SHALL BE 55 FT., CLASS 2.

NOTES

1. POWER TO SOUTH FIELD -- ROUTE 13.2KV POWER TO THE WELL HOUSES VIA EXISTING POLES #12 THRU #25 AND NEW POLES #26 THRU #59. 480V SERVICE ROUTING ON POLES #11 THRU #25 SHALL BE MAINTAINED TO THE SEEPAGE COLLECTION SYSTEM DURING INSTALLATION OF THE 13.2 KV LINE INSTALLATION. SEE DRAWING NO. 95X-5900-E-00235 FOR SINGLE LINE DIAGRAM.
2. SEE DRAWING 95X-5900-E-00241 FOR POWER POLE INSTALLATION NOTES AND POLE EQUIPMENT ARRANGEMENTS.
3. COMMUNICATIONS FROM AWWT TO WELL HOUSES -- FIELD ROUTE TWO FIBER OPTIC CABLES FROM THE AWWT CONTROL CABINET USING EXISTING UNMARKED POLES TO POLES #24 AND #25. ROUTE ONE FIBER OPTIC CABLE AERIAL FROM POLE #24 TO WELL HOUSE EW-15 AND ROUTE THE SECOND FIBER OPTIC CABLE AERIAL FROM POLE #25 TO WELL HOUSE #21. THE COMMUNICATIONS CABLE SHALL BE CONVERTED TO WIRE AT WELL HOUSE EW-15 AND EW-21 AND CONTINUE TO THE REMAINING WELL HOUSE. SEE DRAWING NO. 95X-5900-N-00273 FOR THE CONTROL SYSTEM ARCHETECHTURE
4. MAINTAIN CONDUCTOR CLEARANCES ON OVERHEAD SERVICE IN ACCORDANCE WITH ANSI C2, NATIONAL ELECTRICAL SAFETY CODE.
5. SEE DRAWING 95X-5900-E-00245 FOR WELL HOUSE AND VALVE HOUSE PLANS.
6. SEE DRAWING 95X-5900-E-00240 FOR CONNECTIONS TO EXISTING SUBSTATION N18-1 SWITCHES F1A AND F4A.
7. FOR MODIFICATION OF EXISTING POLE OBSTRUCTION, SEE DETAIL 12 ON DRAWING 95X-5900-E-00246.
8. REMOVE EXISTING 45' POLE #12 AFTER COMPLETION OF NEW WORK ON NEW, 55' POLE #12 AND EXISTING 45' POLE #11. DISCONNECT AND REMOVE EXISTING 480V QUADRUPLEX SERVICE FROM POLE #11 BACK TO POLE #16. CUT, COIL AND TAPE ENDS OF CONDUCTORS AND ABANDON ON POLE #16. MAINTAIN EXISTING 480V SERVICE TO WEST SEEPAGE COLLECTION PUMP (POLES 1-10, 16-25).
9. FOR LOCATION OF SWITCHGEAR AND FEEDER ROUTING TO POLE 40, SEE SWITCHGEAR ARRANGEMENT AND CONDUIT PLAN, DRAWING 95X-5900-E-00240

LEGEND

-·-·- 13.2 KV LINE.

---- DIRECT BURIED COMMUNICATIONS LINE SEE DRAWING 95X-5900-E-00270 FOR UNDERGROUND CABLE SCHEDULE

REF DWG NO.	DRAWING TITLE
95X-5900-E-00235	SINGLE LINE DIAGRAM
95X-5900-E-00240	SECTIONS AND DETAILS 15KV SWITCHGEAR AND DETAILS
95X-5900-E-00241	SECTIONS AND DETAILS POLE DETAILS, SHEET 1
95X-5900-E-00245	WELL HOUSE AND VALVE HOUSE POWER AND 120V DISTRIBUTION PLAN
95X-5900-E-00246	SECTIONS AND DETAILS POLE DETAILS, SHEET 2
95X-5900-x-00203	DRAWING INDEX
95X-5900-E-00273	CONTROL SYSTEM ARCHITECTURE
95X-5900-E-00270	CABLE SCHEDULE - SHEET 2
95X-5900-E-00276	SECTIONS AND DETAILS POLE AND MISCELLANEOUS DETAILS, SHEET 3

000405

REV NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E INITIALS AND DATE	FERNCO DATE
			CON
Ø	CERTIFIED FOR CONSTRUCTION	RMB 4-15-95	NA

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
SOUTH FIELD EXTRACTION SYSTEM

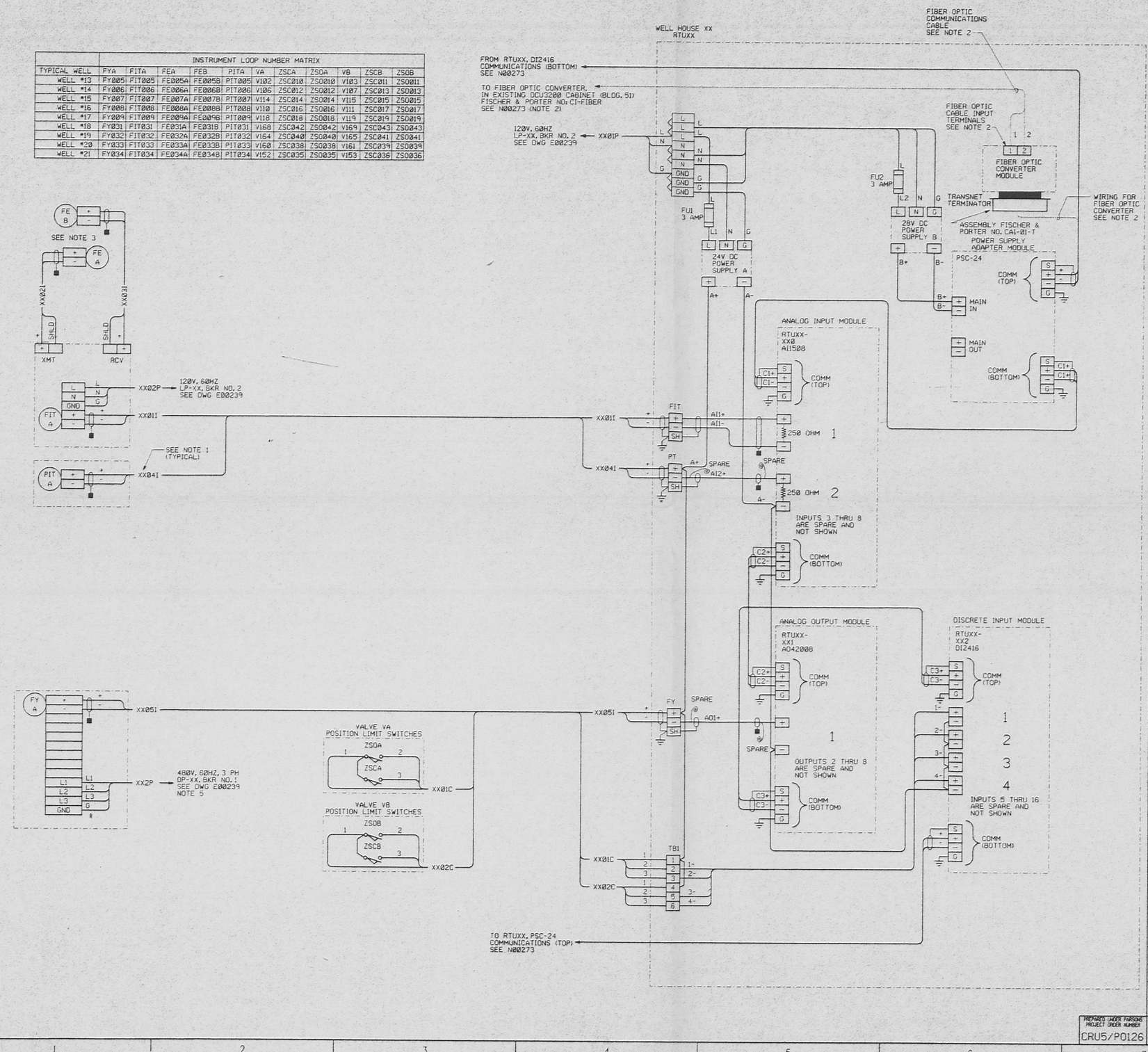
DRAWING TITLE
ELECTRICAL
13.2 KV DISTRIBUTION & COMMUNICATIONS PLAN

DRAWN BY	DATE	LEAD ENGINEER	DATE	CHECKED BY	DATE
J. ALLFORD	06-14-95	J. Powell	9/5/95	J. L. COOPER	08-02-95
PLANT/BLDG NO.		FLOOR		SCALE 1"=150'	CLASS
SUBMITTED FOR APPROVAL RMB 4-15-95		FERNCO CRU APPROVAL NA			

PREPARED UNDER PARSONS PROJECT ORDER NUMBER	A-E DOE PROJECT NO.	FEMP PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
CRU5/P0126		WBS 1.1.1.1.5.3.1 00-90701	95X-5900-E-00244	E0004	Ø

7-SEP-1995 15:15 /usr/area/cad/pa126/dgn00244.dgn

	INSTRUMENT LOOP NUMBER MATRIX										
TYPICAL WELL	FYA	FITA	FEA	FEB	PITA	VA	ZSCA	ZSOA	VB	ZSCB	ZSOB
WELL #13	FY005	FIT005	FE005A	FE005B	PIT005	V102	ZSC010	ZSO010	V103	ZSC011	ZSO011
WELL #14	FY006	FIT006	FE006A	FE006B	PIT006	V106	ZSC012	ZSO012	V107	ZSC013	ZSO013
WELL #15	FY007	FIT007	FE007A	FE007B	PIT007	V114	ZSC014	ZSO014	V115	ZSC015	ZSO015
WELL #16	FY008	FIT008	FE008A	FE008B	PIT008	V110	ZSC016	ZSO016	V111	ZSC017	ZSO017
WELL #17	FY009	FIT009	FE009A	FE009B	PIT009	V118	ZSC018	ZSO018	V119	ZSC019	ZSO019
WELL #18	FY031	FIT031	FE031A	FE031B	PIT031	V168	ZSC042	ZSO042	V169	ZSC043	ZSO043
WELL #19	FY032	FIT032	FE032A	FE032B	PIT032	V164	ZSC040	ZSO040	V165	ZSC041	ZSO041
WELL #20	FY033	FIT033	FE033A	FE033B	PIT033	V160	ZSC038	ZSO038	V161	ZSC039	ZSO039
WELL #21	FY034	FIT034	FE034A	FE034B	PIT034	V152	ZSC035	ZSO035	V153	ZSC036	ZSO036



NOTES

1. 'XX' REPRESENTS THE CORRESPONDING WELL HOUSE NUMBER.
2. WELL HOUSES #15 AND #21 REQUIRE A FIBER OPTIC CONVERTER MODULE. THE REQUIRED WIRING TO AND FROM THE FIBER OPTIC CONVERTOR MODULE HAS BEEN SHOWN BY DOTTED LINES.
3. FEXMT (ULTRASONIC TRANSMITTER) AND FERCV (ULTRASONIC RECEIVER) MAKE UP THE FLOW ELEMENT FOR THE FIT. SEE DRAWING 95X-5900-N-00189 FOR INSTRUMENT TAG IDENTIFICATION.
4. FOR CABLE SCHEDULES SEE DRAWING 95X-5900-E-00270.
5. FOR THREE PHASE POWER CABLES, SEE DRAWING 95X-5900-E-00242.

REF DWG NO.	DRAWING TITLE
95X-5900-X-00203	DRAWING INDEX
95X-5900-E-00239	PANEL SCHEDULES
95X-5900-E-00270	CABLE SCHEDULE - SHEET 2
95X-5900-N-00273	CONTROL SYSTEM ARCHITECTURE
95X-5900-E-00242	ELECTRICAL CABLE SCHEDULE - SHEET 1
95X-5900-E-00189	PIPING AND INSTRUMENTATTION DIAGRAM SYMBOLS AND LEGEND

000421

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	FERMCO	DATE
		INITIALS AND DATE		
0	CERTIFIED FOR CONSTRUCTION		NA	5-15-95

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

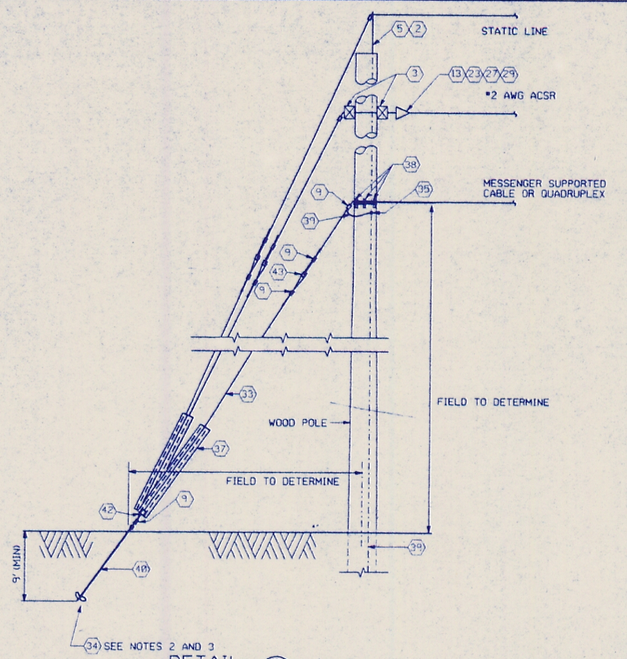
THIS DRAWING PREPARED BY
PARSONS
THE RALPH M. PARSONS CO. - PARSONS MAIN, INC. - ENGINEERING-SCIENCE, INC.
CINCINNATI, OHIO

PROJECT NAME
SOUTH FIELD EXTRACTION SYSTEM

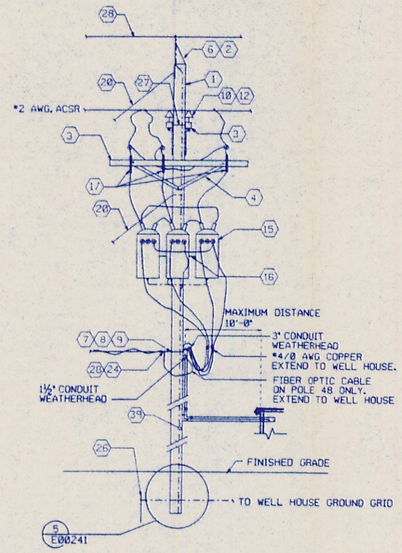
DRAWING TITLE
INSTRUMENTATION INTERCONNECTION DIAGRAM WELL HOUSE DCS RTU

DRAWN BY	DATE	LEAD ENGINEER	DATE	CHECKED BY	DATE
J. SAYATOVIC	07-14-95		9/14/95	J. L. COOPER	08/02/95
PLANT/BLDG. NO.		FLOOR ELEV.		SCALE	CLASS
				NONE	
SUBMITTED FOR APPROVAL		FERMCO CHU APPROVAL			
A-E	DATE		DATE		
	5-15-95	NA			

DOE PROJECT NO.	FEMP PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
PREPARED UNDER PARSONS PROJECT ORDER NUMBER: CRU5/P0126	WBS 1.1.1.1.5.3.1 00-90701	95X-5900-N-00271	N0005	0

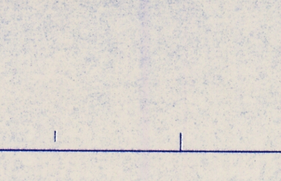


DETAIL (8) REF E00246 E00244
TYPICAL GUY
NTS

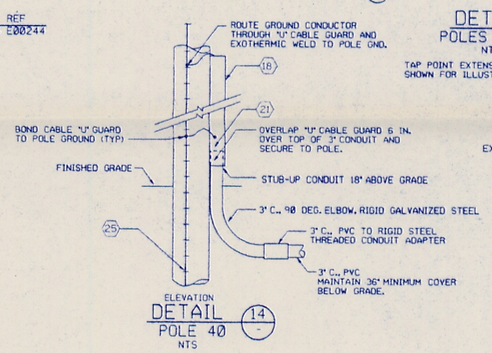


DETAIL (11) REF E00246 E00244
POLES 31, 48
NTS

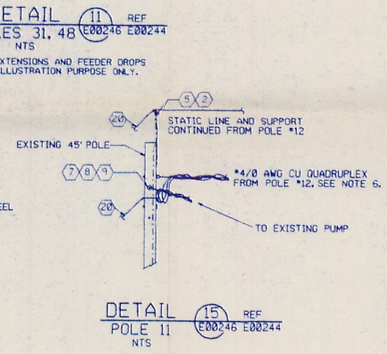
TAP POINT EXTENSIONS AND FEEDER DROPS SHOWN FOR ILLUSTRATION PURPOSE ONLY.



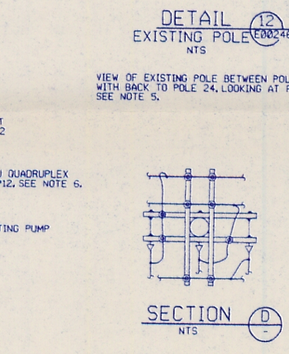
DETAIL (10) REF E00241 E00276
NTS



ELEVATION
DETAIL (14) REF -
POLE 40
NTS



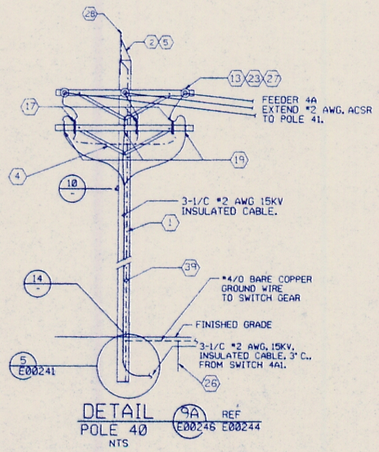
DETAIL (15) REF E00246 E00244
POLE 11
NTS



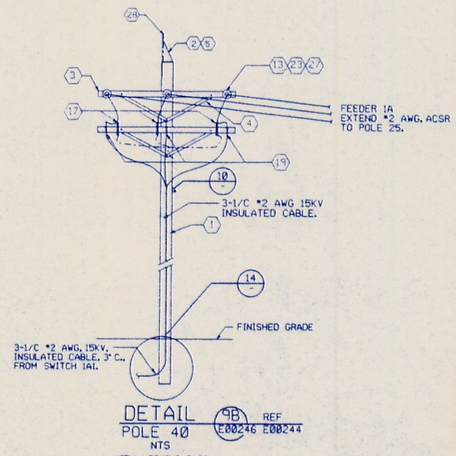
SECTION (D) -
NTS

DETAIL (12) REF E00246 E00244
EXISTING POLE
NTS

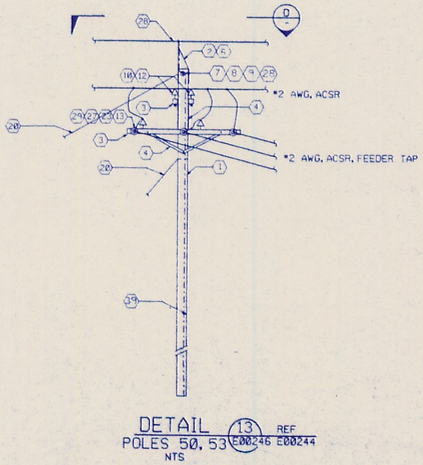
VIEW OF EXISTING POLE BETWEEN POLES 24 AND 25. WITH BACK TO POLE 24, LOOKING AT POLE 25. SEE NOTE 5.



DETAIL (9A) REF E00246 E00244
POLE 40
NTS
VIEW LOOKING WEST



DETAIL (9B) REF E00246 E00244
POLE 40
NTS
VIEW LOOKING EAST



DETAIL (13) REF E00246 E00244
POLES 50, 53
NTS

MATERIAL LIST - CONT. FROM DWG 95X-5900-E-00241

(33) ½" DIA - 7*6 STANDARD CONSTRUCTION, GALVANIZED STEEL STRAND.

(34) 14" DIAMETER HELICAL SCREW TYPE GUY ANCHOR WITH MINIMUM PULLOUT CAPACITY OF 22000 LBS.

(35) COMPRESSION GROUND FITTING.

(36) J-HOOK BOLT AND CLAMP, ½ DIA. BOLT.

(37) GUY WIRE MARKER, HALF ROUND, 2" WIDE, 84" LONG, W/ REQ'D HARDWARE, UV RESISTANT.

(38) GUY AND LOAD PLATE, W/ ANGLE THIMBLE EYE BOLT.

(39) #4 AWG. BARE SOLID COPPER GROUND CONDUCTOR.

(40) TRIPLEEYE, GALVANIZED ANCHOR ROD, ¾" DIA. LENGTH AS REQ'D.

(41) ½" EYENUT

(42) ½" THREADED ROD WITH NUTS, LENGTH AS REQUIRED.

(43) GUY STRAIN INSULATOR, ANSI CLASS 54-4, FOR ⅜" GUY WIRE.

(44) CROSSARM CORNER TYPE PIN, MALLABLE IRON, GALVANIZED 1" THREAD MOUNTING WITH HARDWARE.

(45) LASHING WIRE CLIP, SIZE AS REQUIRED

(46) TRANSFORMER, POLE MOUNTED, THREE 25 KVA, 13.2KV - 480V, 1 PHASE, W/ 2 - 2 1/2% TAPS ABOVE AND 2 - 2 1/2% TAPS BELOW, OIL FILLED.

NOTES

1. SET POLES 7'-6" DEEP.
2. INSTALL SOIL ANCHORS ACCORDING TO MANUFACTURER'S INSTRUCTIONS. DEPTH CALCULATION BASED ON SOIL DATA FOR MINIMUM BLOW COUNT OF 7. IF BLOW COUNT IS LESS THAN 7 THEN CONTACT FERMCO CONSTRUCTION MANAGER.
3. 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.
4. PLACE SIGNAL/COMMUNICATIONS CABLE SIX (6) FEET MINIMUM BELOW 13.2KV POWER LINE CONDUCTORS, FOUR (4) FEET BELOW 600V (OR LESS) POWER CONDUCTORS AND TWO (2) FEET MINIMUM BELOW POLE-GUY ATTACHMENTS.
5. DISCONNECT AND REMOVE STATIC LINE, STATIC LINE SUPPORT, AND QUADRUPLEX FEEDER AND HARDWARE FROM EXISTING POLE. TERMINATE STATIC LINE AND QUADRUPLEX FEEDER AT EXISTING POLE MARKED "RALLY POINT #2". COIL AND SECURE WIRE TO POLE. IF EXISTING POLE HEIGHT INTERFERES WITH 13.2 KV SPAN FROM POLES 25 TO 24, FIELD CUT TOP OF POLE AS REQUIRED TO MAINTAIN ADEQUATE CLEARANCE.
6. EXTEND #4/0 AWG QUADRUPLEX CONDUCTORS FROM POLE #12 TRANSFORMER SECONDARY TO POLE #11, FROM POLE #11, EXTEND CONDUCTORS TO EXISTING PUMP AT POLE 11. ENSURE MESSENGERS ARE CONNECTED TO GROUND AT POLE #12 ONLY.

REF DWG NO.	DRAWING TITLE
95X-5900-E-00241	SECTIONS AND DETAILS POLE DETAILS, SHEET 1
95X-5900-E-00203	DRAWING INDEX
95X-5900-E-00244	13.2 KV DISTRIBUTION AND COMMUNICATIONS PLAN
95X-5900-E-00276	SECTIONS AND DETAILS POLE AND MISCELLANEOUS DETAILS, SHEET 3

000407

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	FERMCO	DATE
			INITIALS AND DATE	
Ø	CERTIFIED FOR CONSTRUCTION	RWB	NA	5-15-95

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

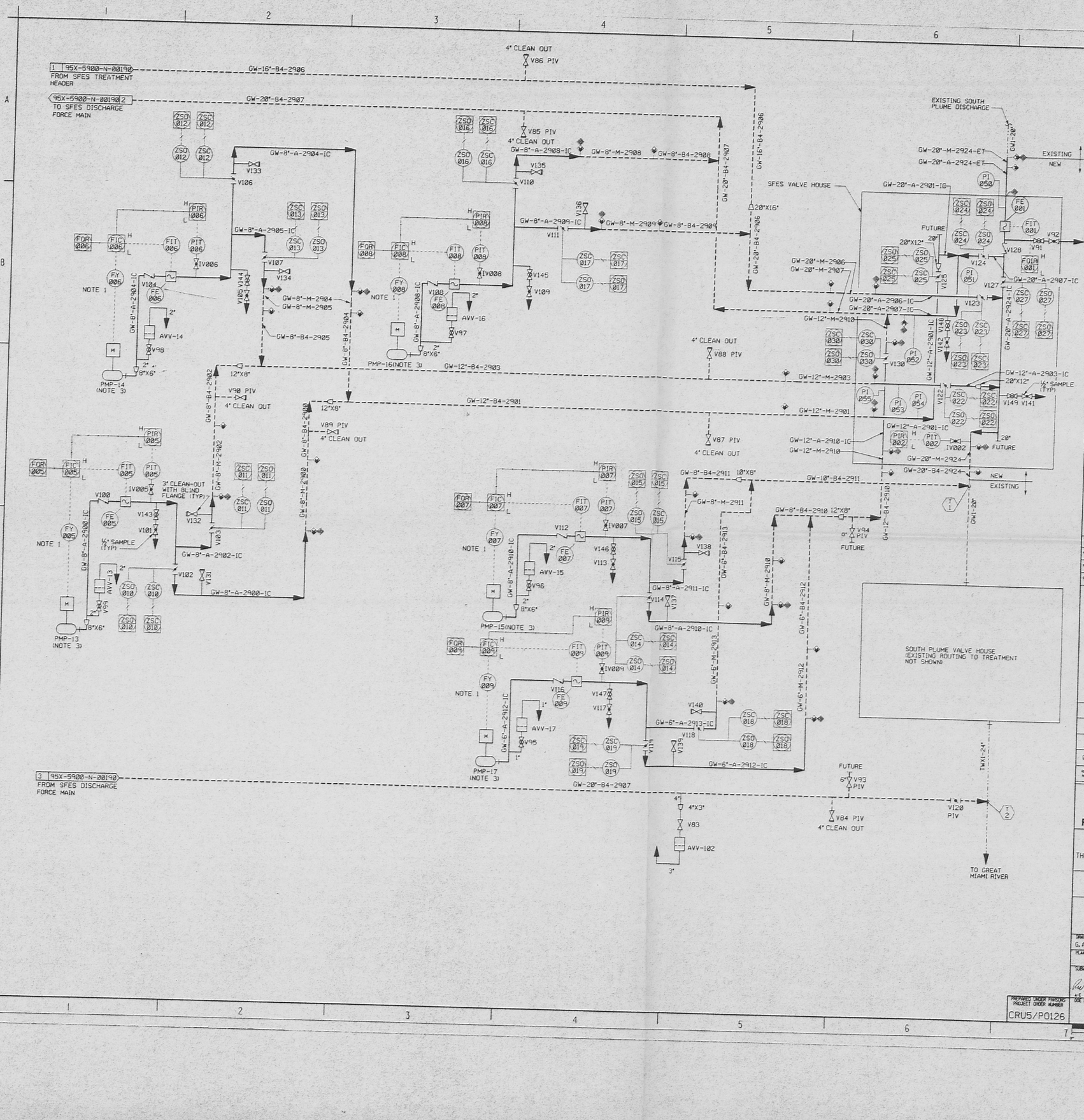
PROJECT NAME
SOUTH FIELD EXTRACTION SYSTEM

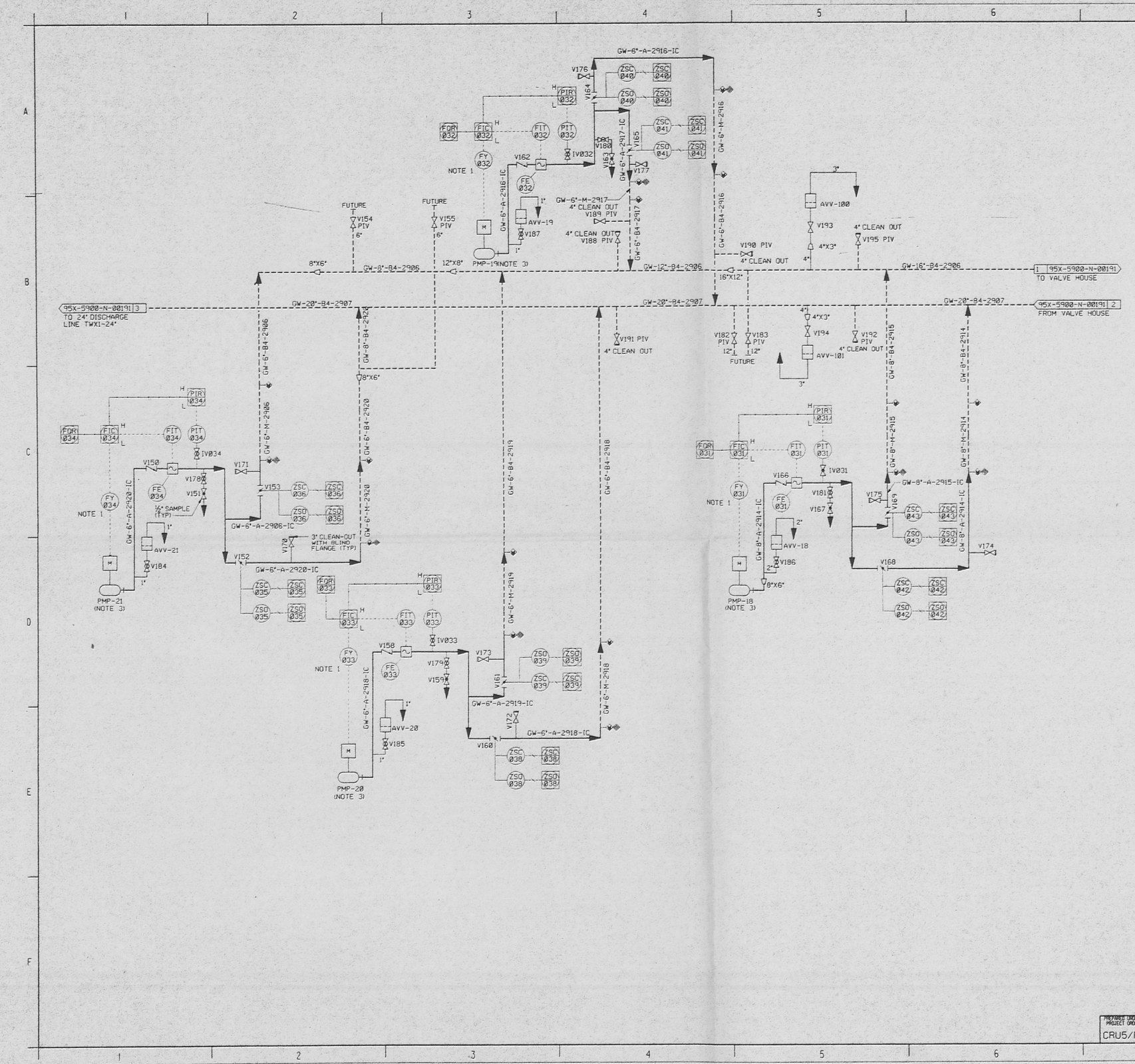
DRAWING TITLE
ELECTRICAL
SECTIONS AND DETAILS
POLE DETAILS, SHEET 2

DRAWN BY	DATE	LEAD ENGINEER	DATE	CHECKED BY	DATE
J. ALLFORD	06-14-95	J Powell	9/14/95	J. L. COOPER	08/02/95
PLANT/BLDG NO.		FLOOR		SCALE: NONE	CLASS
SUBMITTED FOR APPROVAL: RWB 5-15-95		FERMCO CRU APPROVAL: NA			
A-E	DATE		DATE		

DOE PROJECT NO.	FEMP PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV NO.
	WBS 1.1.1.1.5.3.1 00-90701	95X-5900-E-00246	E0006	Ø

PREPARED UNDER PARSONS PROJECT ORDER NUMBER: CRU5/P0126


4" CLEAN OUT
V86 PIV
1 | 95X-5900-N-00190
FROM SFES TREATMENT HEADER
GW-16"-B4-2906
95X-5900-N-00190 2
TO SFES DISCHARGE FORCE MAIN
GW-20"-B4-2907
GW-8"-A-2904-IC
V133
V106
GW-8"-A-2905-IC
V107
V134
GW-8"-M-2904
GW-8"-M-2905
GW-8"-B4-2905
GW-8"-B4-2904
V105
V144
NOTE 1
V104
2"
AVV-14
V98
PMP-14 (NOTE 3)
12"X8"
V90 PIV
4" CLEAN OUT
GW-8"-B4-2902
GW-8"-N-2902
GW-12"-B4-2903
PMP-16(NOTE 3)
GW-12"-B4-2901
V89 PIV
4" CLEAN OUT
V85 PIV
4" CLEAN OUT
GW-8"-A-2908-IC
GW-8"-M-2908
GW-8"-B4-2908
V135
V110
GW-8"-A-2909-IC
V136
V111
GW-8"-M-2909
GW-8"-B4-2909
V145
V109
V103
V108
V97
AVV-16
8"X6"
V87 PIV
4" CLEAN OUT
V88 PIV
4" CLEAN OUT
GW-16"-B4-2906
GW-20"-B4-2907
20"X16"
SFES VALVE HOUSE
EXISTING SOUTH PLUME DISCHARGE
GW-20"-M-2924-ET
GW-20"-A-2924-ET
EXISTING
NEW
GW-20"-A-2901-IC
PI 050
FE 001
FIT 001
V92
V91
V128
FUTURE
20"X12"
20"
V124
V125
PI 051
V127
GW-20"-A-2907-IC
GW-20"-M-2906
GW-20"-M-2907
GW-20"-A-2906-IC
GW-20"-A-2907-IC
V123
GW-12"-M-2910
GW-20"-A-2924-IC
GW-12"-A-2901-IC
V142
V146
V130
PI 052
GW-12"-M-2903
GW-12"-A-2903-IC
20"X12"
½" SAMPLE (TYP)
V122
V149
V141
PI 055
PI 053
PI 054
GW-12"-M-2901
GW-12"-A-2901-IC
GW-12"-A-2910-IC
GW-12"-M-2910
PIR 002
PIT 002
IV002
20"
FUTURE
GW-20"-M-2924
GW-20"-B4-2924
NEW
EXISTING
GW-8"-B4-2911 10"X8"
GW-10"-B4-2911
GW-8"-M-2911
GW-8"-B4-2910 12"X8"
V94 PIV
8"
FUTURE
GW-12"-B4-2910
GW-6"-B4-2913
GW-8"-M-2910
GW-6"-M-2912
GW-6"-B4-2912
GW-20"-M-2924
GW-20"-B4-2924
GW-1-20"
T 1
SOUTH PLUME VALVE HOUSE (EXISTING ROUTING TO TREATMENT NOT SHOWN)
TW1-24"
T 2
TO GREAT MIAMI RIVER
FUTURE
6"
V93 PIV
V84 PIV
4" CLEAN OUT
V120 PIV
4"
4"X3"
V83
AVV-102
3"
3 | 95X-5900-N-00190
FROM SFES DISCHARGE FORCE MAIN
GW-20"-B4-2907
PMP-13 (NOTE 3)
PMP-15(NOTE 3)
PMP-17 (NOTE 3)
V100
V143
V101
V132
V103
V102
V131
GW-8"-A-2902-IC
GW-8"-A-2900-IC
GW-8"-A-2910-IC
GW-6"-A-2913-IC
GW-6"-A-2912-IC
V112
V146
V113
V114
V115
V138
V116
V147
V117
V118
V139
V140
V96
V95
AVV-13
AVV-15
AVV-17
IV005
IV006
IV007
IV008
IV009
3" CLEAN-OUT WITH BLIND FLANGE (TYP)
FOR 005
FIC 005
FIT 005
PIT 005
PIR 005
FY 005
FE 005
FOR 006
FIC 006
FIT 006
PIT 006
PIR 006
FY 006
FE 006
FOR 007
FIC 007
FIT 007
PIT 007
PIR 007
FY 007
FE 007
FOR 008
FIC 008
FIT 008
PIT 008
PIR 008
FY 008
FE 008
FOR 009
FIC 009
FIT 009
PIT 009
PIR 009
FY 009
FE 009
ZSC 010
ZSO 010
ZSC 011
ZSO 011
ZSC 012
ZSO 012
ZSC 013
ZSO 013
ZSC 014
ZSO 014
ZSC 015
ZSO 015
ZSC 016
ZSO 016
ZSC 017
ZSO 017
ZSC 018
ZSO 018
ZSC 019
ZSO 019
ZSC 022
ZSO 022
ZSC 023
ZSO 023
ZSC 024
ZSO 024
ZSC 025
ZSO 025
ZSC 027
ZSO 027
ZSC 030
ZSO 030
NOTES
1. THE INSTRUMENT TAG DESIGNATION 'FY' REPRESENTS A VARIABLE FREQUENCY DRIVE.
2. SEE CIVIL DRAWINGS FOR UNDERGROUND PIPING VENTS AND CLEAN-OUTS.
3. THE TWO DIGIT SUFFIX ASSIGNED TO THE PUMPS CORRESPOND TO THE EXTRACTION WELL NUMBER.
4. PRESSURE INDICATORS IDENTIFIED BELOW REQUIRE AN ISOLATION VALVE:
PRESSURE INDICATOR | ISOLATION VALVE
PI050 | IV050
PI051 | IV051
PI052 | IV052
PI053 | IV053
PI054 | IV054
PI055 | IV055
LAST VALVE NUMBER | V149
REF DWG NO. | DRAWING TITLE
95X-5900-X-00203 | DRAWING INDEX
95X-5900-N-00189 | SYMBOLS AND LEGEND
95X-5900-N-00190 | PIPING AND INSTRUMENTATION DIAGRAM - SHEET 1 OF 2
000419
0 | CERTIFIED FOR CONSTRUCTION | NA | 4-15-95
REV. NO. | ISSUE OR REVISION PURPOSE - DESCRIPTION | A-E INITIALS AND DATE | FERNCO 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
SOUTH FIELD EXTRACTION SYSTEM
DRAWING TITLE
MECHANICAL PROCESS PIPING AND INSTRUMENTATION DIAGRAM SHEET 2 OF 2
DRAWN BY G. AMBUSH | DATE 03-28-95 | LEAD ENGINEER | DATE 4-15-95 | CHECKED BY J. L. COOPER | DATE 4-5-95
PLANT/BLDG. NO. | FLOOR | SCALE NONE | CLASS
SUBMITTED FOR APPROVAL | FERNCO CRU APPROVAL NA
A-E DOE PROJECT NO. | DATE | FEMP PROJECT NO. WBS 1.1.1.1.5.3.1 00-9070I | DRAWING SHEET CODE NO. 95X-5900-N-00191 | SHEET NO. N0003 | REV. NO. 0
PREPARED UNDER PARSONS PROJECT ORDER NUMBER CRU5/P0126



NOTES

1. THE INSTRUMENT TAG DESIGNATION "FY" REPRESENTS A VARIABLE FREQUENCY DRIVE.
2. SEE CIVIL DRAWINGS FOR UNDERGROUND PIPING VENTS AND CLEAN-OUTS.
3. THE TWO DIGIT SUFFIX ASSIGNED TO THE PUMPS CORRESPOND TO THE EXTRACTION WELL NUMBER.

LAST VALVE NUMBER	V195

REF DWG NO.	DRAWING TITLE
95X-5900-X-00203	DRAWING INDEX
95X-5900-N-00189	SYMBOLS AND LEGEND
95X-5900-N-00191	PIPING AND INSTRUMENTATION DIAGRAM - SHEET 2 OF 2

000418

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	FERNCO	DATE
		INITIALS AND DATE		
Ø	CERTIFIED FOR CONSTRUCTION		NA	9.15.95

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
SOUTH FIELD EXTRACTION SYSTEM

DRAWING TITLE
MECHANICAL PROCESS
PIPING AND INSTRUMENTATION DIAGRAM
SHEET 1 OF 2

DRAWN BY	DATE	LEAD ENGINEER	DATE	CHECKED BY	DATE
G. AMBUSH	03-27-95	J.L. COOPER	9-15-95	J.L. COOPER	4-6-95

PLANT/BLDG. NO.	FLOOR	SCALE	CLASS
		NONE	

SUBMITTED FOR APPROVAL	FERNCO CRU APPROVAL
9.15.95	NA
A-E DATE	DATE

PREPARED UNDER PARSONS PROJECT ORDER NUMBER	DOE PROJECT NO.	TEMP PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
CRU5/P0126		WBS 1.1.1.1.5.3.1 00-9070I	95X-5900-N-00190	N0002	Ø

7311

PIPING SYMBOLS

- GATE VALVE
- GLOBE VALVE
- BALL VALVE
- PLUG VALVE
- BUTTERFLY VALVE/DAMPER
- STOP CHECK
- NEEDLE VALVE
- CHECK VALVE
- SLIDING GATE VALVE
- BALL CHECK VALVE
- BACKFLOW PREVENTER
- DIAPHRAGM VALVE
- PINCH VALVE
- 3 WAY VALVE
- 3 WAY BALL VALVE
- 3 WAY PLUG VALVE
- ANGLE GATE VALVE
- ANGLE GLOBE VALVE
- FOOT VALVE
- HUB DRAIN OR FUNNEL
- DIAPHRAGM OPERATOR
- DIAPHRAGM W/ POSITIONER
- PISTON OPERATOR
- SAFETY RELIEF VALVE
- SOLENOID OPERATOR
- SELF-CONTAINED BACK PRESSURE REGULATING VALVE
- 2-WAY SOLENOID VALVE
- 3-WAY SOLENOID VALVE / INDICATES DEENERGIZED SECONDARY
- 4-WAY SOLENOID VALVE
- VALVE WITH OPERATOR (VALVE TYPE UNDEFINED)
- STEAM TRAP
- HOSE QUICK COUPLING
- UNION
- DRAIN LEG
- EXPANSION JOINT
- HANDWHEEL
- EJECTOR
- STRAINER (Y TYPE)
- STRAINER (SINGLE BASKET)
- STRAINER (DOUBLE BASKET)
- STRAINER (CONE TYPE)
- STRAINER (SUCTION TYPE)
- CONCENTRIC REDUCER
- ECCENTRIC REDUCER
- ORIFICE
- VENTURI TUBE
- SIPHON TUBE
- THERMOWELL
- FLOW DIRECTION
- WELDED CONNECTION
- FLANGED CONNECTION
- FLEXIBLE HOSE
- PIPE CAP
- TIE/IN MARK
- PRIMARY
- SECONDARY
- EXISTING PIPING OR EQUIPMENT
- UNDERGROUND
- PACKAGED SYSTEM
- PIPING MATERIAL BREAK
- PIPING INSULATION BREAK
- AIR AND VACUUM VALVE
- PULSATION DAMPENER
- AIR FILTER
- FILTER LUBRICATOR REGULATOR
- AIR OPERATED DIAPHRAGM PUMP
- HORIZONTAL CENTRIFUGAL PUMP
- VERTICAL CENTRIFUGAL PUMP
- SUMP PUMP
- CHEMICAL METERING PUMP
- AGITATOR (MIXER)

SINGLE LINE AIR DUCT SYMBOLS

- FAN WITH INLET VANES AND BACKDRAFT DAMPER
- BACKDRAFT DAMPER
- MOTORIZED DAMPER
- MANUAL VOLUME DAMPER

INSTRUMENT SYMBOLS

- ELECTRICAL BINARY SIGNAL
- PNEUMATIC BINARY SIGNAL
- ELECTROMAGNETIC OR SONIC SIGNAL (GUIDED)
- ELECTROMAGNETIC OR SONIC SIGNAL (NON-GUIDED)
- INSTRUMENT/PLANT AIR SUPPLY
- ELECTRICAL SIGNAL
- DATA HIGHWAY
- CAPILLARY
- HYDRAULIC SIGNAL LINE
- PNEUMATIC OR VACUUM SIGNAL LINE
- INTERLOCK
- DIAPHRAGM SEAL
- ROTAMETER
- SIGHT GLASS
- LOCAL MOUNTED INSTRUMENT
- FRONT OF PANEL MOUNTED INSTRUMENT
- FRONT OF PANEL MOUNTED INSTRUMENT AUXILLIARY LOCATION
- REAR OF PANEL MOUNTED INSTRUMENT
- REAR OF PANEL MOUNTED INSTRUMENT AUXILLIARY LOCATION
- DIGITAL LOGIC OPERATOR INTERFACE AUXILIARY LOCATION
- DIGITAL LOGIC OPERATOR INTERFACE
- SHARED CONTROL AUXILIARY LOCATION
- SHARED DISPLAY COMPUTER CONTROL AND OPERATOR INTERFACE
- AIR VENT FILTER
- ULTRASONICIC FLOW METER
- POSITIVE DISPLACEMENT FLOW METER
- EQUIPMENT NUMBER

FY 102 A

- LETTERS OF IDENTIFICATION
- SPECIAL DESIGNATION
- INSTRUMENT TAG NUMBER

TYPICAL CALL OUT

ABBREVIATIONS

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
AO	AIR TO OPEN
AC	AIR TO CLOSE
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	CLEAN OUT
RH	RELATIVE HUMIDITY
CFM	CUBIC FEET/MINUTE
PIV	POST INDICATOR VALVE
PMP	PUMP
AVV	AIR AND VACUUM VALVE

INSTRUMENTATION SPECIAL DESIGNATIONS

DESIGNATION	FUNCTION/ABBREVIATION
Σ/N OR AVG	AVERAGING
± OR BI	BIAS
1:1.1:3.2:1 (TYP)	BOOST,GAIN OR ATTENUATE (INPUT:OUTPUT)
△ 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
⇌	EXISTING INSTRUMENT TO BE RELOCATED
I/P	CURRENT TO PNEUMATIC TRANSDUCER
RUN	RUNNING
OA	OFF-AUTO
OCA	OPEN-CLOSE-AUTO
I/O	INPUT / OUTPUT
⇌	EXISTING INSTRUMENT
UD	UP/DOWN
EW	EAST/WEST
I/I	CURRENT TO CURRENT

PIPING SPECIFICATIONS

FLOWING MEDIUM	MED CODE	MATL CODE
BACK WASH	BW	T
CHILLED WATER	CHS, CHR	A
CHLORINE	CL	B1
CONDENSATE	LC	W, T
CONDENSER WATER	CWS, CWR	A
COOLING WATER	WS, WR	A
DRAIN	DR	A, T
THICKENER OVERFLOW	TO	T
FILTRATE EFFLUENT	FT	A
FLOCCULANT	FL	A
FLUSH WATER	FW	T
FORCE MAIN	FM	M
GROUND WATER	GW	A, B4, M
INSTRUMENT AIR	IA	T
MELTER OFF-GAS	OG	F
NITRIC ACID	AN	T1
PERCHED GND WATER	PGW	B
PHOSPHORIC ACID	PAPH	T1
PLANT AIR	PA	W
POLISHED WATER	PW	A
POTABLE WATER	DW	W, B, B3
PROCESS WATER	TW, TWX1	A, B4
PROCESS WASTEWATER	CE	A
RAW WATER	RW	A
RECYCLE WATER	RC	T, B2
SCRUBBER RECYCLE	RSL	T
SLURRY	SL	T
SODIUM CARBONATE	SC	A
SODIUM HYDROXIDE	NA	T
SODIUM SILICATE	SS	A
STORM WATER	ST	A
SULFURIC ACID	SB	T1
SUMP DISCHARGE	SU	T
VACUUM	V	A
VENTILATION AIR	VE	T
WASTE WATER	WW	T

EXAMPLE: CE-2"-A-100-ET

- MEDIUM CODE
- NOMINAL PIPE SIZE
- MATERIAL CODE
- LINE NUMBER
- HEAT TRACING AND INSULATION

A - A53,GR. A, SEAMLESS STEEL PIPE
B - PVC
B1 - PVDF
B2 - PVDF, 100 PSI
B3 - CPVC
B4 - HDPE
L - FIBERGLASS REINFORCED PLASTIC
M - DUCTILE IRON
T - 304L, STAINLESS STEEL PIPE
T1 - 316L, STAINLESS STEEL PIPE
W - A53,GR. A, GALVANIZED STEEL PIPE
ET - ELECTRIC TRACED AND INSULATED
IC - ANTI-CONDENSATION INSULATION
ST - STEAM TRACED AND INSULATED

LETTERS OF INSTRUMENT IDENTIFICATION

LETTER	FIRST LETTER: MEASURED OR INITIATING VARIABLE	2ND LETTER: MODIFIER	3RD OR 4TH LETTER: READ OUT OR PASSIVE FUNCTION
A	ANALYSIS	ALARM	ALARM
B	BURNER FLAME	----	----
C	CAMERA	CONTROLLER	CLOSED
D	DENSITY	DIFFERENTIAL	----
E	VOLTAGE	ELEMENT	ELEMENT
F	FLOW RATE	RATIO (FRACTION)	----
G	GAGING (DIM)	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	----	OPEN
P	PRESSURE OR VACUUM	----	POINT (TEST)
Q	QUANTITY OR EVENT	TOTALIZER	----
R	RADIOACTIVITY	RECORDER	RECORDER
S	SPEED OR FREQUENCY	SAFETY/SWITCH	SWITCH
T	TEMPERATURE	TRANSMITTER	TRANSMITTER
U	USER'S GUIDE	----	MULTIFUNCTION
V	VISCOSITY	----	VENT, VALVE
W	WEIGHT OR FORCE	WELL	----
X	UNCLASSIFIED	----	UNCLASSIFIED
Y	RELAY	RELAY	----
Z	POSITION	----	----

NOTES

REF DWG NO.	DRAWING TITLE
95X-5900-X-00203	DRAWING INDEX

000417

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	FERNCO	DATE
			INITIALS AND DATE	
0	CERTIFIED FOR CONSTRUCTION		NA	7-5-95

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

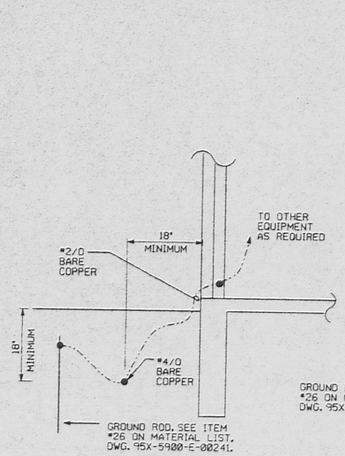
THIS DRAWING PREPARED BY
PARSONS
THE RALPH M. PARSONS CO. - PARSONS MAIN, INC. - ENGINEERING-SCIENCE, INC.
CINCINNATI, OHIO

PROJECT NAME: SOUTH FIELD EXTRACTION SYSTEM

DRAWING TITLE
MECHANICAL PROCESS
PIPING AND INSTRUMENTATION DIAGRAM
SYMBOLS AND LEGEND

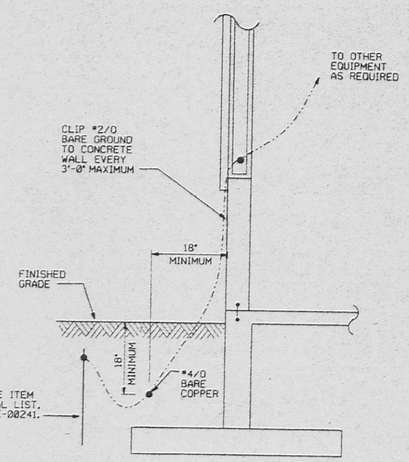
DRAWN BY	DATE	LEAD ENGINEER	DATE	CHECKED BY	DATE
G. AMBUSH	03-27-95		7-15-95	J. L. COOPER	4-6-95
PLANT/BLDG NO.		FLOOR		SCALE: NONE	CLASS
SUBMITTED FOR APPROVAL: 7-15-95		FERNCO CRU APPROVAL: NA			

PREPARED UNDER PARSONS PROJECT ORDER NUMBER	DOE PROJECT NO.	DATE	PERMIT PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
CRU5/P0126			WBS 1.1.1.1.5.3.1 00-9070!	95X-5900-N-00189	N0001	0



DETAIL (23) REF E00277 E00245
NTS

TYPICAL GROUND TAP FOR BUILDING NOT IN FLOOD PLAN



DETAIL (24) REF E00277 E00245
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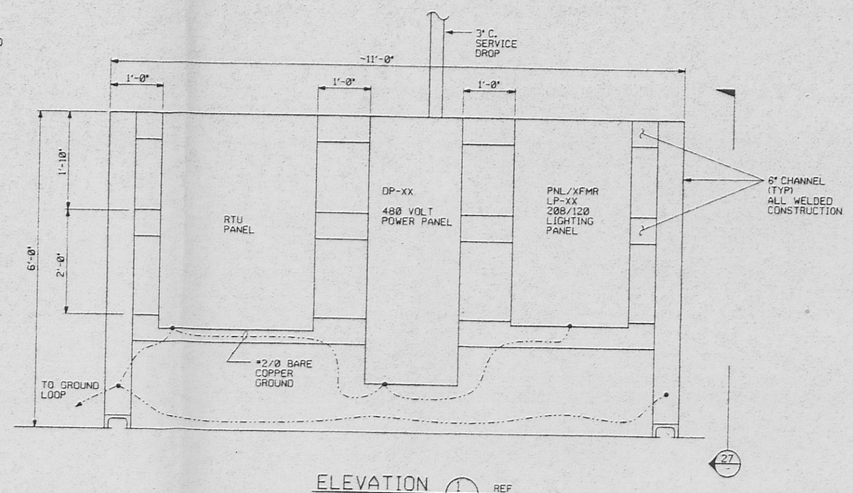
TYPICAL GROUND TAP FOR FLOOD PLAN BUILDING



ELEVATION (1) REF E00277 E00245
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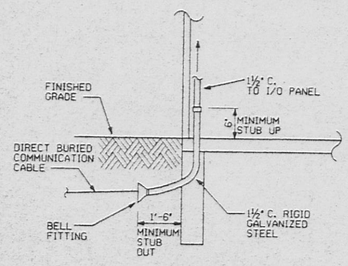
SWITCHRACK REQUIRED IN EACH WELL HOUSE



SECTION (25) REF E00277 E00245
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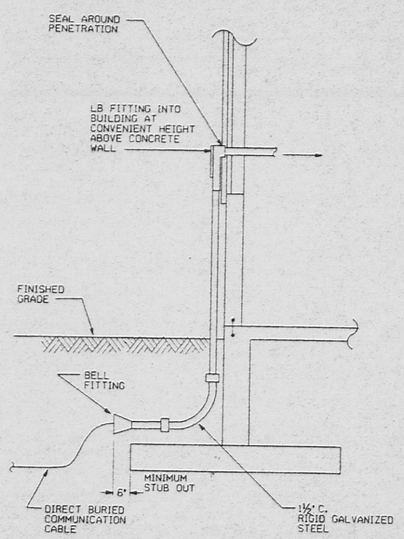
TYPICAL COMMUNICATIONS CABLE BUILDING ENTRANCE WELL HOUSES NO. 15, 16, 17, 18, 19, 20, 21, AND VALVE HOUSE



SECTION (26) REF E00277 E00245
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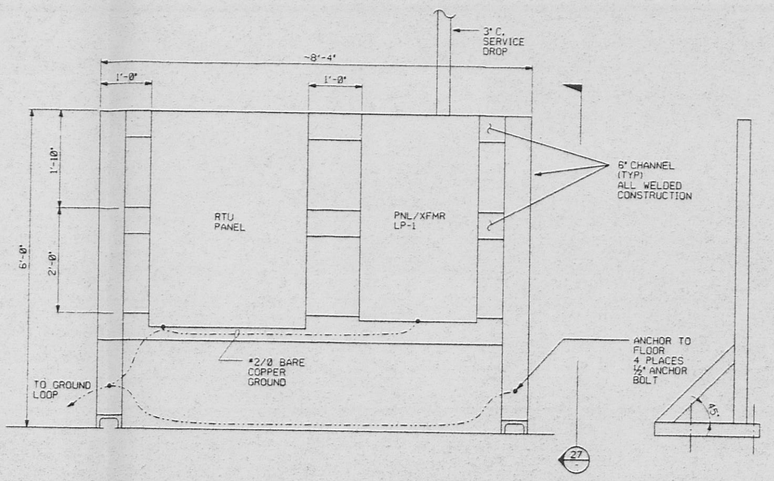
TYPICAL COMMUNICATIONS CABLE ENTRANCE WELL HOUSES NO. 13 AN 14



ELEVATION (2) REF E00277 E00245
NTS

SWITCHRACK REQUIRED IN VALVE HOUSE

SECTION (27) NTS
SIDE VIEW

NOTES

REF DWG NO.	DRAWING TITLE
95X-5900-X-00203	DRAWING INDEX
95X-5900-E-00245	WELL HOUSE AND VALVE HOUSE POWER AND 120V DISTRIBUTION PLAN

000416

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E INITIALS AND DATE	FERNCO INITIALS AND DATE
Ø	CERTIFIED FOR CONSTRUCTION		NA 9-15-95

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
SOUTH FIELD EXTRACTION SYSTEM

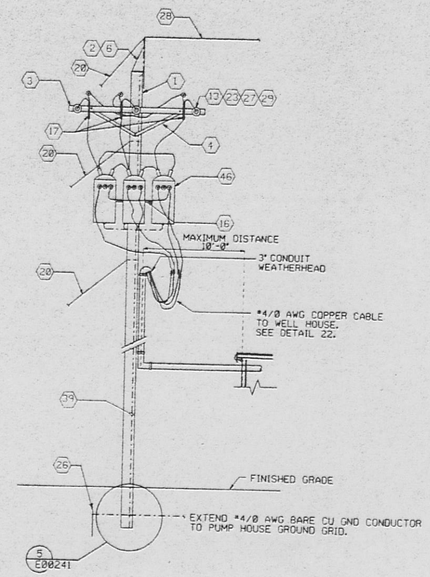
DRAWING TITLE
ELECTRICAL
SECTIONS AND DETAILS
MISCELLANEOUS DETAILS, SHEET 4

DRAWN BY	DATE	LEAD ENGINEER	DATE	CHECKED BY	DATE
J. ALLFORD	06/15/95	J. Powell	9/19/95	J.L. COOPER	08/02/95

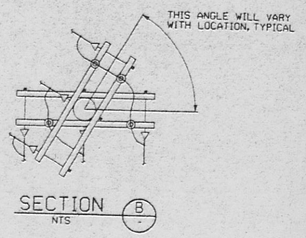
PLANT/BLDG. NO.	FLOOR	SCALE	CLASS
		NONE	

SUBMITTED FOR APPROVAL	FERNCO CRU APPROVAL
A-E DATE	DATE
NA	

PREPARED UNDER PARSONS PROJECT ORDER NUMBER	DOE PROJECT NO.	TEMP PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
CRU5/P0126		WBS 1.1.1.1.5.3.1 00-90701	95X-5900-E-00277	E0015	Ø



DETAIL 16 REF E00276 E00244
POLES 35, 39, 51, 55, 59
NTS



SECTION B
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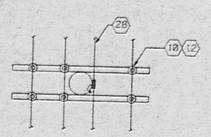

SECTION C
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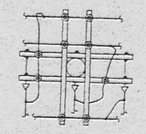
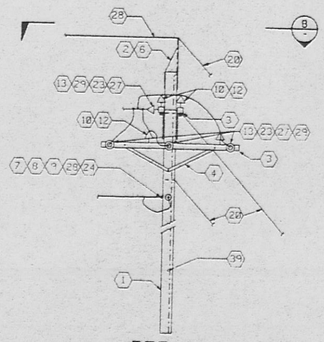
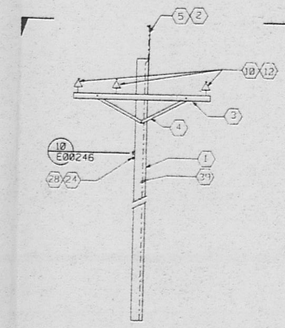


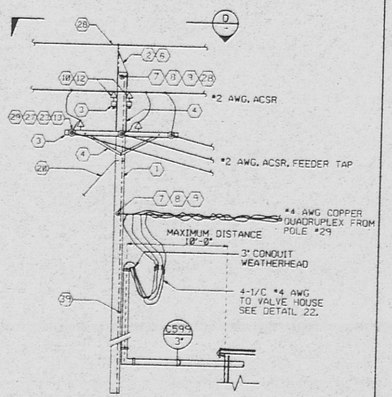
SECTION D
NTS



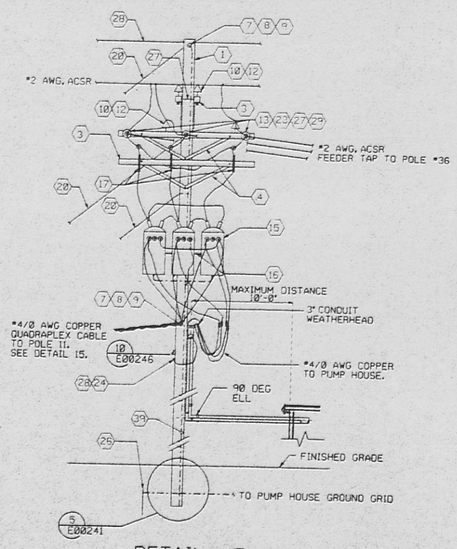
DETAIL 17 REF E00276 E00244
POLES 42, 43, 45, 47
NTS



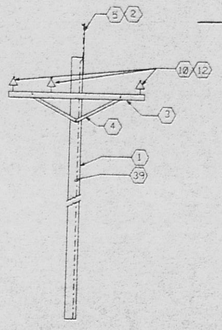
DETAIL 18 REF E00276 E00244
POLES 41, 44, 46
NTS



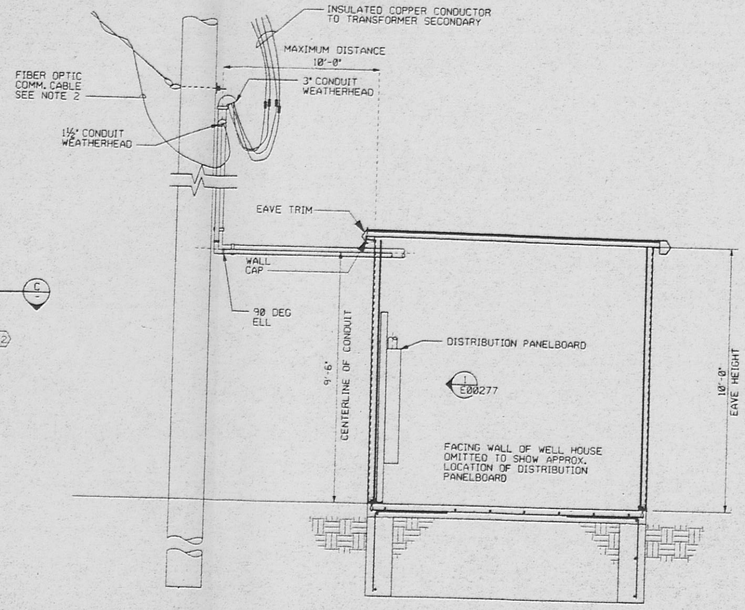
DETAIL 19 REF E00276 E00244
POLE 28
NTS



DETAIL 20 REF E00276 E00244
POLE 12
NTS



DETAIL 21 REF E00276 E00244
POLES 26, 30, 33, 34, 37, 49, 52, 54, 58
NTS



DETAIL 22
TYPICAL WELL HOUSE SERVICE ENTRANCE
NTS

NOTES

1. SEE MATERIAL LIST, DWG. 95X-5900-E-00241, AND -E-00246.
2. 1½" CONDUIT AND WEATHERHEAD FOR FIBER OPTIC CABLE REQUIRED ON POLES 12 AND 48 ONLY.

REF DWG NO.	DRAWING TITLE
95X-5900-E-00235	SINGLE LINE DIAGRAM
95X-5900-E-00244	13.2KV DISTRIBUTION & COMMUNICATIONS PLAN
95X-5900-E-00241	SECTIONS AND DETAILS POLE DETAILS, SHEET 1
95X-5900-E-00246	SECTIONS AND DETAILS POLE DETAILS, SHEET 2
95X-5900-E-00277	SECTIONS AND DETAILS MISCELLANEOUS DETAILS, SHEET 4
95X-5900-E-00203	DRAWING INDEX

000415

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E INITIALS AND DATE	FERNCO INITIALS AND DATE
0	CERTIFIED FOR CONSTRUCTION		NA 6-15-95

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
SOUTH FIELD EXTRACTION SYSTEM

DRAWING TITLE
ELECTRICAL
SECTIONS AND DETAILS
POLE AND MISCELLANEOUS DETAILS, SHEET 3

DRAWN BY	DATE	LEAD DRAWER	DATE	CHECKED BY	DATE
J. ALLFORD	06/15/95	J. Fewell	9/15/95	J.L. COOPER	08/02/95

PLANT/BLDG. NO.	FLOOR	SCALE	CLASS
		NONE	

SUBMITTED FOR APPROVAL	FERNCO CRU APPROVAL
A-E DATE 9-15-95	NA DATE

PREPARED UNDER PARSONS PROJECT ORDER NUMBER	DOE PROJECT NO.	FEMP PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
CRU5/P0126		WBS 1.1.1.1.5.3.1 00-90701	95X-5900-E-00276	E0014	0

CONDUIT SCHEDULE

CONDUIT NO	FROM	TO	COND SIZE	CONTAINS CABLE(S)	REMARKS
C101	EXISTING 15KV SWITCH SUBSTATION N18-1 PRIMARY	DISCONNECT SWITCH DSW2	5" C	F4A	15KV
C102	DISCONNECT SWITCH DSW1	POLE #40 STUB UP	3" C	F1A1	15KV
C103	EXISTING 15KV SWITCH SUBSTATION N18-1 PRIMARY	DISCONNECT SWITCH DSW2	5" C	F1A	15KV
C104	DISCONNECT SWITCH DSW2	POLE #40 STUB UP	3" C	F4A1	15KV
C105	DISCONNECT SWITCH DSW2	DISCONNECT SWITCH DSW1	5" C	F1A	15KV
CXX1-1	WEATHERHEAD ON POLE BELOW TRANSFORMER T-XX	DISTRIBUTION PANEL DP-XX	3"	XX1P-1	CONDUIT FOR WELLS 17, 19, 20 AND 21
CXX1-2	WEATHERHEAD ON POLE BELOW TRANSFORMER T-XX	DISTRIBUTION PANEL DP-XX	3"	XX1P-2	CONDUIT FOR WELLS 13, 14, 15, 16, AND 18
CXX2	DISTRIBUTION PANEL DP-XX	VARIABLE SPEED DRIVE VSD-XX	1½"	XX2P	
CXX3	VARIABLE SPEED DRIVE VSD-XX	WELL HOUSE PUMP PMP-XX MOTOR	1½"	XX3P	
CXX4	DISTRIBUTION PANEL DP-XX	DISCONNECT SWITCH DSWXX	¾" C	XX4P	
CXX5	DISTRIBUTION PANEL DP-XX	FAN STARTER EF-XX	¾" C	XX5P	
CXX6	FAN STARTER EF-XX	FAN MOTOR EF-XX	¾" C	XX6P	
CXX7	DISTRIBUTION PANEL DP-XX	LIGHTING PANEL LP-XX	¾" C	XX7P	
C599	WEATHER HEAD ON POLE #28	VALVE HOUSE LIGHTING PANEL LP-1	3" C	599P	
C575	RTU8	FLOW INDICATING TRANSMITTER FIT001	1½"	1001C TO 1004C,1006C 1008C,1022I,1023I	
C577	TEE IN C575	POSITION SWITCHES ZSO025 & ZSC025	¾"	1004C	
C578	TEE IN C575	POSITION SWITCHES ZSO030 & ZSC030	¾"	1008C	
C579	TEE IN C575	PRESSURE IND TRANSMITTER PIT002	¾"	1023I	
C580	TEE IN C575	POSITION SWITCHES ZSO022 & ZSC022	¾"	1001C	
C581	TEE IN C575	POSITION SWITCHES ZSO024 & ZSC024	¾"	1003C	
C582	TEE IN C575	POSITION SWITCHES ZSO023 & ZSC023	¾"	1002C	
C583	TEE IN C575	POSITION SWITCHES ZSO027 & ZSC027	¾"	1006C	
C585	FLOW INDICATING TRANS-MITTER FIT001	FE 001A (TRANSMITTER)	¾"	1021I, 1022I	
C586	TEE IN C585	FE 001B (RECIEVER)	¾"	1022I	
CXX8	RTUXX	FLOW INDICATING TRANSMITTER FITA	¾"	XX05I, XX01C XX02C, XX04I	
CXX9	TEE IN CXX8	POSITION SWITCHES ZSOA & ZSCA	¾"	XX01C	
CXX10	TEE IN CXX8	POSITION SWITCHES ZSOB & ZSCB	¾"	XX02C	
CXX11	TEE IN CXX8	PRESSURE IND TRANSMITTER PITA	¾"	XX04I	
CXX12	FLOW INDICATING TRANSMITTER FITA	FE-A (TRANSMITTER)	¾"	XX02I, XX03I	
CXX13	TEE IN CXX12	FE-B (RECIEVER)	¾"	XX03I	
CXX14	DISCONNECT SWITCH DSWXX	UNIT HEATER UH-XX	¾"	XX8P	
CXX15	TEE IN CXX17	EXHAUST FAN EF-XX THERMOSTAT	¾"	XX01I, XX01C XX22C	
CXX16	TEE IN CXX17	DAMPER MOTOR M1	¾"	XX20P	
CXX17	FAN STARTER EF-XX	DAMPER MOTOR M2	¾"	XX20P, XX21P, XX22C	
CXX18	UNIT HEATER UH-XX	UNIT HEATER HOA SWITCH	¾"	XX9C	
C590	LIGHTING PANEL LP-1	EXHAUST FAN EF-1 HAND-OFF-AUTO SWITCH	¾"	800P, 801P, 802P	
C591	TEE IN CONDUIT C590	VALVE HOUSE DAMPER MOTOR	¾"	802P	
C592	TEE IN CONDUIT C590	EXHAUST FAN EF-1 MOTOR	¾"	801P	
C593	EXHAUST FAN EF-1 HAND-OFF-AUTO SWITCH	EXHAUST FAN EF-1 THERMOSTAT	¾"	803C	
C594	LIGHTING PANEL LP-1	JUNCTION BOX JB-1	¾"	804P	
C595	JUNCTION BOX JB-1	DISCONNECT SWITCH DSW1	¾"	805P	
C596	DISCONNECT SWITCH DSW1	UNIT HEATER UH-1	¾"	806P	
C597	TEE IN CONDUIT C596	UNIT HEATER UH-1 HAND-OFF-AUTO SWITCH	¾"	807C	
CXX19	VARIABLE SPEED DRIVE VSD-XX (FYA)	RTUXX	¾"	XX05I	

CONDUIT SCHEDULE

CONDUIT NO	FROM	TO	COND SIZE	CONTAINS CABLE(S)	REMARKS
C550	JUNCTION BOX JB-1	DISCONNECT SWITCH DSW2	¾"	808P	
C551	DISCONNECT SWITCH DSW2	UNIT HEATER UH-2	¾"	809P	
C552	TEE IN C551	UNIT HEATER UH-2 HOA SWITCH	¾"	810C	
C1520	WEATHERHEAD ON WELL HOUSE #15	RTU15	1½"	1001I	CONTAINS FIBER OPTIC CABLE
C2120	WEATHER HEAD ON WELL HOUSE #21	RTU21	1½"	1010I	CONTAINS FIBER OPTIC CABLE

NOTES

1. SEE DRAWING 95X-5900-E-00242 FOR CABLE SCHEDULE.
2. SEE DRAWING 95X-5900-E-00245 FOR ELECTRICAL PLANS.
3. CONDUIT RIGID GALVANIZED UNLESS OTHERWISE INDICATED.

REF DWG NO.	DRAWING TITLE
95X-5900-X-00203	DRAWING INDEX
95X-5900-E-00242	CABLE SCHEDULE
95X-5900-E-00245	WELL HOUSE AND VALVE HOUSE POWER AND 120V DISTRIBUTION PLAN
95X-5900-E-00240	SECTIONS AND DETAILS 15KV SWITCHGEAR AND DETAILS

000414

REV. NO.	ISSUE OR REVISION PURPOSE DESCRIPTION	A-E INITIALS AND DATE	FERNCO DATE
0	CERTIFIED FOR CONSTRUCTION	Paul B	NA 9-15-95

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
SOUTH FIELD EXTRACTION SYSTEM

DRAWING TITLE
ELECTRICAL
CONDUIT SCHEDULE

DRAWN BY	DATE	LEAD ENGINEER	DATE	CHECKED BY	DATE
B. JASPER	05/15/95	J. Ferrell	9/15/95	J. L. COOPER	08/02/95

PLANT/BLDG NO.	FLOOR	SCALE	CLASS
		NONE	

SUBMITTED FOR APPROVAL A-E DATE	FERNCO CRU APPROVAL DATE
Paul Brother 9-15-95	NA

DOE PROJECT NO.	TEMP PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
	WBS 1.1.1.1.5.3.1 00-90701	95X-5900-E-00243	E0013	0

PREPARED UNDER PARSONS PROJECT ORDER NUMBER
CRU5/P0126

E-7311

CABLE SCHEDULE

CABLE NO	FROM	TO	CONDUCTOR NUMBER	CONDUCTOR SIZE	CONDUCTOR INSUL	CONDUCTOR FUNCTION	WIRE TERMINATIONS 1	2	3	4	5	6	7	8	9	10	11	12	ROUTING	REF DWG	REMARKS
1001I	AWWT OCS, OCU FIBER OPTIC CONVERTER MODULE	RTU15 FIBER OPTIC CONVERTER MODULE	2/BNDL	62.5/125 MULTIMOD	FIBER OPTIC	COMM	1	2											BLDG 51 TO POLE 24 TO POLE 12, C1520	N-00271, N-00273 E-00244	FIELD ROUTE CABLE VIA EXISTING POLES NEAR BLDG 51 TO POLE 24
1002I	RTU15 DIGITAL INPUT MODULE	RTU17, PSC-24	1 PAIR	#22 TWINAX	600V	COMM	+	-	SHLD										DIRECT BURIAL	N-00271 N-00273, E-00244	ALPHA NO. 9818D OR EQUAL
1003I	RTU17 DIGITAL INPUT MODULE	RTU16, PSC-24	1 PAIR	#22 TWINAX	600V	COMM	+	-	SHLD										DIRECT BURIAL	N-00271 N-00273, E-00244	ALPHA NO. 9818D OR EQUAL
1004I	RTU16 DIGITAL INPUT MODULE	RTU8, PSC-24	1 PAIR	#22 TWINAX	600V	COMM	+	-	SHLD										DIRECT BURIAL	N-00272 N-00273, E-00244	ALPHA NO. 9818D OR EQUAL
1005I	RTU8 DIGITAL INPUT MODULE	RTU14, PSC-24	1 PAIR	#22 TWINAX	600V	COMM	+	-	SHLD										DIRECT BURIAL	N-00272 N-00273, E-00244	ALPHA NO. 9818D OR EQUAL
1006I	RTU14 DIGITAL INPUT MODULE	RTU13, PSC-24	1 PAIR	#22 TWINAX	600V	COMM	+	-	SHLD										DIRECT BURIAL	N-00271 N-00273, E-00244	ALPHA NO. 9818D OR EQUAL
1010I	AWWT OCS, OCU FIBER OPTIC CONVERTER MODULE	RTU21 FIBER OPTIC CONVERTER MODULE	2/BNDL	62.5/125 MULTIMOD	FIBER OPTIC	COMM	1	2											BLDG 51 TO POLE 25 TO POLE 48, C2120	N-00271 N-00273, E-00244	FIELD ROUTE CABLE VIA EXISTING POLES NEAR BLDG 51 TO POLE 25
1011I	RTU21 DIGITAL INPUT MODULE	RTU20, PSC-24	1 PAIR	#22 TWINAX	600V	COMM	+	-	SHLD										DIRECT BURIAL	N-00271 N-00273, E-00244	ALPHA NO. 9818D OR EQUAL
1012I	RTU20 DIGITAL INPUT MODULE	RTU19, PSC-24	1 PAIR	#22 TWINAX	600V	COMM	+	-	SHLD										DIRECT BURIAL	N-00271 N-00273, E-00244	ALPHA NO. 9818D OR EQUAL
1013I	RTU19 DIGITAL INPUT MODULE	RTU18, PSC-24	1 PAIR	#22 TWINAX	600V	COMM	+	-	SHLD										DIRECT BURIAL	N-00271 N-00273, E-00244	ALPHA NO. 9818D OR EQUAL
1020I	FIT001	RTU8 ANALOG INPUT MODULE	1 PAIR	#16	600V	ANALOG	+	-	SHLD										C575	N-00272 E-00245	
1021I	FE001A (TRANSMITTER)	FIT001	1/C COAX	VENDOR		ULTRSNC X-MITTR	+	SHLD											C585	N-00272 E-00245	VENDOR CABLE
1022I	FE001B (RECEIVER)	FIT001	1/C COAX	VENDOR		ULTRSNC RECEIVER	+	SHLD											C585, C586	N-00272 E-00245	VENDOR CABLE
1023I	PIT002	RTU8 ANALOG INPUT MODULE	1 PAIR	#16	600V	ANALOG	+	-	SHLD										C575, C579	N-00272 E-00245	
XX01I	FITA	RTUXX ANALOG INPUT MODULE	1 PAIR	#16	600V	ANALOG	+	-	SHLD										CXX8	N-00271 E-00245	
XX02I	FEA (TRANSMITTER)	FITA	1/C COAX	VENDOR		ULTRSNC X-MITTR	+	SHLD											CXX12	N-00271 E-00245	VENDOR CABLE
XX03I	FEB (RECEIVER)	FITA	1/C COAX	VENDOR		ULTRSNC X-MITTR	+	SHLD											CXX12, CXX13	N-00271 E-00245	VENDOR CABLE
XX04I	PITA	RTUXX ANALOG INPUT MODULE	1 PAIR	#16	600V	ANALOG	+	-	SHLD										CXX8, CXX11	N-00271 E-00245	
XX05I	FYA	RTUXX ANALOG OUTPUT MODULE	1 PAIR	#16	600V	ANALOG	+	-	SHLD										CXX19	N-00271 E-00245	
1001C	ZSO022/ZSC022	RTU8 DISCRETE INPUT MODULE	3-1/C	#14	600V	DIGITAL	1	2	3										C575, C580	N-00272 E-00245	
1002C	ZSO023/ZSC023	RTU8 DISCRETE INPUT MODULE	3-1/C	#14	600V	DIGITAL	1	2	3										C575, C582	N-00272 E-00245	
1003C	ZSO024/ZSC024	RTU8 DISCRETE INPUT MODULE	3-1/C	#14	600V	DIGITAL	1	2	3										C575, C581	N-00272 E-00245	
1004C	ZSO025/ZSC025	RTU8 DISCRETE INPUT MODULE	3-1/C	#14	600V	DIGITAL	1	2	3										C575, C577	N-00272 E-00245	
1006C	ZSO027/ZSC027	RTU8 DISCRETE INPUT MODULE	3-1/C	#14	600V	DIGITAL	1	2	3										C575, C583	N-00272 E-00245	
1008C	ZSO030/ZSC030	RTU8 DISCRETE INPUT MODULE	3-1/C	#14	600V	DIGITAL	1	2	3										C575, C578	N-00272 E-00245	
XX01C	ZSOA/ZSCA	RTUXX DISCRETE INPUT MODULE	3-1/C	#14	600V	DIGITAL	1	2	3										CXX8, CXX9	N-00271 E-00245	
XX02C	ZSOB/ZSCB	RTUXX DISCRETE INPUT MODULE	3-1/C	#14	600V	DIGITAL	1	2	3										CXX8, CXX10	N-00271 E-00245	
1001P	RTU8	LP-1, BKR NO. 2	3-1/C	#12	600V	POWER	L	N	G										FIELD ROUTE	N-00272 E-00245	
1002P	FIT001	LP-1, BKR NO. 2	3-1/C	#12	600V	POWER	L	N	G										FIELD ROUTE	N-00272 E-00245	DO NOT ROUTE IN CONDUIT C575
XX01P	RTUXX	LP-XX, BKR NO. 2	3-1/C	#12	600V	POWER	L	N	G										FIELD ROUTE	N-00271 E-00245	
XX02P	FITA	LP-XX, BKR NO. 2	3-1/C	#12	600V	POWER	L	N	G										FIELD ROUTE	N-00271 E-00245	DO NOT ROUTE IN CONDUIT CXX8

INSTRUMENT LOOP NUMBER MATRIX

TYPICAL WELL	FYA	FITA	FEXMT	FERCV	PITA	VA	ZSCA	ZSOA	VB	ZSCB	ZSOB
WELL #13	FY005	FIT005	FE005A	FE005B	PIT005	V102	ZSC010	ZSO010	V103	ZSC011	ZSO011
WELL #14	FY006	FIT006	FE006A	FE006B	PIT006	V106	ZSC012	ZSO012	V107	ZSC013	ZSO013
WELL #15	FY007	FIT007	FE007A	FE007B	PIT007	V114	ZSC014	ZSO014	V115	ZSC015	ZSO015
WELL #16	FY008	FIT008	FE008A	FE008B	PIT008	V110	ZSC016	ZSO016	V111	ZSC017	ZSO017
WELL #17	FY009	FIT009	FE009A	FE009B	PIT009	V118	ZSC018	ZSO018	V119	ZSC019	ZSO019
WELL #18	FY031	FIT031	FE031A	FE031B	PIT031	V168	ZSC042	ZSO042	V169	ZSC043	ZSO043
WELL #19	FY032	FIT032	FE032A	FE032B	PIT032	V164	ZSC040	ZSO040	V165	ZSC041	ZSO041
WELL #20	FY033	FIT033	FE033A	FE033B	PIT033	V160	ZSC038	ZSO038	V161	ZSC039	ZSO039
WELL #21	FY034	FIT034	FE034A	FE034B	PIT034	V152	ZSC035	ZSO035	V153	ZSC036	ZSO036

SEE NOTE 3

NOTES

1. SEE DRAWING 95X-5900-E-00243 FOR CONDUIT SCHEDULE.
2. 'XX' REPRESENTS WELL HOUSE NUMBER.
3. FEA (ULTRASONIC TRANSMITTER) AND FEB (ULTRASONIC RECEIVER) MAKE UP THE FLOW ELEMENT FOR FITA.

REF DWG NO.	DRAWING TITLE
95X-5900-X-00203	DRAWING INDEX
95X-5900-N-00271	INTERCONNECTION DIAGRAM WELL HOUSE DCS RTU
95X-5900-N-00272	INTERCONNECTION DIAGRAM VALVE HOUSE DCS RTU
95X-5900-N-00273	CONTROL SYSTEM ARCHITECTURE
95X-5900-E-00243	CONDUIT SCHEDULE
95X-5900-E-00244	13.2 KV DISTRIBUTION & COMMUNICATIONS PLANS
95X-5900-E-00245	PUMP HOUSE AND VALVE HOUSE PLAN

000413

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E INITIALS AND DATE	FERNCO	DATE
0	CERTIFIED FOR CONSTRUCTION	RWB	NA	6-15-95

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
SOUTH FIELD EXTRACTION SYSTEM

DRAWING TITLE
ELECTRICAL
CABLE SCHEDULE - SHEET 2

DRAWN BY	DATE	LEAD ENGINEER	DATE	CHECKED BY	DATE
J. SAYATOVIC	07/18/95	J. Terrell	6/15/95	J. L. COOPER	08/02/95

PLANT/FIELD NO.	FLOOR	SCALE	CLASS
		NONE	

SUBMITTED FOR APPROVAL	FERNCO CRU APPROVAL
A-E DATE	DATE
RWB 6-15-95	NA

PREPARED UNDER PARSONS PROJECT ORDER NUMBER	DOE PROJECT NO.	TEMP PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
CRU3/P0126		WBS 1.1.1.1.5.3.1 00-90701	95X-5900-E-00270	E0012	0

E-7311

CABLE SCHEDULE

CABLE NO	FROM	TO	CONDUCTOR NUMBER	CONDUCTOR SIZE		CONDUCTOR INSUL	CONDUCTOR FUNCTION	WIRE TERMINATIONS 1	2	3	4	5	6	7	8	9	10	11	12	ROUTING	REF DWG	REMARKS
F1A	PRIMARY TAP N18-1 SWITCH F1A	DISCONNECT SWITCH DSW1	3-1/C 1-1/C	350KCMIL 2/0 AWG		15KV 133%	13.2 KV POWER	F1A L1	F1A L2	F1A L3										C101, C105	E00235	
F1A1	DISCONNECT SWITCH DSW1	FUSED CUTOUT FC-16 (POLE 29)	3-1/C 1-1/C	#2 AWG #6 AWG	NOTE 3	15KV 133%	13.2 KV POWER	F1A1 L1	F1A1 L2	F1A1 L3	GND									POLE #40, C102 POLES 12 THRU 29	E00235, E00244	INSTALL 15KV INSULATED CABLE FROM DSW1 TO POLE #40; OTHERWISE USE ASCR
F1A3	F1A1 TAP AT POLE #12	FUSED CUTOUT FC-17 (POLE 39)	3-1/C	#2 AWG		NONE	13.2 KV POWER	F1A3 L1	F1A3 L2	F1A3 L3										POLES 12,36,37,38, AND 39	E00235, E00244	ACSR AERIAL CONDUCTOR/#4 AWG BARE AL
F1A4	F1A1 TAP AT POLE #12	FUSED CUTOUT FC-15 (POLE 12)	3-1/C	#4 AWG		NONE	13.2 KV POWER	F1A4 L1	F1A4 L2	F1A4 L3										POLE #12	E00235, E00244	#4 AWG BARE ALUMINUM
F1A5	F1A1 TAP AT POLE #28	FUSED CUTOUT FC-13 (POLE 35)	3-1/C	#2 AWG		NONE	13.2 KV POWER	F1A5 L1	F1A5 L2	F1A5 L3										POLES #28,30,31,32 33,34, AND 35	E00235, E00244	ACSR AERIAL CONDUCTOR/#4 AWG BARE AL
F1A6	F1A5 TAP AT POLE #31	FUSED CUTOUT FC-14 (POLE 31)	3-1/C	#4 AWG		NONE	13.2 KV POWER	F1A6 L1	F1A6 L2	F1A6 L3										POLE #31	E00235, E00244	#4 AWG BARE ALUMINUM
F1A15	FUSED CUTOUT FC-15	TRANSFORMER T-15	3-1/C	#2 AWG		NONE	13.2 KV POWER	FC15 L1	FC15 L2	FC15 L3										POLE #12	E00235, E00244 E00276	#6 BARE SOLID COPPER
F1A17	FUSED CUTOUT FC-17	TRANSFORMER T-17	3-1/C	#6 AWG		NONE	13.2 KV POWER	FC17 L1	FC17 L2	FC17 L3										POLE #39	E00235, E00244 E00276	#6 BARE SOLID COPPER
F1A14	FUSED CUTOUT FC-14	TRANSFORMER T-14	3-1/C	#6 AWG		NONE	13.2 KV POWER	FC14 L1	FC14 L2	FC14 L3										POLE #31	E00235, E00244 E00241	#6 BARE SOLID COPPER
F1A13	FUSED CUTOUT FC-13	TRANSFORMER T-13	3-1/C	#6 AWG		NONE	13.2 KV POWER	FC13 L1	FC13 L2	FC13 L3										POLE #35	E00235, E00244 E00241	#6 BARE SOLID COPPER
F1A16	FUSED CUTOUT FC-16	TRANSFORMER T-16	3-1/C	#6 AWG		NONE	13.2 KV POWER	FC16 L1	FC16 L2	FC16 L3										POLE #29	E00235, E00244 E00241	#6 BARE SOLID COPPER
F4A	PRIMARY TAP N18-1 SWITCH F4A	DISCONNECT SWITCH DSW2	3-1/C 1-1/C	350KCMIL 2/0 AWG		15 KV 133%	13.2 KV POWER	F4A L1	F4A L2	F4A L3										C103	E00235	
F4A1	DISCONNECT SWITCH DSW2	FUSED CUTOUT FC-18	3-1/C 1-1/C	#2 AWG #6 AWG	NOTE 3	15 KV 133%	13.2 KV POWER	F4A1 L1	F4A1 L2	F4A1 L3	GND									C104, POLES 40 THRU 50, 52,53,56 THRU 59	E00235, E00244 E00276	INSTALL 15KV INSULATED CABLE FROM DSW3 TO POLE #40; OTHERWISE USE ASCR
F4A3	F4A1 TAP AT POLE #48	FUSED CUTOUT FC-21	3-1/C	#4 AWG		NONE	13.2 KV POWER	F4A3 L1	F4A3 L2	F4A3 L3										POLE #48	E00235, E00244 E00276	#4 AWG. BARE ALUMINUM
F4A4	F4A1 TAP AT POLE #50	FUSED CUTOUT FC-20	3-1/C	#2 AWG		NONE	13.2 KV POWER	F4A4 L1	F4A4 L2	F4A4 L3										POLES #50, AND #51	E00235, E00244 E00276	ACSR AERIAL CONDUCTOR/#4 AWG BARE AL
F4A5	F4A1 TAP AT POLE #53	FUSED CUTOUT FC-19	3-1/C	#2 AWG		NONE	13.2 KV POWER	F4A5 L1	F4A5 L2	F4A5 L3										POLES #53, 54, & 55	E00235, E00244 E00276	ACSR AERIAL CONDUCTOR/#4 AWG BARE AL
F4A21	FUSED CUTOUT FC-21	TRANSFORMER T-21	3-1/C	#6 AWG		NONE	13.2 KV POWER	FC21 L1	FC21 L2	FC21 L3										POLE #48	E00235, E00244 E00276	#6 BARE SOLID COPPER
F4A20	FUSED CUTOUT FC-20	TRANSFORMER T-20	3-1/C	#6 AWG		NONE	13.2 KV POWER	FC20 L1	FC20 L2	FC20 L3										POLE #51	E00235, E00244 E00276	#6 BARE SOLID COPPER
F4A19	FUSED CUTOUT FC-19	TRANSFORMER T-19	3-1/C	#6 AWG		NONE	13.2 KV POWER	FC19 L1	FC19 L2	FC19 L3										POLE #55	E00235, E00244 E00276	#6 BARE SOLID COPPER
F4A18	FUSED CUTOUT FC-18	TRANSFORMER T-18	3-1/C	#6 AWG		NONE	13.2 KV POWER	FC18 L1	FC18 L2	FC18 L3										POLE #59	E00235, E00244 E00276	#6 BARE SOLID COPPER
XX1P-1	TRANSFORMER T-XX (17,19,20,21)	DISTRIBUTION PANEL DP-XX (17,19,20,21)	4-1/C	#2 AWG		600 V	480 V POWER	TXX1 L1	TXX1 L2	TXX1 L3	GND									CXX1-1 (17,19,20, 21)	E00235, E00243	ROUTING FROM ADJACENT POWER POLE TO WEATHERHEAD AND CONDUIT CXX1-1
XX1P-2	TRANSFORMER T-XX (13,14,15,16,18)	DISTRIBUTION PANEL DP-XX (13,14,15,16,18)	4-1/C	4/0 AWG		600 V	480 V POWER	TXX2 L1	TXX2 L2	TXX2 L3	GND									CXX1-2 (13,14,15,16,18)	E00235, E00243	ROUTING FROM ADJACENT POWER POLE TO WEATHERHEAD AND CONDUIT CXX1-2
XX2P	DISTRIBUTION PANEL DP-XX (13-21)	VARIABLE SPEED DRIVE VSD-XX (13-21)	3-1/C 1-1/C	#2 AWG #8 GND		600 V	480 V POWER	PMPXX T1	PMPXX T2	PMPXX T3	GND									CXX2 (13-21)	E00235, E00245 E00243	
XX3P	VARIABLE SPEED DRIVE VSD-XX (13-21)	EXTRACTION WELL PUMP MOTOR PMP-XX (13-21)	3-1/C 1-1/C	#2 AWG #8 GND		600 V	480 V POWER	PMPXX T11	PMPXX T21	PMPXX T31	GND									CXX3 (13-21)	E00235, E00245 E00243	
XX4P	DISTRIBUTION PANEL DP-XX (13-21)	DISCONNECT SWITCH DSW-XX (13-21)	4-1/C	#12 AWG		600 V	480 V POWER	UHXX L1	UHXX L2	UHXX L3	GND									CXX4 (13-21)	E00235, E00245 E00243	
XX5P	DISTRIBUTION PANEL DP-XX (13-21)	FAN STARTER EF-XX (13-21)	4-1/C	#12 AWG		600 V	480 V POWER	EFXX T1	EFXX T2	EFXX T3	GND									CXX5 (13-21)	E00235, E00245 E00243	
XX6P	FAN STARTER EF-XX (13-21)	FAN MOTOR EF-XX (13-21)	4-1/C	#12 AWG		600 V	MOTOR POWER	EFXX T11	EFXX T21	EFXX T31	GND									CXX6 (13-21)	E00235, E00245 E00243	
XX7P	DISTRIBUTION PANEL DP-XX (13-21)	COMBINATION TRANSFORMER/ PANELBOARD LP-XX (13-21)	4-1/C	#8 AWG		600 V	480 V POWER	LPXX L1	LPXX L2	LPXX L3	GND									CXX7 (13-21)	E00235, E00245 E00243	
XX8P	DISCONNECT SWITCH DSW-XX (13-21)	UNIT HEATER UH-XX (13-21)	4-1/C	#12 AWG		600 V	480 V POWER	UHXX L11	UHXX L21	UHXX L31	GND									CXX14 (13-21)	E00235, E00245 E00243	
XX9C	UNIT HEATER UH-XX (13-21)	UNIT HEATER UH-XX (13-21) HAND-OFF-AUTO SWITCH	3-1/C	#16 AWG		600 V	CONTROL	HOA 1	HOA 2	HOA 3										CXX18	E00243, E00245	
599P	TRANSFORMER T-16	VALVE HOUSE LIGHTING PANEL LP-1	4-1/C	#4 AWG		600 V	480 V POWER	LP1 L1	LP1 L2	LP1 L3	GND									POLE #28, POLE #29, & C599	E00235 E00244, E00243	USE #4 QUADRUPLEX FROM T-16 TO 3" CONDUIT ON POLE #28, USE 4-1/C #4 AWG TO LP-1
XX20P	MOTOR STARTER EF-XX	DAMPER MOTOR M1	3-1/C	#12 AWG		600V	120V POWER	M1 T1	M1 T2	GND										CXX16, CXX17	E00238, E00245	
XX21P	MOTOR STARTER EF-XX	DAMPER MOTOR M2	3-1/C	#12 AWG		600V	120V POWER	M2 T1	M2 T2	GND										CXX17	E00238, E00245	
XX22C	MOTOR STARTER EF-XX	EF-XX THERMOSTAT	3-1/C	#16 AWG		600V	CONTROL	T 2	T 3											CXX15, CXX17	E00238, E00245	
800P	LIGHT PANEL LP-1, CKT 7	EXHAUST FAN EF-1 HAND-OFF-AUTO	3-1/C	#12 AWG		600V	120V POWER	1	N	GND										C590	E00238, E00245	
801P	EXHAUST FAN EF-1 HAND-OFF-AUTO SWITCH	EXHAUST FAN EF-1 MOTOR	3-1/C	#12 AWG		600V	120V POWER	3	N	GND										C590, C592	E00238, E00245	
802P	EXHAUST FAN EF-1 HAND-OFF-AUTO SWITCH	VALVE HOUSE MOTORIZED DAMPER	3-1/C	#12 AWG		600V	120V POWER	3	N	GND										C590, C591	E00238, E00245	
803C	EXHAUST FAN EF-1 HAND-OFF-AUTO SWITCH	EXHAUST FAN EF-1 THERMOSTAT	2-1/C	#16 AWG		600V	CONTROL	2	3											C593	E00238, E00245	
804P	LIGHT PANEL LP-1, CKT 4	JUNCTION BOX JB-1	4-1/C	#10 AWG		600V	208V POWER	JB1 L1	JB1 L2	JB1 L3	GND									C594	E00238, E00245	
805P	JUNCTION BOX JB-1	DISCONNECT SWITCH DSW1	4-1/C	#10 AWG		600V	208V POWER	UH1 L1	UH1 L2	UH1 L3	GND									C595	E00238, E00245	
806P	DISCONNECT SWITCH DSW1	UNIT HEATER UH-1	4-1/C	#10 AWG		600V	208V POWER	UH1 L11	UH1 L21	UH1 L31	GND									C596	E00238, E00245	
807C	UNIT HEATER UH-1	UNIT HEATER UH-1 HAND-OFF-AUTO SWITCH	3-1/C	#16 AWG		600V	CONTROL	T 1	T 2	T 3										C596, C597	E00238, E00245	
808P	JUNCTION BOX JB-1	DISCONNECT SWITCH DSW2	4-1/C	#10 AWG		600V	208V POWER	UH2 L1	UH2 L2	UH2 L3	GND									C550	E00238, E00245	
809P	DISCONNECT SWITCH DSW2	UNIT HEATER UH-2	4-1/C	#10 AWG		600V	208V POWER	UH2 L11	UH2 L21	UH2 L31	GND									C551	E00238, E00245	
810C	UNIT HEATER UH-2	UNIT HEATER UH-2 HAND-OFF-AUTO SWITCH	3-1/C	#16 AWG		600V	CONTROL	T 1	T 2	T 3										C551, C552	E00238, E00245	

NOTES

1. SEE DRAWING 95X-5900-E-00243 FOR CONDUIT SCHEDULE.
2. "XX" REPRESENTS WELL HOUSE NUMBER.
3. INSTALL GROUND IN CONDUIT TO POLE #40 ONLY. EXOTHERMIC WELD TO POLE GROUND CONDUCTOR.

REF DWG NO.	DRAWING TITLE
95X-5900-X-00203	DRAWING INDEX
95X-5900-E-00235	SINGLE LINE DIAGRAM
95X-5900-E-00244	13.2KV DISTRIBUTION AND COMMUNICATIONS PLAN
95X-5900-E-00245	WELL HOUSE AND VALVE HOUSE POWER AND 120V DISTRIBUTION PLAN
95X-5900-E-00238	ELEMENTARY AND INTERCONNECTION DIAGRAM
95X-5900-E-00243	CONDUIT SCHEDULE
95X-5900-E-00241	SECTIONS AND DETAILS POLE DETAILS, SHEET 1
95X-5900-E-00276	SECTIONS AND DETAILS POLE AND MISCELLANEOUS DETAILS, SHEET 3

000412

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	FERNCO	DATE
		INITIALS AND DATE		
0	CERTIFIED FOR CONSTRUCTION	Paul B	NA	9-15-95

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
SOUTH FIELD EXTRACTION SYSTEM

DRAWING TITLE
ELECTRICAL
CABLE SCHEDULE - SHEET 1

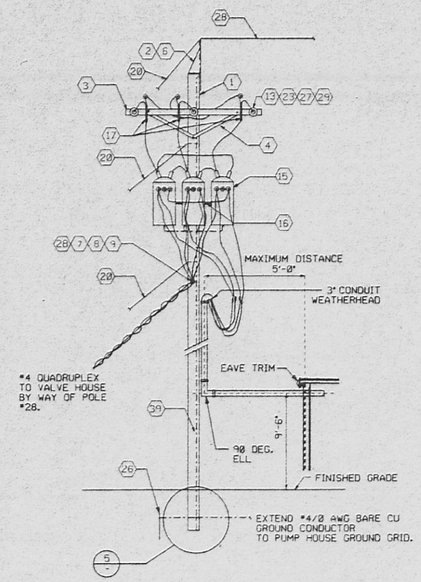
DRAWN BY	DATE	LEAD ENGINEER	DATE	CHECKED BY	DATE
B. JASPER	06/19/95	J. Ferrell	9/15/95	J. L. COOPER	08/02/95

PLANT/BLDG NO.	FLOOR	SCALE	CLASS

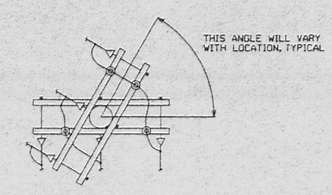
SUBMITTED FOR APPROVAL — A-E — DATE: Paul Brotton 9-15-95
FERNCO CRU APPROVAL — NA — DATE

PREPARED UNDER PARSONS PROJECT ORDER NUMBER	DOE PROJECT NO.	TEMP PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
CRU5/PO126		WBS 1.1.1.1.5.3.1 00-90701	95X-5900-E-00242	E0011	0

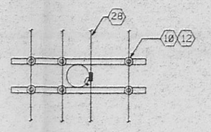
E-7311



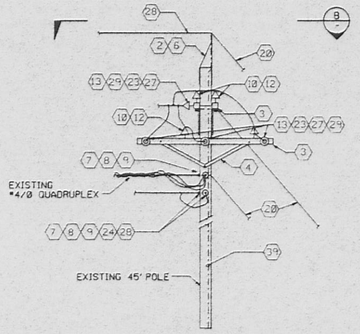
DETAIL 1 POLE 29 NTS — REF E00241 E00244



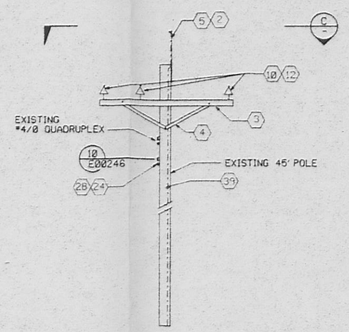
SECTION B NTS



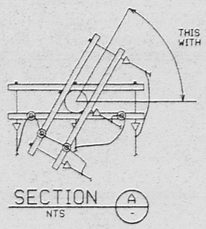
SECTION C NTS



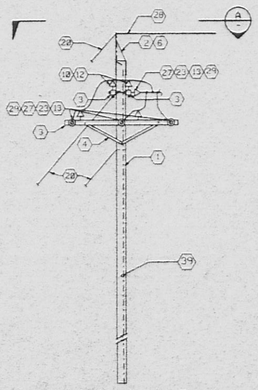
DETAIL 3 POLES 15, 16, 22, 24 NTS — REF E00241 E00244



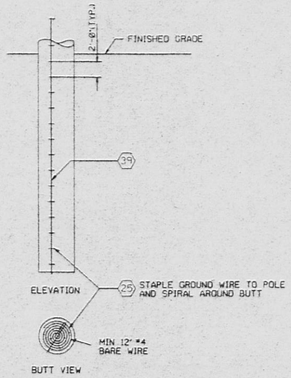
DETAIL 4 POLES 13, 14, 17, 18, 19, 20, 21, 23, 25 NTS — REF E00241 E00244



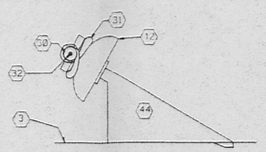
SECTION A NTS



DETAIL 2 POLES 27, 32, 36, 38, 56, 57, 58 NTS — REF E00241 E00244

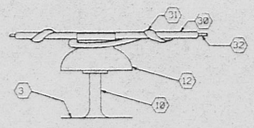


DETAIL 5 NTS — REF E00246 E00276



DETAIL 6 NTS

CROSSARM CORNER TYPE PINS USE ON POLES AS REQUIRED



DETAIL 7 NTS

STRAIGHT ATTACHMENT TYPE PINS USE ON POLES AS REQUIRED

MATERIAL LIST

1. POLE, 55 FT. CLASS 2, PRESSURE TREATED, SOUTHERN YELLOW PINE.
2. GROUND WIRE CLAMP, USED TO ATTACH STATIC WIRE TO BAYONET.
3. CROSSARM, 3½" x 4½" x 8'-0", PRESSURE TREATED DOUGLAS FIR.
4. CROSSARM BRACE, 5'-3" LONG x 1'-6" DROP, HOT DIP GALVANIZED.
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, ⅝" DIA., WITH ONE SQUARE NUT, ADDITIONAL NUTS, WASHERS, AND LENGTH AS REQUIRED.
9. GUY GRIP, FOR STATIC WIRE, PREFORMED WIRE TYPE.
10. HIGH VOLTAGE FORGED STEEL PIN, FOR PIN TYPE INSULATORS 1" LEAD THREAD, LONG SHANK, WITH WASHERS AND NUTS AS REQUIRED.
11. SURGE ARRESTER, DIRECT CONNECTED, 15KV, RISER POLE TYPE, METAL OXIDE VALVE, WITH CROSSARM MOUNTING HARDWARE.
12. INSULATOR, PIN TYPE, 14.4 KV, GLAZED PORCELIAN, 1" THREADS ANSI CLASS 55-5, "F" NECK.
13. INSULATOR, DEAD-END TYPE, 6¼" LONG, 4⅜" DIA. ANSI CLASS 52-9, CLEVIS TYPE WITH STEEL HARDWARE.
14. CLAMP, DEAD-END, FOR #2 AWG ACSR CONDUCTOR, U-BOLT TYPE.
15. TRANSFORMER, POLE MOUNTED, THREE 50 KVA, 13.2KV-480V, 1 PHASE, W/ 2-2 1/2% TAPS ABOVE AND 2-2 1/2% TAPS BELOW, OIL-FILLED
16. EQUIPMENT MOUNT, FOR 3 POLE MOUNTED, TRANSFORMERS DOUBLE-BANDED ALUMINUM CLUSTER MOUNT W/ GND LUG.
17. FUSED CUTOUT ARRESTER COMBINATION UNIT, CUTOUT RATED 15KV, 200 AMPS, 12,000 AMPS IC, WITH CROSSARM MOUNTING HARDWARE. FOR ARRESTER, SEE ITEM 11, THIS MATERIAL LIST.
18. CABLE GUARD, "U" SHAPE, 14-GAUGE, HOT DIPPED GALVANIZED STEEL, 8 FT. LONG, 4" INSIDE DIAMETER, WITH STRAPS AND HARDWARE AS REQUIRED.
19. TERMINATOR, 15 KV, #2-#3/0 CONDUCTOR SIZE, COLD SHRINK SILICONE RUBBER, SIZED TO FIT INSULATION DIAMETER.
20. FOR GUY INSTALLATION, SEE DETAIL 8 ON DWG. 95X-5900-E-00246.
21. CABLE SUPPORT, 3" CONDUIT TOP, OUTDOOR, WATERTIGHT, SEAL WITH FILLING COMPOUND.
22. CLAMP, SUSPENSION, FOR ⅜" MESSENGER.
23. EYENUT, ⅝" BOLT DIA.
24. PUMPING SYSTEM COMMUNICATIONS CABLE, LASHED TO ⅜" MESSENGER. SEE NOTE 4 ON DWG. E-00246.
25. STAPLE, COPPERCLAD, 1½" LONG.
26. GROUND ROD, ¾" DIAMETER x 10' LONG, COPPERWELD.
27. BOLTS, DOUBLE ARMING, SQUARE NUTS, ⅝"DIA. x LENGTH AS REQUIRED.
28. ⅜" DIAMETER, 7X8, STANDARD CONSTRUCTION, GALVANIZED STEEL STRAND.
29. DISTRIBUTION TYPE DEAD-END GRIP, FOR USE ON #2 AWG, ACSR CONDUCTOR.
30. ARMOR ROD, FOR USE ON #32, THIS MATERIAL LIST.
31. CONDUCTOR TIE ROD FOR ACSR CONDUCTOR TO "F" NECK PIN TYPE INSULATOR. SIZE TIE RODS TO FIT OVER ARMOR ROD ASSEMBLY.
32. AERIAL POWER CONDUCTOR, #2 AWG, ACSR, "SPARROW".

MATERIAL LIST CONT. ON DWG 95X-5900-E-00246

SAG AND TENSION TABLE

200-FT MAXIMUM SPAN - 28.5" INITIAL SAG AT 60 DEG F

CONDUCTOR ACSR BARE (KCM OR AWG)	ULTIMATE STRENGTH (LB)	CONDUCTOR AREA (SQ IN)	WEIGHT PER 1000 FOOT (LB)	15 DEG F LOADING			INITIAL STRINGING SAG AND TENSION								FINAL SAG AND TENSION					
							15 DEG F		30 DEG F		60 DEG F		90 DEG F		120 DEG F		15 DEG F		60 DEG F		120 DEG F	
				S	T	% ULT	S	T	S	T	S	T	S	T	S	T	S	T	S	T	S	T
#2 (SPARROW)	2,850	0.0608	91.3	44.4	815	29.2	16.6	338	19.7	277	28.5	195	34.6	151	43.8	128	19.3	289	32.4	170	46.3	122

S = SAG IN INCHES
T = TENSION IN POUNDS
(6/1) = STRANDS
AVERAGE SPAN = 146.6 FT
RULING SPAN = 182 FT
MAXIMUM SPAN = 200 FT

HEAVY LOADING AREA, NESC C2

NOTES

1. SEE DRAWING 95X-5900-E-00235 FOR SINGLE LINE DIAGRAM.
2. SEE DRAWING 95X-5900-E-00244 FOR 13.2 KV DISTRIBUTION PLAN.

REF DWG NO.	DRAWING TITLE
95X-5900-E-00235	SINGLE LINE DIAGRAM
95X-5900-E-00244	13.2KV DISTRIBUTION & COMMUNICATIONS PLAN
95X-5900-E-00246	SECTIONS AND DETAILS POLE DETAILS, SHEET 2
95X-5900-E-00203	DRAWING INDEX
95X-5900-E-00276	SECTIONS AND DETAILS POLE AND MISCELLANEOUS DETAILS, SHEET 3

OC0411

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E INITIALS AND DATE	FERNCO INITIALS AND DATE
0	CERTIFIED FOR CONSTRUCTION	[illegible]	NA 5-15-95

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
SOUTH FIELD EXTRACTION SYSTEM

DRAWING TITLE
ELECTRICAL
SECTIONS AND DETAILS
POLE DETAILS, SHEET 1

DRAWN BY	DATE	LEAD ENGINEER	DATE	CHECKED BY	DATE
J. ALLFORD	05/16/95	J. Ferrell	4/15/95	J. L. COOPER	05/02/95

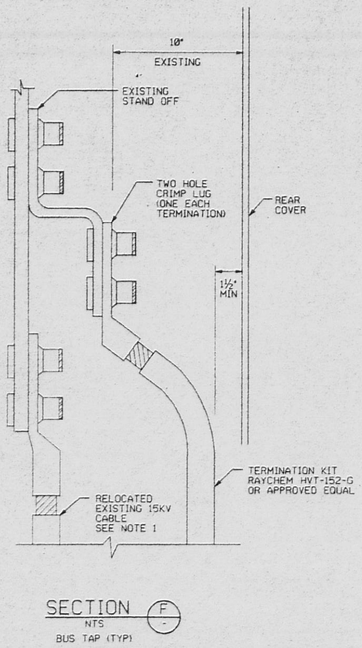
PLANT/BLDG NO.	FLOOR	SCALE	CLASS
		NONE	

SUBMITTED FOR APPROVAL	FERNCO CRU APPROVAL
[signature] 5-15-95	NA

A-E DOE PROJECT NO.	DATE	TEMP PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV NO.
		WBS 1.1.1.1.5.3.1 00-90701	95X-5900-E-00241	E0010	0

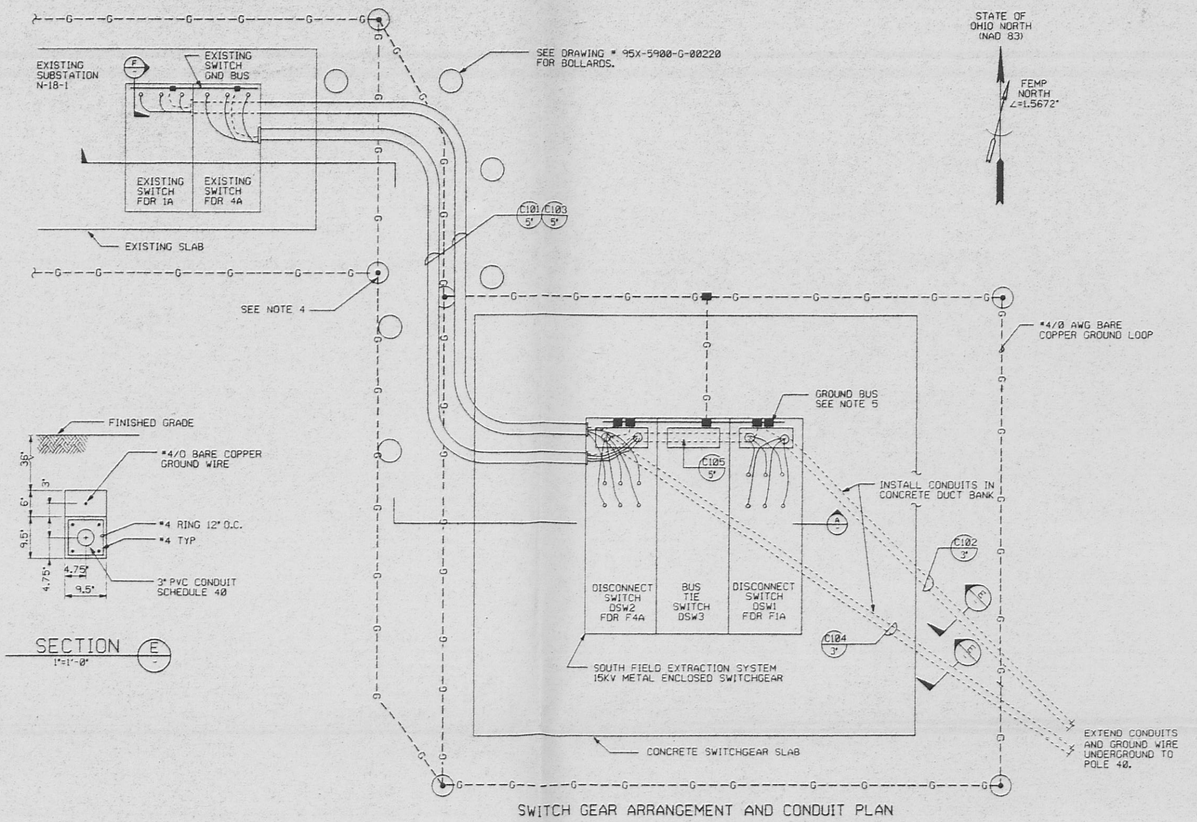
PREPARED UNDER PARSONS PROJECT ORDER NUMBER: CRU5/P0126

E-7311

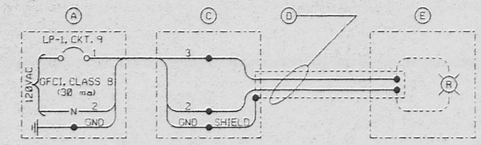


SECTION F
NTS
BUS TAP (TYP)

SECTION E
1"=1'-0"



SWITCH GEAR ARRANGEMENT AND CONDUIT PLAN

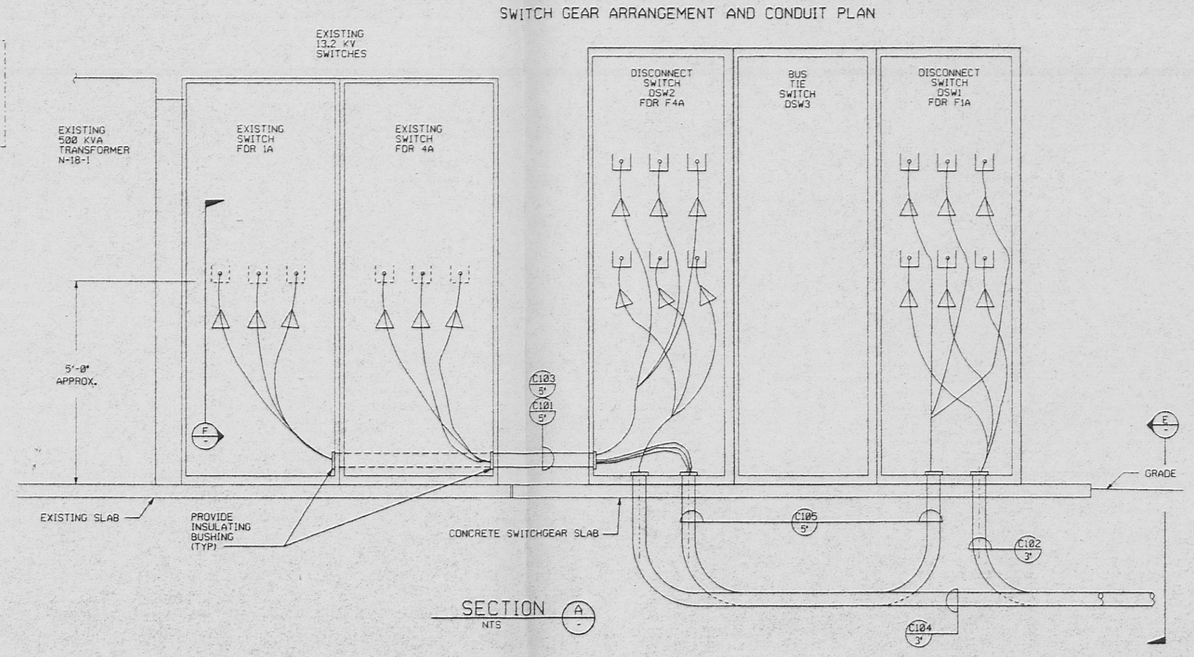


TYPICAL WIRING DIAGRAM FOR HEAT TRACING SYSTEM

BILL OF MATERIAL		
ITEM	QUANTITY	DESCRIPTION
A	1	CIRCUIT BKR. 20A, GFCI, CLASS B, 30MA, 1 POLE
C	1	POWER CONNECTION KIT
D	65 FT	SELF REGULATING HEAT TRACE, NOMINAL 15 W/FT
E	1	PILOT LIGHT CONNECTION KIT, WITH RED LIGHT

ELECTRIC HEAT TRACE DIAGRAM

SEE NOTE 6



SECTION A
NTS

NOTES

1. MOVE EXISTING 15KV CABLE FROM EXISTING BUS STANDOFF DOWN TO EXISTING NEMA HOLES ON BUS. REUSE BOLTS AND NUTS.
2. MAXIMUM BENDING RADIUS FOR STRESS CONE IS 10 DEG. OR 14.7".
3. PROVIDE BOLTS, NUTS AND LOCK WASHER FOR NEW BUS TAPS LIKE EXISTING HARDWARE.
4. LOCATE EXISTING #4/0 AWG GROUND LOOP AT EXISTING SWITCHGEAR. CONNECT 15KV SWITCHGEAR GROUND LOOP TO EXISTING GROUND LOOP TWO PLACES.
5. CONNECT #4/0 BARE STRANDED COPPER GROUND LOOP TO SWITCHGEAR GROUND BUS USING #2/0 AWG BARE STRANDED COPPER. EXOTHERMIC WELD ALL CONCEALED GROUND CONNECTIONS AND CONNECTIONS TO GROUND RODS.
6. ROUTE POWER TO HEAT TRACE POWER CONNECTION KIT FROM LP-1, CKT. #9. SEE DRAWING 95X-5900-E-00245 FOR APPROX. LOCATION.

REF DWG NO.	DRAWING TITLE
95X-5900-X-00203	DRAWING INDEX
95X-5900-G-00265	ENLARGED GRADING/SITE/UTILITY PLAN
95X-5900-E-00235	SINGLE LINE DIAGRAM
95X-5900-E-00244	13.2KV DISTRIBUTION & COMMUNICATIONS PLAN
95X-5900-G-00220	DETAILS , SHEET 2 OF 3
95X-5900-E-00245	WELL HOUSE AND VALVE HOUSE POWER AND 120V DISTRIBUTION PLAN

000410

REV NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E INITIALS AND DATE	FERNCO INITIALS AND DATE
0	CERTIFIED FOR CONSTRUCTION-		NA 6-15-95

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
SOUTH FIELD EXTRACTION SYSTEM

DRAWING TITLE
ELECTRICAL
SECTIONS AND DETAILS
15KV SWITCHGEAR AND DETAILS

DRAWN BY	DATE	LEAD ENGINEER	DATE	CHECKED BY	DATE
J. ALLFORD	06/15/95	J. Fennell	6/15/95	J. L. COOPER	06/02/95

PLANT/BLDG NO.	FLOOR	SCALE	CLASS
		NONE	

SUBMITTED FOR APPROVAL — A-E — DATE
FERNCO CRU APPROVAL — NA — DATE

PREPARED UNDER PARSONS PROJECT ORDER NUMBER	DOE PROJECT NO.	PIMP PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
CRU5/P0126		WBS 1.1.1.1.5.3.1 00-90701	95X-5900-E-00240	E0009	0

E-7311

DISTRIBUTION PANEL DP-XX

VOLTAGE : 480 VOLTS, 3 PHASE, 4 WIRE
MAIN BUS : 100 AMP, 100 MAIN BKR
MOUNTING : SURFACE

REMARKS : 1. • INDICATES 6MA GFCI CLASS A, •• INDICATES 30MA GFCI CLASS B
2. ALL BREAKERS SHALL BE LOCKABLE IN THE 'OFF' POSITION
3. SEE NOTE 3.

MAIN BUS 225 AMP

DIRECTORY	WATTS LOAD L1	WATTS LOAD L2	WATTS LOAD L3	CKT NO	WIRE SIZE	BKR AMPS	BKR AMPS	WIRE SIZE	CKT NO	WATTS LOAD L1	WATTS LOAD L2	WATTS LOAD L3	DIRECTORY
EXTRACTION WELL PUMP PUMP-XX	14.4K									1100			
		14.4K		1	#2	80	15	#12	2		1100		UNIT HEATER UH-XX
			14.4K									1100	
EXHAUST FAN EF-XX	942									5882			
		942		3	#12	15	40	#8	4		5882		COMBINATION TRANSFORMER/PANELBOARD LP-XX
			942									5882	
SPACE				5					6				SPACE
SUB-TOTALS	15.3K L1	15.3K L2	15.3K L3	NEUTRAL BUS						6982 L1	6982 L2	6982 L3	SUB-TOTALS

TOTAL WATTS L1 : 22.3K TOTAL WATTS L2 : 22.3K TOTAL WATTS L3 : 22.3K TOTAL WATTS : 66.9K

LIGHTING PANEL LP-XX

VOLTAGE : 208Y/120 VOLT, 3 PHASE, 4 WIRE
MAIN BKR : 60 AMP
MOUNTING : COMBINATION TRANSFORMER/PANEL

REMARKS : 1. • INDICATES 6MA GFCI CLASS A, •• INDICATES 30MA GFCI CLASS B
2. CONFIGURATION FOR EXTRACTION WELLS 13, 14, 15, 16, 17, 18 19, 20, AND 21.
3. SEE NOTE 3.

MAIN BUS : 100 AMP

DIRECTORY	WATTS LOAD L1	WATTS LOAD L2	WATTS LOAD L3	CKT NO	WIRE SIZE	BKR AMPS	BKR AMPS	WIRE SIZE	CKT NO	WATTS LOAD L1	WATTS LOAD L2	WATTS LOAD L3	DIRECTORY
RECEPTACLES	900			1	#12	20	20	#12	2	80			INSTRUMENT POWER FITA (N000271) & RTUXX
LIGHTS - INSIDE		174		3	#12	20			4				SPACE
LIGHTS - OUTSIDE & EXIT			66	5	#12	20			6				SPACE
SPACE				7					8				SPACE
SPACE				9					10				SPACE
SPACE				11					12				SPACE
SUB-TOTALS	900 L1	174 L2	66 L3	NEUTRAL BUS						80 L1	Ø L2	Ø L3	SUB-TOTALS

TOTAL WATTS L1 : 980 TOTAL WATTS L2 : 174 TOTAL WATTS L3 : 66 TOTAL WATTS : 1220

LIGHTING PANEL LP-1

VOLTAGE : 208Y/120 VOLT, 3 PHASE, 4 WIRE
MAIN BKR : 80 AMP
MOUNTING : COMBINATION TRANSFORMER/PANEL

REMARKS : 1. • INDICATES 6MA GFCI CLASS A, •• INDICATES 30MA GFCI CLASS B

MAIN BUS : 100 AMP

DIRECTORY	WATTS LOAD L1	WATTS LOAD L2	WATTS LOAD L3	CKT NO	WIRE SIZE	BKR AMPS	BKR AMPS	WIRE SIZE	CKT NO	WATTS LOAD L1	WATTS LOAD L2	WATTS LOAD L3	DIRECTORY
RECEPTACLES	1200			1	#12	20	20	#12	2	150			INSTRUMENT POWER FIT-001 & RTU8
LIGHTS - INSIDE		464		3	#12	20					3333		
LIGHTS - OUTSIDE & EXIT			33	5	#12	20	30	#10	4			3333	UNIT HEATERS
EXHAUST FAN EF-1	193			7	#12	20				3333			UH-1 & UH-2
HEAT TRACE POWER		975		9	#12	20			6				SPACE
SPACE				11					8				SPACE
SPACE				13					10				SPACE
SPACE				15					12				SPACE
SPACE				17					14				SPACE
SUB-TOTALS	1393 L1	1439 L2	33 L3	NEUTRAL BUS						3483 L1	3333 L2	3333 L3	SUB-TOTALS

TOTAL WATTS L1 : 4876 TOTAL WATTS L2 : 4772 TOTAL WATTS L3 : 3366 TOTAL WATTS : 13014

NOTES

1. SEE DRAWING 95X-5900-E-00245 FOR POWER AND 120V PLAN.
2. SEE DRAWING 95X-5900-N-00271 FOR WELL HOUSE INTERCONNECTION DIAGRAM AND DRAWING 95X-5900-N-00272 FOR VALVE HOUSE INTERCONNECTION DIAGRAM.
3. "XX" REPRESENTS THE CORRESPONDING WELL HOUSE NUMBER.

REF DWG NO.	DRAWING TITLE
95X-5900-E-00203	DRAWING INDEX
95X-5900-E-00245	WELL HOUSE AND VALVE HOUSE POWER AND 120V DISTRIBUTION PLANS
95X-5900-E-00271	WELL HOUSE INTERCONNECTION DIAGRAM
95X-5900-E-00272	VALVE HOUSE INTERCONNECTION DIAGRAM

000409

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E INITIALS AND DATE	FERNCO	DATE
Ø	CERTIFIED FOR CONSTRUCTION		NA	6-15-95

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
SOUTH FIELD EXTRACTION SYSTEM

DRAWING TITLE
ELECTRICAL
PANEL SCHEDULES

DRAWN BY	DATE	LEAD ENGINEER	DATE	CHECKED BY	DATE
B. JASPER	06/15/95	J. Fewell	6/15/95	J.L. COOPER	06/02/95

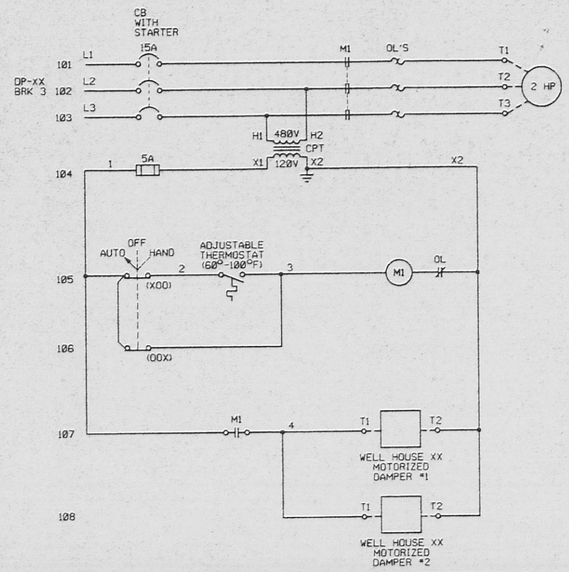
PLANT/BLDG NO.	FLOOR	SCALE	CLASS
		NONE	

SUBMITTED FOR APPROVAL: A-E DATE 6-15-95
FERNCO CRU APPROVAL: NA DATE

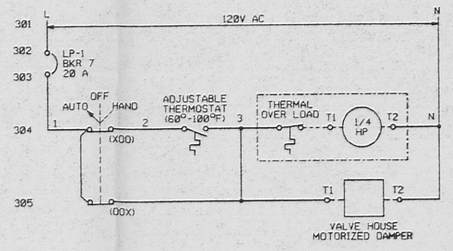
PREPARED UNDER PARSONS PROJECT ORDER NUMBER	DOE PROJECT NO.	FEMP PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
CRU5/P0126		WBS 1.1.1.1.5.3.1 00-90701	95X-5900-E-00239	E0008	Ø

SEE NOTE 1 (TYPICAL)

EQUIPMENT NAME : WELL HOUSE XX EXHAUST FAN EF-XX
EQUIPMENT NO. : EF-XX
S/L DWG NO. : E00235
PLAN DWG NO. : E00245



EQUIPMENT NAME : VALVE HOUSE EXHAUST FAN EF-1
EQUIPMENT NO. : EF-1
PANEL SCH'D DWG NO. : E00239
PLAN DWG NO. : E00245



NOTES

1. 'XX' REPRESENTS THE CORRESPONDING WELL HOUSE NUMBER.

REF DWG NO.	DRAWING TITLE
95X-5900-X-00203	DRAWING INDEX
95X-5900-E-00235	SINGLE LINE DIAGRAM
95X-5900-E-00239	PANEL SCHEDULES
95X-5900-E-00245	PUMP HOUSE AND VALVE HOUSE PLANS POWER AND 120 V DISTRIBUTION
95X-5900-E-00248	SYMBOLS AND LEGEND SHEET 1 OF 2

000408

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E INITIALS AND DATE	FERNCO INITIALS AND DATE
0	CERTIFIED FOR CONSTRUCTION		NA 9-15-95

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
SOUTH FIELD EXTRACTION SYSTEM

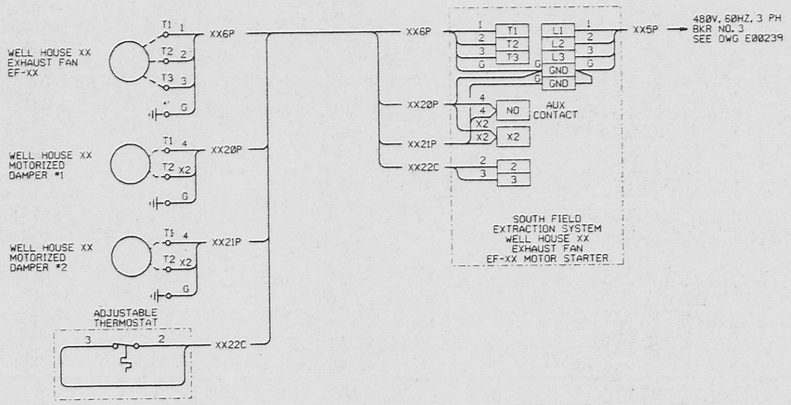
DRAWING TITLE
ELECTRICAL
ELEMENTARY AND INTERCONNECTION DIAGRAM

DRAWN BY	DATE	LEAD ENGINEER	DATE	CHECKED BY	DATE
B. JASPER	06/15/95	J. Fowell	9/9/95	J. L. COOPER	08/02/95

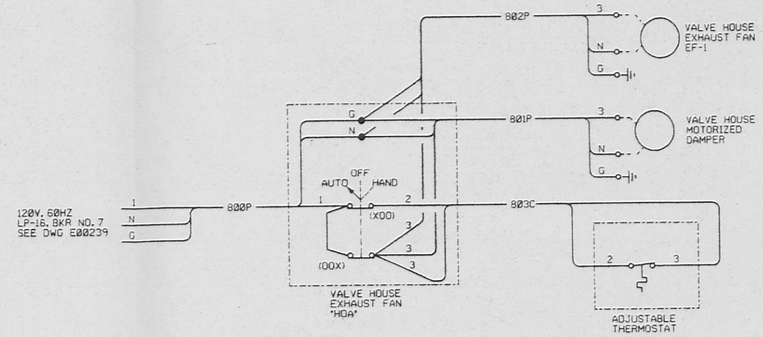
PLANT/BLDG. NO.	FLOOR	SCALE	CLASS

SUBMITTED FOR APPROVAL	FERNCO CRU APPROVAL
A-E DATE 9-15-95	NA DATE

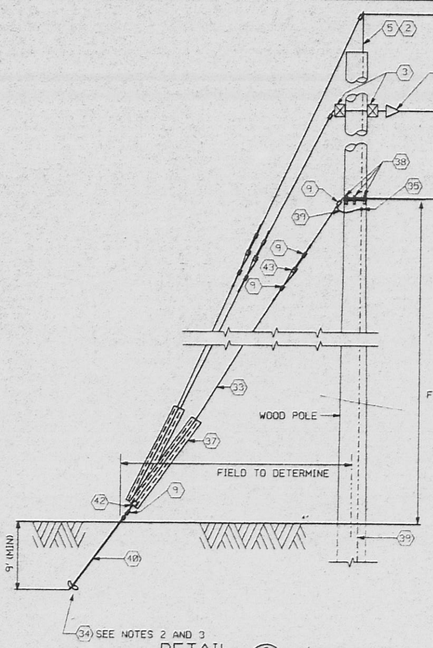
PREPARED UNDER PARSONS PROJECT ORDER NUMBER	DOE PROJECT NO.	FEMP PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
CRU5/P0126		WBS 1.1.1.1.5.3.1 00-90701	95X-5900-E-00238	E0007	0



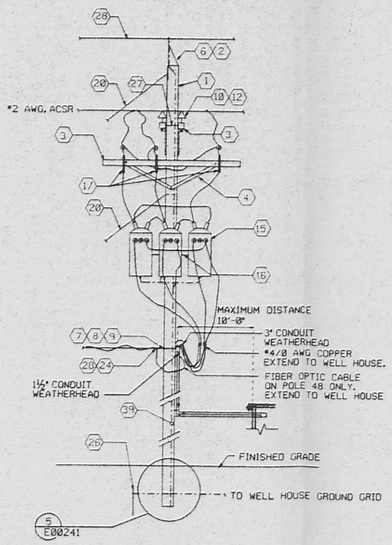
WELL HOUSE EXHAUST FAN EF-XX
INTERCONNECTION DIAGRAM



VALVE HOUSE EXHAUST FAN EF-1
INTERCONNECTION DIAGRAM

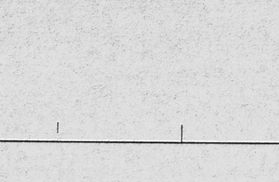


DETAIL (8) REF E00246 E00244
TYPICAL GUY
NTS

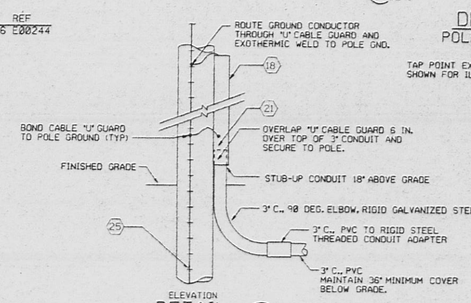


DETAIL (11) REF E00246 E00244
POLES 31, 48
NTS

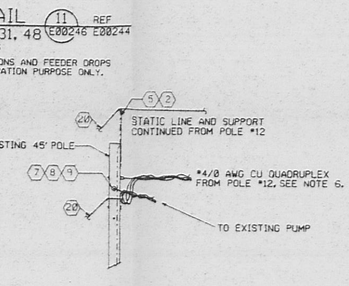
TAP POINT EXTENSIONS AND FEEDER DROPS SHOWN FOR ILLUSTRATION PURPOSE ONLY.



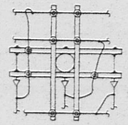
DETAIL (10) REF E00241 E00276
NTS



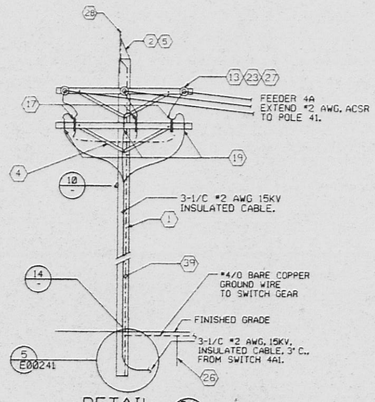
ELEVATION
DETAIL (14) REF
POLE 40
NTS



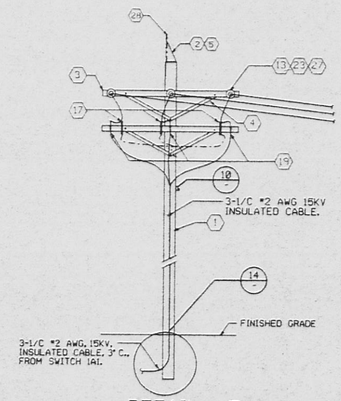
DETAIL (15) REF E00246 E00244
POLE 11
NTS



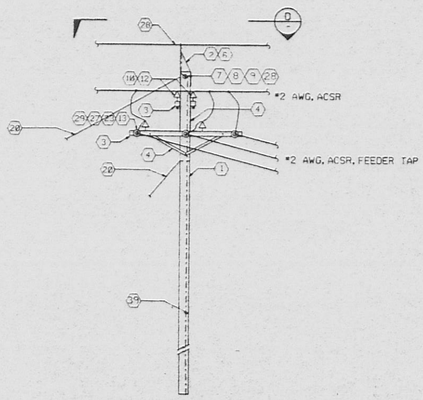
SECTION (D)
NTS



DETAIL (9A) REF E00246 E00244
POLE 40
NTS
VIEW LOOKING WEST



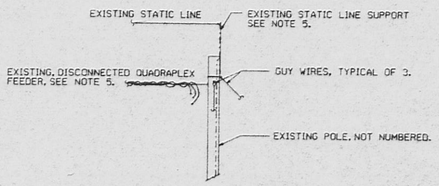
DETAIL (9B) REF E00246 E00244
POLE 40
NTS
VIEW LOOKING EAST



DETAIL (13) REF E00246 E00244
POLES 50, 53
NTS

MATERIAL LIST - CONT. FROM DWG 95X-5900-E-00241

33	½" DIA - 7*6 STANDARD CONSTRUCTION, GALVANIZED STEEL STRAND.
34	14" DIAMETER HELICAL SCREW TYPE GUY ANCHOR WITH MINIMUM PULLOUT CAPACITY OF 22000 LBS.
35	COMPRESSION GROUND FITTING.
36	J-HOOK BOLT AND CLAMP, ½ DIA. BOLT.
37	GUY WIRE MARKER, HALF ROUND, 2" WIDE, 84" LONG, W/ RED'D HARDWARE, UV RESISTANT.
38	GUY AND LOAD PLATE, W/ ANGLE THIMBLE EYE BOLT.
39	#4 AWG. BARE SOLID COPPER GROUND CONDUCTOR.
40	TRIPLEEYE, GALVANIZED ANCHOR ROD, ¾" DIA. LENGTH AS REQ'D.
41	½" EYENUT
42	½" THREADED ROD WITH NUTS. LENGTH AS REQUIRED.
43	GUY STRAIN INSULATOR, ANSI CLASS 54-4, FOR ⅜" GUY WIRE.
44	CROSSARM CORNER TYPE PIN, MALLABLE IRON, GALVANIZED 1" THREAD MOUNTING WITH HARDWARE.
45	LASHING WIRE CLIP, SIZE AS REQUIRED
46	TRANSFORMER, POLE MOUNTED, THREE 25 KVA, 13.2KV - 480V, 1 PHASE, W/ 2 - 2 1/2% TAPS ABOVE AND 2 - 2 1/2% TAPS BELOW, OIL FILLED.



DETAIL (12) REF E00246 E00244
EXISTING POLE
NTS

VIEW OF EXISTING POLE BETWEEN POLES 24 AND 25. WITH BACK TO POLE 24, LOOKING AT POLE 25. SEE NOTE 5.

NOTES

1. SET POLES 7'-6" DEEP.
2. INSTALL SOIL ANCHORS ACCORDING TO MANUFACTURER'S INSTRUCTIONS. DEPTH CALCULATION BASED ON SOIL DATA FOR MINIMUM BLOW COUNT OF 7. IF BLOW COUNT IS LESS THAN 7 THEN CONTACT FERMCO CONSTRUCTION MANAGER.
3. 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.
4. PLACE SIGNAL/COMMUNICATIONS CABLE SIX (6) FEET MINIMUM BELOW 13.2KV POWER LINE CONDUCTORS; FOUR (4) FEET BELOW 600V (OR LESS) POWER CONDUCTORS AND TWO (2) FEET MINIMUM BELOW POLE-GUY ATTACHMENTS.
5. DISCONNECT AND REMOVE STATIC LINE, STATIC LINE SUPPORT, AND QUADRUPLEX FEEDER AND HARDWARE FROM EXISTING POLE. TERMINATE STATIC LINE AND QUADRUPLEX FEEDER AT EXISTING POLE MARKED "RALLY POINT #2", COIL AND SECURE WIRE TO POLE. IF EXISTING POLE HEIGHT INTERFERES WITH 13.2 KV SPAN FROM POLES 25 TO 24, FIELD CUT TOP OF POLE AS REQUIRED TO MAINTAIN ADEQUATE CLEARANCE.
6. EXTEND #4/0 AWG QUADRUPLEX CONDUCTORS FROM POLE #12 TRANSFORMER SECONDARY TO POLE #11, FROM POLE #11, EXTEND CONDUCTORS TO EXISTING PUMP AT POLE 11. ENSURE MESSENGERS ARE CONNECTED TO GROUND AT POLE #12 ONLY.

REF DWG NO.	DRAWING TITLE
95X-5900-E-00241	SECTIONS AND DETAILS POLE DETAILS, SHEET 1
95X-5900-E-00203	DRAWING INDEX
95X-5900-E-00244	13.2 KV DISTRIBUTION AND COMMUNICATIONS PLAN
95X-5900-E-00276	SECTIONS AND DETAILS POLE AND MISCELLANEOUS DETAILS, SHEET 3

000407

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A/E INITIALS	FERMCO INITIALS	DATE
0	CERTIFIED FOR CONSTRUCTION	Paul B	NA	5-15-95

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
SOUTH FIELD EXTRACTION SYSTEM

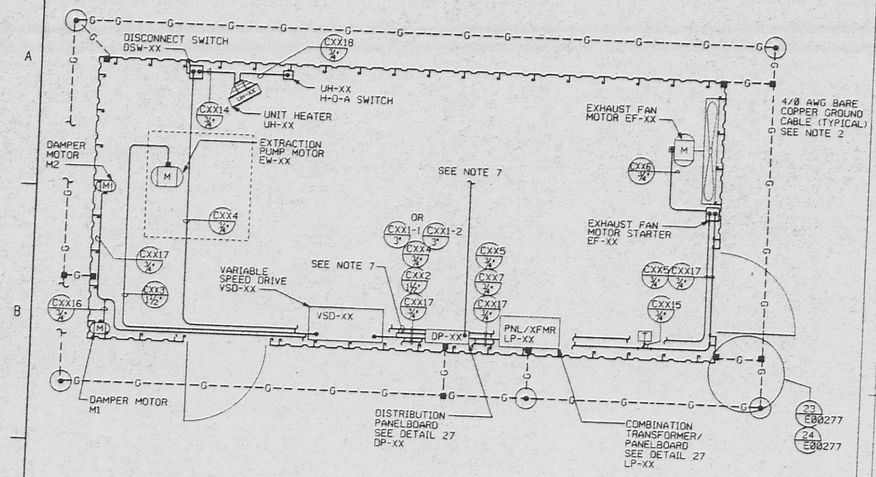
DRAWING TITLE
ELECTRICAL
SECTIONS AND DETAILS
POLE DETAILS, SHEET 2

DRAWN BY	DATE	LEAD ENGINEER	DATE	CHECKED BY	DATE
J. ALLFORD	05-14-95	J. Terrill	5/14/95	J. L. COOPER	05/02/95

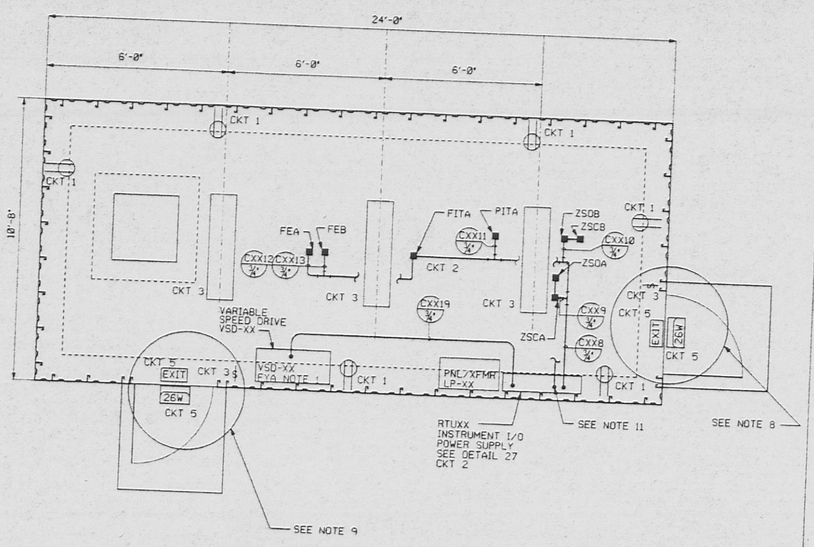
PLANT/BLDG NO.	FLOOR	SCALE	CLASS
		NONE	

SUBMITTED FOR APPROVAL	FERMCO CRU APPROVAL
Paul Brotherton 5-15-95	NA
A/E DATE	DATE

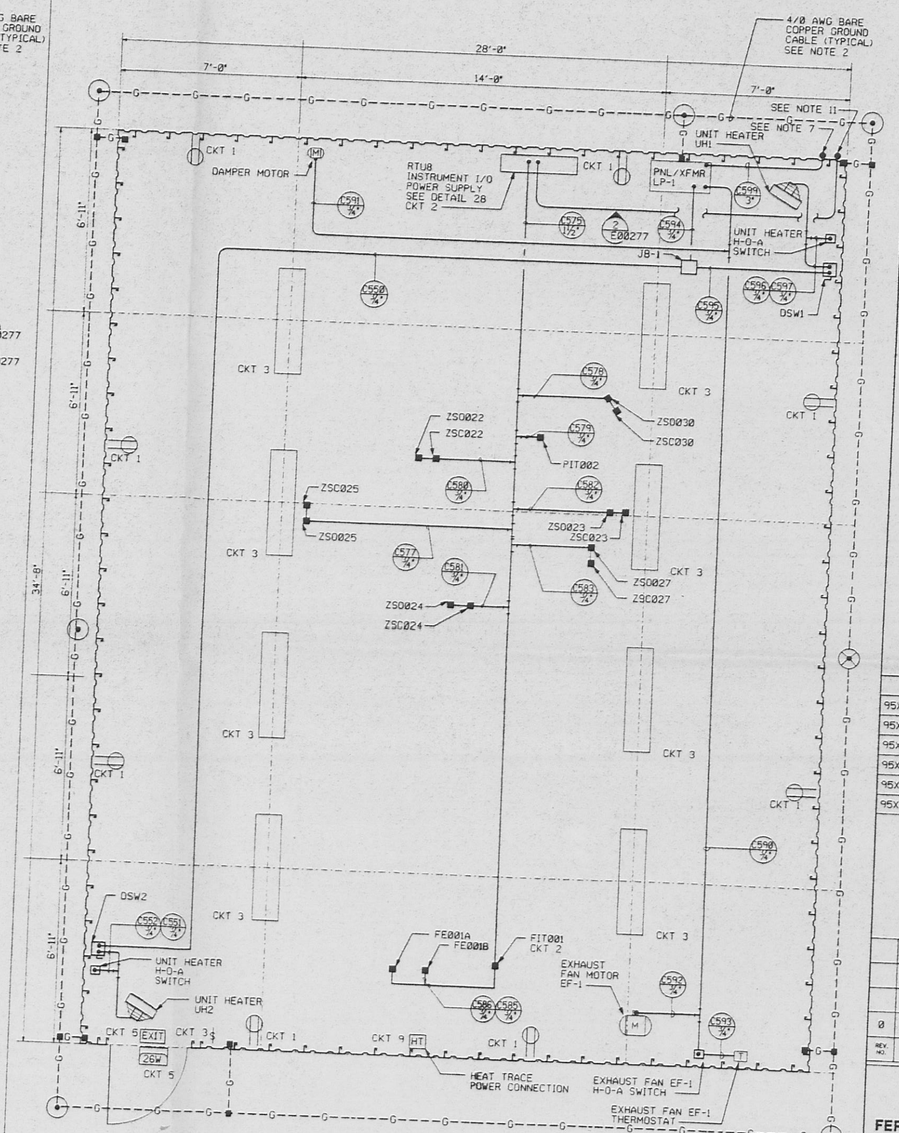
PREPARED UNDER PARSONS PROJECT ORDER NUMBER	DOE PROJECT NO.	FEMP PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
CRU5/P0126		WBS 1.1.1.1.5.3.1 00-90701	95X-5900-E-00246	E0006	0



WELL HOUSE EW-XX
POWER PLAN



WELL HOUSE EW-XX
LIGHTING AND INSTRUMENT PLAN



VALVE HOUSE
POWER, INSTRUMENTS, AND LIGHTING PLAN

NOTES

1. FYA DENOTES 4-20 MA INPUT TO VARIABLE SPEED DRIVE.
2. INSTALL #4/0 AWG BARE COPPER BUILDING GROUND GRID. CONNECT COLUMNS TO GROUND GRID USING #2/0 AWG BARE COPPER GROUND CABLE. ALLOW 10 FOOT PIGTAIL AT GROUND STUB UP LOCATIONS FOR CONNECTION TO EQUIPMENT.
3. CONDUIT RUNS ARE SHOWN DIAGRAMMATICALLY. FIELD ROUTE AND SUPPORT CONDUITS AS NECESSARY SUBJECT TO APPROVAL OF THE FERMCO CONSTRUCTION MANAGER.
4. ALL ELECTRICAL DISTRIBUTION RACKS, PANELS, SWITCHES, TRANSFORMER, AND STARTERS SHALL BE GROUNDED USING A #1/0 AWG COPPER GROUND CABLE.
5. SEE DRAWING 95X-5900-E-00242 FOR CONDUIT SCHEDULE.
6. 'XX' REPRESENTS THE CORRESPONDING WELL HOUSE NUMBER.
7. ROUTE CONDUIT TO BUILDING WALL ADJACENT TO POLE WITH TRANSFORMER T-XX. PROVIDE 480 V SERVICE ENTRANCE AND CONTINUE FEEDER TO TRANSFORMER T-XX .
8. DOORWAY, EXIT SIGN, SWITCH, AND OUTSIDE LIGHT LOCATIONS ARE APPLICABLE TO WELL HOUSES 14, 16, 17, 18, AND 21 ONLY.
9. DOORWAY, EXIT SIGN, SWITCH, AND OUTSIDE LIGHT LOCATIONS ARE APPLICABLE TO WELL HOUSES 13, 15, 19, AND 20 ONLY.
10. FOR CORRESPONDING WELL HOUSE INSTRUMENT TAG NUMBERS, SEE DRAWING 95X-5900-E-00238.
11. ROUTE INSTRUMENT CONDUIT AND CABLE TO 1½" CONDUIT STUB-OUT AND CONTINUE INSTRUMENT CABLE ROUTE AS SHOWN ON DRAWING 95X-5900-E-00277, SECTIONS 25 AND 26.
12. FIELD ROUTE 120V POWER FOR LIGHTING, RECEPTACLES AND INSTRUMENTS IN ¾" RIGID GALVANIZED STEEL CONDUIT TO LIGHTING PANEL LP-XX (OR LP-1) CIRCUIT INDICATED. SEE DRAWING 95X-5900-E-00239 FOR PANEL SCHEDULES.

REF DWG NO.	DRAWING TITLE
95X-5900-X-00203	DRAWING INDEX
95X-5900-E-00235	SINGLE LINE DIAGRAM
95X-5900-E-00238	ELEMENTARY AND INTERCONNECTION DIAGRAM
95X-5900-E-00239	PANEL SCHEDULES
95X-5900-E-00242	CONDUIT SCHEDULE
95X-5900-E-00277	SECTIONS AND DETAILS MISCELLANEOUS DETAILS - SHEET 4

000406

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A/E INITIALS AND DATE	FERMCO INITIALS AND DATE
0	CERTIFIED FOR CONSTRUCTION	NA	9-15-95

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
SOUTH FIELD EXTRACTION SYSTEM

DRAWING TITLE
ELECTRICAL
WELL HOUSE AND VALVE HOUSE
POWER AND 120V DISTRIBUTION PLANS

DRAWN BY	DATE	LEAD ENGINEER	DATE	CHECKED BY	DATE
B. JASPER	6/28/95	J. Ferrell	9/14/95	J. L. COOPER	08/02/95
PLANT/BLDG NO.		FLOOR		SCALE: NONE	CLASS
SUBMITTED FOR APPROVAL: 9-15-95		FERMCO CRU APPROVAL: NA			
A/E DOC PROJECT NO.	DATE	FERMCO PROJECT NO.	DATE	DRAWING INDEX CODE NO.	SHEET NO. / REV. NO.
		WBS 1.1.1.1.5.2.1 00-90701		95X-5900-E-00245	E0005 / 0

PREPARED UNDER PARSONS PROJECT ORDER NUMBER: CRU5/P0126

E-7311

POWER POLE COORDINATES (NAD83)

POLE NO.	NORTH	EAST	DETAIL NO.	DETAIL DWG. NO 95X-5900-
1 #	478,142.00	1,347,382.00	NOT IN CONTRACT	
2 #	478,294.00	1,347,387.20	NOT IN CONTRACT	
3 #	478,388.00	1,347,477.20	NOT IN CONTRACT	
4 #	478,298.00	1,347,567.20	NOT IN CONTRACT	
5 #	478,248.00	1,347,679.00	NOT IN CONTRACT	
6 #	478,198.00	1,347,794.00	NOT IN CONTRACT	
7 #	478,153.00	1,347,922.00	NOT IN CONTRACT	
8 #	478,109.00	1,348,053.00	NOT IN CONTRACT	
9 #	478,098.00	1,348,186.00	NOT IN CONTRACT	
10 #	478,098.00	1,348,322.00	NOT IN CONTRACT	
* 11 #	477,518.00	1,348,304.00	15	E-00246
* 12 #	477,553.00	1,348,341.00	20	E-00276
13 #	477,692.00	1,348,377.00	4	E-00241
14 #	477,831.00	1,348,426.00	4	E-00241
* 15 #	477,970.00	1,348,474.00	3	E-00241
* 16 #	478,103.00	1,348,442.20	3	E-00241
17 #	478,203.00	1,348,480.00	4	E-00241
18 #	478,320.00	1,348,526.00	4	E-00241
19 #	478,441.00	1,348,573.00	4	E-00241
20 #	478,555.00	1,348,618.00	4	E-00241
21 #	478,681.00	1,348,653.00	4	E-00241
* 22 #	478,797.00	1,348,708.00	3	E-00241
23 #	478,876.00	1,348,809.00	4	E-00241
* 24 #	478,935.00	1,348,902.00	3	E-00241
* 25 #	478,986.62	1,349,085.56	4	E-00241
26	477,419.00	1,348,286.00	21	E-00276
* 27	477,265.00	1,348,236.00	2	E-00241
* 28	477,144.00	1,348,288.00	19	E-00276
* 29	477,069.00	1,348,361.00	1	E-00241
* 30	477,106.00	1,348,090.00	21	E-00276
31	477,104.00	1,347,989.00	11	E-00246
* 32	477,130.00	1,347,743.00	2	E-00241
33	477,321.00	1,347,708.00	21	E-00276
34	477,487.00	1,347,673.00	21	E-00276
* 35	477,637.00	1,347,660.00	16	E-00276
* 36	477,562.00	1,348,535.00	2	E-00241
37	477,639.00	1,348,656.00	21	E-00276
* 38	477,740.00	1,348,783.00	2	E-00241
* 39	477,890.00	1,348,857.00	16	E-00276
40	478,905.00	1,349,188.00	9A 9B	E-00246
41	478,925.00	1,349,333.00	18	E-00276
* 42	478,923.00	1,349,483.00	17	E-00276
* 43	478,822.00	1,349,594.00	17	E-00276
44	478,647.00	1,349,581.00	18	E-00276
* 45	478,448.00	1,349,566.00	17	E-00276
46	478,317.00	1,349,518.00	18	E-00276
* 47	478,152.00	1,349,460.00	17	E-00276
* 48	477,954.00	1,349,488.00	11	E-00246
49	477,832.00	1,349,457.00	21	E-00276
* 50	477,670.00	1,349,412.00	13	E-00246
* 51	477,671.00	1,349,262.00	16	E-00276
52	477,494.00	1,349,389.00	21	E-00276
* 53	477,341.00	1,349,377.00	13	E-00246
54	477,369.00	1,349,230.00	21	E-00276
* 55	477,382.00	1,349,256.00	16	E-00276
* 56	477,161.00	1,349,333.00	2	E-00241
* 57	477,060.00	1,349,250.00	2	E-00241
58	477,241.00	1,349,113.00	21	E-00276
* 59	477,027.00	1,348985.00	16	E-00276

* -INDICATES POLE GUY WIRE SUPPORT REQUIRED. SEE DETAIL 8, DWG NO. 95X-5900-E-00246

-INDICATES EXISTING POLES, PROVIDED BY SEEPAGE COLLECTION SYSTEM PROJECT. SEE DRAWING NO. 92X-5900-E-00120 FOR PLAN.

ALL OTHER POLES INSTALLED UNDER THIS PROJECT SHALL BE 55 FT., CLASS 2.

NOTES

1. POWER TO SOUTH FIELD -- ROUTE 13.2KV POWER TO THE WELL HOUSES VIA EXISTING POLES #12 THRU #25 AND NEW POLES #26 THRU #59. 480V SERVICE ROUTING ON POLES #11 THRU #25 SHALL BE MAINTAINED TO THE SEEPAGE COLLECTION SYSTEM DURING INSTALLATION OF THE 13.2 KV LINE INSTALLATION. SEE DRAWING NO. 95X-5900-E-00235 FOR SINGLE LINE DIAGRAM.
2. SEE DRAWING 95X-5900-E-00241 FOR POWER POLE INSTALLATION NOTES AND POLE EQUIPMENT ARRANGEMENTS.
3. COMMUNICATIONS FROM AWWT TO WELL HOUSES -- FIELD ROUTE TWO FIBER OPTIC CABLES FROM THE AWWT CONTROL CABINET USING EXISTING UNMARKED POLES TO POLES #24 AND #25. ROUTE ONE FIBER OPTIC CABLE AERIAL FROM POLE #24 TO WELL HOUSE EW-15 AND ROUTE THE SECOND FIBER OPTIC CABLE AERIAL FROM POLE #25 TO WELL HOUSE #21. THE COMMUNICATIONS CABLE SHALL BE CONVERTED TO WIRE AT WELL HOUSE EW-15 AND EW-21 AND CONTINUE TO THE REMAINING WELL HOUSE. SEE DRAWING NO. 95X-5900-N-00273 FOR THE CONTROL SYSTEM ARCHETECHTURE
4. MAINTAIN CONDUCTOR CLEARANCES ON OVERHEAD SERVICE IN ACCORDANCE WITH ANSI C2, NATIONAL ELECTRICAL SAFETY CODE.
5. SEE DRAWING 95X-5900-E-00245 FOR WELL HOUSE AND VALVE HOUSE PLANS.
6. SEE DRAWING 95X-5900-E-00240 FOR CONNECTIONS TO EXISTING SUBSTATION N18-1 SWITCHES F1A AND F4A.
7. FOR MODIFICATION OF EXISTING POLE OBSTRUCTION, SEE DETAIL 12 ON DRAWING 95X-5900-E-00246.
8. REMOVE EXISTING 45' POLE #12 AFTER COMPLETION OF NEW WORK ON NEW, 55' POLE #12 AND EXISTING 45' POLE #11. DISCONNECT AND REMOVE EXISTING 480V QUADRUPLEX SERVICE FROM POLE #11 BACK TO POLE #16. CUT, COIL, AND TAPE ENDS OF CONDUCTORS AND ABANDON ON POLE #16. MAINTAIN EXISTING 480V SERVICE TO WEST SEEPAGE COLLECTION PUMP (POLES 1-10, 16-25).
9. FOR LOCATION OF SWITCHGEAR AND FEEDER ROUTING TO POLE 40, SEE SWITCHGEAR ARRANGEMENT AND CONDUIT PLAN, DRAWING 95X-5900-E-00240

LEGEND

—·—·— 13.2 KV LINE.

– – – – DIRECT BURIED COMMUNICATIONS LINE SEE DRAWING 95X-5900-E-00270 FOR UNDERGROUND CABLE SCHEDULE

REF DWG NO.	DRAWING TITLE
95X-5900-E-00235	SINGLE LINE DIAGRAM
95X-5900-E-00240	SECTIONS AND DETAILS 15kV SWITCHGEAR AND DETAILS
95X-5900-E-00241	SECTIONS AND DETAILS POLE DETAILS, SHEET 1
95X-5900-E-00245	WELL HOUSE AND VALVE HOUSE POWER AND 120V DISTRIBUTION PLAN
95X-5900-E-00246	SECTIONS AND DETAILS POLE DETAILS, SHEET 2
95X-5900-X-00203	DRAWING INDEX
95X-5900-E-00273	CONTROL SYSTEM ARCHITECTURE
95X-5900-E-00270	CABLE SCHEDULE - SHEET 2
95X-5900-E-00276	SECTIONS AND DETAILS POLE AND MISCELLANEOUS DETAILS, SHEET 3

000405

REV NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A/E	FERNCO	DATE
			CON	
Ø	CERTIFIED FOR CONSTRUCTION	Ralph Barth	NA	4-15-95
		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
SOUTH FIELD EXTRACTION SYSTEM

DRAWING TITLE
ELECTRICAL
13.2 KV DISTRIBUTION & COMMUNICATIONS PLAN

DRAWN BY	DATE	LEAD ENGINEER	DATE	CHECKED BY	DATE
J. ALLFORD	06-14-95	J. Tuttell	4/5/95	J. L. COOPER	08-02-95

PLANT/BLDG NO.	FLOOR	SCALE	CLASS
		1"=150'	

SUBMITTED FOR APPROVAL — A/E — DATE: Ralph Barth 4-15-95
FERNCO CRU APPROVAL — DATE: NA

PREPARED UNDER PARSONS PROJECT ORDER NUMBER	DOE PROJECT NO.	FEMP PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
CRU5/P0126		WBS 1.1.1.1.5.3.1 00-90701	95X-5900-E-00244	E0004	Ø

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