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R-009-204.20

APPLICATION FOR APPROVAL - INSTALLATION OF AN ALTERNATE WATER SUPPLY SYSTEM - FERNALD ENVIRONMENTAL MANAGEMENT PROJECT (FEMP)

01/03/92

DOE-784-92
DOE-FO/OEPA
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LETTER
OU5

Department of Energy
Fernald Environmental Management Project
P.O. Box 398705
Cincinnati, Ohio 45239-8705
(513) 738-6357

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FEB 0 3 1992

DOE-784-92

Thomas A. Winston, District Chief
Southwest District Office
Ohio Environmental Protection Agency
40 South Main Street
Dayton, OH 45402-2086

Dear Mr. Winston:

APPLICATION FOR APPROVAL - INSTALLATION OF AN ALTERNATE WATER SUPPLY SYSTEM - FERNALD ENVIRONMENTAL MANAGEMENT PROJECT (FEMP)

Please find enclosed a completed application and an application fee check in the amount of $2,700.00 for the above referenced project. This project will provide an alternate water supply to two facilities; Albright & Wilson Americas Inc. (AWA) and Delta Steel Inc., under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), South Groundwater Contamination Plume Removal Action, Part 1. The Department of Energy (DOE) will construct the water supplies. However, after a period of performance testing, AWA will assume sole ownership of its designated system, but the system supplying Delta Steel will remain under DOE possession.

This application consists of the following:

Enclosure 1 - Ohio EPA "Water Supply Data Sheet" including an attachment which describes the background of this project.
Enclosure 2 - Two complete sets of plans and specifications.
Enclosure 3 - One copy of the Ohio EPA well site approval letter.
Enclosure 4 - One copy of the Ohio Department of Health chemical analysis of the proposed water source.

The draft final report containing the pumping test results and well logs prepared by Advanced Sciences Incorporated/International Technologies Corporation (ASI/IT) was received by the DOE on January 28, 1992. As part of this application, the report will be supplied to the Ohio Environmental Protection Agency (OEPA) under separate cover approximately one week from the date of this transmittal letter. In addition, a copy of the easement for the designated well field will be provided when it has been obtained.

Recycled and Recyclable

The DOE is asking approval of this application before the date for start of construction on March 16, 1992. However, if approval has not been granted on or before this date, the DOE will proceed with construction in order to meet its CERCLA commitments.

If you have any questions, please contact Ed Skintik at (513) 738-6660.

Sincerely,

R. E. Tiller

R. E. Tiller
Manager

FO:Skintik

Enclosures: As stated

cc w/enc. (one set of plans and specifications only):

J. A. Saric, USEPA-V, 5HR-12
G. E. Mitchell, OEPA-Dayton
AR Coordinator

cc w/o enc.:

K. A. Hayes, EM-424, TREV II
S. M. Beckman, WEMCO
D. J. Brettschneider, WEMCO

[redacted]

[redacted]

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ENCLOSURE 1

OHIO EPA

WATER SUPPLY DATA SHEET

WATER SUPPLY DATA - OHIO EPA 2723

(See Pages 3 and 4 for additional information)

COUNTY: Hamilton **TOWNSHIP:** Crosby

MUNICIPALITY (if any): N/A **SEWER DISTRICT (if any):** N/A

NAME OF PROJECT: Environmental, Health, & Safety Improvements - Phase IV (WBS 1.1.2.4.04.01); South Groundwater Contamination Plume Removal Action, Part 1 Alternate Water Supply System

ADDRESS AND/OR SPECIFIC LOCATION OF FACILITY:

U.S. Department of Energy
Fernald Environmental Management Project
P.O. Box 398705
Cincinnati, Ohio 45239

Albright & Wilson Americas Inc.
P.O. Box 39066
Cincinnati, Ohio 45239

Delta Steel
P.O. Box 39040
Cincinnati, Ohio 45239

NAME AND ADDRESS OF ULTIMATE OWNER:

U.S. Department of Energy
Fernald Environmental Management Project
P.O. Box 398705
Cincinnati, Ohio 45239
ATTN: Mr. Carlos J. Fermaintt

PHONE: 513/738-6319

Albright & Wilson Americas, Inc.
P.O. Box 39066
Cincinnati, Ohio 45239
ATTN: Mr. Simon Robson

PHONE: 513/738-1261

NAME AND ADDRESS OF ENGINEER:

Westinghouse Environmental Management Company of Ohio
P.O. Box 398704
Cincinnati, Ohio 45239

PHONE: 513/738-6200

BASIS OF DESIGN

(See Pages 3 and 4 for additional information)

ESTIMATED NUMBER OF PROPOSED INITIAL WATER USERS (Population):

Albright & Wilson Americas, Inc. system: 26 employees
U.S. Department of Energy system: 50 employees

ANTICIPATED ULTIMATE POPULATION TO BE SERVED:

Albright & Wilson Americas, Inc. system: 26 employees WHEN: At present
U.S. Department of Energy system: 50 employees WHEN: At present

ESTIMATED WATER CONSUMPTION:

Albright & Wilson Americas, Inc. system: 175 gpm (single well operation)
250 gpm (double well operation)
U.S. Department of Energy system: 50+/- gpm (single well operation)

DESCRIBE SOURCE OF SUPPLY (Provide capacity figures):

Groundwater will serve as the water supply source. Preliminary results from an aquifer pump-down test at the proposed well field area indicated that the test well responded with a 4.35 feet drawdown after 72 hours of pumpage at a flow rate of 380 gpm. (The draft final report containing the pumping test results and well logs will be supplied under separate cover).

PROVIDE BRIEF DESCRIPTION OF PROPOSED FACILITIES, INCLUDING PROCESSES TO BE USED, CAPACITY OF TREATMENT FACILITIES, AREA TO BE SERVED BY DISTRIBUTION SYSTEM, ETC.:

(See Pages 3 and 4 for additional information)

ESTIMATED COST OF CONSTRUCTION:

Albright & Wilson Americas, Inc. system:	$715,000
U.S. Department of Energy system:	$585,000

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ATTACHMENT TO WATER SUPPLY DATA

The U.S. Department of Energy (DOE) has agreed to undertake, as part of site remediation under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), the responsibility to provide alternate water supplies to two industries whose water supply has been affected by contaminants allegedly arising from operations at DOE's Fernald Environmental Management Project (FEMP). The alternate water supplies constitute Part 1 of the South Groundwater Contamination Plume (South Plume) Removal Action being conducted under CERCLA.

BACKGROUND

The DOE has entered into a Consent Agreement with the U.S. Environmental Protection Agency (U.S. EPA) which includes a requirement that a removal action be undertaken to address uranium contamination in groundwater south of the FEMP. The resulting evaluation of removal action alternatives is described in an Engineering Evaluation/Cost Analysis, or EE/CA. The EE/CA identified that an alternate water supply is to be furnished to the two local industries, Albright & Wilson Americas, Inc. (AWA) and Delta Steel, as Part 1 of the South Plume Removal Action. The subsequent CERCLA Removal Action Work Plan describes the implementation of the Part 1 alternate water supply.

In addition, the DOE has entered into a legal agreement with AWA to supply alternate water and is currently negotiating a separate legal agreement with Delta Steel. The AWA agreement involves the DOE furnishing two water supply withdrawal wells capable of delivering at a rate of 250 gpm for combined operation and 175 gpm for single well operation at a negotiated water quality specification. AWA uses its water as a raw material in its manufacturing of phosphorus and phosphoric acid-based chemicals. The alternate water supply will be connected to AWA's existing water treatment facility. Currently being negotiated, the Delta Steel agreement will involve the DOE furnishing a single water supply withdrawal well capable of producing approximately 50 gpm and serviced utilizing a hydropneumatic tank. The 50 gpm well will replace Delta Steel's existing well. Currently, Delta Steel restricts it's water usage to non-potable demands because of the uranium contamination. The water use by both of these industries has been considered by the Ohio Environmental Protection Agency as non-transient, non-community public water systems.

A test well was installed and will become one of the water supply withdrawal wells for AWA. The purpose of the well was to verify the proposed well field's hydraulic capacity and water quality, and to establish design information for the wells.

The proposed location of the water supply well field is presently situated on privately-owned land, as shown of Drawing No. 18A-4445-C-01136. The U.S. Army Corps of Engineers (COE) is proceeding with the acquisition of the designated well field as a perpetual easement. The layout of the well field includes the isolation radius of three hundred (300) feet as required by the Ohio EPA regulations. The COE is including language into the deed of perpetual easement language prohibiting the present land owner from constructing buildings, septic systems, or other sources of possible well contamination within the easement

boundary to comply with the intent of the isolation radius.

The construction details of these two separate water supply systems are described in the attached construction drawings and specifications. The construction drawings do not reflect the fourth water supply well located next to the designated Delta Steel well shown in Figure 1 of the draft test well report. This fourth water supply well was considered for future installation, but presently is not planned to be constructed. Also the well depth, screen selection and elevation, well diameter, etc., as noted with the Pitless Wellhead Pump Details A and D on Drawing No. 18A-4445-P-01142 will be determined upon the submittal of the final test well report to the DOE expected in late January.

Upon completion of each alternate water supply system and after a period of performance acceptance testing, AWA will assume sole ownership of its designated system. The DOE plans to maintain possession of the system serving Delta Steel until a proposed extension of the Hamilton County public water supply system is installed to serve the surrounding Fernald area. The extension is planned to be installed within three to five years. At that time, it is intended that Delta Steel will be serviced by the public water supply system. In the meantime, the well casing and screen for Delta Steel will be designed to permit an additional 100 gpm should system demands increase or in the event that South Plume contamination affects other area groundwater users.

FEE WORKSHEET

[redacted]

PAYER: WESTINGHOUSE ENVIRONMENTAL MANAGEMENT COMPANY OF OHIO

PROJECT NAME AND COUNTY: ENVIRONMENTAL, HEALTH, & SAFETY - PHASE IV
SOUTH GROUNDWATER CONTAMINATION PLUME
REMOVAL ACTION - PART 1
ALTERNATE WATER SUPPLY SYSTEM

HAMILTON COUNTY

ESTIMATED COST: $ 1,300,000

MULTIPLIED BY 0.2% (0.002) $ 2,600.00

SUBTOTAL: $ 2,600.00

PLUS $100.00: $ 2,700.00

TOTAL FEE DUE (not to exceed $5,000.00): $ 2,700.00

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ENCLOSURE 2

TWO SETS - PLANS AND SPECIFICATIONS

SOUTH GROUNDWATER CONTAMINATION PLUME

ALTERNATE WATER SUPPLY SYSTEM

(ATTACHED SEPARATELY TO THIS APPLICATION)

2783

[redacted]

SPECIFICATION NO. 02902-4601

CERTIFIED FOR CONSTRUCTION

ALTERNATE WATER SUPPLY SYSTEM

FOR

SOUTH GROUNDWATER CONTAMINATION PLUME

(WBS 1.1.2.4.04.01)

Prepared for

Westinghouse Environmental Management Company of Ohio
Fernald Environmental Management Project
Fernald, Ohio

Contract No. N-77207

November 1, 1991

Prepared by

A. M. KINNEY, INC.
CONSULTING ENGINEERS
CINCINNATI, OHIO

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SPECIFICATION NO. 02902-4601

A. M. KINNEY, INC.

PREPARED BY A. W. Pfirrman DATE 11-01-91
A. W. Pfirrman - Deputy Project Manager

CHECKED BY DATE 11-01-91
R. L. Hird - Specifications

APPROVED BY DATE 11-01-91
J. H. K. Yuan - Project Manager

WESTINGHOUSE ENVIRONMENTAL MANAGEMENT COMPANY OF OHIO

APPROVED BY DATE 12-16-91
J. R. Hughes - Project Manager

APPROVED BY T M Patterson DATE 12-17-91
T. M. Patterson - Manager, Project Management

APPROVED BY DATE 12-18-91
D. J. Brettschneider - OU5 Manager

DEPARTMENT OF ENERGY

APPROVED BY Wayne E. Pasko DATE 12/18/91
RCF W. E Pasko - Project Manager

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INDEX TO

SPECIFICATION NO. 02902-4601

CERTIFIED FOR CONSTRUCTION

ALTERNATE WATER SUPPLY SYSTEM

FOR

SOUTH GROUNDWATER CONTAMINATION PLUME

(WBS 1.1.2.4.04.01)

Section No.	Title	Pages
00004	Drawing List	1
01100	General Requirements	8
01101	Attachment No. 1 to Section 01100 Submittal Listing	3
01102	Attachment No. 2 to Section 01100 Cost Breakdown For Estimate Reconciliation	1
General Construction:		
02200	Earthwork	6
02221	Trenching & Backfilling For Utilities	8
02505	Crushed Stone Paving	2
02510	Asphaltic Concrete Pavement	6
02670	Water Wells	5
02831	Chain Link Fences and Gates	4
02930	Topsoil and Grass	5
02960	Aggregate Topping	2
03310	Cast-in-place Concrete	4
09910	Exterior Painting	5
Mechanical:		
15050	General Mechanical Work Requirements	8
15250	Insulation	4
15400	Piping Systems	8
15990	Tests and Adjustments, Operating Instructions	2

Electrical:

16010	Electrical Work - General	8
16020	Scope of Electrical Work	2
16307	Electrical Switching and Controls - Low Voltage (1,000 Volts and Below)	2
16400	Electrical Wiring	9
16480	Underground Electrical Work	2
16500	Luminaires and Lighting	1
16850	Electrical Heat Tracing	2

END OF SECTION

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SECTION 00004

SCHEDULE OF DRAWINGS

FEMP DRAWING NO.	AMK SHEET NO.	TITLE	REV.	DATE
18A-4445-X-01134	X-1	Cover Sheet	0	11-1-91
18A-4445-C-01135	AC-1	Routing Location Plan	0	11-1-91
18A-4445-C-01136	AC-2	Site Plan & Profile, Sheet 1 of 4	0	11-1-91
18A-4445-C-01137	AC-3	Site Plan & Profile, Sheet 2 of 4	0	11-1-91
18A-4445-C-01138	AC-4	Site Plan & Profile Sheet 3 of 4	0	11-1-91
18A-4445-C-01139	AC-5	Site Plan & Profile, Sheet 4 of 4	0	11-1-91
18A-4445-C-01140	AC-6	Site Plan	0	11-1-91
18A-4445-C-01141	AC-7	Site Details & Sections	0	11-1-91
18A-4445-P-01142	AP-1	Piping Details	0	11-1-91
18A-4445-P-01143	AP-2	New 4" Aboveground Pipe Routing	0	11-1-91
18A-4445-E-01144	AE-1	Electrical Plan - Power & Control	0	11-1-91
18A-4445-E-01145	AE-2	Electrical Site Plan & Details Well Pump Area	0	11-1-91
18A-4445-E-01146	AE-3	Electrical Plans & Details Well Pump Area	0	11-1-91

END OF SECTION

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SECTION 01100

GENERAL REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. These General Requirements form a part of all the technical sections of these specifications.

B. All work shall be accomplished in accordance with the requirements of the Ohio Basic Building Code, the Uniform Building Code (including requirements for seismic construction, Zone 2), and in accordance with the requirements of 29 CFR 1926 (OSHA).

C. The Subcontractor shall provide all material, equipment and services to provide new potable well water systems including well drilling, pumps, piping to the Albright & Wilson Americas Inc. facility and the Delta Steel facility, electrical service and appurtenant construction to the extent shown and specified, except as otherwise amended by the accepted bid and/or contract.

1. Drilling of Well No. AWA 1 has been completed as a test well. The casing and screen for this well has been provided.

D. The Subcontractor shall perform all construction acceptance tests as coordinated and supervised by the Construction Manager and witnessed by the Operating Contractor. In addition, before the final acceptance of the work, the Subcontractor shall perform an integrated system construction acceptance test as coordinated and supervised by the Construction Manager and witnessed by the Operating Contractor.

E. The Subcontractor shall provide written procedures for the Construction Manager's review and approval of all tests to be performed as identified in the Subcontractor's final design drawings and specifications. These procedures shall provide detailed step by step operations with sign-off columns and shall be submitted and approved at least 30 days prior to testing.

F. All field test instruments shall have been calibrated within the last 12 months prior to use on this subcontract by a calibration laboratory whose calibration equipment and instruments are fully traceable to NIST standards. The Subcontractor shall provide individual certification of calibration and NIST standards traceability for all field test instruments used on this subcontract.

G. Provide all field labor and other assistance required by the Operating Contractor or Construction Manager during any on-site field inspections being performed by the Operating Contractor or Construction Manager.

1.2 DEFINITIONS

A. A. M. Kinney, Inc. prepared these performance specifications. In all cases where the word "Engineers" appears in these specifications, it shall be understood to refer to A. M. Kinney, Inc., or to such other individuals or organizations acting within the scope of the specific duties entrusted to them.

B. 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 sub-subcontract to the Subcontractor.

C. In all cases where the words "Operating Contractor" appear, they shall be understood to refer to the FEMP Operating Contractor, The Westinghouse Environmental Management Company of Ohio.

D. In all cases where the words "Construction Manager" appear, they shall be understood to refer to the FEMP Construction Manager, the Rust Engineering Company.

E. In all cases where the word "Others" appears, it shall be understood to refer to firms other than the Subcontractor doing related work on the site.

1.3 SPECIFICATION EXPLANATION

A. The technical specifications are of the abbreviated, simplified or streamlined type and include incomplete sentences. Omissions of words or phrases such as "the Subcontractor 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.

B. 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.

C. For convenience of reference and to facilitate the letting of sub- subcontracts, the specifications may be separated into titled Sections and Divisions. Such separations, however, shall not operate to make the Engineers arbitrators to establish the limits of sub-subcontracts in any manner.

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

	Term	Definition
1.	Indicated:	As shown on the drawings and/or specified.
2.	Directed, Authorized, or Permitted:	As directed, authorized, or permitted by the Construction Manager.
3.	Satisfactory or Acceptable:	Satisfactory or acceptable to the Operating Contractor.

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4. Necessary, required, or suitable: As necessary, required, or suitable for the intended purpose as determined by the Construction Manager.

5. Submit: Submit to the Construction Manager unless otherwise specified.

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

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

Abbreviations	Authority
AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
ACPA	American Concrete Pipe Association
AIMA	Acoustical and Insulating Materials Association
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
ANSI	American National Standards Institute
API	American Petroleum Institute
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
AWS	American Welding Society
AWWA	American Water Works Association
CRSI	Concrete Reinforcing Steel Institute
IEEE	Institute of Electrical and Electronics Engineers
NIST(NBS)	National Institute for Standards and Technolgy (formerly National Bureau of Standards
NEC	National Electrical Code
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
NRMCA	National Ready Mixed Concrete Association
PCA	Portland Cement Association
PPI	Plastic Piping Institute
SSPC	Steel Structures Painting Council
UL	Underwriters Laboratories Inc.

1.4 SUBMITTALS

A. Article SC-24 of the "Rust Special Terms and Conditions" shall be supplemented by the following (any submittals not in conforming to these requirements will be returned without review for correction and resubmittal):

B. Submittals for unrelated items shall not be included in the same transmittal. Each separate submittal shall be coordinated and shall include all drawings and data required for the item or system covered.

C. Submittals shall indicate project name and Engineers' specification number (if pages are securely bound in a brochure, this is needed on the cover only) and 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 CFC drawings and specifications.

D. 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.

E. Assemble and submit, in logically arranged folders. 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.

F. The Engineers' review of such submittals shall not relieve the Subcontractor from any responsibility for deviations from contract documents, unless the Subcontractor has in writing called the Engineers' 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.

1. 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. If the Engineers determine that the data submitted, in part or in whole, is not within the purview of their review, such submittal, or part thereof, will be returned unchecked. 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.

2. 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.

G. 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 to the Subcontractor bearing certificate attachment permitting the Subcontractor to employ them in the furtherance of work under the contract, but only with the express understanding that such permission shall not relieve the Subcontractor of responsibilities for the full performance of the work required under the contract conforming to 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 Subcontractors whether or not such deficiencies where observed or noted in the course of the review of the shop drawings.

H. Submittal requirements: Submittals required include drawings and/or data for all items listed in the attached submittals listing; Refer technical divisions for more detailed requirements:

Designations	Requirements Description
A	Shop drawings and pertinent performance data and curves.
B	Catalog data, and pertinent performance data and curves.
C	Items are to be included on a listing giving manufacturer and brief type description for each item. Listing shall be submitted not later than 30 days after notice to proceed. note that shop drawings or catalog data may also be required for items included on this list.
D	Samples of finishes with full range of color choices and/or patterns submitted.
E	Physical samples of materials.
F	Individual certifications for conformity to qualifications and standards specified. For equipment items, this indicates certified equipment drawings are to be submitted.
G	Technical specifications contain specific submittal requirements.
H	Engineering calculations.
I	Spare parts list.
J	Installation, operation and maintenance manual.
K	Manufacturer's material safety data sheets.
L	Test reports for tests noted in technical specifications.
M	Wiring diagrams for power, signal, and control wiring.
N	Schematic piping diagrams, with sizes and components shown.
O	Copy of the original Purchase Order.

1.5 COST BREAKDOWN

A. As part of the Subcontractor's responsibilities under Article A.14 of the Rust General Terms and Conditions with design, the Subcontractor shall, within 10 days after notice to proceed, submit a cost breakdown allocating the total contract amount into the various categories shown on Attachment No. 2 to this section. This cost breakdown is for the use of the Operating Contractor, and is in addition to the cost breakdown submitted with the initial proposal, and in addition to any cost breakdown requested by the Construction Manager for payment request purposes. Attachment No. 2 shall not be used for invoicing purposes.

1.6 OPERATING MANUALS AND SPARE PARTS LISTS

A. Copies of a priced recommended spare parts list shall be submitted at least 30 days 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. Cover of the IOM manuals shall include the following information:

Project Title	- ALTERNATE WATER SUPPLY SYSTEM
W.B.S. NO.	- 1.1.2.4.04.01 Westinghouse Environmental Management Company of Ohio
Consulting Engineers	- A. M. Kinney, Inc.
Construction Manager	- The Rust Engineering Company
Subcontractor	- (Name of Subcontractor)
Consulting Engineer's Specification No.	- 02902-4601

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 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 no later than 30 days prior to the shipment of the equipment or system.

1.7 CODES AND STANDARDS

A. In addition to codes and standards referenced in the technical divisions of these performance specifications, all work, and the completed project, shall comply with the latest editions of the following at the time of final offer:

1. All applicable federal and State of Ohio codes, laws and regulations.

2. Ohio Basic Building Code (OBBC).

3. 29 CFR 1926 (OSHA)

2783 [redacted]

4. DOE 6430.1A General Design Criteria

5. FMPC-720, Control of Construction Waste

6. WEMCO Standard Operating Procedure SOP-20-60-01.

7. Comprehensive Environmental Response, Compensation, and Liability Act/Superfund Amendments and Reauthorizaton act (CERCLA/SARA).

8. Great Lakes - Upper Mississippi River Board of State Sanitary Engineers Recommended Standards for Sewage Works.

9. FEMP - Work Permit Procedures

10. Westinghouse Environmental Management Company of Ohio - Industrial Hygiene and Safety Manual "Control of Entering and/or Working in Confined Spaces".

B. At the completion of the project, the Subcontractor shall submit to the Construction Manager a statement certifying that the completed project complies with all such referenced codes and standards.

PART 2 - PRODUCTS

(Not Applicable)

PART 3 - EXECUTION

3.1 CONTAMINATED MATERIALS

A. All contaminated materials resulting from the demolition operations or cutting and patching operations under this specification are to be handled in accordance with standard FMPC 720 and the Project Work Plan.

3.2 ASBESTOS ABATEMENT

A. Removal and abatement of asbestos to conform to FEMP standards and to the following standards:

1. American Industrial Hygiene Association - recommendations for asbestos abatement projects.

2. Occupational Safety and Health Administration Standards 1926.58.

3. Environmental Protection Agency - National Emission Standards for Asbestos.

B. Sub-Subcontractors, testing laboratories and industrial hygienists for asbestos removal work shall be licensed for asbestos removal in accordance with the laws of the State of Ohio.

C. The Operating Contractor will obtain all licenses, permits and inspections, and pay all fees therefor, from all federal, state or local agencies involved with the control of asbestos materials. The Subcontractor shall obtain all required asbestos work permits from the FEMP Operating Contractor.

D. Sixty [60] days prior to commencing any asbestos abatement work, the Subcontractor shall submit for approval a proposed asbestos work plan for WEMCO to arrange for an inspection by Environmental Protection Agency. Included in this work plan shall be the scope of the asbestos work, estimate of non friable asbestos, the Subcontractor's abatement methods, air monitoring procedures, analytical method to detect friable and non friable asbestos, protection equipment including respiratory protection and protective clothing, documentation of employee training for asbestos and respirators, and asbestos and respirator medical certification. Work plan shall include scheduled starting and completion dates for renovation.

E. The Operating Contractor's industrial hygiene personnel will periodically monitor the jobsite during the asbestos abatement work.

F. Asbestos removed during construction work to be encapsulated in plastic bags and placed in white barrels and boxes furnished by the Operating Contractor. The Operating Contractor will remove such barrels and boxes from the construction site to an approved on-site disposal area.

3.3 UTILITY OUTAGES

A. All work requiring utility outages or system shutdowns shall be performed on weekends.

3.4 CLEANING UP

A. Article A-26 of the Rust "General Terms and Conditions" shall be supplemented by the following:

1. The Subcontractor shall, upon completion and acceptance of the work, turn over to the Operating Contractor all permanent work furnished and preformed under this subcontract in a thoroughly cleaned and workmanlike condition, free from any dirt, grit, oil, paint, and other forms of soilage, and ready for the Operating Contractor's use in every respect.

END OF SECTION

ATTACHMENT NO. 1 TO SECTION 01100 OF SPECIFICATION 02902-4601

November 1, 1991

[redacted]

SUBMITTAL LISTING

MATERIAL/EQUIP'T/ITEM DESCRIPTION	SHOP DWGS A	CAT./ CURVES B	LIST ONLY C	FIN. SMPL D	PHYS SMPL E	MAT/PER CERTIF. F	TECH SPECS G	ENG'G CALCS H	PARTS LIST I	IOM MNLS J	M.S. D.S. K	TEST REPT L	WIRING DIAGRM M	PIPING DIAGRM N
SECTION NO.: 02200														
SECTION TITLE: EARTHWORK														
FILL						F								
TESTS							G					L		
SECTION NO.: 02221														
SECTION TITLE: TRENCHING FOR UTILITIES														
CONCRETE MIX DESIGN							G							
GRANULAR MATERIALS						F	G							
SECTION NO.: 02505														
SECTION TITLE: PAVING														
AGGREGATE						F								
SUBGRADE DENSITY												L		
TESTS							G					L		
SECTION NO.: 02670														
SECTION TITLE: WATER WELL														
DRILLING RECORDS												L		
GROUT						F								
MATERIALS			C											
WATER					E							L		
SECTION NO.: 02830														
SECTION TITLE: FENCES AND GATES														
CONCRETE						F								
FENCING	A						G	H						
GATES AND SUPPORTS	A							H						
HARDWARE		B												
SECTION NO.: 02900														
SECTION TITLE: GRASS AND TOPPINGS														
CHEMICALS											K			
FERTILIZER						F								
HERBICIDE							G							

[redacted]

SUBMITTAL LISTING

MATERIAL/EQUIP'T/ITEM DESCRIPTION	SHOP DWGS A	CAT./ CURVES B	LIST ONLY C	FIN. SMPL D	PHYS SMPL E	MAT/PER CERTIF. F	TECH SPECS G	ENG'G CALCS H	PARTS LIST I	IOM MNLS J	M.S. D.S. K	TEST REPT L	WIRING DIAGRM M	PIPING DIAGRM N
SECTION NO.: 02900														
SECTION TITLE: GRASS AND TOPPINGS														
SEED MIX						F								
SECTION NO.: 03300														
SECTION TITLE: CONCRETE														
MIX DESIGN						F						L		
SECTION NO.: 09900														
SECTION TITLE: PAINTING														
PAINT		B		D			G				K			
SECTION NO.: 15050														
SECTION TITLE: GENERAL MECHANICAL														
PIPE IDENTIFICATION			C											
WELDER QUALIFICATIONS						F								
WELDING PROCEDURES						F								
SECTION NO.: 15250														
SECTION TITLE: MECHANICAL INSULATION														
INSULATION AND JACKETING		B												
SECTION NO.: 15400														
SECTION TITLE: PIPING														
HANGERS & SUPPORTS		B						H						
PIPING MATERIALS						F								
PRESSURE INDICATORS		B												
PRESSURE REDUCING VALVE		B							I	J				
PRESSURE SWITCH		B												
WELL HEADS	A	B							I	J			M	
WELL PUMP		B	C											
VALVES, STRAINERS		B												

[redacted]

ATTACHMENT NO. 1 TO SECTION 01100 OF SPECIFICATION 02902-4601

SUBMITTAL LISTING

MATERIAL/EQUIP'T/ITEM DESCRIPTION	SHOP DWGS A	CAT./ CURVES B	LIST ONLY C	FIN. SMPL D	PHYS SMPL E	MAT/PER CERTIF. F	TECH SPECS G	ENG'G CALCS H	PARTS LIST I	IOM MNLS J	M.S. D.S. K	TEST REPT L	WIRING DIAGRM M	PIPING DIAGRM N
SECTION NO.: 16050														
SECTION TITLE: BASIC ELECTRICAL MATERIALS														
INSPECTIONS						F	G							
TESTS							G					L		
SECTION NO.: 16307														
SECTION TITLE: SWITCHING AND CONTROLS														
LIGHTING PANELBOARD		B												
MOLDED CASE CIRCUIT BREAKERS		B												
MOTOR CONTROL CENTER	A	B				F	G		I	J			M	
MOTOR STARTERS		B												
POWER CIRCUIT BREAKERS		B												
RELAYS		B												
SECTION NO.: 16400														
SECTION TITLE: WIRING METHODS														
COMMUNICATION WIRE		B												
CONDUIT & FITTINGS			C											
INSTRUMENTATION WIRE		B												
WALL PLATES & COVERS			C											
WIRE & CABLE 600 VOLTS & BELOW			C											
WIRING DEVICES		B	C											
SECTION NO.: 16500														
SECTION TITLE: LIGHTING														
BALLASTS			C											
LUMINAIRES (EACH TYPE)	A	B												
PHOTOELECTRIC CONTROL		B												
SECTION NO.: 16850														
SECTION TITLE: TITLE ELECTRICAL HEAT TRACING														
CABLE		B							I			L	M	
THERMOSTAT		B											M	

[redacted]

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ATTACHMENT NO. 2 TO SECTION 01100

COST BREAKDOWN FOR ESTIMATE RECONCILIATION

Item No.	Cost/Contract Item	Labor and Materials Total per Item
1.	Mechanical - Prime and General Conditions	$ _____
2.	Well	$ _____
3.	Fence	$ _____
4.	Road	$ _____
5.	Boring	$ _____
6.	Electrical	$ _____
		_____
	Total Contract Amount	$ _____

1. Breakdown must equal the subcontractor's total contract amount. Contingency, escalation, overhead, profit and bonding shall be proportionately spread among the items.

2. Items 2 through 6 are considered as sub-subcontractors under Item 1. Any additional sub-subcontractors not shown are to be included with Item 1. Any additional levels of sub-subcontracting not shown are to be included with the level immediately above.

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SECTION 02200

EARTHWORK

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Rough Grading for site work.

2. Strip ground surfaces within grading area to depths as necessary to remove existing topsoil but in no event less than 6 inches.

3. Finish grades for topping and pavement.

B. Related Work In Other Sections:

1. Excavating and backfilling for utility trenches.

2. Finish Site Grading.

3. Topsoil for planting.

4. Aggregate topping.

5. Paving.

1.2 DEFINITIONS

A. Excavation consists of removal of material encountered to subgrade elevations indicated and subsequent disposal of materials removed.

B. Unauthorized excavation consists of removal of materials beyond indicated subgrade elevations or dimensions without specific direction of Construction Manager. Unauthorized excavation, as well as remedial work directed by Construction Manager, shall be at Subcontractor's expense.

1. Backfill and compact unauthorized excavations as specified for authorized excavations of same classification.

C. Additional Excavation: When excavation has reached required subgrade elevations, notify Construction Manager, who will make an inspection of conditions. If Construction Manager determines that bearing materials at required subgrade elevations are unsuitable, continue excavation until suitable bearing materials are encountered and replace excavated material as directed by Construction Manager.

D. Subgrade: The undisturbed earth or the compacted soil layer immediately below [redacted] aggregate topping, pavements, or topsoil materials.

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1.3 PERMITS

A. Subcontractor to obtain permits required by authorities having jurisdiction.

1.4 QUALITY ASSURANCE

A. Codes and Standards: Perform excavation work in compliance with applicable requirements of authorities having jurisdiction.

1.5 TESTING AND INSPECTION SERVICE

A. Construction Manager will employ and pay for a qualified independent geotechnical testing and inspection laboratory to perform soil testing and inspection service during earthwork operations.

B. Testing Laboratory Qualifications: To qualify for acceptance, the geotechnical testing laboratory must demonstrate to Construction Manager's satisfaction, based on evaluation of laboratory-submitted criteria conforming to ASTM E 699, that it has the experience and capability to conduct required field and laboratory geo-technical testing without delaying the progress of the Work.

1.6 PROJECT CONDITIONS

A. Existing Utilities: Locate existing underground utilities in areas of excavation work. Provide adequate means of support and protection during earthwork operations.

1. Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, consult utility owner immediately for directions. Cooperate with utility companies in keeping respective services and facilities in operation. Repair damaged utilities to satisfaction of utility owner.

B. Do not interrupt existing utilities serving occupied facilities, during occupied hours, except when permitted in writing by Construction Manager and then only after acceptable temporary utility services have been provided.

1. Provide minimum of 48-hour notice to Construction Manager, and receive written notice to proceed before interrupting any utility.

C. Use of Explosives: Use of explosives is not permitted.

D. Operate warning lights as recommended by authorities having jurisdiction.

E. Protect structures, utilities, pavements, monitoring wells and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. Satisfactory soil materials are defined as those complying with ASTM D2487 soil classification groups GW, GP, GM, SM, SW, and SP.

B. Unsatisfactory soil materials are defined as those complying with ASTM D2487 soil classification groups GC, SC, ML, MH, CL, CH, OL, OH, and PT.

C. Backfill and Fill Materials: Satisfactory soil materials free of clay, rock or gravel larger than 2 inches in any dimension, debris, waste, frozen materials, vegetation and other deleterious matter.

PART 3 - EXECUTION

3.1 EXCAVATION

A. Excavation is unclassified and includes excavation to subgrade elevations indicated, regardless of character of materials and obstructions encountered.

3.2 STABILITY OF EXCAVATIONS

A. Comply with local codes, ordinances, and requirements of agencies having jurisdiction.

B. Slope sides of excavations to comply with local Federal and State codes and ordinances. Provide shoring where required to hold excavation within easements.

3.3 DEWATERING

A. Control grades to prevent surface water from flowing into excavations and from flooding project site and surrounding area.

1. Do not allow water to accumulate in excavations. Remove water detrimental to stability of subgrades and foundations. Provide and maintain pumps, sumps, suction and discharge lines, and other dewatering system components necessary to convey water away from excavations.

2. Construct and maintain temporary drainage ditches and other diversions outside excavation limits to convey rain water and water removed from excavations to collecting or runoff areas. Do not use trench excavations as temporary drainage ditches.

B. Should the subcontractor fail to promptly initiate dewatering procedures when directed, the right is reserved to have the work performed by others at subcontractor's expense.

3.4 DISPOSITION OF EXCAVATED MATERIALS

A. Dispose of the following materials offsite:

1. Materials not acceptable for use as backfill or fill.

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2. Removed trees, including stumps and roots.

3. Debris and trash.

B. Where removed materials are suitable for topsoil and are in excess of topsoil requirements for work under these specifications, spread as authorized or directed so that no suitable topsoil will be wasted.

3.5 CLEARING AND GRUBBING

A. Miscellaneous material - Remove all existing miscellaneous materials encountered, including, but not limited to:

1. Exposed or buried debris.

2. Curbs

3. Small structures.

4. Foundations.

B. Vegetation: Remove existing vegetation from within the grading area. Grub the area, removing stumps and roots larger than 2 inches in diameter to a depth of 2 feet below finish grades.

3.6 EXCAVATION

A. Cut surface under pavement and topping to comply with cross-sections, elevations and subgrades.

B. Cold Weather Protection: Protect excavation bottoms against freezing when atmospheric temperature is less than 35 degrees F.

3.7 BACKFILL AND FILL

A. Place soil material in layers to required subgrade elevations, for each area classification listed below, using materials specified in Part 2 of this Section.

1. Under grassed areas or areas with aggregate topping, use satisfactory soil material.

2. Under pavement, use satisfactory soil material.

B. Ground Surface Preparation: Remove vegetation, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface prior to placement of fills. When existing ground surface has a density less than that specified under "Compaction" for particular area classification, break up ground surface, pulverize, moisture-condition to optimum moisture content, and compact to required depth and percentage of maximum density.

C. Compaction:

1. Place and fill materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

2. Before compaction, moisten or aerate each layer as necessary to provide optimum moisture content. Compact each layer to required percentage of maximum dry density or relative dry density for each area classification. Do not place fill material on surfaces that are muddy, frozen, or contain frost or ice.

3. Control compaction, providing minimum percentage of density specified for each area classification indicated below. Correct improperly compacted areas or lifts as directed by Construction Manager if soil density tests indicate inadequate compaction.

4. Percentage of Maximum Density Requirements: Compact soil to not less than the following percentages of maximum density, in accordance with ASTM D 698:

   a. Under paving, and aggregate topping, compact top 12 inches of subgrade and each layer of fill material at 95 percent maximum density.

   b. Under grassed areas, compact top 6 inches of subgrade and each layer of backfill or fill material at 90 percent maximum density.

5. Moisture Control: Where subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply water to surface of subgrade or layer of soil material. Apply water in minimum quantity as necessary to prevent free water from appearing on surface during or subsequent to compaction operations.

   a. Remove and replace, or scarify and air dry, soil material that is too wet to permit compaction to specified density.

   b. Spread soil material that has been removed because it is too wet to permit compaction. Assist drying by discing, harrowing, or pulverizing until moisture content is reduced to a satisfactory value.

3.8 GRADING

A. Uniformly grade areas within limits of grading under this section, including adjacent transition areas. Smooth finished surface within specified tolerances, compact with uniform levels or slopes between points where elevations are indicated or between such points and existing grades.

B. Grading Outside Fence Lines: Grade areas adjacent to fence lines to drain away from area and to prevent ponding. Finish surfaces free from irregular surface changes and as follows:

1. Grassed Areas: Finish areas to receive topsoil to within not more than 0.10 foot above or below required subgrade elevations.

2. Paving and Aggregate Topping: Shape subgrade to line, grade, and cross-section, with finish surface not more than 1/2 inch above or below required subgrade elevation.

C. Compaction: After grading, compact subgrade surfaces to the depth and indicated percentage of maximum or relative density for each area classification.

3.9 FIELD QUALITY CONTROL

A. Quality Control Testing During Construction: Allow testing service to inspect and approve each subgrade and fill layer before further backfill or construction work is performed.

3.10 PROTECTION

A. Erosion Control: Provide erosion control methods in accordance with requirements of authorities having jurisdiction.

B. Maintenance:

1. Protection of Graded Areas: Protect newly graded areas from traffic and erosion. Keep free of trash and debris.

2. Repair and re-establish grades in settled, eroded, and rutted areas to specified tolerances.

3. Reconditioning Compacted Areas: Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, reshape, and compact to required density prior to further construction.

4. Settling: Where settling is measurable or observable at excavated areas within one year of placement, remove surface (pavement, grassed areas or other finish), add backfill material, compact, and replace surface treatment. Restore appearance, quality, and condition of surface or finish to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

END OF SECTION

2703

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SECTION 02221

TRENCHING & BACKFILLING FOR UTILITIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Site clearing.

2. Utilities trenching.

3. Bedding for piping.

4. Backfilling.

5. Compacting.

6. Jacking pipe under roads and railroad crossings.

7. Concrete encasement.

B. Related Work In Other Sections:

1. Shoring and bracing.

2. Finish grading topsoil.

3. Installation of underground utilities.

4. Protection Board and Tape over Electrical Lines.

1.2 SUBMITTALS

A. Test Reports: Make provisions for testing service to submit the analysis of proposed trench backfill materials directly to the Construction Manager.

1.3 QUALITY ASSURANCE

A. Codes and Standards: Perform work in compliance with requirements of authorities responsible for code enforcement.

B. Field Inspection Service: The Construction Manager will engage soil inspection service for quality control testing during earthwork operations. Give inspection service timely notice of readiness of the work for required tests and inspections.

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C. Material Certification Testing: For each soil material proposed for use as fill or backfill, whether obtained on or off site, obtain the services of a testing laboratory to classify soil material, develop Proctor curve, and perform any other tests required.

1.4 SITE CONDITIONS

A. Traffic: Conduct operations to ensure minimum interference with roads, and other adjacent occupied or used facilities. Do not close or obstruct any such facilities without permission from authorities having jurisdiction.

B. Site Utilities:

1. Advise utility companies of excavation activities before starting excavations. Locate existing underground utilities in areas of work.

2. Should uncharted or incorrectly charted utilities be encountered, consult owners of utilities immediately for direction.

3. Protect existing utilities. Cooperate with the Operating Contractor and with utility companies in keeping existing services in operation.

4. Do not interrupt existing utilities serving occupied facilities during hours of occupation, except when permitted in writing by the Operating Contractor.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. Insitu Materials: Obtain approval of the Construction Manager for inplace soil materials forming the subgrades for backfill, pipe or drainage structures.

1. Satisfactory Material: ASTM D 2487 groups GW (well-graded gravel; GP (poorly graded gravel); GM (silty gravel); GC (clayey gravel); SW (well-graded sand); SC (clayey sand); and CL (lean clay).

2. Unsatisfactory Material: ASTM D 2487 groups SP (poorly graded sand), SM (silty sand), ML (silt), OL (organic clay and silt), CH (fat clay), MH (elastic silt), OH (organic clay), OH (organic silt) PT (peat).

B. Topsoil:

1. Topsoil to be removed: Friable clay loam surface soil.

2. Topsoil for reuse: Reasonably free of subsoil, clay lumps, stones, and other objects 2 inches or more in any dimension; acidity range (pH) of 5.5 to 7.5; containing not less than 4 percent and not more than 25 percent organic matter.

C. Backfill materials: Satisfactory insitu material removed by trenching that is free of clods and stones larger than 2 inches in any dimension and free of debris, waste, frozen materials, and organic and other deleterious matter.

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1. Where sufficient approved materials are not available from required excavations on site, obtain materials from approved sources off site.

2. Obtain approval of the Construction Manager for each soil material.

D. Select Granular Material: Well-graded sand, gravel, crushed gravel, crushed stone, or crushed slag; at least 95 percent passing a 1-inch sieve, not more than 10 percent passing a No. 200 sieve.

2.2 CONCRETE

A. Material:

1. Portland cement: ASTM C 150, Type III, high early strength.

2. Aggregates: ASTM C 33, 1-inch maximum size aggregate

B. Proportioning: Provide standard FEMP No. 4 concrete mix design with a minimum 28-day compressive strength of 3,000 psi:

1. Slump: maximum 4-inch.

2. Entrained Air: 3 to 5 percent.

2.3 STEEL CASING

A. Steel pipe conforming to ASTM A 139, Grade B, Schedule 40, with welded joints.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protection: Provide markers indicating limits of work and clear identification of items and areas requiring protection.

B. Barricade open excavations and post with warning lights as recommended by governing authorities.

C. The Subcontractor is solely responsible for determining the potential for injury to persons and damage to property.

1. Where such potential is present, take appropriate protective measures.

2. Protect persons, existing and new structures, utilities, pavements, and other facilities from injury or damage caused by settlement, lateral movement, undermining, washout, and other hazards created by operations under this section.

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3. Establish and maintain sheeting, shoring, bracing, or other protective measures in compliance with applicable codes and ordinances and regardless of time period excavations will be open. Carry down shoring and bracing as excavation progresses.

D. Protect bottoms of excavations, and soil adjacent to and beneath foundations, from frost and freezing temperatures.

3.2 CLEARING AND GRUBBING

A. Remove all vegetable matter from within the limits to extent required.

1. Protect existing trees as directed by the Construction Manager.

2. Completely remove debris protruding above ground surface, stumps, and roots. Remove both above- and below-ground portions. Fill holes thus created with approved, compacted soil.

3. Strip topsoil from areas to be excavated. Stockpile satisfactory topsoil required for later reuse. Construct stockpiles to freely drain surface water. Cover if necessary to prevent wind blown dust.

4. Strip topsoil to whatever depths encountered in a manner to prevent intermingling with underlying subsoil or other objectionable material. Remove heavy plant growth from areas before stripping.

3.3 DEWATERING

A. Prevent surface water and subsurface or ground water from flowing into excavations and from flooding project site and surrounding area. Do not allow water to be diverted onto adjacent properties.

B. Establish and maintain temporary drainage ditches and other diversions outside excavation limits to convey rainwater and water removed from excavations to collecting or runoff areas. Do not use trench excavations as temporary drainage ditches.

3.4 EXCAVATION

A. Explosives: Use of explosives is not permitted.

B. Excavation consists of the removal of materials encountered in achieving subgrade elevations indicated and the subsequent reuse or disposal of materials removed. Excavation is unclassified and includes achievement of subgrades by whatever means necessary, regardless of character of materials and types of obstructions encountered.

C. Unauthorized Excavation: Removal of materials beyond indicated subgrade elevations or dimensions without specific order of the Construction Manager constitutes unauthorized excavation. The subcontractor shall be responsible for expenses of unauthorized excavation and remedial work required by the Construction Manager.

1. Under footings, foundation bases, or retaining walls: Fill unauthorized excavation by extending indicated bottom elevation of bedding to excavation bottom without altering

required top elevation. Lean concrete fill may be used to bring elevations to proper position when acceptable to the Construction Manager.

2. At locations other than below footings, foundation bases, or retaining walls: Backfill and compact unauthorized excavations with approved materials as required by the Construction Manager.

D. Additional Excavation: When excavation has reached required subgrade elevations, notify the Construction Manager, who will make an inspection of conditions.

1. If unsuitable bearing materials are encountered at required subgrade elevations, carry excavations deeper, remove unsuitable materials, and replace with approved material as required by the Construction Manager.

2. Removal and disposal of unsuitable material and its replacement as required will be paid on basis of contract conditions relative to changes in work.

E. Excavation for Trenches:

1. Unless otherwise required, begin trenching, utility installation, and backfilling at lowest portion of utility line, working toward highest portion of line.

2. Dig trenches to depths indicated.

3. Provide clearance of 6 to 9 inches on both sides of pipe or conduit.

   a. Where indicated trench widths are exceeded, redesign, stronger pipe, or special installation procedures may be required by the Construction Manager at no additional cost to the Operating Contractor.

4. Unless otherwise indicated, trench walls for piping shall be vertical from trench bottom to one foot above top of pipe or to top elevation of initial backfill, whichever is higher.

5. Where rock is encountered and bedding is not otherwise required, carry excavation 6 inches below required elevation and backfill with a 6-inch layer of select grannular material prior to installation of pipe.

6. Grade bottoms of trenches as indicated, notching under joints and couplings to provide solid bearing for entire body of pipe or conduit.

7. Underground electrical circuits:

   a. Excavate to depths required to provide minimum cover indicated.

   b. Grade trench bottoms toward manholes or handholes.

   c. Remove stones and sharp objects from trench bottoms.

3.5 INSTALLATION OF STEEL CASING

A. Install a casing of the diameter indicated to permit the laying of the water supply line under Paddy's Run Road, Willey Road and the railroad. Casing to be installed under railroad by boring or jacking. Casing under road may be installed by open cut methods if approved by governing authorities.

B. Installation:

1. Subcontractor to make any necessary excavation, boring or jacking necessary to install the steel casing. Install casing to conform to these control points. Any deviation in grade or alignment of the casing, which prevents the installation as designed or access for maintenance, will require the Subcontractor to reinstall the casing in the proper manner.

2. After water main is laid, completely fill all voids between the outside of the pipe and the casing with pea gravel. Both ends of the casing shall be closed with a brick bulkhead.

3. Provide chocks for protection of pipe during placing in casing.

3.6 ENCASEMENT AT CREEK CROSSING

A. Preparation: Construct encasement in sections. Divert creek as required.

B. Construction: Block pipe in place and encase in concrete. Regrade Creeks to match preconstruction grades.

3.7 STORAGE

A. Stockpile materials to be used for filling and backfilling, including excavated materials classified as satisfactory soil materials, at locations indicated or as directed. Place, grade, and shape stockpiles for proper drainage away from excavations. Store materials without intermixing. Protect from contamination with other solids or debris.

3.8 BACKFILLING

A. Preparation: Backfill excavations promptly as work permits, but not before the following operations are complete:

1. Recording of locations of underground utilities.

2. Removal of trash and debris from excavations.

B. Testing of Piping:

1. Before performing testing of utilities (specified elsewhere): Backfill and compact trench to a level 1 foot above top of pipe, except at joints and couplings.

2. After successful testing, complete backfilling as soon as practicable.

C. Installation: Place approved soil materials in layers to required elevations.

1. Do not place material on muddy or frozen surfaces or on surfaces containing frost.

2. Do not allow pipe or conduit to be intermittently supported by blocking or by uneven trench bottoms.

3. Place and compact haunching and initial backfill material evenly on both sides of pipe to avoid pipe displacement.

4. Use methods to ensure required compaction under haunches of pipe.

3.9 COMPACTION

A. Placement: Take care in placement and compaction of materials adjacent to structures and utilities to prevent wedging action or displacement.

B. Moisture Control: Where subgrade or layer of soil material must be moisture-conditioned before compaction, uniformly apply water to surface of subgrade or layer of soil material to prevent free water from appearing on surface during or after compaction operations. Remove and replace soil material that is too wet to permit compaction to specified density.

3.10 FIELD QUALITY CONTROL

A. Quality Control Testing during Construction: Provide timely notice to testing service to inspect and approve subgrades and fill layers before further construction work is performed.

B. Maximum Density at Optimum Moisture Content: Determine in accordance with ASTM D 698, Method D.

C. In-Place Density Tests: ASTM D 1556 (sand cone method), ASTM D 2167 (rubber balloon method), or ASTM D 2922 (nuclear method), as applicable.

D. If testing service reports indicate that subgrade or fills are below specified density, scarify or remove and replace to the required depth, recompact, and retest at no additional cost to the Operating Contractor.

3.11 MAINTENANCE

A. Reconditioning Compacted Areas: Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, reshape, return to optimum moisture content, and compact to required density prior to further construction.

3.12 DISPOSAL OF EXCESS AND WASTE MATERIALS

A. Evenly spread any excess satisfactory topsoil in adjacent locations as directed by the Construction Manager. Properly dispose of unsatisfactory topsoil off site.

B. Remove any unsatisfactory soil, trash, debris, and other materials not required for use on the project and legally dispose of it.

C. Burning is not permitted.

3.13 TRENCHING SCHEDULE

A. Excavate, backfill, and compact in accordance with the schedule below.

B. Water Supply System:

1. Bedding material: Select granular material.

a. Maximum loose lift: 4 inches.

b. Minimum compaction: 95 percent.

c. Place bedding material to spring line of pipe.

2. Backfill: Satisfactory soil material.

a. Maximum loose lift: 4 inches.

b. Minimum compaction: 95 percent.

END OF SECTION

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SECTION 02505

CRUSHED STONE PAVING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Provide crushed stone paving.

2. Provide geotextile fabric on subgrade where indicated.

3. Provide herbicide on subgrade where geotextile fabric is omitted.

B. Related Work in Other Sections:

1. Earthwork including establishment and compaction of subgrades.

1.2 SUBMITTALS

A. Material Certificates: Provide certificates for herbicide that material complies with, or exceed, specified requirements of the United States Environmental Protection Agency.

B. Product Data: For geotextile fabric include tensile strength.

1.3 QUALITY ASSURANCE

A. Specified Standards:

1. Comply with "State of Ohio Department of Transportation, Construction and Material Specifications" (ODOT).

2. Pavement section to conform to specified item and additional provisions referenced therein, except:

a. Provisions for methods of measurement and payment are inapplicable.

b. References to the "Engineer" are to be construed as the Construction Manager.

B. References to "Laboratory" therein or elsewhere in this section refers to laboratory specified under "Tests and Inspections".

C. Tests and Inspections: The Construction Manager reserves the right to employ a Testing Laboratory to conduct testing and inspection of materials, mixtures, and in-place construction.

1.4 JOB CONDITIONS

A. Weather Limitations: Construct work when substrates are dry.

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B. Grade Control: Establish and maintain required lines and grades, including crown and cross-slopes, for each course during construction so that the finished work is within the tolerances required by the Specified Standard.

PART 2 - PRODUCTS

2.1 MATERIALS AND CONSTRUCTION

A. Pavement to conform to ODOT Item 411, stabilized crushed aggregate.

B. Geotextile fabric to conform to ODOT Item 712.09, Type D.

2.2 HERBICIDE

A. United States Environmental Protection Agency approved herbicide.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine areas and conditions where paving is to be placed. Notify Construction Manager of conditions detrimental to proper and timely completion of Work.

B. Starting of work constitutes acceptance by the subcontractor.

3.2 PREPARATION

A. Thoroughly subgrade till to a depth of 8 inches and apply herbicide in quantities sufficient to prevent germination and/or growth of any plants in the treated area.

B. Recompact and smooth subgrade.

3.3 FILTER FABRIC

A. On finish subgrade constructed loosely lay (do not stretch) a single layer of filter cloth lapped not less than 18 inches at joints and secured with pins as recommended by manufacturer. Use no more than 2 horizontal (in direction of water flow) laps and stagger vertical laps not less than 5 feet.

B. Use full rolls insofar as practical to minimize vertical laps.

3.4 CRUSHED STONE PAVEMENT

A. Install pavement in accordance with the requirements of the Specified Standard of the types and in a compacted thickness of 12 inches.

B. Provide a smooth top surface not below required finish elevations.

END OF SECTION

2783 [redacted]

SECTION 02510

ASPHALTIC CONCRETE PAVEMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Provide the following Asphaltic Concrete Pavement.

a. Subbase.

b. Aggregate Base Course.

c. Asphaltic Prime Coat.

d. Asphalt concrete intermediate course.

e. Asphaltic tack coat.

f. Asphalt Concrete Surface Course.

2. Provide tack coat on:

a. Existing paving.

b. Joints with existing pavements.

c. Intermediate asphalt courses.

3. Prepare subgrade by compacting to specified density.

B. Related Work in Other Sections:

1. Earthwork including establishment and compaction of subgrades.

2. Submittal Requirements.

1.2 DESCRIPTION

A. Asphalt emulsions will not be permitted for bituminous binders for work performed during the period between September 1 and the following May 1, or where more restrictly precluded by the standard specifications.

[redacted]

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1.3 SUBMITTALS

A. Material Certificates: Provide certificates for each type of material and mix signed by the Producer and the Paving Contractor certifying that each material and mixture complies with, or exceed, specified requirements.

B. Bituminous Materials: Submit, not less than 21 days prior to placing of bituminous pavement:

1. Job-mix formula for asphalt pavement for each plant mix to be provided.

2. Test property curves: AASHTO T-245 (Marshall Method) for a series of test specimens prepared in accordance with the job mix formula for gradation of aggregates and for a range of different asphalt contents for each asphalt course to be provided.

a. Prepare test specimens for a range of different asphalt contents so that the test data curves show a well defined optimum asphalt content value.

1.4 QUALITY ASSURANCE

A. Specified Standards:

1. Comply with applicable provisions referenced herein for the following standards:

a. "State of Ohio", Department of Transportation, Construction and Material Specifications" (ODOT).

2. Pavement sections to conform to specified item and additional provisions referenced therein, except:

a. Provisions for methods of measurement and payment are inapplicable.

b. References to "Engineer" are to be construed as the Construction Manager.

c. References to "Laboratory" therein or elsewhere in this section are to be construed as the laboratory specified hereinafter under "Testing".

B. Tests and Inspections: Employ a Testing Laboratory or Geotechnical Engineer to conduct testing and inspection of materials, mixtures, and in-place construction.

1. Proposed Job-Mix Check:

a. Review and/or check proposed aggregate and bitumen materials for compliance with the specifications.

b. Perform necessary testing required to develop test curves as determined by AASHTO T-245 for a series of test specimens prepared in accordance with the proposed job-mix formula for gradation of aggregates and for a range of different asphalt contents for each asphalt course to be provided. Test specimens to be prepared for a range of different asphalt contents so that the data curves show a well defined optimum asphalt content value.

2. Sampling: Obtain all test samples in compliance with AASHTO T-168 for sampling bituminous paving mixtures.

3. Field Testing: Secure from different batches, on a random basis, samples for testing as required below in accordance with the applicable AASHTO Standard. Clearly mark each test specimen as to exact location of field placement, type or course of bituminous material, and time and date of sample.

   a. Asphalt Content: Determine asphalt content in compliance with AASHTO T-164. Perform 3 asphalt content tests per each location of asphaltic materials placed, but not less than 3 tests total for project.

   b. Compressive Strength Tests: Mold, cure and test specimens for strength in compliance with AASHTO T-167. Perform 3 compressive strength tests per each location of asphaltic materials placed, but not less than 3 tests total for project.

   c. Compaction:

      1) Obtain test specimens and determine degree of pavement compaction of asphaltic aggregate mixtures in compliance with AASHTO T-230. Determine standard specimen specific gravity Marshall Method, AASHTO T 245, for the job-mix formula.

      2) Determine degree of compaction for 3 test specimens per each location of asphaltic materials placed, but not less than 3 tests total for project.

4. Authority and Duties of Testing Agency: Use of an independent testing agency does not relieve Subcontractor of responsibility to furnish materials and construction in full compliance with plans and specifications. Testing agency is not authorized to modify the specifications, nor approve the work.

   a. Submit a copy of the results of each tests and inspections, to the Subcontractor and Construction Manager.

   b. Should any of the test results fail to meet the requirements specified, make an immediate telephone report to the Subcontractor and Construction Manager.

1.5 JOB CONDITIONS

A. Weather Limitations: Construct work when substrates are dry and ambient temperatures exceed the minimum required by the Specified Standards.

B. Grade Control: Establish and maintain required lines and grades, including crown and cross-slopes, for each course during construction so that the finished work is within the tolerances required by the Specified Standard.

1.6 SEQUENCING/SCHEDULING

A. The Subcontractor may, as an option, use pavement bases and/or pavements provided under this section for other operations under these specifications, subject to the following:

1. Immediately prior to application of prime coat for asphalt concrete surface course, return such bases to conditions, lines and grades as shown and specified.

2. Maintain existing and new pavements used during construction in satisfactory condition throughout life of contract. Repair as necessary to restore to specified condition prior to acceptance at completion of job.

B. Coordinate work under this section with work being performed under other sections. Do not construct subgrades or aggregate bases until all items shown crossing there under are installed complete.

PART 2 - PRODUCTS

2.1 BASE COURSES

A. Aggregate Base:

1. ODOT Item 304.

2.2 ASPHALT PAVEMENT

A. Acceptable job-mix formula to be limited by the following criteria as determined by AASHTO T-245 (Marshall Method).

1. Stability, all mixtures: 1000 Min.

2. Flow, all mixtures: 8 Minimum; 16 Maximum.

3. Asphalt content: 5.5 Minimum; 9.5 Maximum.

B. Prime Coat:

1. Bituminous material RC 70, RC 250, MC 30, MC 70, MC 250 OR RT 2.

2. Standard Specification:

a. ODOT Item 408.

C. Tack Coat:

1. Bituminous material RC 70, RC 250, MC 30, MC 70, MC 250 OR RT 2.

2. Standard Specification:

a. ODOT Item 407.

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D. Asphalt Concrete Intermediate Course:

1. ODOT Item 402.

E. Asphaltic Concrete Surface Course:

1. ODOT Item 404.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine areas and conditions where paving is to be placed. Notify Construction Manager of conditions detrimental to proper and timely completion of Work. Starting of work constitutes acceptance.

3.2 PREPARATION

A. Do not install any base course until subgrade has been approved by Laboratory.

B. Lines and Grades: Prior to construction of various components of pavements courses establish and maintain satisfactory lines, levels, layout and stakes. Be responsible for same. Employ registered engineer or surveyor for this purpose. Set stakes not farther than 25 feet on center. Mark stakes to show top elevation of such components including top of paving elevation.

3.3 SUBGRADE PREPARATION

A. Compact upper 6 inches of subgrade soil to minimum of 95 percent of maximum dry density determined by ASTM D 698 Standard Procter at a moisture content at least 2 percent over optimum. Overexcavate soft or wet areas to firm soil. If exposed soil is dry and cracked, excavate dry soil to depth of cracks to expose firm and moist soil.

3.4 BASES

A. Prior to installation of base course, repair any damage caused to subgrade construction by the work under this specification.

B. Install base course to compacted thickness required in accordance with the requirements of the Specified Standard for the construction specified under PART 2.

C. Unless material in its natural condition is fairly moist, sprinkle with water either prior to or during the mixing process. When the wetting and mixing have been completed, spread the material to the desired cross section and thoroughly compact by rolling with 10 ton smooth wheel rollers, or equal equipment.

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3.5 BITUMINOUS PAVEMENT

A. Install pavement courses in accordance with requirements of Specified Standards for materials specified in Part 2 in compacted thicknesses required.

B. Prior to installation of surface courses, repair any damage caused to pavement base construction.

C. Prime Coat: Thoroughly clean substrate before application of prime coat.

1. Apply a single application of .30 to .50 gallon per square yard as directed by the laboratory. allow 24 hours for prime coat to penetrate and then spread a cover of fine aggregate.

2. Spread graded cover aggregate to absorb any excess prime coat as required by the laboratory.

D. Tack Coats: Apply tack coat immediately prior to placing asphalt pavement on or against surfaces.

1. Apply tack coat to asphalt paving in a single application to a cleaned surface at a rate of .10 to .15 gallon per square yard as required by the Laboratory. Apply a cover of fine aggregate to absorb excess bitumen on surfaces to be overlayed.

E. Make joints between successive day's work for continuous bond and to have same texture, density and smoothness as adjacent surfaces.

F. Immediately after the asphalt mixture has been spread and any surface irregularities adjusted, uniformly compact the mixture with rollers of adequate capacity to obtain in-place density not less than the density determined for the job-mix formula by the Marshall Method, AASHTO T-245.

3.6 PROTECTION AND RESTORATION

A. Protect newly placed material from traffic until mixture has cooled and attained its maximum degree of hardness.

B. Where pavement is damaged by construction operations or become contaminated with foreign materials, remove and replace defective areas and fill with fresh hot mix properly compacted. Remove deficient areas for full depth of course. Cut sides perpendicular and parallel to direction of traffic with edges vertical.

END OF SECTION

[redacted]

SECTION 02670

WATER WELLS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Applications and permits for drilling and developing well.

2. Drilling pilot hole.

3. Drilling for final water well depth.

4. Placing and grouting well casing.

5. Development of well.

6. Testing and disinfection.

B. Related Work in Other Sections:

1. Piping.

C. Work Not Included:

1. Drilling of Well No. AWA 1 has been completed as a test well. The casing and screen for this well has been provided.

1.2 DESCRIPTION

A. Provide wells with producing capacity of not less than 175 gallons of water per minute each. Information from Well No.1 will be provided to the bidders, and will be the criteria upon which proposals are based.

B. Water well work is based on following criteria:

1. Drill well to a depth as indicated.

2. Place 10-inch diameter casing full depth of drilling.

3. Minimum 3-inch thick cement grout to a depth of not less than 25-feet from grade.

4. Well screen to extend not less than 10-feet from end of casing.

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1.3 SUBMITTALS

A. Samples, Records and Reports: Take samples of sub-strata formation at ten foot intervals and at changes in formation throughout entire depth of well. Carefully preserve samples at site in glass jars properly labeled for identification.

B. Records: Provide Construction Manager following for information only:

1. Casing - diameter, thickness, weight per foot, depth below grade.

2. Screen - diameter, opening size.

3. Pumping test static water level, maximum safe yield, drawdown at maximum yield. Formation log indicating strata encountered.

4. Alignment - certification that well is aligned and plumb within specified tolerances.

5. Samples of water-bearing formation material.

6. Provide samples of water and test requirements in accordance with project work plan of the General Conditions.

1.4 QUALITY ASSURANCE

A. Protecting Water Quality: Take precautions to prevent contaminated water or water having undesirable physical or chemical characteristics from entering stratum from which well is to draw its supply. Prevent contaminants from entering well either through opening or by seepage through ground surface.

B. If well becomes contaminated or water having undesirable physical or chemical characteristics enters well due to neglect, provide casings, seals, sterilizing agents or other materials to eliminate contamination or shut off undesirable water. Provide remedial work at no cost to the Operating Contractor.

C. Exercise care in performance of work to prevent breakdown or caving in of strata overlaying that from which water is to be drawn. Develop, pump or bail well until water pumped from well is substantially free from sand.

D. Protect work to prevent either tampering with well or entrance of foreign matter. Upon completion, provide temporary well cap.

E. Driller's requirements: Experienced foreman or driller to be constantly in control of well site and who has authority to take orders from Construction Manager and, upon request, furnish well drilling information desired by Construction Manager.

PART 2 - PRODUCTS

2.1 CASING

A. Provide permanent seamless and welded carbon steel pipe casing for well, complying with ASTM A 589, Type IV; size, wall thickness and weight per lineal foot as indicated.

B. Joints may be welded or threaded coupling.

C. Provide galvanized pipe complying with ASTM A 120.

2.2 GROUT

A. Cement: ASTM C 150, Type to suit project conditions.

B. Water: Potable.

C. Aggregate: ASTM C 33, size and gradation to suit project conditions.

2.3 WELL SCREEN

A. Construct screen of AISI type 302/304 stainless steel, continuous slot type, fabricated by welding. Provide V-shaped openings, widening inwardly. For joints connecting screen sections, use butt-type stainless steel coupling rings. Provide screen with necessary fittings to close bottom and to provide tight seal between top of screen and well casing.

PART 3 - EXECUTION

3.1 WELL CONSTRUCTION

A. Install casing, screen and grout. Provide first section of casing with hardened steel driving shoe of standard commercial quality having an outside diameter slightly larger than casing couplings where threaded couplings are used.

B. Mix grout with proportions of one cubic foot of cement (94 lb. sack) with 5 to 6 gallons of water. Bentonite clay may be added in amounts of 3 to 5 pounds per cubic foot of cement. If bentonite clay is added, water may be increased to 6.5 gallons per cu. ft. of cement.

C. Place grout continuously to insure entire filling of annular space in one operation. Drilling operation or other work in well will not be permitted within 72 hours after grouting of casing. If quick-setting cement is used this period may be reduced to 24 hours.

D. Top of casing approximately 54" below existing grade, as required to fit pitless well head purchased.

3.2 DEVELOPMENT

A. Develop well by such methods as will effectively extract from water-bearing formation maximum practical quantity of sand, drilling mud and other fine materials in order to bring well to a maximum yield per foot of drawdown and to a sand-free condition. Perform work in a

manner that does not cause settlement and disturbance of strata above water bearing formation nor disturb seal effected around well casing, reducing sanitary protection otherwise afforded by such seal.

B. Continue development of well until water pumped from well at maximum testing pumping rate is clear and free from sand. Water shall be considered sand- free when no samples, taken during test pumping, contain more than 2 parts per million of sand by weight.

3.3 TESTING FOR PLUMBNESS AND ALIGNMENT

A. Set casing round, plumb and true to line. Tests for plumbness and alignment must be made after construction of well and before its acceptance. Additional tests, however, may be made during performance of work.

B. Test plumbness and alignment by lowering into well, to depth of lowest anticipated pump setting, a section of pipe. Provide outer diameter of plumb not less than 1/2" smaller than diameter of that part of casing or hole being tested.

3.4 TESTING FOR YIELD AND DRAWDOWN

A. After well has been constructed and cleaned out and depth of well accurately measured, conduct final pumping test.

B. Provide a bailer or air ejection test as a preliminary determination of expected yield. Make preliminary tests at depths where evidence is found of sufficient quantity of water to satisfy desired yield. Provide two preliminary tests as part of this work.

C. Provide a variable capacity test pump with minimum capacity of maximum expected yield at a total head equal to drawdown in well plus head loss in pump column and discharge pipe.

D. Provide necessary discharge piping for pumping unit to conduct water to a point of disposal so as to avoid a nuisance or endanger adjacent property. Provide and maintain equipment of adequate size and type for measuring flow of water, such as a weir box, orifice or water meter. Measure elevation to water level in well.

E. Provide labor, motive power, and other necessary materials, equipment and supplies required to operate pumping unit. Final testing shall consist of 8 hours of continuous pumping after maximum drawdown has been reached. After completion of final test, remove by bailing, sand pumping or other methods, sand, stones or other foreign materials that may become deposited in well.

F. After test pump and auxiliary equipment have been installed, make arrangements for conducting pumping test and notify Construction Manager 3 days prior to starting test. Note water level elevations, referred to an assigned datum in well, test pump started and adjusted to required pumping rate. Record readings of water level in well and pumping rate at 30 minute intervals. When drawdown in well is 5 feet above top of suction screen after designated time, record maximum yield of well. Upon completion of pumping test, record returning water levels in well for a sufficient period, at time intervals so that a curve of recovery rate of well may be plotted.

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3.5 DISINFECTION

A. Use disinfection procedures as required by governing authorities. Clean the completed, tested and developed well of foreign substances. Swab casing thoroughly using alkalis, if necessary, to remove foreign substances.

B. Disinfect well with chlorine solution of sufficient strength to provide a minimum of 100 parts per million chlorine to water within well. Introduce solution into well using gravity, pump or drop feeder. Allow a contact period of 24 hours and then pump well until chlorine residual is less than 0.2 parts per million.

END OF SECTION

SECTION 02831

CHAIN LINK FENCES AND GATES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Galvanized steel chain link fence and gates.

2. Barbed wire top.

3. Swinging gates.

B. Related Work in Other Sections:

1. Earthwork for filling and grading work.

1.2 SUBMITTALS

A. Product data in the form of manufacturer's technical data, specifications, and installation instructions for fence and gate posts, fabric, gates, and accessories.

B. Shop drawings showing location of fence, gates, each post, and details of post installation, extension arms, gate swing, hardware, and accessories.

1.3 QUALITY ASSURANCE

A. Single-Source Responsibility: Obtain chain link fences and gates as complete units, including necessary erection accessories, fittings, and fastenings from a single source or manufacturer.

PART 2 - PRODUCTS

2.1 FABRIC

A. Selvage: Fabric shall be knuckled at one selvage and twisted at the other.

B. Steel Fabric: Comply with Chain Link Fence Manufacturers Institute (CLFMI) Product Manual. Furnish one-piece fabric widths for fencing. Wire size includes zinc coating.

1. Size: 2-inch mesh, 9-gage (0.148-inch diameter) wire.

2. Finish:

a. Galvanized Steel: ASTM A 392, Class 2, with not less than 2.0 oz. zinc per sq. ft. of uncoated wire surface on wire coated before weaving or not less than 2.0 oz. zinc per sq. ft. of uncoated wire surface on wire of fabric coated after weaving as

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determined from the average of two or more samples and not less than 1.8 oz. zinc per sq. ft. of uncoated wire surface for any individual sample.

2.2 FRAMING

A. Strength requirements for posts and rails conforming to ASTM F 669.

B. Pipe shall be straight, true to section, material, and sizes specified, and shall conform to the following weights per foot:

NPS in inches	Outside Diameter (OD) in inches	Type I Steel
1-1/2	1.900	2.72
2	2.375	3.65
2-1/2	2.875	5.79

C. Steel Framework: Posts, rails, braces, and gate frames.

1. Type I Pipe: Hot-dipped galvanized steel pipe conforming to ASTM F 1083, plain ends, standard weight (schedule 40) with not less than 1.8 oz. zinc per sq. ft. of surface area coated.

2.3 BARBED WIRE

A. Barbed Wire Supporting Arms: Manufacturer's standard barbed wire supporting arms conforming to ASTM F 626, metal and finish to match fence framework, with provision for anchorage to posts and attaching two rows of barbed wire to each arm. Supporting arms may be either attached to posts or integral with post top weather cap and must be capable of withstanding 250 lb. downward pull at outermost end.

B. Barbed Wire: Galvanized Steel two strand, 12-1/2-gage steel wire with 14-gage, 4-point barbs spaced not more than 5 inches o.c.. Comply with ASTM A 121.

2.4 FITTINGS AND ACCESSORIES

A. Material: Comply with ASTM F 626. Galvanized iron or steel, to suit manufacturer's standards.

1. Zinc Coating: Unless specified otherwise, galvanize steel fence fittings and accessories in accordance with ASTM A 153, with zinc weights per Table I.

2. Tension Wire 7 Gauge: (0.177-inch-diameter) metallic-coated steel marcelled tension wire conforming to ASTM A 824 with finish to match fabric.

3. Type II Zinc Coated in following class:

   a. Class 2, with a minimum coating weight of 1.20 oz. per sq. ft. of uncoated wire surface.

   b. Tie Wires: 12-gage (0.106-inch diameter) galvanized steel with a minimum of 0.80 oz. per sq. ft. of zinc coating of surface area in accordance with ASTM A 641, to match fabric core material.

   c. Post Brace Assembly: Manufacturer's standard adjustable brace at end and gate posts and at both sides of corner and pull posts, with horizontal brace. Use same material as top rail for brace, and truss to line posts with 3/8-inch- diameter rod and adjustable tightener. Provide manufacturers standard galvanized steel cap for each end.

   d. Concrete: Provide concrete consisting of Portland cement, ASTM C 150, aggregates ASTM C 33, and clean water. Mix materials to obtain concrete with a minimum 28-day compressive strength of 2500 psi. Use at least 4 sacks of cement per cu. yd., 1-inch maximum size aggregate, maximum 3-inch slump, and 2 to 4 percent entrained air.

2.5 GATES

A. Fabrication: Fabricate perimeter frames of gates from metal and finish to match fence framework. Assemble gate frames by welding. Provide horizontal and vertical members to ensure proper gate operation and attachment of fabric, hardware, and accessories.

   1. Provide same fabric as for fence. Install fabric with tension bars and bands at vertical edges and at top and bottom edges.

   2. Install diagonal cross-bracing consisting of 3/8-inch-diameter adjustable-length truss rods on gates to ensure frame rigidity without sag or twist.

   3. Extend end members of gate frames 12 inches above top member and prepare to receive 2 strands of wire. Provide necessary clips for securing wire to extensions.

   4. Swing Gates: Comply with ASTM F 900.

   5. Steel: Fabricate perimeter frames of minimum 2.375-inch OD Type I.

   6. Gate Hardware: Provide hardware and accessories for each gate, galvanized per ASTM A 153, and in accordance with the following:

      a. Hinges: Size and material to suit gate size, non-lift-off type, offset to permit 180-deg gate opening.

      b. Latch: Forked type or plunger-bar type to permit operation from either side of gate, with padlock eye as integral part of latch.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install fence in compliance with ASTM F 567. Do not begin installation and erection before final grading is completed, unless otherwise permitted.

B. Excavation: Drill or hand-excavate (using post-hole digger) holes for posts to diameters and spacings indicated, in firm, undisturbed or compacted soil.

C. Setting Posts: Center and align posts in holes 4 inches above bottom of excavation. Space maximum 10 feet o.c..

D. Protect portion of posts above ground from concrete splatter. Place concrete around posts and vibrate or tamp for consolidation. Check each post for vertical and top alignment, and hold in position during placement and finishing operations.

E. Extend concrete footings 2 inches above grade and trowel to a crown to shed water.

F. Top Rails: Run rail continuously through line post caps, and at other posts terminating into rail end attached to posts or post caps fabricated to receive rail. Provide expansion couplings as recommended by fencing manufacturer.

G. Brace Assemblies: Install braces so posts are plumb when diagonal rod is under proper tension.

H. Bottom Tension Wire: Install tension wire within 2 inches of bottom of fabric before stretching fabric and tie to each post with not less than same gage and type of wire. Pull wire taut, without sags. Fasten fabric to tension wire with 11-gage hog rings of same material and finish as fabric wire, spaced maximum 24 inches o.c.

I. Fabric: Leave approximately 2 inches between finish grade and bottom selvage. Pull fabric taut and tie to posts, rails, and tension wires. Install fabric on security side of fence, and anchor to framework so that fabric remains in tension after pulling force is released.

J. Tie Wires: Use U-shaped wire of proper length to secure fabric firmly to posts and rails with ends twisted at least 2 full turns. Bend ends of wire to minimize hazard to persons or clothing. Tie fabric to line posts 12 inches o.c. and to rails and braces 24 inches o.c..

K. Fasteners: Install nuts for tension bands and hardware bolts on side of fence opposite fabric side. Peen ends of bolts or score threads to prevent removal of nuts.

L. Gates: Install gates plumb, level, and secure for full opening without interference. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation and lubricate where necessary.

M. Barbed Wire: Pull wire taut and install securely to extension arms and secure to end post or terminal arms in accordance with manufacturer's instructions.

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END OF SECTION

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SECTION 02930

TOPSOIL AND GRASS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fine grading and preparation of grass areas.

2. Furnish new topsoil.

3. Furnishing and application of fertilizer.

4. Seeding of new grass areas.

5. Reconditioning of existing grass areas.

6. Maintenance of grass areas.

7. Replanting of unsatisfactory or damaged grass.

B. Related Work in Other Sections:

1. Grading and excavation.

2. Submittal Requirements.

1.2 DESCRIPTIONS

A. Topsoil and grass all originally grassed areas disturbed by construction and not covered by other construction.

B. Recondition existing grassed areas damaged by Contractor's operations including storage of materials or equipment and movement of vehicles. Also recondition grass areas where settlement or washouts occur or where minor regrading is required.

C. Provide erosion control in the following areas:

1. All areas to be seeded.

2. In drainage channels.

1.3 SUBMITTALS

A. Product Certification: Submit inspection certificates required by governing authorities to accompany shipments. For standard products submit manufacturer's certified analysis. For

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other materials submit analysis by a recognized laboratory, made in accordance with methods established by the Association of Official Agricultural Chemists wherever applicable.

B. Certification of Grass Seed: Submit seed vendor's certified statement for seed mixture, stating botanical and common name; percentage by weight; and percentages of purity, germination, and weed seed for each grass seed required.

1.4 QUALITY ASSURANCE

A. Comply with applicable federal, state, county, and local regulations governing landscape materials and work.

B. Employ only experienced personnel familiar with required work. Provide adequate supervision by qualified foreman.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Packaged Materials: Deliver packaged materials in containers showing weight, analysis, and manufacturer's name. Protect materials from deterioration during delivery and while stored at site.

1.6 PROJECT CONDITIONS

A. Proceed with and complete grassing as rapidly as portions of site become available, working within seasonal limitations.

B. Coordinate with work of other sections:

1. Maintain grade stakes set by others until removal is mutually agreed upon by entities involved.

C. Excavation: When conditions detrimental to plant growth, such as rubble fill, adverse drainage conditions, or obstructions, are encountered, notify the Construction Manager before planting.

D. Planting Time:

1. Grass during normal planting seasons.

2. Do not plant in frozen ground.

1.7 MAINTENANCE

A. Begin maintenance immediately after each area is planted; continue maintenance until 120 days after the date when planting is substantially complete.

B. Maintain grass by watering; fertilizing; mowing; trimming; and other operations such as rolling, regrading, and replanting as required to establish a smooth, acceptable stand of grass.

1. Basis of acceptance: At end of maintenance period, grass shall be uniform in texture, density, and color; substantially weed-free; without gaps or bare spots; and with vigorous growth of proper grass.

2. Mulch: Replace mulch in areas where mulch has been displaced. Anchor as required to prevent displacement.

3. Watering: Keep grass areas uniformly moist as required for proper growth.

   a. Lay out watering system and arrange schedule to prevent puddling, erosion, and displacement of seed.

4. Mow grass at regular intervals to maintain a maximum height of 1-1/2 inches. Do not cut more than 1/3 of grass blade at any one mowing.

5. Control growth of weeds. Apply herbicides in accordance with manufacturer's instructions. Remedy damage resulting from use of herbicides.

6. Provide warning signs, barricades, or both, as required to protect new grass from traffic damage.

PART 2 - PRODUCTS

2.1 TOPSOIL

A. Topsoil at Site: Verify suitability and quantity of topsoil stockpiled at site. If sufficient quantities of suitable topsoil are not available at site, provide additional topsoil as required to complete landscape work.

B. Topsoil: Fertile agricultural soil, typical for locality, capable of sustaining vigorous plant growth and taken from a drained site; free of subsoil, rocks larger than 2 inches in diameter, clay, toxic matter, plants, weeds, and roots.

2.2 SOIL AMENDMENTS

A. Commercial Fertilizer: Complete fertilizer of neutral character, containing:

   1. Minimum content of available plant nutrients: 12 percent nitrogen, 12 percent phosphoric acid, and 12 percent soluble potash.

2.3 GRASS MATERIALS

A. Grass Seed: Provide fresh, clean, new crop seed complying with tolerance for purity and germination established by the Association of Official Seed Analysts.

B. Grass Seed Mix:

   1. Provide certified mixture as follows:

      a. 30 percent by weight rough bluegrass (Poa trivialis).

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b. 60 percent by weight K-31 tall fescue (Festuca elatior var.).

c. 10 percent by weight perennial ryegrass (Lolium perenne).

2. Sowing rate: 3 pounds per 1000 square feet

2.4 MISCELLANEOUS LANDSCAPE MATERIALS

A. Mulch: Clean, seed-free hay or threshed straw of wheat, rye, oats, or barley.

B. Asphalt Emulsion: ASTM D 977.

PART 3 - EXECUTION

3.1 PREPARATION

A. Preparation for Planting:

1. Limit preparation to areas which will be planted promptly after preparation.

2. Preparation of stripped areas: Loosen subgrade to a minimum depth of 4 inches.

a. Remove stones of more than 1-1/2 inches in any dimension, sticks, roots, rubbish and other extraneous matter.

b. Spread topsoil to minimum depth required to meet lines, grades, and elevations shown, allowing for light rolling and natural settlement.

3. Apply commercial fertilizer at rate of 2 pounds per 100 square feet and mix into upper 2 inches of planting soil.

4. Fine-grade area to smooth, even surface with loose, fine texture. Roll, rake, and drag grass areas, removing ridges and filling depressions, as required to meet finish grades.

5. Moisten prepared areas before planting if soil is dry. Water thoroughly and allow surface moisture to dry before planting grass. Do not create a muddy soil condition.

6. Prior to planting, restore to specified condition areas eroded or otherwise disturbed after fine grading.

3.2 SEEDING GRADED AREAS

A. Seeding: Sow seed using a spreader or seeding machine. Do not seed when wind velocity exceeds 5 miles per hour. Distribute seed evenly over entire area by sowing equal quantities in 2 directions at right angles to each other.

1. Do not use seed which is moldy, wet, or otherwise damaged in transit or storage.

2. Sow not less than the quantity of seed specified.

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3. Rake seed lightly into top 1/8 inch of topsoil, roll lightly, and water with fine spray.

B. Hydroseeding: Use only equipment specifically designed for hydraulic seeding application.

1. Mix seed, fertilizer, and pulverized mulch in water. Mix until uniformly blended into homogeneous slurry; continue mixing during application.

2. Apply slurry uniformly to all areas to be seeded. Rate of application as required to obtain specified sowing rate.

3.3 RESTORING EXISTING GRASS

A. Removals: Strip diseased, contaminated, or otherwise unsatisfactory grass areas and dispose of vegetation off site; do not bury into topsoil.

1. Remove topsoil containing foreign materials resulting from contractor's operations, including, but not limited to, oil drippings, stone, gravel, and other construction material; replace with new topsoil.

2. Plant grass as specified for new grass in similar areas.

B. Reseeding: Where substantial grass remains (but is thin), mow, rake, aerate if compacted, fill low spots, remove humps, remove thatch, remove lumps and cultivate soil, fertilize, and seed.

1. If weeds are extensive, apply selective chemical weed killers as required.

C. Apply seed mulch if required to keep soil moist.

D. Water newly planted areas and keep moist until new grass is established.

3.4 INSTALLATION OF MISCELLANEOUS MATERIALS

A. Erosion Control:

1. Straw mulch: Spread uniform layer 1-1/2 inches thick. Apply asphalt emulsion coating to straw at the rate of 10 to 13 gallons per 1000 square feet. Take precautions to prevent damage or staining of structures or other plantings adjacent to mulched areas. Immediately clean such areas where damage occurs.

END OF SECTION

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SECTION 02960

AGGREGATE TOPPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Crushed Stone topping for ground cover.

2. Herbicide Soil Treatment.

B. Related Work in Other Sections:

1. Rough grading for subgrades.

2. Crushed Stone Paving.

1.2 DESCRIPTIONS

A. Provide aggregate topping where indicated.

B. Place topping to a uniform depth not less than 4 inches.

1.3 SUBMITTALS

A. Certifications:

1. Gradation on aggregate material.

2. United States Environmental Protection Agencies herbicide certification.

B. Sample: Submit 3 pound bag of aggregate.

1.4 JOB CONDITIONS

A. Grade Control: Establish and maintain required lines and grades, during construction so that the finished work is within the tolerances required by the Specified Standard.

1.5 SEQUENCING AND SCHEDULING

A. Perform work only after all associated site work has been completed.

B. Protect finished areas and promptly repair damage to aggregate topping resulting from other operations.

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PART 2 - PRODUCTS

2.1 AGGREGATE TOPPING

A. Crushed Stone:

1. ASTM C 33 Size No. 57.

2.2 HERBICIDES

A. United States Environmental Protection Agency approved herbicide.

PART 3 - EXECUTION

3.1 INSPECTION AND PREPARATION

A. Examine areas and conditions where topping is to be placed. Notify Construction Manager of conditions detrimental to proper and timely completion of Work. Starting of work constitutes acceptance of subgrade by the subcontractor.

B. Compact soil subgrade before placing aggregate. Finish grade the areas to receive topping reasonably smooth with finished surfaces not more than 1.5 inches above or below the required elevations or acceptable cross section to receive the toppping.

3.2 WEED CONTROL

A. Herbicide: Prior to grading thoroughly till to a depth of 6 inches and apply herbicide in quantities sufficient to insure against germination and/or growth of any plants in areas treated. Treat earth in strict accordance with instructions of herbicide manufacturer. After surfaces have been treated, recompact and smooth subgrade.

3.3 AGGREGATE TOPPING

A. Spread material on subgrade to required depth, and rake to provide a relatively smooth top surface not below required finish elevations.

END OF SECTION

SECTION 09910

EXTERIOR PAINTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Field painting of ferrous metal items.

B. Related Work in Other Sections:

1. Shop priming.

1.2 DESCRIPTION

A. Paint job-fabricated ferrous surfaces, pipe sleeves, structural and/or supporting steel members and other parts which are subject to rust or corrosion, with one coat of primer and one finish coat of paint.

B. Reprime shop-coated and field-coated materials or equipment which show damage to prime coat or evidence of corrosion and finish paint with one finish coat of paint.

C. Prime and finish paint above grade galvanized steel with one finish coat of paint.

1.3 SUBMITTALS

A. Product Data: Manufacturer's technical information, label analysis, and application instructions for each material proposed for use, including solids by volume.

1. List each material and cross-reference the specific coating and finish system and application. Identify each material by the manufacturer's catalog number and general classification.

1.4 QUALITY ASSURANCE

A. Single-Source Responsibility: Provide primers and undercoat paint produced by the same manufacturer as the finish coats.

B. Coordination of Work: Review other sections in which primers are provided to ensure compatibility of the total systems for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.

1. Notify the Owner's Representative of problems anticipated using the materials specified.

C. Material Quality: Provide the manufacturer's best quality trade sale paint material of the various coating types specified. Paint material containers not displaying manufacturer's product identification will not be acceptable.

1. Proprietary names used to designate colors or materials are not intended to imply that products named are required or to exclude equal products of other manufacturers.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to the job site in the manufacturer's original, unopened packages and containers bearing manufacturer's name and label.

B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F (7 deg C). Maintain containers used in storage in a clean condition, free of foreign materials and residue.

1.6 JOB CONDITIONS

A. Apply water-based paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 50 deg F (10 deg C) and 90 deg F (32 deg C).

B. Apply solvent-thinned paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 45 deg F (7 deg C) and 95 deg F (35 deg C).

C. Do not apply paint in snow, rain, fog, or mist, when the relative humidity exceeds 85 percent, at temperatures less than 5 deg F (3 deg C) above the dew point, or to damp or wet surfaces.

1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by the manufacturer during application and drying periods.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. The Sherwin-Williams Company (S-W).

B. PPG Industries, Pittsburgh Paints (Pittsburgh).

C. The Glidden Company (Glidden).

D. Porter Paint Co. (Porter).

2.2 PRIMERS

A. Universal Metal Primer: Ferrous metals on the under high-gloss alkyd enamels.

1. Sherwin-Williams: B50N6 universal metal primer.

2. Porter: 285 U-Prime Gray universal primer.

3. Glidden: 5210 universal metal primer.

4. Pittsburgh: B50N6 Universal Metal Primer.

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B. Galvanized Metal Primer: Zinc-coated (galvanized) metal surfaces:

1. S-W: Galvite B50W3.

2. Glidden: 5229 Glid-Guard All-Purpose Metal Primer.

3. Pittsburgh: 6-215/216 Speedhide Galvanized Steel Primer.

4. Porter: 290 Galvanized Metal Primer.

2.3 EXTERIOR FINISH PAINT MATERIAL

A. Alkyd Gloss Enamel: Weather-resistant high-gloss enamel for primed ferrous metal surfaces:

1. S-W: Industrial Enamel B-54 Series.

2. Glidden: 4500 Glid-Guard Industrial Enamel.

3. Porter Paint Co.: I.A. - 94 Gloss Finish.

4. Pittsburgh: 97-601 Fast-Dry Industrial Gloss Enamel.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions under which painting will be performed for compliance with requirements for application of paint. Do not begin paint application until unsatisfactory conditions have been corrected.

1. Start of painting will be construed as the Applicator's acceptance of surfaces and conditions within a particular area.

3.2 PREPARATION

A. Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items in place that are not to be painted, or provide surface-applied protection prior to surface preparation and painting. Remove these items if necessary for complete painting of the items and adjacent surfaces. Following completion of painting operations in each space or area, have items reinstalled by workers skilled in the trades involved.

1. Clean surfaces before applying paint or surface treatments. Remove oil and grease prior to cleaning. Schedule cleaning and painting so that dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.

B. Surface Preparation: Clean and prepare surfaces to be painted in accordance with the manufacturer's instructions for each particular substrate condition and as specified.

1. Provide barrier coats over incompatible primers or remove and reprime. Notify Owner's Representative in writing of problems anticipated with using the specified finish-coat material with substrates primed by others.

2. Ferrous Metals: Clean nongalvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with recommendations of the Steel Structures Painting Council.

   a. Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by the paint manufacturer, and touch up with the same primer as the shop coat.

3. Galvanized Surfaces: Clean galvanized surfaces with non- petroleum-based solvents so that the surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.

C. Materials Preparation: Carefully mix and prepare paint materials in accordance with manufacturer's directions.

1. Maintain containers used in mixing and application of paint in a clean condition, free of foreign materials and residue.

2. Stir material before application to produce a mixture of uniform density; stir as required during application. Do not stir surface film into material. Remove film and, if necessary, strain material before using.

3. Use only thinners approved by the paint manufacturer, and only within recommended limits.

3.3 APPLICATION

A. Apply paint in accordance with manufacturer's directions. Use applicators and techniques best suited for substrate and type of material being applied.

B. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.

1. The number of coats and film thickness required is the same regardless of the application method. Do not apply succeeding coats until the previous coat has cured as recommended by the manufacturer. Sand between applications where sanding is required to produce an even smooth surface in accordance with the manufacturer's directions.

2. Apply additional coats when undercoats, or other conditions show through final coat of paint until paint film is of uniform finish, color, and appearance and to ensure that surfaces, including edges, corners, crevices, welds, and exposed fasteners, receive a dry film thickness equivalent to that of flat surfaces.

C. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.

1. Allow sufficient time between successive coats to permit proper drying. Do not recoat until paint has dried to where it feels firm, and does not deform or feel sticky under moderate thumb pressure and where application of another coat of paint does not cause lifting or loss of adhesion of the undercoat.

D. Minimum Coating Thickness: Apply materials at not less than the manufacturer's recommended spreading rate. Provide a total dry film thickness of the entire system as recommended by the manufacturer.

E. Prime Coats: Before application of finish coats, apply a prime coat of material as recommended by the manufacturer to material that is required to be painted or finished and has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to assure a finish coat with no burn through or other defects due to insufficient sealing.

F. Pigmented (Opaque) Finishes: Completely cover to provide an opaque, smooth surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.

3.4 CLEANING

A. Cleanup: At the end of each work day, remove empty cans, rags, rubbish, and other discarded paint materials from the site.

B. Upon completion of painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping, using care not to scratch or damage adjacent finished surfaces.

3.5 PROTECTION

A. Protect work of other trades, whether to be painted or not, against damage by painting. Correct damage by cleaning, repairing or replacing, and repainting, as acceptable to Owner's Representative.

B. Provide "wet paint" signs to protect newly painted finishes. Remove temporary protective wrappings provided by others for protection of their work after completion of painting operations.

1. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

END OF SECTION

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SECTION 15050

GENERAL MECHANICAL WORK REQUIREMENTS

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. The requirements of this section, as applicable, form a part of all sections of Division 15.

1.2 CODES AND STANDARDS

A. In addition to compliance with state and local codes, laws and ordinances, equipment, materials and work to conform to applicable standards of ANSI, local utility companies and other authorities or agencies to which specific reference is made.

B. Where contract drawings and/or specifications are more strict than, or indicate additional work not required by specified authorities, agencies or any law or ordinance, then contract drawings and specifications govern.

C. Provide equipment and materials having features and characteristics as required so that the completed facilities comply with all applicable safety requirements, including Federal Occupational Safety and Health Act Standards.

1.3 MANUFACTURERS' NAMES

A. Listing of a manufacturer's name does not constitute acceptance of that manufacturer's product unless it complies with the standards and detail specifications relating thereto. Deviations in standards and details are to be noted at the time of proposal in accordance with the requirements for substitutions.

1.4 QUALITY ASSURANCE

A. Subcontractor's quality assurance program to be submitted for approval prior to fabrication, and to include a quality assurance plan, which outlines inspection and test plans, process controls, nondestructive examination, cleaning procedures, reports, records, identification of nonconforming condition, control of purchased material, control of special processes, and a handling and shipping procedure. (Refer to Section 01100 of these specifications for standard requirements for FEMP suppliers.)

B. The Construction Manager to be provided the opportunity to witness any and all tests specified herein. Seven days' notice to be provided to the Construction Manager for all tests.

1.5 TEST REPORTS

A. The Subcontractor to submit a completed report on all tests within one week of test completion. Reports to be completed on tests, submitted for approval, and approved by the Construction Manager.

1.6 SUBMITTALS

A. Shop drawings to include all performance data, operating sound level data, characteristic curve, equipment numbers, equipment weight, purchase order number, material sizes, material thicknesses, dimensions, material types, piping and electrical connection locations, wiring diagrams, and operating data. See reference for standard requirements for FEMP suppliers.

B. All shop drawings to be approved by the Construction Manager prior to construction or fabrication.

C. Refer to Section 01100 for additional information and requirements regarding submittals.

PART 2 - PRODUCTS

2.1 PIPING HANGERS AND SUPPORTS

A. General:

1. Unless otherwise specified, hangers and supports to be Grinnell of Figure Numbers specified, or equivalent Fee & Mason, B-Line, Carpenter & Paterson, or approved equal. All hangers and supports to be galvanized steel, cadmium plated or stainless steel. (Perforated steel straps will not be permitted.)

B. Materials:

1. Steel pipe - 2 inches and smaller, adjustable steel swivel ring hanger, Grinnell Figure 269. 2-1/2 inches and larger, adjustable steel Clevis hanger, Grinnell Figure 260.

2. Supports at walls or columns to be cast-iron or steel brackets, Grinnell Figure 194, 195 or 199.

3. Hanger rods to be steel, ASTM A 36 or A 307, with sizes corresponding to tappings in hangers. Cadmium plated finish.

4. Insulation protection saddles to be similar to Grinnell Figure 161. Manufacturers Figure Number specified is for 1-1/2 inch thick insulation. Select saddle for full insulation thickness as specified. Prime painted or cadmium plated finish.

2.2 PIPE SLEEVES

A. Pipe sleeves to be steel pipe, standard weight.

2.3 SLEEVE SEALS

A. Sleeve seals to be of the type specified for the location indicated.

B. Where piping passes through sleeves in exterior walls below grade and concrete pads on grade, use Thunderline "Link-Seal", or approved equal, modular mechanical type seal assembly.

[redacted]

2.4 BUILDING ATTACHMENTS

A. For securing piping hangers and supports to building construction, attachments to be in accordance with the following:

1. For suspension from existing concrete, provide Phillips series S or series F self-drilling expansion anchors or series JS stud anchors, or approved equal. Anchor sizes to be selected by limiting the applied load to 10 percent or less of manufacturer's published pullout ratings.

2. For suspension from masonry, provide expansion shields, toggle bolts, or lag screws.

2.5 MISCELLANEOUS MATERIALS

A. Steel plates, shaped and bars, and connections to be in accordance with provisions of AISC "Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings," where applicable.

B. Structural steel to be in accordance with ASTM A36.

C. Threaded rods, machine bolts, nuts and washers to be in accordance with ASTM A307, Grade 7, cadmium plated.

D. All ferrous supporting materials located outdoors to be galvanized.

2.6 PRIME PAINT

A. Universal Metal Primer: Ferrous metals under high-gloss alkyd enamels. Fast drying rust inhibitive universal alkyd primer having not less than 38.5% solids by volume.

1. Sherwin-Williams: B50NZ6 universal metal primer.

2. Porter: 285 U-Prime Gray universal primer.

3. Glidden: 5210 universal metal primer.

4. Pittsburgh: 97-682 Multi-prime Metal Primer.

2.7 UNDERGROUND PIPE MARKERS

A. Underground pipe markers to be permanent, bright-colored, continuous-printed plastic tape, intended for direct-burial service, not less than 6 inches wide by 4 mils thick. Printing on tape to accurately indicate type of buried pipe service.

2.8 PIPE BEDDING MATERIAL

A. Water Piping: Bed and backfill around pipe and to within 12 inches above the piping with bank run gravel having a gradation of 95 percent passing the 3/4 inch sieve and not more than 5 percent passing the No. 4 sieve.

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PART 3 - EXECUTION

3.1 GENERAL PIPING REQUIREMENTS

A. General:

1. Cut pipes accurately to measurements established at job. Install piping without springing or forcing. Install exposed pipes parallel to building lines. Install vertical pipes plumb. Offset piping to avoid structural and other interferences. Allow ample space around piping for insulation.

2. Where detailed method of installing work is not indicated, install as directed, and in accordance with manufacturer's recommendations.

3. Use standard pipe fittings for making changes in direction of piping.

4. Support piping close to equipment connections so weight of pipe will not be borne by equipment.

5. Repair promptly leaks which develop. If leaks develop after insulation is applied, replace insulation in original condition, and paint as necessary to complete repair.

B. Screwed joints:

1. Cut ends of pipe square, ream ends and remove burrs. Provide clean and sharp taper pipe threads conforming to ANSI B1.20.1.

2. Pull joints up tight using teflon tape applied to male threads. clean and paint exposed threads of cold service ferrous piping with Koppers Bitumastic No. 50, or approved equal, immediately after installation.

C. Flanged joints:

1. Use flanged fittings and connections only where indicated, and at flanged valves and equipment. Provide companion flanges as required.

2. In each flanged joint, provide gasket of type indicated in applicable piping system material schedules.

3. In any location where a flange is to be bolted to a flat-faced 125 psi cast-iron flange, use flat-face companion flange with full-face gasket in lieu of a cut ring gasket.

4. Use carbon steel, heavy hex head bolts, cadmium plated, ASTM A 307, Grade B, with standard heavy semifinished hexagon nuts. Threads to conform to ANSI B1.1, coarse thread series, Class 2 fit.

5. Apply antiseize thread lubricant compound on bolts when making up joints. Nuts to be uniformly tightened using sufficient torque to prevent leaks without overstressing bolts.

D. Solder joints: Cut ends of tubing square, ream ends and remove burrs. Sand clean contact surfaces. Use solder specified under piping system material schedules, applied in strict accordance with instructions of fitting manufacturer, with flux recommended by solder manufacturer for each service.

3.2 UNIONS

A. Install unions in screwed piping at intervals and locations where they will facilitate disconnection of piping and valves, and at other locations indicated.

3.3 PIPE WELDING

A. Connect by welding all piping, fittings, flanges, and weld-end appurtenances for services for which butt welding is indicated in the piping system material schedules.

B. Do all welding in accordance with applicable ANSI codes for pressure piping or with any state or local code requirements which supersede it.

C. Use welding rod of analysis to match pipe.

D. Welding must be done by acceptable qualified welders. Before doing any pipe welding, submit, for each welder, certification of compliance with Section IX "Welding and Brazing Qualifications of the ASME Boiler and Pressure Vessel Code." Certification to consist of ASME form QW-484 "Record of Welder or Welding Operator Qualification Tests," completed by a recognized testing laboratory for the welding process, procedures and materials to be used in the fabrication of piping on this project. Qualification certificates must not be more than one year old.

3.4 PIPING HANGERS AND SUPPORTS

A. Provide all hangers, supports and bracing required for piping. Select hangers, supports and bracing using a minimum safety factor of five. Calculate loads for operating weight or for weight during hydrostatic pressure test, whichever is greater. All hangers and supports to be designed for use in Seismic Zone 2.

B. Supports at walls or columns to be properly selected to support weight suspended.

C. For insulated piping, provide hanger and support materials similar to those for uninsulated pipe, but with the requirements specified hereinafter.

1. For insulated piping specified in Section 15250 to be sealed for a vaporproof installation, size hanger ring to fit outside of insulation. Provide minimum 18 gage galvanized steel insulation protection shields outside of insulation finish, minimum 12 inches long, centered on hanger, and covering lower 1/3 of the insulation. A circumferential insert of foam glass pipe insulation for each hanger is to be furnished under Section 15250 for installation under Section 15400.

D. Unless otherwise indicated, maximum hanger and support spacing to be as follows:

Pipe size, Inches	Hanger spacing, Feet (maximum)
1-1/4 and smaller	7
1-1/2 to 2-1/2	10
3	12
4 and 5	14
6	17

3.5 PIPE SLEEVES

A. Provide sleeves of the types indicated, centered on pipes through walls, in accordance with the following:

1. In finished areas where piping is not insulated beyond the sleeve, size sleeve as specified for bare pipe.

B. Provide steel pipe sleeves for exterior walls above grade and concrete pads on grade.

3.6 SLEEVE SEALS

A. Where piping passes through sleeves in exterior walls above grade and concrete pads on grade, close the annular space between piping and sleeves with modular mechanical type seal assembly. Each seal assembly to be sized as recommended by the manufacturer to fit the pipe and sleeve.

3.7 DIRT IN PIPING

A. Remove dirt, welding spatter, and other substances from pipe, fittings, valves, flanges, and similar items before installation to avoid injury to valves or equipment caused by foreign substances in piping system. Clean out and repair, or replace, such damaged materials as directed by the Construction Manager.

3.8 INSTALLATION OF UNDERGROUND PIPING

A. General:

1. Excavation and backfilling is specified in Section 02221, Trenching for Utilities.

2. Drawings indicate approximate location of known existing utility lines and other possible interferences. Where any interference, whether or not shown, is encountered, proceed as indicated or directed.

3. When measured from final grade, depth of bury or cover over underground construction to be not less than the following, unless otherwise indicated:

a. Well water mains: 48 inch depth.

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B. Pipe laying:

1. Provide firm bed, compacted and of materials specified herein. Shape bedding to provide a uniformly and continuous bearing and support along the entire length of the pipe.

2. Inspect and clean pipes before lowering into trenches. Lay to uniform grade between elevations shown. Use electronic beam to establish vertical and horizontal control.

3. Close open ends of piping during construction, when directed by the Constructon Manager, by approved means, to prevent earth entering lines. Close stub ends of lines and unused openings in fittings. When pipe laying is not in progress, open end of pipe is to be closed with water tight plugs. If ground or rain water rises in trench, such plugs to remain in place until water is pumped from trench.

4. Provide concrete thrust blocks at all tees, plugs, or bends, to resist any thrust that may be encountered. Thrust blocks to be in accordance with the latest edition of NFPA Standard No. 24. Install thrust blocks between solid ground and the fittings so that the joints will be accessible for inspection and repair.

5. Do not backfill until piping has been inspected and tested as specified under Section 15990. Where required to hold pipe firmly in trench during testing, place backfill over center of each length of pipe keeping joints exposed.

3.9 PROTECTION

A. Protect piping and equipment at all times against entrance of dirt and moisture and injury to pipe joints or equipment surfaces during construction by means of caps, plugs, canvas or plastic covers.

B. During shipment, and before and during erection, protect materials and equipment from weather damage. Keep materials and equipment off ground by means of wood blocks or skids. Take all necessary measures to prevent rusting or binding of internal parts of rotating equipment.

3.10 FIELD CONDITIONS

A. The various trades involved in the project must properly coordinate their work to fit available space. If there is any question as to where system components should be located so that the work of other trades can be properly installed, meet and discuss such questions with the other trades involved, jointly prepare sketches or coordination drawings if necessary, and otherwise coordinate the work. Any work installed in such locations as to prevent other trades from installing their work with reasonable convenience must be relocated without increase in the contract price.

B. Drawings indicate desired position of equipment and routing of piping and conduits. If field conditions are encountered which make arrangements indicated impractical or impossible, submit request for deviation in writing, with drawings if required to clarify request. Do not proceed until request is accepted and authorized in writing.

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3.11 RESTORATION OF EXISTING FACILITIES

A. Replace and restore to their original undamaged condition, all facilities of every description damaged or disturbed during progress of work. Such replacement or restoration applies to both surface and subsurface installations and materials. Match existing installations.

3.12 SHOP PAINTING

A. General:

1. Clean surfaces to remove all dirt, oil, grease, dust, scale and foreign matter before applying paint.

2. Items not to be prime painted:

a. Factory finished surfaces unless furnished as part of unitary assembly
b. Stainless steel surfaces
c. Plated surfaces
d. Inside of pipes, conduits and electrical devices
e. Wearing and machine finished surfaces

B. Shop-fabricated or manufactured equipment and materials:

1. Prior to shipment to the job and unless factory finish is specified, clean and prime paint all ferrous surfaces, including black steel piping, with one coat of primer.

2. If prior painting is not part of manufacturer's standard procedure, prime paint surfaces as hereinafter specified for field-painted items.

3.13 APPEARANCE

A. Give special attention to the appearance of work exposed to view. In general, install materials and devices in accordance with the requirements specified hereinafter and as otherwise required to give a pleasing appearance.

B. Where appropriate, install materials and devices parallel or perpendicular to the building lines.

C. Where installation height is not indicated or where there is any question as to the appearance of the installation, locate devices as directed.

3.14 UNDERGROUND PIPE MARKERS

A. During backfilling of exterior underground piping, provide continuous underground line markers located directly over buried line at 6 to 8 inches below finished grade.

END OF SECTION

SECTION 15250

INSULATION

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. Applicable provisions of Section 15050 form a part of this Section.

1.2 DESCRIPTION OF WORK

A. Furnish all labor, materials and equipment, and do all work necessary for the complete installation of insulation work as specified hereinafter.

PART 2 - PRODUCTS

2.1 MATERIALS - GENERAL

A. Where pipe insulation is specified hereafter to be sealed for a vaporproof installation, furnish a circumferential insert of foam glass pipe insulation, for installation at each pipe hanger, equivalent to thickness scheduled hereinafter, complete with vapor barrier jacket. Insert to be same length as the insulation protection shield. Vapor barrier jacket to overlap the adjoining insulation a minimum of 2 inches. Pipe hangers and insulation protection shields are specified in Section 15050 and are to be provided under Section 15400.

B. Factory-applied all purpose jacket specified hereinafter to be UL-Rated white kraft bonded to aluminum foil and reinforced with fiber glass yarn. Kraft to be treated with permanent flame and smoke retardant and treated to prevent corrosion of foil. Mullen bursting strength to be not less than 70 PSI when tested in accordance with ASTM D 774. Permeability rating to be 0.02 when tested in accordance with ASTM E 96, procedure A.

C. Field-applied plastic jacket sheets to be Ceel-Co "Ceel-Tite" 300 series, or approved equal, ultraviolet resistant, thermoplastic, minimum 0.030 inch thick. Color to be gloss white.

D. Field-applied Stainless steel jacket to be 0.020 inch thick stainless steel with screwed or self-locking longitudinal seam, butt type circumferential joints, and butt joint sealing strips having an integral weatherproof mastic.

2.2 CLASS 2 INSULATION

A. Service:

1. Well water piping outdoors, aboveground, starting at a point 12 inches above grade.

2. Well water piping inside hydropneumatic tank enclosure.

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B. Materials:

1. Manville, Certain-Teed, Knauf, Owens-Corning Fiberglas, or approved equal, glass fiber insulation in one-piece molded sections, nominal 4 pounds per cubic foot density, 1-1/2 inches thick inside tank enclosures, 2 inches thick outdoors.

C. Factory-applied jacket:

1. All purpose jacket.

2.3 CLASS 3 INSULATION

A. Service:

1. Well water piping from a point 3 feet below grade to a point 12 inches above grade.

B. Materials:

1. Pittsburgh Corning, or approved equal, premolded cellular glass pipe insulation, 2 inches thick.

C. Factory-applied jacket:

1. All purpose jacket.

2.4 CLASS 9 INSULATION

A. Service:

1. Hydropneumatic Tank.

B. Materials:

1. Manville, Certain-Teed, Knauf, Owens-Corning Fiberglas, or approved equal, rigid glass fiber board insulation, minimum 6.0 pounds per cubic foot density, 1-1/2 inches thick.

2. Factory-applied jacket:

a. None required.

PART 3 - EXECUTION

3.1 GENERAL WORKMANSHIP

A. Install insulation in strict accordance with manufacturer's recommendations and these specifications. In cases of conflict, these project specifications govern.

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B. Apply insulation only after:

1. Pipes and equipment have been tested and proved tight as specified, are thoroughly clean and dry, and show no evidence of leakage. Notify the Construction Manager immediately if leaks are found.

2. Surfaces to be heat traced have been completed and tested. Insulation applied over traced piping to be sized to accommodate tracing. Do not groove insulation.

C. Butt adjoining sections of all insulation firmly together. Cut, miter and shape insulation to insure close fit, eliminating cracks and voids.

D. Do not use staples or other penetrating devices on any insulation, unless otherwise specified.

E. Insulation jackets installed outdoors to be completely weatherproof.

3.2 INSTALLATION OF CLASS 2 INSULATION

A. Seal insulation for a vaporproof installation.

B. Seal longitudinal seams of jacket with Foster 85-75, Childers CP-82, or approved equal, vapor barrier adhesive. Seal circumferential joints with 3 inch wide factory- furnished vapor barrier butt sealing strips adhered with the same vapor barrier adhesive.

C. Seal ends of pipe insulation at flanges and valves and at intervals of not more than 21 feet with Foster 30-35, Childers CP-30, or approved equal, vapor barrier coating.

D. At each insulation protection shield location, provide vapor seal using Foster 95-49, Childers CP-76, or approved equal, vapor barrier sealant.

E. Insulate flanges, fittings, valves, strainers and other miscellaneous piping specialties with blanket insulation or fabricated insulation blocks and shapes of material and thickness specified for adjacent insulation. Wire or tape insulation in place.

F. Field finish to be as follows:

1. All straight runs of insulation to have an outer stainless steel weatherproof jacket.

2. Place longitudinal seam of weatherproof jacket at either 4 or 8 o'clock, approximately, position to shed water. Secure in place with stainless steel bands 18 inches on center.

3. Over flanges, fittings, valves, and other miscellaneous piping specialties, apply 0.020 inch thick stainless steel jacket with weatherproof banding strips at joints. Elbows to be factory-fabricated two-piece preshaped or three-piece miter. Seal all joints with Foster 95-44, Childers CP-76, or approved equal, weatherproof sealant.

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3.3 INSTALLATION OF CLASS 3 INSULATION

A. Seal insulation for a vaporproof installation.

B. Seal all butt joints and longitudinal seams with Pittsburgh Corning Pittseal 444, or approved equal, sealant, in accordance with manufacturer's recommendations for the temperature of the pipe being insulated.

C. Seal longitudinal seams of jacket with Pittsburgh Corning Pittseal 222 FR, or approved equal, adhesive. Seal circumferential joints with 3 inch wide factory-furnished butt sealing strips adhered with Pittsburgh Corning Pittseal 222 FR, or approved equal, adhesive.

D. Field finish to be as follows:

1. Apply plastic jacket sheets over all piping. Lap all seams and joints a minimum of 1 inch. Apply solvent weld adhesive continuously in all laps. Smooth excess adhesive to produce an even fillet. Plastic jacket to be sealed for a water tight installation.

3.4 INSTALLATION OF CLASS 9 INSULATION

A. Cut, score and miter insulation as required to fit shape and contour of the equipment.

B. For round equipment, band insulation in place with stainless steel bands 12 inches on center.

C. For flat or irregular surfaces, impale over weld pins, with speed washers, secured to all surfaces on approximately 12 inch centers maximum.

D. Completely fill all cracks, joints and voids with mineral fiber insulating cement, neatly troweled and finished to a smooth, even surface, conforming in shape to the surface being insulated.

E. Provide removable sections of insulation or readily disassembled insulation boxes at all points at which access is required. Assemble and install all such sections or boxes in such manner that disassembly, removal and replacement will not damage the insulation or otherwise impair the insulating function.

F. Provide continuous 20 gage sheet metal angle insulation protectors at all corners and edges.

G. Field finish for outdoor insulation to be as follows:

1. Cover all insulation with 0.016 inch thick aluminum jacket. Lap all seams and joints a minimum of 1-1/2 inches. Hold in place with stainless steel banding strips. Seal all joints and seams with Foster 95-44, Childers CP-76, or approved equal weatherproof sealant.

END OF SECTION

SECTION 15400

PIPING SYSTEM

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. Applicable provisions of Sections 15050 and 15990 form a part of this section.

1.2 SUMMARY

A. Section Includes:

1. Furnish all labor, materials and equipment, and do all work necessary for the complete installation of piping system work as specified hereinafter and as shown on the drawings.

2. In general, work under this Section includes:

   a. Aboveground well water piping
   b. Underground well water piping
   c. Well pumps
   d. Pitless well heads
   e. Hydropneumatic Tank
   f. Tank enclosure
   g. Flushing and cleaning
   h. Sterilization
   i. Underground pipe markers
   j. Prime painting
   k. Tests and adjustments

B. Related Work Specified under Other Sections:

1. Water wells.

2. Excavation and backfilling.

3. Insulation.

4. Concrete.

1.3 DESCRIPTION OF SYSTEMS

A. New water supply for Albright & Wilson Americas, Inc. (AWA):

1. Two new pitless type wells with submersible pumps and underground discharges to supply 175 gpm each with one pump operating, or 250 gpm combined, to the AWA plant by means of a new 6 inch underground main. After entering the plant site the line to be continued underground to the northeast corner of the water building. At that point the line to be routed above ground along the east wall of the water building to a tie-in point

within the water building. The above ground portion of the line to be new 4 inch insulated piping. Shut-off valves and pressure reducing valved to be provided in the new line upstream of the tie-in point.

B. New water supply for Delta Steel (DS):

1. New pitless type well with submersible pump, hydropneumatic tank and underground discharge to supply 50 gpm of well water to the Delta Steel Facility by means of a new 6 inch underground main.

PART 2 - PRODUCTS

2.1 WELL WATER PUMP

A. General:

1. Peerless Model as scheduled, motor-driven, submersible turbine, multi stage, deep well pumps, or equivalent Worthington, Bryon-Jackson, or approved equal.

B. Operating conditions (each pump):

1. Pumps to be suitable for operation under the following conditions:

Unit Designation	AWA-1 and AWA-2	DS-1
Peerless Model No.	6LB	6WS-L
Capacity	125 gpm	50 gpm
Pump setting depth	155 feet	155 feet
Total dynamic head	300 feet	110 feet
Standing water level below top of well	86 feet	86 feet
Speed, maximum	3,460 rpm	3,460 rpm
Number of stages	5	2
Motor Horsepower	20	5
Size of Wells (Inside Diameter)	10 inches	10 inches

C. Pump bowl assemblies:

1. Cast-iron, with vitreous enameled flow passages for Type 6LB pumps, each intermediate bowl assembly to have a bronze bearing and a neoprene bearing to support the impeller shaft.

D. Impellers:

1. Bronze, statically and dynamically balanced, with Type 416 stainless steel shaft.

E. Pump motor coupling:

1. Type 416 stainless steel.

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F. Motor:

1. Submersible type with Type 416 stainless steel shaft and stainless steel fastenings where exposed to well water. Motor to be 230 volts, 3-phase, 60 hz.

G. Interconnector:

1. Cast-iron, to couple bowl assembly to the motor, and to include bronze sleeve bearing and a corrosion resistant suction screen. Bearing to have a labyrinth type sand slinger. Interconnector to completely enclose the upper motor end.

H. Submersible cable:

1. Cable to be three separate conductors, jacketed and included in a single jacket assembly. Cable to be supported from the column.

2.2 PITLESS WELL HEADS

A. Baker "Monitor PS" 10 inch pitless well head for submersible pump, or approved equal. Units to include watertight well cap, O-ring seal protection, lift-out bail, hold down hooks, protected screen vent, and support rings.

2.3 HYDROPNEUMATIC TANK (TK-1)

A. Amtrol "Well-X-Trol" Model No. WX-421, or approved equal, vertical steel tank.

B. Capacity: 165 gallons.

C. Approximate size:

1. Diameter: 30 inches.

2. Height: 73-1/4 inches.

D. Provide butyl rubber diaphragm to separate air charge from system water with 2 inch system connection and charge valve.

E. Tank to be welded steel for 100 PSIG working pressure.

2.4 HYDROPNEUMATIC TANK ENCLOSURE

A. Hydrocowl of size indicated on drawing and specified herein, or approved equal.

B. Housing: 24 gage galvanized steel supported with 14 gage galvanized steel angle braces and wood support members. Provide removable access panel and hinged drain panel to open against hydrostatic pressure.

C. Insulate housing with closed cell faced insulation:

1. Minimum R-Value - 11.8.

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2. Insulation thicknesses: 1-1/2" on walls and 3 inches in the roof.

2.5 ELECTRIC HEATER

A. Chromolox Model No. HVT-241, or approved equal, UL listed strip heater, with perforated steel enclosure and integral thermostat. Unit to be rated at 1.0 kW, 120 volts, 60 hz.

2.6 PRESSURE REDUCING VALVE

A. Clayton 90G-01, or approved equal, 2-1/2 inch size, 75 psig outlet pressure, 250 gpm flow rate, 125 pound cast-iron body, single seated, hydraulically operated, pilot controlled diaphragm type globe style valve with stainless steel trim. The pilot control to be direct acting, adjustable, spring loaded, normally open, diaphragm type and to include a fixed orifice.

2.7 PRESSURE SWITCH

A. Mercoid Model No. DA-41-153, or approved equal, with Type 316 stainless steel bourdon tube actuating a mercury switch. Range to be as indicated on the drawings. Range to be as indicated on the drawings. Switch to be rated 4 amps at 120 volts and to have deadband adjustable up to a maximum of 100 percent of switch range. Switch to have calibrated dial and two pointers indicating set and reset points and have visible on/off indication. Set points to be adjustable without removing switch cover or shutting down the system.

2.8 PRESSURE INDICATORS (GAGES)

A. Ashcroft No. 1220A, 4-1/2 inch dial, phenolic case, or equivalent Palmer, Marshalltown, Weksler, Treice, or approval equal. Scale range, approximately double the operating pressure.

B. Pulsation Dampener:

1. Ashcroft No. 1/4-1106B, or approved equal, with corrosion resistant porous metal disc. Disc material to be selected for fluid served and pressure rating.

C. Needle valve:

1. Provide brass bar stock blunt needle valve, Dragon Model 100, W. H. Bolton No. 250 FF, or approved equal, with 1/4 female NPT on each end.

2.9 PRESSURE-RELIEF VALVE

A. Clayton Model 50-01, or equivalent Farris, Crosby, Kunkle, or approved equal.

B. Description:

1. Set to relieve at 100 psig.

2. Size: Angle 1-1/2" screwed.

3. Pressure Rating: 125 Class - 175 Max.

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4. Flow Rate: 125 gpm normal to 280 gpm maximum.

2.10 PIPING SYSTEM MATERIALS

A. General:

1. Provide piping system materials for services as specified in schedules hereinafter.

2. Provide valves of Manufacturer's Numbers designated in schedules hereinafter, or approved equal. Refer to other subsections in this section and to drawings for valves furnished with equipment, or for special valve requirements and exceptions to valve types specified in the schedules.

B. Aboveground well water and sampling lines:

1. 2 Inches and smaller:

a.	Pipe:	Galvanized steel, Schedule 40, ASTM A 53
b.	Joints:	Screwed
c.	Fittings:	Malleable iron, 150 pounds, screwed, ANSI B16.3
d.	Valves:	Ball valves - screwed ends, 2,000 pounds, carbon steel body, two-piece design, chrome-plated carbon steel ball and stem, reinforced Teflon seats and seals, Nibco Figure T-560-CS-R-25-FS, Milwaukee No. BA-170S or Stockham Figure S-2120CS2-R-T

2. 2-1/2 Inches and larger:

a.	Pipe:	Black steel, Schedule 40, ASTM A 53
b.	Joints:	Butt weld
c.	Fittings:	Standard weight steel, butt weld
d.	Flanges:	Forged steel, 150 pound, raised face welding neck, ANSI B16.5
e.	Gaskets:	Garlock "Blue-gard", or approved equal, 1/16 inch, cut ring
f.	Valves:	Gate valves - flanged ends, 125 pound, cast-iron body, bronze mounted, bolted bonnet, OS&Y, solid wedge, renewable seat, Powell Figure 1793, Stockham Figure G-623, Nibco Figure F-617-0 or Milwaukee Model F-2885

C. Underground well water (except for tie-in at Delta Steel):

1. Pipe: Polyethylene P 34CH compound, PE 3408, SDR 9, ASTM D 1248, Type III, Class C, Category 5, Grade P34, NSF approved

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2. Joints: 1-1/2 inches and smaller, socket fusion heat joined, 2 inches and larger, butt fusion heat joined

3. Fittings:

   a. 1-1/2 inches and smaller, socket type molded from material to match pipe, ASTM D 2683

   b. 2 inches through 4 inches, butt type molded from material to match pipe, ASTM D 3261

   c. 6 inches and larger, butt type shop fabricated from same material as pipe, ASTM D 1248

4. Flanges: Ductile iron, 125 pound, lap joint, AWWA C 207, Class D. Use flanges only for mating with valves, and where shown on the drawings

5. Gaskets: Neoprene, 1/8 inch, full faced

6. Valves: Balancing valves - eccentric plug valves, flanged ends, 175 pound WWP, cast-iron body, stainless steel seats Buna-N coated cast-iron plug, 2 inch square operating nut, Clow-Figure F-5412, or approved equal. Provide each valve with two-piece valve box. Provide two tee-handled operating wrenches of length suitable for valve depth.

   Check valves - Globe style, non-slam spring loaded type, flanged ends, flat faced, 125 pound, cast-iron body, bronze disc and seat, Buna-N seals, stainless steel trim, Mueller No. 105M-AP

7. Polyethylene piping, fittings and appurtenances to be by the same manufacturer, of identical virgin material, and to have a cell classification in accordance with ASTM D 3350. The minimum hydrostatic design basis to be 1,600 psig at 73.4 degree F and 800 psig at 140 degree F per ASTM D 2387 and validated in accordance with Plastic Pipe Institute PPI TR-3. The pipe to have tensile strength at yield point per ASTM D 638 of a nominal molecular weight average of 300,000. Piping materials to be Plexco, Driscopipe, or approved equal.

8. Piping to have four co-extruded equally spaced blue stripes into the pipe outside surface. The stripping material to be the same as the pipe material except for color.

9. Mitered fittings to be fully pressure rated. A 90 degree elbow to have five segments and a 45 degree elbow to have 3 segments.

D. Underground well water at tie-in to Delta Steel:

1. Pipe: Copper tube, Type K, Hard, ASTM B 88.

2. Joints: Soldered, Engelhard "Silvabrite" 100, lead/antimony free, or approved equal.

3. Fittings: Wrought copper, solder type, ANSI B16.22.

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4. Flanges: Cast bronze, 150 pound, solder type, ANSI B16.18.

5. Gaskets: Rubber, 1/16 inch, cut ring.

2.11 SAMPLING PIT

A. Steel pipe, Armco "Hel-Corr", or approved equal, corrugated metal pipe, 16 gage, hot-dip galvanized after fabrication and coated with bituminous material not less than 0.05 inch thick.

212 POST INDICATOR VALVES

A. Waterous Series 500, or equivalent Stockham, M & H, Kennedy, or approved equal, flanged ends, 175 pound WWP, cast-iron body, bronze mounted, rubber coated cast-iron wedge, epoxy coated inside and out, non-rising stem, 2 inch square operating nut. Provide Waterous No. A-240 indicator post, or approved equal, with target to show if valve is open or shut. Provide post indicator extension, if required, length as required for depth of bury. Provide minimum of two wrench handles.

PART 3 - EXECUTION

3.1 PIPING

A. Provide piping, fittings, flanges, valves, and other miscellaneous piping products of sizes, types, pressure ratings, and temperature ratings indicated, and in accordance with the piping system material schedules.

B. Piping, fitting, flanges, valves and miscellaneous appurtenances to be installed in accordance with the requirements of Section 15050. In addition, polyethylene piping systems to be installed in accordance with the following:

1. Polyethylene pipe and fittings to be heat joined using the butt fusion method as specified herein in accordance with applicable requirements of ASTM D 2675, and the manufacturer's recommendations. No extrudate welding is to be used.

2. The Polyethylene pipe and fitting manufacturer to perform the requirements as follows:

a. Provide a qualified fusion instructor to train a maximum of two designated fusion operators from the Subcontractor's personnel. Fusions to only be performed by operators who have been approved and trained by the manufacturer, or the fusions are to be performed by the manufacturer's fusion technicians.

b. Provide fusion equipment that is in good working order. Fusion equipment to have suitable quick release, no contamination on surfaces of the heater faces.

c. Provide a qualified representative to visually inspect and mark each fusion bead prior to installation of the pipe and fittings.

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3.2 PRESSURE INDICATORS (GAGES)

A. Provide pressure indicators at locations as indicated, located so as to be easily read.

B. Provide each pressure indicator with needle valve and pulsation dampener.

3.3 FLUSHING AND CLEANING PIPING

A. After all piping and equipment have been installed and tested as specified in Section 15990, and before any operating tests, clean and flush well water piping as described herein. Provide all necessary temporary equipment required for cleaning and flushing including pumps, strainers, valves, pipe, fittings, drains and hoses.

B. Flush with clean water. Flush all underground piping with water at the flow rate designated in NFPA Standard No. 24. Flush all aboveground piping using sufficient water to produce a minimum water velocity of 2.5 feet per second through piping being flushed. Continue flushing until discharged water shows no discolorations. Drain at low points. Leave piping drained in preparation for sterilization as hereinafter specified.

3.4 STERILIZATION OF WELL WATER PIPING

A. After well water piping has been cleaned and flushed as specified hereinbefore, and before connecting to the wells, sterilize the piping with chlorine in manner specified herein, as required to conform to requirements of AWWA Standard C651 and The Board of Health having jurisdiction.

B. Use sodium hypochlorite or liquid chlorine, conforming respectively to AWWA Standards B300 and B301, introduced into piping in quantities required to provide a concentration of chlorine of not less than 50 parts per million. Open and close valves in piping several times during contact period. After contact period of not less than 8 hours, flush piping with clean domestic water until residual chlorine content is not greater than 2 parts per million.

3.5 TESTS AND ADJUSTMENTS

A. All tests and adjustments to be as specified under Section 15990.

END OF SECTION

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SECTION 15990

TESTS AND ADJUSTMENTS, OPERATING INSTRUCTIONS

PART 1 - GENERAL

1.1 INSTRUMENTS AND TEST EQUIPMENT

A. Furnish all necessary temporary equipment and instruments required for adjustments and for operating tests. Instruments used for tests to be maintained under a calibration program as specified in Section 01100.

1.2 WITNESSING TESTS

A. Before a test is to be made, notify the Construction Manager and approving authority having jurisdiction not less than 7 days before any on-site test is scheduled to start. Such representatives will have the right to defer the start of any test or the start-up of any system by not more than two work days if the proposed date conflicts with other commitments of the personnel assigned to witness the tests. All tests to prove tight to the satisfaction of the Construction Manager.

PART 2 - PRODUCTS

(NOT APPLICABLE)

PART 3 - EXECUTION

3.1 PIPING PRESSURE TESTS

A. Test piping which is to be insulated, before insulation is applied. Test underground piping after pipe has been laid in the trench, but piping prior to backfilling of pipe trench. Test well water piping before cleaning and sterilizing.

B. Disconnect devices, equipment and attached piping which are not designed for the test pressure, and install plugs and blind flanges to close openings.

C. Above ground well water piping - Test and prove tight at a hydrostatic pressure of 200 psig, held for a period of two hours.

D. Underground well water piping - Test and prove tight at a hydrostatic pressure of 200 psig, held for not less than three hours. During this time, the pipe is to be maintained at a test pressure by periodic addition of makeup water to compensate for stretching of pipe and temperature changes. All joints to be visually examined to assure tightness.

E. Replace work found defective, or repair if so directed. After replacement or repair, test work again as specified. Repeat until satisfactory.

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3.2 EQUIPMENT AND SYSTEMS

A. Place in operation and adjust all equipment and systems.

B. For starting up and adjusting which is not within the normal function or capacity of the Subcontractor's personnel, arrange and pay for the services of employees of the manufacturers of the various major items of equipment to supervise such adjustment and initial operation. If the subcontractor elects to provide such service for any equipment with his own personnel, and this proves unsatisfactory, the subcontractor must, upon notification of such dissatisfaction, arrange immediately for services of manufacturer's employees as specified hereinbefore.

C. Take all necessary readings to determine that equipment is operating satisfactory.

D. Check all equipment during operation. If excessive vibration of equipment is noted, have a representative of the manufacturer check shafts, motors, bearings, couplings and other components of the equipment which is vibrating. Make all corrections necessary to eliminate the vibration to obtain satisfactory performance.

3.3 TEST REPORTS

A. Keep complete and accurate records of test data. After all tests have been completed, or at intervals during the testing if directed by the Construction Manager, submit in triplicate, typewritten reports of all test data. Data to include test pressures and duration of test, and pump motor load readings and motor nameplate data.

3.4 OPERATING INSTRUCTIONS

A. Instruct the personnel designated by the operating contractor in the details of operation and maintenance of all equipment. Base instructions on the operating manuals furnished for the equipment, and demonstrate procedures and methods described in the manuals. Normal operating pressures and motor amperages, etc., are to be included in the operating manuals.

END OF SECTION

2733 [redacted]

SECTION 16010

ELECTRICAL WORK - GENERAL

1.1 GENERAL

A. Furnish materials and equipment which are new, products of reputable manufacturers conforming to the requirements of applicable standards and recommended practices of authorities listed below and which conform to those standards and recommended practices in design, manufacture, ratings and test.

1. American National Standards Institute (ANSI)

2. Institute of Electrical and Electronic Engineers (IEEE)

3. Insulated Cable Engineers Association (ICEA)

4. National Electrical Manufacturers Association (NEMA)

5. Underwriters Laboratories Inc. (UL), including product directories

6. American Society for Testing and Materials (ASTM)

7. Factory Mutual (FM) "Approval Guide" and "Loss Prevention Data"

8. Electrical and Electronics Graphic Symbols and Reference Designations, ANSI/IEEE Y32E

9. General Services Administration, Federal Supply Service, "Federal Standards" and "Federal Specifications"

B. All work to comply with the following:

1. Department of Labor "Occupational Safety and Health Standards," Title 29, Code of Federal Regulations (CFR), Part 1910 (OSHA), Part 1926 (Safety and Health Regulations for Construction), and Supart S.

2. National Electrical Code (NEC)

3. National Electrical Safety Code (NESC)

4. National Fire Protection Association (NFPA)

5. Ohio Basic Building Code (OBBC)

6. Federal, State and Local Codes

7. DOE 6430.1A, "General Design Criteria Manual"

8. Uniform Building Code (UBC), Section 2312 "Earthquake Regulations" [redacted]

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9. American Welding Society (AWS), Structural Welding Code (AWS D1.1)

10. DOE/EV-0042 "Standard on Fire protection for portable Structures."

C. Obtain required permits and, at completion of work, certificates of final inspection by Operating Contractor.

D. Provide equipment and materials having features and characteristics as required so that the completed facilities comply with all applicable safety requirements.

E. All work and materials to be such that the completed facilities comply with all applicable requirements of Seismic Zone 2 (OBBC).

1.2 MANUFACTURERS' NAMES

A. Listing of a manufacturer's name for any material or equipment does not necessarily imply acceptance of that manufacturer's product unless it complies with standards and detail specifications relating thereto.

1.3 EQUIPMENT RATINGS

A. Voltage, ampere, interrupting and other ratings for equipment are shown on drawings, unless otherwise indicated.

1.4 NAMEPLATES

A. Provide nameplate for each of the following items of equipment, and as additionally indicated, to indicate designation or purpose.

1. Combination motor starter.

2. Control or alarm device.

B. Nameplate to be engraved laminated phenolic, black letters on white background, 1 inch high by 3 inches wide, or other acceptable smaller size. Fasten by means other than adhesives, such as suitably sized self-tapping screws or rivets.

C. Provide suitable stainless steel mounting plate adjacent to equipment and fasten nameplate thereto when size, contour, or NEMA classification of the enclosure prohibits fastening nameplate to equipment.

D. All electrical utilization equipment and receptacles to have their sources of power identified using nameplates as hereinbefore specified. Fasten nameplate to equipment, receptacle or device plate as appropriate, and to its disconnecting means. Coordinate nomenclature with Construction Manager so as to be consistent with plantwide identification methods.

E. Nameplate requirements will not be further specified under individual headings.

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1.5 APPEARANCE

A. Give special attention to the appearance of all facilities exposed to view, and install material and devices as required to give a neat and orderly appearance.

B. Where exposed to view, install raceways, materials and devices parallel or perpendicular to structure lines. Install devices and panels in alignment with one another, with construction installed under other divisions of these specifications and, where appropriate, with existing devices, panels and construction.

C. Where installation height for devices is not indicated or where there is any question as to the appearance of the installation, locate devices as directed by the Construction Manager.

1.6 SUPPORTS FOR EQUIPMENT

A. Provide all necessary supports for equipment provided or installed under this division. Supports to consist of steel frames, plates, brackets, racks and other shapes of adequate size and fastened with bolts, screws or by welding, to provide rigid support of sufficient strength.

B. Welds to be continuous and reasonably smooth. Surfaces to be suitably protected from the environment. Acceptable methods include full galvanizing after refabrication or covering with zinc rich paint as specified hereinafter. Where paint is used, maintain tight control on each step of the operation from surface preparation, through primer and to final finish coats.

1.7 FIELD CONDITIONS

A. Coordinate work with the various trades involved in the project to fit available space. If there is any question as to where electrical system components should be located so that the work of other trades can be properly installed, meet and discuss such questions with the other trades involved, jointly prepare sketches or coordination drawings if necessary, and otherwise coordinate the work. Any work installed in such locations as to prevent other trades from installing their work with reasonable convenience must be relocated at no additional contract cost.

B. Drawings indicate desired position of equipment. Unless dimensioned, raceway routing is shown schematically. Do not install raceways in locations which would make impossible the work of other trades. Coordinate work with other trades to avoid interferences. If conditions are encountered which make indicated arrangements impossible or impractical, submit request for deviation with drawings as required to clarify the request.

1.8 OPENINGS, PENETRATIONS AND SEALS FOR CONDUIT OR CABLE

A. Sleeves for single conduits: Provide a schedule 40 pipe sleeve for each single conduit which penetrates building walls. Use pipe two sizes larger than conduit. Pack void between conduits and pipe sleeve with oakum where conduit passes through sleeve in exterior walls above grade. Fill ends of sleeves with General Electric Silicone Foam RTV 851, or approved equal, and trowel neatly to make seal. Pipe sleeves in walls to be flush with wall surface. Provide split plates to close around exposed conduits passing through walls.

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[redacted]

B. Conduit seals: Where individual conduit seals are indicated, provide Crouse-Hinds type EYS conduit seals, or approved equal as manufactured by Appleton, O-Z/Gedney or Pyle-National. Pack seals with General Electric Silicone Foam RTV 851, or approved equal.

1.9 ACCESS

A. Provide access for all items requiring inspection or maintenance, such as junction, pull and outlet boxes and sealing fittings.

1.10 PROTECTION OF PROPERTY

A. Protect equipment and materials from intrusion of all foreign materials. Do not install sensitive electrical equipment until major construction work is completed. During and after installation, protect equipment from damage by water, dust, paint, wet concrete, impact, etc.

1.11 CUTTING AND PATCHING

A. Where sleeves, framing or forming have not been placed for proper installation of work, obtain from the Construction Manager the locations necessary to continue with construction operation.

B. Patch such openings in accordance with applicable requirements specified under other divisions of these specifications by workers skilled in the trade involved.

C. Neatly band holes cut in gratings. Where gratings are galvanized, immediately coat the banding and any abraded surfaces with two coats of zinc rich paint as specified hereinafter.

D. Insofar as possible, avoid making holes in structural steel. If holes are required, obtain Construction Manager's permission and drill or punch holes in structural steel; do not cut with torch.

1.12 WELDING

A. No welding or open flame work will be permitted in the construction area unless permitted by, prearranged with, and coordinated with the Construction Manager.

B. Welding must be done by acceptable certified welders and in accordance with FEMP approved Welding Standards and complying with the latest AWS D1.1 Code or with any state or local code requirements which supersede it.

C. Before welding, submit certification of compliance forms for each welder. All welding and materials to be suitable for use in Seismic Zone 2.

1.13 PAINTING

A. Unless factory finish is specified, or prior painting is part of manufacturer's standard procedure, prime paint fabricated or manufactured equipment and material prior to, or immediately after, installation as hereinafter specified.

B. Items not included:

1. Galvanized or similar treated surfaces.

2. Nonferrous surfaces.

3. Nonmetallic surfaces.

4. Plated surfaces.

5. Stainless steel surfaces.

6. Inside of conduits and devices.

7. Wearing surfaces.

C. Thoroughly clean and reprime shop coated materials or equipment which show evidence of corrosion.

D. Field finish painting is specified under Section 09900, except as indicated for touch-up of damaged galvanized surfaces.

E. Insofar as possible, avoid field cutting, burning or welding of galvanized hardware. Where such operations are necessary, spot prime and paint involved surfaces with high zinc dust content paint for regalvanizing galvanized steel, as manufactured by Ameron, Carboline, Porter, TNEMEC, or approved equal.

F. Clean all surfaces to remove dirt, oil, grease, dust, scale, rust and foreign matter before applying paint. Prepare surfaces and apply paint in accordance with paint Manufacturer's recommendations.

G. Paint with one coat of primer, using one of the following metal primers:

1. Porter U-Prime

2. Sherwin-Williams Kemkromik

3. Pratt & Lambert No. C-107 gray

1.14 TESTS AND REPORTS

A. Make tests and arrange for inspections necessary to determine that wiring and equipment installed under these specifications are in satisfactory condition to be energized. Schedule tests and inspections at times satisfactory to the Construction Manager's Representative to enable them to be present. All parts of the installation, when tested, to meet applicable standards.

B. Keep a complete and accurate record of all tests and inspections and submit one copy for review.

C. Furnishing and setting up of required test equipment and performance of work incidental to making tests is a part of work under this division.

D. Replace any work and equipment provided under this division and found faulty or defective under test. Should the Construction Manager agree, faulty or defective work and equipment may be repaired rather than replaced. After replacement or repair, test work again. Final acceptance of work depends on successful completion of operational tests on all equipment to show that the equipment will perform the functions for which it is specified.

E. Prior to making alterations or additions to existing equipment or systems, check such existing equipment or systems for proper operation. If equipment or systems are found to be faulty, damaged, or inoperative so as to be unsuitable for alteration or addition, immediately notify Construction Manager for disposition.

F. Instruments used for tests are to be maintained under a documented calibration program as specified in Section 01100.

G. Perform continuity and operational tests on all receptacle, power and control circuits.

H. Test all 125 volt, 3-wire grounding receptacles including those provided for temporary power, for correct wiring and for correct operation of GFCI (if receptacle is so protected), by use of a receptacle circuit tester such as General Electric Model TRC2-3 or approved equal.

I. Check all control and interlocking wiring for proper operation. Perform operational tests with Construction Manager to assure that control wiring has been properly installed.

J. Perform insulation resistance test on 480 volt circuits and motors after installation and before energization using a 1,000 volt Biddle Megger Test set, or approved equal. Investigate causes and take appropriate remedial action when insulation resistance tests less than 5 megohms, or when multiple tests indicate a significant downward trend in the resistance readings. Similarly test circuits for lower voltages using a 500 volt test set.

K. Do not perform insulation resistance test on circuits operated below 120 volts nor on solid-state equipment or static ground fault devices, including ground fault circuit interrupters, nor on any circuit connected to equipment containing solid-state devices, unless such test is authorized by, and is performed in strict accordance with, equipment manufacturer's recommendations, or in lieu thereof, disconnect equipment from the circuit.

L. Inspect all ground connections for continuity and tight electrical and mechanical connections. Test resistance at various points on grounding system, using Biddle Ground Ohmer, or approved equal, or other standard method. Maximum permissible grounding system resistance is 5 ohms.

M. Test alarm annunciator system for satisfactory operation.

N. Inspect and make a record of the manufacturer, size and catalog number of overload relay heater elements, manufacturer, type and trip rating of associated circuit protective device in each motor starter, along with description of motor drive, horsepower, motor (locked - rotor indicating) code letter, and full load current rating of each motor. Ascertain that size of heater element, as determined in the heater element selection table of the starter manufacturer, corresponds to motor full load current and ambient temperature experienced by motor and starter, and that motor will start and operate. If motor will not operate satisfactorily, notify Construction Manager immediately. Where directed, install next larger size overload relay heater element.

O. Record above data in tabular form and furnish one copy to the Construction Manager, and include tabulation in operating manual.

P. Where data of the overload relay heater manufacturer stipulates a maximum branch circuit protective device size, limit the branch circuit protective device size to that maximum size, in accordance with NEC requirements.

1.15 PHASE ROTATION AND IDENTIFICATION

A. Maintain NEMA phase positions in all electrical equipment connections.

B. Check direction of rotation of all motors and reverse rotation if necessary.

C. Tag each terminal of motors and equipment with phase markings as an aid in making proper wiring connections and to assure correct rotation.

1.16 WORK ON ENERGIZED CIRCUITS AND EQUIPMENT

A. Certain existing facilities will remain in service throughout construction with only brief shutdown periods permitted for tie-in connections. Schedule shutdown periods to conform to Operating Contractor's and Construction Manager's requirements, and only with written authorization from the Construction Manager.

B. All energized circuits requiring work are to be locked-out and tagged in accordance with FEMP 719 prior to working on such services.

1.17 CODES, PERMITS AND INSPECTIONS

A. Contract documents govern where more strict than laws, ordinances, FEMP requirements or applicable standards of UL, NFPA, and NEC, even though such additional work is not statuatorily required by any law or ordinances.

B. Provide materials and equipment bearing certification of UL where such labels or stamps are customary, required, or specified.

C. Within 30 days after award of contract, submit to Construction Manager such working and layout drawings as may be required. Provide services of a qualified Engineer, if required by the Construction Manager, to prepare drawings. Obtain approval before proceeding.

1.18 SHOP DRAWINGS

A. Submit wiring diagrams or connection diagrams accompanied by adequately defined symbols list. Prepare schematic and wiring diagrams in accordance with ANSI/IEEE Publication Y32E, "Electrical and Electronics Graphic Symbols and Reference Designations."

B. Refer to Section 01100 for additional information and requirements regarding submittals.

1.19 TEMPORARY ELECTRICAL WIRING

A. Feeders: All temporary electrical service feeders to comply with the National Electric Code.

END OF SECTION

SECTION 16020

SCOPE OF ELECTRICAL WORK

1.1 SCOPE OF WORK

A. Furnish all equipment and materials, all labor and services, and do all work shown or specified, together with all necessary appurtenances, to provide complete and operable electrical systems.

B. In general, work under this division includes:

1. Underground electrical system.

2. Motor control, wiring and equipment.

3. Grounding.

4. Conduit and wiring systems for lighting, power, control and instrumentation.

5. Luminaires, including lamps.

6. Wiring devices.

7. Additions and alterations to existing installations.

1.2 WORK IN CONNECTION WITH MATERIALS, EQUIPMENT OR SYSTEMS NOT PROVIDED UNDER THIS DIVISION

A. Except where factory prewired, or where a portion of required wiring is specified under other divisions, or where otherwise indicated, provide under this division all conduit, wiring and make all wiring connections to devices such as pressure switch and equipment provided under other divisions or by Operating Contractor.

1.3 WORK NOT INCLUDED IN THIS DIVISION

A. Motors, factory-mounted on equipment, will be installed with driven equipment.

1.4 ALTERATIONS AND ADDITIONS TO EXISTING INSTALLATIONS

A. Alter and rewire existing electrical equipment, devices, outlets, conduit and wiring as indicated or required.

B. Materials removed and not reused remain the property of Building Owner unless otherwise advised by the Construction Manager. Promptly deliver these materials to storage location on site as directed by the Construction Manager.

C. All phases and scheduling of work to be closely coordinated with the Construction Manager and other trades, and authorized in writing by the Construction Manager at least 1 week prior

to the execution of any work. Disconnect and reconnect electrical services as required by other trades.

D. Schedule the work to minimize electrical circuit outages and downtime periods. Make temporary connections where necessary to maintain operation of existing systems. Replace temporary wiring with permanent wiring as soon as practicable.

E. When specific types of equipment, methods of connection, disconnection or relocation are not indicated, provide equipment, devices, wiring and workmanship compatible with the existing system and satisfactory to the system manufacturer and the Construction Manager.

1.5 RESTORATION OF EXISTING FACILITIES

A. Replace or restore to their original undamaged condition all facilities damaged during progress of work. Such replacement or restoration applies to both surface and subsurface installations and materials. Use materials and installation methods to match existing installations. Perform site work in accordance with the requirements of Division 2.

1.6 TEMPORARY ELECTRICAL FACILITIES FOR CONSTRUCTION WORK

A. In the event that temporary electrical power is required at construction sites for use during construction work, the Subcontractor or Sub-Subcontractor requiring such service is to make all arrangements for obtaining such service (including provision of generators where necessary), provide the necessary distribution facilities, pay all charges for installation and maintenance of the service, and at conclusion of the work, remove all traces of this service from the premises.

END OF SECTION

SECTION 16307

ELECTRICAL SWITCHING AND CONTROLS - LOW VOLTAGE
(1,000 VOLTS AND BELOW)

1.1 SWITCHING AND CONTROL EQUIPMENT

A. General:

1. Switching and control Manufacturer's (or approved equal) unless otherwise indicated:

a. Allen-Bradley
b. Square D

2. Except as otherwise indicated, enclosure types to conform to the following requirements:

a. General use indoors: NEMA 1.

b. Areas exposed to the weather and wet (Stainless steel) or damp locations: NEMA 4 X.

B. Motor circuit protectors

1. Trip units to be adjustable magnetic trip only for combination starters. Provide integral current-limiter accessory as necessary to meet short circuit rating requirements. Trip adjustment accessible from front of breaker. Set magnetic trip in accordance with Manufacturer's recommendations.

C. Magnetic motor starters

1. Provide NEMA standard across-the-line magnetic starters, with three overload relays having their reset button in cover. Provide integral current-limiter accessory as necessary to meet short circuit rating requirements.

2. Provide a separate 120 volt control transformer for each starter. Transformers to be Manufacturer's standard size as determined by the starter size plus capacity for additional indicated control devices in control circuit, plus an additional 25 percent spare capacity.

3. Protect transformer with two primary fuses and one secondary fuse. Ground other side of transformer secondary.

D. Combination magnetic starters:

1. Motor circuit protector type combination starters. Components in accordance with the respective articles of this section.

E. Control station components:

1. Components on combination starters to be heavy-duty type with NEMA A600 rating.

2. Components added to the existing Control Room Operator's Console to be similar to existing components, as indicated on the drawings.

END OF SECTION

SECTION 16400

ELECTRICAL WIRING

1.1 ELECTRICAL SERVICE SYSTEMS

A. Voltages are nominal system voltages in accordance with ANSI C84.1. Utilization equipment provided under this specification to be suitable for use under the conditions outlined in this standard.

B. Power distribution:

1. 240 volts, 3-phase, 3-wire, 60 HZ

C. Small power:

1. 120 volts, single phase, 60 hz.

1.2 WIRING

A. General:

1. Install all wiring in conduit or other acceptable raceway, unless otherwise indicated.

2. Pull no wire, until the conduit system is completely and thoroughly swabbed. Use inert pulling compounds free of ingredients harmful to insulation. Do not use grease or oil. Place all wires of a circuit in same raceway.

3. Label and color code wire and cable in accordance with NEC and in accordance with Operating Contractor's criteria, as follows.

a. Handwritten or wraparound labels are not acceptable. Label all cables properly using a Raychem type TMS, or approved equal, rectangular, flat, nonheat-shrinkable tag with 1/8 inch high lettering, fastened by nylon "Tie-wraps" passed through prepunched holes. For single conductors and individual cable wires, provide slip-on, heat-shrinkable sleeve markers, with black lettering on a white background, W. H. Brady computer-printable "Brady-sleeve" or approved equal. Mark all spare wires and cables "SP" at both ends. Mark cables with a circuit or cable number. Mark all single conductor wire and conductors of cables with a wire number and circuit number. If several circuits are contained within the cable, also mark each conductor with a circuit number.

b. With the exceptions noted below, locate markers at origin and destination, and at all intervening accessible splice or junction boxes. Mark all wire and cable with a cable or circuit number only.

c. Locate wire markers within 3 inches of a termination or splice. Locate cable markers within 3 inches of the spread, cable end, penetration, or box exit.

d. For branch circuits and all interior supply side circuits, color code as follows:

1) For 120 VAC Systems:
   a) Hot - Red.
   b) Neutral - White.
   c) Ground - Green.

2) For 230 VAC System:
   a) Phase A - Black with wire markers.
   b) Phase B - Black with wire markers.
   c) Phase C - Black with wire markers.
   d) Neutral - White.
   e) Ground - Green.

e. Color code ungrounded ("Phase" or "Hot") circuit conductors in sizes No. 8 AWG and smaller by means of colored insulation or jacket. Where colored insulations or jackets are only available on special order, alternate methods for color coding ungrounded conductors may be approved upon request to the Construction Manager. Color code these conductors in sizes No. 6 AWG and larger by means of colored insulation or jacket, or by use of colored tape at terminals and at all points where accessible after installation.

f. Yellow tape to consist of two separate bands at each application points in order to avoid confusion with white, gray, or orange after aging.

g. For all conductor sizes, green, gray or white colors are reserved exclusively for grounding and grounded conductors respectively. Do not use these colors in any way to identify an ungrounded conductor. Use gray or white, as required by the appropriate color code, only for the grounded or neutral conductor identification.

h. Color code grounded ("Neutral") circuit conductors and equipment grounding ("Ground wire") conductors in sizes No. 6 AWG and smaller only by means of colored insulation or jacket. Color code these conductors in sizes No. 4 AWG and larger by means of colored insulation or jacket or by means of colored tape at terminals and at all points where accessible after insulation.

i. Painting, taping, or other alteration of the color of a green, white, or gray colored conductor is prohibited.

4. Control wire to be red and numbered, and tagged at locations indicated hereinabove. Tag control wires with numbers as shown on control drawings or Manufacturer's drawings.

5. Install wiring continuous from outlet to outlet, without splices, except in outlet boxes, accessible junction boxes or accessible raceways.

6. Train and lace wiring inside equipment and panel with plastic wrap for workmanlike neatness. Do not lace or strap tightly any current carrying lighting or power wiring.

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7. Make all spare wires in cabinets or panel of adequate length for connection to most remote terminal in enclosure.

8. Insulate ends of spare wires, and tag.

9. Insulate ends of pull wires which terminate in cabinets, panels or other electrical device enclosures to prevent contact with "live" terminations.

1.3 TAPS, SPLICES AND CONNECTIONS

A. Thoroughly clean wires before installing lugs and connectors so that joint will carry full capacity of conductors without perceptable temperature rise above conductor temperature.

B. Soldered joints will not be permitted, except when part of Vendor-furnished equipment where soldering is standard practice.

C. For wire No. 10 AWG or smaller, use insulated spring pressure connectors utilizing an expandable cone-shaped coil spring such as 3M Company "Scotchloks", Ideal Industries Inc. "Wing Nuts", Thomas & Betts "Piggy Connectors", "Buchanan B-Caps", or approved equal. Insulated spring pressure connectors utilizing a nonexpandable fully seated coil spring, such as Ideal "Wire-Nut" are not acceptable. Also acceptable are crimp-type caps applied with proper indentor tool, which provides deformation of the cap in two directions at right angles to each other, as manufactured by Amp, Burndy, Thomas & Betts, or approved equal. Split bolt connectors are not acceptable.

D. For No. 8 AWG and larger wire, splice or terminate with indentor, crimp-type connectors and compression tools or with bolted clamp-type connectors, as manufactured by Amp, Burndy, Thomas & Betts, or approved equal.

E. Unless properly insulated by the connector, insulate all joints at least equal to the conductor insulation. Install self-fusing rubber-based insulating compound, molded around sharp edges and/or difficult shapes, to provide smooth surface for applying electrical tape. Insulating compound to be 3M Company Scotch No. 2200 pads or No. 2210 rolls, or approved equal. Electrical tape, 3M Company No. 33+ Scotch tape, or approved equal.

1.4 LOCATION OF OUTLETS AND EQUIPMENT

A. General:

1. Securely anchor all outlet boxes, independent of conduit supports.

2. Drawings indicate approximate locations only, unless specifically dimensioned. Verify outlet locations in field and change if conditions require. Where new location is within a radius of 10 feet from location shown, such changes are a part of the work original work under this division.

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1.5 HANGERS AND SUPPORTS

A. Equipment supports:

1. Unless otherwise indicated, provide equipment supports fabricated with structural steel, rigidly welded or bolted to present workmanlike appearance, and suitable for the Seismic Zone 2 requiremnts specified. Use hexagon head bolts with spring lock washers under all nuts.

B. Conduit supports:

1. Arrange conduit supports to prevent distortion of alignment by wire pulling operations. Provide galvanized steel hangers, clamps and malleable iron galvanized conduit straps. Perforated pipe straps will not be accepted. Unless otherwise indicated, fasten hangers to building steel with mechanical beam clamps. Use toggle bolts in hollow masonry walls, and expansion shields in concrete or brick walls. Trapeze hangers with conduit clamps may be used where groups of conduits run parallel. Do not support conduits from piping, ductwork, ceiling support system, or other such facilities. Unless otherwise indicated, support conduits only from structure. Provide a support at each elbow or conduit body.

C. Luminaire supports:

1. For luminaire supports, employ materials which are suitable for use in Seismic Zone 2 and capable of supporting the weight of the luminaire.

2. Secure post-mounted lights to hold the unit in place during a seismic disturbance.

3. Employ only fire-resistant materials.

1.6 CONDUIT SYSTEMS

A. General:

1. Use PVC coated rigid, galvanized threaded steel conduit within plant site with all cast ferrous metal outlet boxes, junction boxes and conduit bodies, except as otherwise indicated. Cast boxes to have threaded hubs and/or conduit openings.

2. Except for underground work, intermediate metal conduit may be substituted for rigid steel conduit.

3. Cut conduits square and carefully ream ends. Bring joints to a shoulder. Securely fasten conduits to sheet metal boxes and enclosures with galvanized double locknuts and insulating bushings, except provide suitable bonding fittings where required by the NEC. Provide Myers, or approved equal, watertight type hubs for conduit connections to sheet metal enclosed devices in wet locations. Use care so that sufficient threads project through to permit bushing to be drawn thightly against end of conduit. Do not install conduit with rusty threads.

4. Where conduit systems cannot otherwise be constructed use Erickson type unions, or threaded split couplings. Where split couplings are used, ensure threads of conduits and couplings are matched prior to final tighting.

5. Run exposed conduit parallel with, or perpendicular to, members of the structure.

6. Ring pipe or trapeze hangers may be used to support conduits except for the first and last hangers of the conduit run where a vertical or horizontal direction change occurs. In these cases, rigidly brace conduit supports so that wire may be pulled without damage to the conduit system. Stud welds may be used for fastening clamps to steel. Do not use flat straps to support conduit or boxes.

7. Seal conduits stubbed up or terminating in cabinets, outlets, and similar equipment against entrance of foreign matter into system by use of appropriate conduit pennies and retaining bushings prior to swabbing and pulling in wire.

8. Avoid moisture traps where possible. Where unavoidable, provide drain fittings at low points.

9. Install Crouse-Hinds type EZS seal fittings, or Appleton equal, or approved equal, at all points where conduits pass from hot to cold locations and from inside to outside of building walls and roofs. Pack seal fittings, in nonhazardous areas with nonhardening duct sealing compound, Graybar Permagum, or equal.

10. Do not install conduits closer than 6 inches to parallel runs of flues, steam lines, hot water pipes or other pipes carrying materials hotter than 200F.

11. Liquidtight flexible metal conduit in wet locations where flexibility is required and for all motor connections.

12. Standard flexible metal conduit in dry locations where flexibility is required.

13. Minimum conduit size 3/4 inch.

B. Rigid steel conduit:

1. Manufacturers (or approved equal):

   a. Allied Tube and Conduit
   b. Steelduct
   c. Triangle - PWC
   d. Wheatland Tube

2. Hot-dip galvanized, threaded, rigid steel in accordance with UL 6 and ANSI C80.1.

C. PVC coated rigid steel conduit:

1. Manufacturers (or approved equal):

   a. Robroy Industries

b. Kraloy
c. Permacote

2. Same as rigid steel except coated with 40 mil PVC exterior coating.

D. Intermediate conduit:

1. Manufacturers (or approved equal):

a. Allied Tube and Conduit
b. Triangle - PWC

2. Hot-dip galvanized, threaded, rigid-type steel in accordance with UL 1242.

E. Standard flexible steel:

1. Manufacturers (or approved equal):

a. Triangle - PWC
b. American Flexible Conduit

2. Concave single strip, helically wound galvanized steel strip interlocked and tightly jointed in accordance with UL 1.

F. Liquidtight flexible conduit:

1. Manufacturers (or approved equal):

a. Anaconda Industries - Sealtite type UA
b. Electri-Flex LA
c. Liquatite LA
d. O-Z/Gedney Flexi-Guard type UAG

2. UL listed, concave single strip, helically wound galvanized steel strip interlocked and tightly jointed, the whole covered with a continuous liquidtight PVC jacket. Extra-flexible non UL-listed types will not be acceptable.

G. Conduit bodies:

1. Manufacturers (or approved equal):

a. Appleton
b. Crouse-Hinds
c. Pyle-National
d. Raco

2. Unless otherwise indicated, all conduit bodies for rigid steel and intermediate metal conduit to be cast ferrous, threaded. Neoprene gasketed covers with blind type captive screws. Covers to be cast type in wet or damp locations. Covers may be sheet steel in dry locations.

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H. Couplings, fittings and connectors:

1. Manufacturers (or approved equal): [redacted]

a. Appleton
b. Efcor
c. O-Z/Gedney
d. Pyle-National
e. Raco
f. Steel City
g. Thomas & Betts

2. For liquidtight flexible metal conduit, use O-Z/Gedney "Ground-Tight" type 4QLT, or approved equal, grounding liquidtight connectors with insulated throats.

1.7 LUMINAIRE OUTLETS AND JUNCTION BOXES

A. Support outlets and junction boxes independent of raceway systems, except as indicated.

1.8 SWITCH, RECEPTACLE AND SPECIAL BOXES

A. Crouse-Hinds, or Appleton, or approved equal, FS or FD series bodies for exposed work. Boxes threaded for rigid conduit. Use two gang single box for two single gang covers Crouse-Hinds F0029 or equal).

B. Except by special permission, no gangable boxes will be allowed.

C. Receptacle boxes which are to receive weatherproof covers are to be installed so that the lift covers will open upwards (vertically).

D. Where a switch outlet is indicated or used for a pull box, provide extra deep box or multigang box with device opening in the center of the cover plate.

1.9 PULL BOXES AND JUNCTION BOXES

A. Pull boxes and junction boxes 6 inches by 6 inches by 4 inches deep minimum or sized as indicated. Construction and materials to conform to the requirements of the environmental schedule on the drawings.

1.10 WIRE AND CABLE

A. 600 volts or less:

1. Use no wire smaller than No. 12 AWG, rated at 600 volts, for power and lighting circuits and no smaller than No. 12 for control wiring, unless otherwise specified or indicated.

2. All wire, regardless of size, to be stranded copper.

3. No reduction in wire sizes based on ampacity or other reason will be permitted. [redacted]

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4. Determine, for each item of equipment furnished, whether special wiring is required, and provide that type of wiring.

5. Provide UL listed copper building wire and cable as manufactured by American, Essex, Royal, Cablec, Pirelli, Rome, Triangle - PWC, or approved equal, types as indicated below.

6. For lighting, and power:

a. All sizes type THHN/THWN.

B. For direct burial control application:

1. Cablec Corp. Product No. AP63570 flame-guard FREP control cable or equal, 19 - conductor, 600 volt, 90C round cable with flame - retardant ethylene propylene conductor insulation and overall jacket or chlorinated polyethylene meeting UL1277 requirements for flame retardance, cold bend and sunlight resistance.

2. Do not install conductors of more than 4 wire gage differences in the same conduit.

1.11 GROUNDING

A. General:

1. Grounding materials and hardware - Burndy, Chance, Blackburn, Illsco, Joslyn, McGraw Edison, O-Z/Gedney, Thomas & Betts, or approved equal.

2. Exothermic welding - heavy-duty Cadweld or heavy-duty Thermoweld, or approved equal.

3. Ground the following as required by the NEC and as specified:

a. Derived system neutral.
b. All equipment enclosures.
c. Receptacles.
d. Switch boxes.
e. Luminaires.
f. Fence and gates.
h. Other electrical devices as indicated or required by NEC.

4. Clean surfaces to bright metal before making ground connections and restore original finish after making connections.

5. Install a separate insulated metallic ground conductor in all conduits containing circuits operating at 120 volts or higher whether or not indicated. Size ground conductor in accordance with NEC Table 250-95.

6. Provide ground jumpers around flexible conduits as required by NEC, run inside the conduits.

7. Provide grounding system for new fence and swing gates.

8. Make connections thereto and to the grounding devices indicated.

B. Ground rods or grounding system: Copper-clad steel ground rods with copper ground conductors of the sizes shown. Make underground ground grid connections and connections to ground rods by an exothermic weld process. Make aboveground connections by an exothermic weld process or with nonturning pressure type grounding connectors. Make connection to water pipe above slab, using clamp type connector.

1.12 EXTERIOR POWER RECEPTACLES

A. Ground Fault Circuit Interrupter Type: UL 943, with class A tripping.

1. Configuration: (NEMA 5 -20R) 120V ac 20 ampere circuit rating.

2. Square D "Qwil-Gard" Series.

B. Weatherproof Cover: Receptacle covers, weatherproof, UL listed as suitable for wet locations with cover "Open," double-lift for duplex receptable, Hubbell catalog No. 5206 WO, or equivalent TayMac other approved equal.

END OF SECTION

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[redacted]

SECTION 16480

UNDERGROUND ELECTRICAL WORK

1.1 UNDERGROUND ELECTRICAL SYSTEMS

A. General:

1. Duct system to consist of single round bore conduits. Conduits not perfectly circular will not be permitted. Protect conduit in stockpiles pending installation to prevent deformation.

B. Conduits:

1. Where indicated, provide rigid steel conduit as specified in Section 16400.

2. Conduit to be thoughly cleaned before using or laying, and the ends plugged or capped during construction and after the duct line is completed. Take particular care to keep the conduits clean of concrete, dirt and any other substance during construction.

C. Excavation, trenching, backfilling and resurfacing:

1. Do all necessary excavating, backfilling and resurfacing required for work included under this division.

2. Perform all excavation, trenching etc., in accordance with Section 02221 Trenching and Excavation For Utilities.

D. Installation of conduits and direct burial cable:

1. Where conduit cuts are necessary, make all cuts straight and true.

2. Install conduit and direct burial cable a minimum of 2 feet 6 inches to top of conduit or cable below grade, on 3 inches of sand and cover with minimum of 3 inches of same. Other excavation and backfill to be provided by Subcontractor installing piping.

3. Where indicated, direct burial cable is to be installed in same trench with piping. Coordinate cable installation with piping installation.

4. Indentification: Lay 2" thick by 8" treated wood board and 6 inch wide orange vinyl tape 12 inches below grade directly over cable or conduit.

a. Tape to be imprinted with wording such as "Caution-buried electric line below."

b. Wood board: PS 20 "American Softwood Lumber Standard" grade lumber any species. Pressure-treat water-borne preservatives for ground contact use complying with AWPB LP-22.

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5. Cables enclosed in steel conduits are required under roadways and paving, and extending a distance of 5 feet minimum on either side of roadways and from the edge of paving. This requirement applies whether or not roadway is paved.

END OF SECTION

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SECTION 16500

LUMINAIRES AND LIGHTING

1.1 LUMINAIRES - GENERAL

A. Provide a new luminaire of the type shown at each location indicated.

B. Luminaire of similar design, with lens equivalent in construction, light distribution and brightness characteristics, and of equal finish and quality to that shown may be submitted for consideration by indicating such luminaires on the substitution sheet included with the proposal form.

C. Luminaire complete with lamp and lamp holder, mounting arm, and other components necessary for complete and finished installation when mounted as shown.

1.2 LAMPS

A. Incandescent:

1. General Electric, Sylvania or Philips with ratings as indicated and suitable for luminaire types utilized.

2. Install new incandescent lamps in all incandescent lamp luminaires immediately prior to acceptance by Construction Manager.

1.3 LUMINAIRE MOUNTING

A. Mount fixtures plumb, level and in alignment. Provide mounting in accordance with the applicable requirements of Section 16400 and as otherwise indicated.

B. Remove dust and soil marks from luminaires after installation.

C. Mounting height - as indicated on the drawings.

END OF SECTION

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SECTION 16850

ELECTRICAL HEAT TRACING

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Section Includes:

1. Provide all labor, materials, installation equipment and tools, and do all work necessary for the complete design and installation of the electric heat tracing system.

B. Related Work in Other Sections:

1. Hydropneumatic tank.

2. Piping.

3. Insulation.

4. Electrical power for heat tracing systems including electrical wiring from panelboards to thermostats is provided under another section of Division 16.

1.2 DESCRIPTIONS

1. Provide complete electric heat tracing systems for heating of and Hydropneumatic tank as specified herein and as indicated on the drawings.

2. Systems to be completely designed by the manufacturer, Thermon, Raychem, or approved equal.

3. Systems to be designed using criteria of surface area or pipe size, insulation, minimum fluid temperature of plus 45F and minimum outdoor ambient temperature of minus 20F, and wind velocity of zero mph.

4. All components are to be UL listed.

1.3 SUBMITTALS

A. Provide shop drawings for review prior to construction, and "as built" drawings and manuals for record at completion of the project. See reference to standard requirements for FEMP suppliers.

B. Provide electrical design data showing proper circuit breaker size required for each heat tracing circuit provided under these specifications.

C. Refer to Section 01100 for additional information and requirements regarding submittals.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Heat Tracing Cables: Self-limiting, parallel circuit type, with ground braid and polyolefin jacket, designed for operation with service voltage of 120 volts, 60 hz, with rating as required to satisfy criteria specified. Use Chemelex cable or equivalent Thermon, or approved equal.

B. Thermostats: Ambient sensing type, and located where sensing is not influenced by radiation off heated surfaces.

PART 3 - EXECUTION

3.1 GENERAL

A. Installation to be in accordance with contract drawings and manufacturer's recommendations.

B. After application of thermal insulation, provide warning labels on all heat-traced piping at each end and at 20 foot maximum intervals, or closer in complex areas, using Raychem type ETL markers, or equivalent Thermon, or approved equal.

3.2 TESTING

A. Make electrical, short-circuit, ground and insulation resistance tests of the systems before and after application of the pipe insulation, in accordance with the manufacturer's recommendations. Submit a copy of test readings to the Construction Manager for review.

END OF SECTION

[redacted]

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ENCLOSURE 4

OHIO DEPARTMENT OF HEALTH

CHEMICAL ANALYSES

FOR THE PROPOSED WATER SOURCE

OhioEPA
State of Ohio Environmental Protection Agency
Southwest District Office
40 South Main Street
Dayton, Ohio 45402-2086
(513) 285-6357
FAX (513) 285-6249 DERR AND HAZARDOUS WASTE FAX NO. (513) 285-6404

2783

[redacted]

George V. Voinovich
Governor

PLEASE DELIVER THE FOLLOWING PAGES TO:

NAME: Jack CRAIG

FROM: Kurt Messer - OEPA - Drinking Water

TOTAL NUMBER OF PAGES INCLUDING COVER SHEET: 2

DATE: 10-30-91

IF YOU DO NOT RECEIVE ALL OF THE PAGES AND/OR ANY PROBLEMS ARISE DURING TRANSMISSION, PLEASE CONTACT US AS SOON AS POSSIBLE AT (513) 285-6357.

APPROVED TO TELECOPY:

Thomas A. Winston

THOMAS A. WINSTON

MESSAGE: Mr. Craig:

The only analysis complete at this time, on the new well for Albright & Wilson, is the inorganics. As additional

[redacted]

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2783

OhioEPA

DIVISION OF PUBLIC DRINKING WATER

Inorganic Chemical Sample Submission [redacted]

Return Completed Report To:

Ohio EPA, Division of Public Drinking Water
1800 WaterMark Dr.
P.O. Box 1049
Columbus, Ohio 43266-0149

Laboratory Name: ODH

Certification Number: (47) 1 2 3 4 5 (51)

Sample Number: (52) 9 1 0 9 0 5 4 0 - 1 (61)

Analyst: [illegible]

Date Received: 9/30/91 Date Reported: (27) Month 1 0 Day 2 2 Year 9 1 (32)

Sample Identification

PWS ID: (1) 3 1 3 7 5 1 2 (7)

Water Supply Name: Albright & Wilson

Address: [illegible]

City & Zip:

County: [illegible] Phone: ( )

Sample Date: Month 0 9 Day 3 0 Year 9 1 (36) (41)

Time (Use Military Time): Hour 0 5 Minute 1 0 (43) (46)

Sample Collected By: [illegible] Messer

Sample Location: New Well @ Crosby & Willey

Additional Information — Analyst Remarks — Non Routine Analytical Requests

New Well Auth: 4393

☐ Filtered ☐ $CuSO_4 + H_3PO_4$ ☐ Iced ☑ H_2SO_4 @ pH
☐ NaOH ☑ HNO_3 @ pH ☑ Unpreserved Gal

DISTRICT RESPONSE REQUIRED

☐ Other (Explain)

☐ Sample Type (Raw-R, Plant-P, Dist-D)	R	☐ Phosphate Reactive, P mg/l	1073.	☑ Silver Total, Ag ug/l	1050. <30.
		☐ Chloride, Cl mg/l	1017. 10	☐ Strontium Total, Sr ug/l	1051.
☐ Sample Type (Check-C, Special-S)		☑ Fluoride Total, F mg/l	1025. 0.12	☐ Thallium Total, Tl ug/l	1085.
		☐ Cyanide, CN mg/l	1024.	☐ Tin Total, Sn ug/l	1086.
☐ Well Identification		☐ Silica, Diss. SiO_2 mg/l	1049.	☐ Titanium Total, Ti ug/l	1087.
☐ Turbidity FTU	0100.	☐ Calcium Total, Ca mg/l	1016. 83	☐ Vanadium Total, V ug/l	1088.
☐ Color Pt-Co	1905.	☐ Magnesium Total, Mg mg/l	1031. 20.9	☐ Zinc Total, Zn ug/l	1095.
☐ Conductivity at 25° CU-MHO	1064.	☑ Sodium Total, Na mg/l	1052. <5 ✓	☐ Phenol, ug/l	2910.
☐ pH, Lab S.U.	1925.	☐ Potassium Total, K mg/l	1042.	☐ MBAS, mg/l	1089.
☐ pH, $CaCO_3$ Stability S.U.	1066.	☐ Aluminum Total Al ug/l	1002.	☐ Oil-Grease, Total mg/l	1090.
☑ Alkalinity Total, $CaCO_3$ mg/l	1927. 250.	☐ Antimony Total, Sb ug/l	1074.	☐ BOD, 5-Day mg/l	1091.
☐ Alkalinity Phth, $CaCO_3$ mg/l	1931.	☑ Arsenic Total, As ug/l	1005. <10	☐ COD, mg/l	1076.
☐ Alkalinity $CaCO_3$ Stabl, mg/l	1067.	☑ Barium Total, Ba ug/l	1010. <300	☐ TOC, mg/l	1092.
☐ Acidity Total, $CaCO_3$ mg/l	1068.	☐ Beryllium Total, Be ug/l	1075.	☐ Asbestos, mg/l	1094.
☐ Acidity M.O. $CaCO_3$ mg/l	1969.	☐ Bismuth Total, Bi ug/l	1078.	☐ Sulfate, SO_4 mg	1055. 35
☐ Hardness Total, $CaCO_3$ mg/l	1915.	☐ Boron Total, B ug/l	1079.	☐	
☐ Residue, Total mg/l	1070.	☐ Cadmium Total, Cd ug/l	1015. <0.5	☐	
☐ Residue, Total Volatile mg/l	1060.	☑ Chromium Total, Cr ug/l	1020. <30	☐	
☐ Residue, Total Nfilt (Sus) mg/l	1061.	☐ Chromium Hex, Cr ug/l	1080.	☐	
☐ Residue, Vol. Nfilt mg/l	1077.	☐ Cobalt Total, Co ug/l	1081.	☐	
☑ Residue, Total Filt (Diss) mg/l	1057. 332.	☐ Copper Total, Cu ug/l	1022.	☐	
☐ Residue, Vol Filt mg/l	1058.	☐ Iron Total, Fe ug/l	1026. <80	☐	
☐ Residue, Settable mg/l	1071.	☐ Iron Diss., Fe ug/l	1082.	☐	
☑ Nitrate, mg/l	1040. 1.73	☑ Lead Total, Pb ug/l	1030. <7	☐	
☐ Nitrogen TKN, N mg/l	1037.	☐ Lithium Total, Li ug/l	1083.	☐	
☐ Nitrogen Ammonia, N mg/l	1003.	☑ Manganese Total, Mn ug/l	1032. 190	☐	
☐ Nitrite, N mg/l	1041.	☑ Mercury Total, Hg ug/l	1035. <0.5	☐	
☑ Nitrate-Nitrite, N mg/l	1038. 1.73	☐ Molybdenum Total, Mo ug/l	1084.	☐	
☐ Phosphorus Total, P mg/l	1093.	☐ Nickel Total, N ug/l	1036.	☐	
☐ Phosphorus Sol, P mg/l	1072.	☐ Selenium Total, Se ug/l	1045. <5	☐	

Distribution: (1-3) Ohio EPA, Division of Public Drinking Water (4) Owner or Purveyor of Water Supply (5) Laboratory File
EPA 5020 (Rev. 8/90)

[redacted]

State of Ohio Environmental Protection Agency

Southwest District Office
40 South Main Street
Dayton, Ohio 45402-2086
(513) 285-6357
FAX (513) 285-6249 DERR AND HAZARDOUS WASTE FAX NO. (513) 285-6404

2783 [redacted]

George V. Voinovich
Governor

PLEASE DELIVER THE FOLLOWING PAGES TO:

NAME: Tom Crawford 1-738-9214

FROM: Kurt Messer

TOTAL NUMBER OF PAGES INCLUDING COVER SHEET: 2

DATE: 1-6-92

IF YOU DO NOT RECEIVE ALL OF THE PAGES AND/OR ANY PROBLEMS ARISE DURING TRANSMISSION, PLEASE CONTACT US AS SOON AS POSSIBLE AT (513) 285-6357.

APPROVED TO TELECOPY:

Thomas A. Winston

THOMAS A. WINSTON

MESSAGE: Rads on A&W well

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NOV 21 1991

Ohio EPA New Well

DIVISION OF PUBLIC WATER SUPPLY

RADS, THM and SOC Sample Submission Report

Return Completed Report To:

Ohio EPA, Division of Public Drinking Water
1800 Watermark Drive
P.O. Box 1049
Columbus, Ohio 43266-0149

Laboratory Name: ODH [redacted]

Certification Number: (47) 1 2 3 0 5 (51)

Sample Number: (52) 1 6 5 7 2 (61)

Analyst: [illegible]

Date Received: 9/30/91 Date Reported: (27) Month Day Year 1 1 0 7 9 1 (32)

Sample Identification DISTRICT RESPONSE REQUIRED

PWS ID: (1) [illegible] (7)

Water Supply Name: [illegible]

Address: [illegible]

City & Zip: [illegible]

County: [illegible] **Phone:** [illegible]

Sample Date Month Day Year [illegible] (36) (41)

Time (Use Military Time) Hour Minute [illegible] (43) (46)

Sample Collected By: [illegible]

Sample/Well Location: [illegible]

Additional Information—Analyst Remarks—Non Routine Analytical Requests

Field Treatment: ☐ Iced ☐ NaOH ☐ HNO_3 ☐ $Na_2O_3S_2$ ☐ $CuSO_4 + H_3PO_4$ ☐ H_2SO_4 ☐ Other (Explain) [illegible]

☐ Sample Type (Raw-R, Plant-P, Dist-D)		R	☐ PCB	2383.	
☐ Sample Type (Check-C, Special-S)			☐ Pentachlorophenol	2326.	
☐ Well Identification			☐ Toxaphene	2020.	
RADIO ISOTOPES (RADS) pc/l			☐ 2,4-D	2105.	
☒ Alpha, Total	<3.0	4000. <3.0	☐ 2,4,5-TP (Silvex)	2110.	
☐ Alpha, Diss		4040.	☐ Acrolein	2238.	
☐ Alpha, Suspd		4041.	☐ Acrylonitrile	2240.	
☒ Beta, Total	<4.0	4100. <4.0	☐ Adipates	2035.	
☐ Beta, Diss		4042.	☐ Cyanazine	2054.	
☐ Beta, Suspd		4043.	☐ Dalapon	2031.	
☐ Barium 140		4278.	☐ Dicamba	2440.	
☐ Cesium-134		4270.	☐ Dinoseb	2041.	
☐ Cesium-137		4276.	☐ Diquat	2032.	
☐ Iodine-131		4264.	☐ Endothall	2033.	
☐ Potassium-40		4044.	☐ Glyphosate	2034.	
☐ Radium-226		4020.	☐ Hexachlorocyclopentadiene	2042.	
☐ Radium-228		4030.	☐ PAH's	2038.	
☐ Radon-222		4004.	☐ Phthalates	2039.	
☐ Strontium-90		4174.	☐ Picloram	2040.	
☐ Strontium-89		4172.	☐ Simazine	2037.	
☐ Tritium		4102.	☐ 2,3,7,8-TCDD (Dioxin)	2063.	
☐ Combined Uranium		4006.	☐ 1,1,2-Trichloroethane	2985.	
☐ Uranium-234		4007.	☐ Trifluralin	2055.	
☐ Uranium-235		4008.	☐ Vydate	2036.	
☐ Uranium-238		4009.	☐		
TRIHALOMETHANES (THM) ug/l			☐		
☐ Chloroform		2941.	☐		
☐ Bromoform		2942.	☐		
☐ Bromodichloromethane		2943.	☐		
☐ Dibromochloromethane		2944.	☐		
SYNTHETIC ORGANIC CHEMICALS (SOC) ug/l			☐		
☐ Acrylamide		2265.	☐		
☐ Alachlor		2051.	☐		
☐ Aldicarb		2047.	☐		
☐ Aldicarb Sulfoxide		2043.	☐		
☐ Aldicarb Sulfone		2044.	☐		
☐ Atrazine		2050.	☐		
☐ Carbofuran		2046.	☐		
☐ Chlordane		2959.	☐		
☐ Endrin		2005.	☐		
☐ Epichlorohydrin		2257.	☐		
☐ Heptachlor		2065.	☐		
☐ Heptachlor Epoxide		2067.	☐		
☐ Lindane		2010.	☐		
☐ Methoxychlor		2015.	☐		
☐ Metolachlor		2045.	☐		

Distribution: (1-3) Ohio EPA, Division of Public Drinking Water (4) Owner or Purveyor of Water Supply (5) Laboratory File

EPA 5022 (Rev. 3/89)

OhioEPA
State of Ohio Environmental Protection Agency

P.O. Box 1049, 1800 WaterMark Dr.
Columbus, Ohio 43266-0149
(614) 644-3020
FAX (614) 644-2329

2733

[redacted]

George V. Voinovich
Governor

December 6, 1991

Re: Hamilton County
Albright and Wilson
Non-Transient/Non-Community Water Supply
PWS ID: 3137512

Jack Craig
DOE
FEMP
P.O. Box 398705
Cincinnati, OH 45239-8705

Dear Mr. Craig:

~~This letter is in reference to~~ the September 24, 1991 ~~samples collected~~ from the proposed drinking water well and submitted to the Ohio Department of Health Laboratory (ODH Lab.) for volatile organic chemical (VOC) analyses. The results are enclosed for your review.

On July 8, 1987 the United States Environmental Protection Agency in the Federal Register, Volume 52, Number 130, promulgated regulations pertaining to the presence of volatile organic chemicals (VOCs) in drinking water. The regulations include maximum contaminant levels (MCL) for 8 VOCs and monitoring requirements for these 8 regulated VOCs and 51 unregulated VOCs. Results of the VOC analyses indicate compliance with current state and federal drinking water standards.

This letter does not grant approval for the use of this well as a drinking water well. Further information concerning approval of this well will be forthcoming from our district office.

If you have any questions, please contact me at (614) 644-2752.

Respectfully,

Tonya Selby Rees

Tonya Selby Rees
Enforcement and Water Quality Section
Division of Public Drinking Water

TSR/clk
56

Attachment: ODH Lab. sample no. T5407

cc: SWDO, DPDW

Date Rec'd DEC 13 1991
Log E-0995
File
Library [redacted]

Printed on recycled paper

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DIVISION OF PUBLIC DRINKING WATER

VOC Sample Submission Report

Return Completed Report To:

Ohio EPA, Division of Public Drinking Water
1800 WaterMark Dr.
P.O. Box 1049
Columbus, Ohio 43266-0149

Laboratory Name: ODI 2733 [redacted]

Certification Number: (47) 1 2 3 4 5 (51)

Sample Number: (52) T 5 4 0 7 (61)

Analyst: E. Stafford

Date Received: 9/30/91 Date Reported: (27) 1 0 0 2 9 1 (32) (Month Day Year)

Sample Identification

New Well

PWS ID: (1) 3 1 3 7 5 1 2 (7)

Water Supply Name: Albright & Wilson

Address: Hebble Run Road

City & Zip:

County: Hamilton Phone: ( )

Sample Date (Month Day Year): 0 9 2 4 9 1 (36) (41)

Time (Hour Minute): 0 8 0 5 (43) (46)

Sample Collected By: Kurt Nesser

Sample Location: Hebble Cross & Miller

Additional Information — Analyst Remarks — Non Routine Analytical Requests

☐ $CuSO_4 + H_3PO_4$ ☐ Iced ☐ H_2SO_4 ☐ NaOH ☐ HNO_3 ☐ $Na_2O_3S_2$ Date: Sept. 91

☒ Other (Explain)

☐ Sample Type (Raw-R, Plant-P, Dist-D)		☐ Chloroethane, Total ug/l	2216. <0.5
~~☐ Sample Type (Check-C, Special-S)~~		☐ 1,3-Dichloropropene, Total ug/l	2413. <0.5
☐ Well Identification		☐ Hexachlorobutadiene, Total ug/l	2246. <0.5
☐ Trichloroethylene, Total ug/l	2984. <0.5	☐ Naphthalene, Total ug/l	2248. <0.5
☐ Benzene, Total ug/l	2990. <0.5	☐ tert-Butylbenzene, Total ug/l	2426. <0.5
☐ Carbon Tetrachloride, Total ug/l	2982. <0.5	☐ p-Isopropyltoluene, Total ug/l	2030. <0.5
☐ 1,2-Dichloroethane, Total ug/l	2980. <0.5	☐ Dichloromethane, Total ug/l	2964. <0.5
☐ Vinyl Chloride, Total ug/l	2976. <0.5	☐ Fluorotrichloromethane, Total ug/l	2218. <0.5
☐ 1,1-Dichloroethylene, Total ug/l	2977. <0.5	☐ sec-Butylbenzene, Total ug/l	2428. <0.5
☐ 1,1,1-Trichloroethane, Total ug/l	2981. <0.5	☐ 1,1-Dichloroethane, Total ug/l	2978. <0.5
☐ p-Dichlorobenzene, Total ug/l	2969. <0.5	☐ Ethylbenzene, Total ug/l	2992. <0.5
☐ CIS-1,2-Dichloroethylene, Total ug/l	2380. <0.5	☐ Bromobenzene, Total ug/l	2993. <0.5
☐ Tetrachloroethylene, Total ug/l	2987. <0.5	☐ Isopropylbenzene, Total ug/l	2994. <0.5
~~☐ o-Dichlorobenzene, Total ug/l~~	2968. <0.5	☐ m-Xylene, Total ug/l	2995. <0.5
☐ 1,2-Dibromo-3-Chloropropane, Total ug/l	2931. <0.5	☐ o-Xylene, Total ug/l	2997. <0.5
☐ TRANS-1,2-Dichloroethylene, Total ug/l	2979. <0.5	☐ p-Xylene, Total ug/l	2962. <0.5
☐ Monochlorobenzene, Total ug/l	2989. <0.5	☐ n-Propylbenzene, Total ug/l	2998. <0.5
☐ 1,2-Dibromoethane (EDB), Total ug/l	2946. <0.5	☐ o-Chlorotoluene, Total ug/l	2965. <0.5
☐ Styrene, Total ug/l	2996. <0.5	☐ p-Chlorotoluene, Total ug/l	2966. <0.5
☐ Toluene, Total ug/l	2991. <0.5	☐ m-Dichlorobenzene, Total ug/l	2967. <0.5
☐ Total Xylene, Total ug/l	2955. <0.5	☐ 1,2,3-Trichlorobenzene, Total ug/l	2420. <0.5
☐ Chloroform, Total ug/l	2941. <0.5	☐ 1,2,4-Trimethylbenzene, Total ug/l	2418. <0.5
☐ Bromoform, Total ug/l	2942. <0.5	☐ n-Butylbenzene, Total ug/l	2422. <0.5
☐ Bromodichloromethane, Total ug/l	2943. <0.5	☐ 1,3,5-Trimethylbenzene, Total ug/l	2424. <0.5
☐ Dibromochloromethane, Total ug/l	2944. <0.5	☐ 1,2,4-Trichlorobenzene, Total ug/l	2378. <0.5
☐ 2,2-Dichloropropane, Total ug/l	2416. <0.5		
☐ Dichlorodifluoromethane, Total ug/l	2212. <0.5	Residual Chlorine Negative	
☐ Dibromomethane, Total ug/l	2408. <0.5		
☐ 1,3-Dichloropropane, Total ug/l	2412. <0.5		
☐ Chloromethane, Total ug/l	2210. <0.5		
☐ Bromomethane, Total ug/l	2214. <0.5		
☐ Bromochloromethane, Total ug/l	2430. <0.5		
☐ 1,2,3-Trichloropropane, Total ug/l	2414. <0.5		
☐ 1,2-Dichloropropane, Total ug/l	2983. <0.5		
☐ 1,1,2-Trichloroethane, Total ug/l	2985. <0.5		
☐ 1,1,1,2-Tetrachloroethane, Total ug/l	2986. <0.5		
☐ 1,1,2,2-Tetrachloroethane, Total ug/l	2988. <0.5		
☐ 1,1-Dichloropropene, Total ug/l	2410. <0.5		

Distribution: (1-3) Ohio EPA, Division of Public Drinking Water (4) Owner or Purveyor of Water Supply (5) Laboratory File

EPA 5019 (Rev. 8/90)

125 [redacted]

ALTERNATE WATER SUPPLY SYSTEM

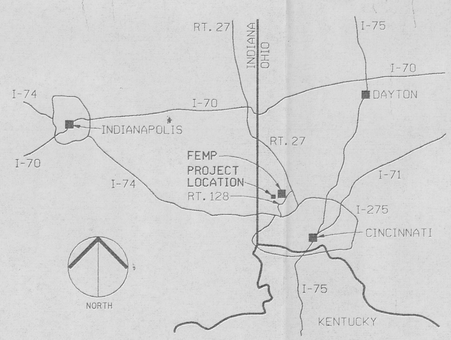
(WBS 1.1.2.4.04.01)

ENVIRONMENTAL, HEALTH & SAFETY IMPROVEMENTS, PHASE IV
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
FERNALD, OHIO

UNITED STATES DEPARTMENT OF ENERGY

DRAWING INDEX

FEMP DRAWING NO.	A.M.K. SHEET NO.	REV.	DATE	TITLE
18A-4445-X-01134	X-1	0	11-1-91	COVER SHEET
18A-4445-C-01135	AC-1	0	11-1-91	ROUTING LOCATION PLAN
18A-4445-C-01136	AC-2	0	11-1-91	SITE PLAN & PROFILE-SHEET 1 OF 4
18A-4445-C-01137	AC-3	0	11-1-91	SITE PLAN & PROFILE-SHEET 2 OF 4
18A-4445-C-01138	AC-4	0	11-1-91	SITE PLAN & PROFILE-SHEET 3 OF 4
18A-4445-C-01139	AC-5	0	11-1-91	SITE PLAN & PROFILE-SHEET 4 OF 4
18A-4445-C-01140	AC-6	0	11-1-91	SITE PLAN
18A-4445-C-01141	AC-7	0	11-1-91	SITE DETAILS & SECTIONS
18A-4445-P-01142	AP-1	0	11-1-91	PIPING DETAILS
18A-4445-P-01143	AP-2	0	11-1-91	NEW 4" ABOVEGROUND PIPE ROUTING
18A-4445-E-01144	AE-1	0	11-1-91	ELECTRICAL PLAN - POWER & CONTROL
18A-4445-E-01145	AE-2	0	11-1-91	ELECTRICAL SITE PLAN & DETAILS - WELL PUMP AREA
18A-4445-E-01146	AE-3	0	11-1-91	ELECTRICAL PLANS & DETAILS - WELL PUMP AREA



VICINITY MAP
SCALE:NONE

01 11 92 1360

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	OPERATOR	DOE
0	CFC	FWB 11-1-91		

INITIALS AND DATE

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
A. M. KINNEY, INC.
CONSULTING ENGINEERS
CINCINNATI, OHIO

WEMCO SUBCONTRACT NO. N-77207 — A-E PROJECT NO. 02962

PROJECT NAME: ENVIRONMENTAL, HEALTH & SAFETY IMPROVEMENTS

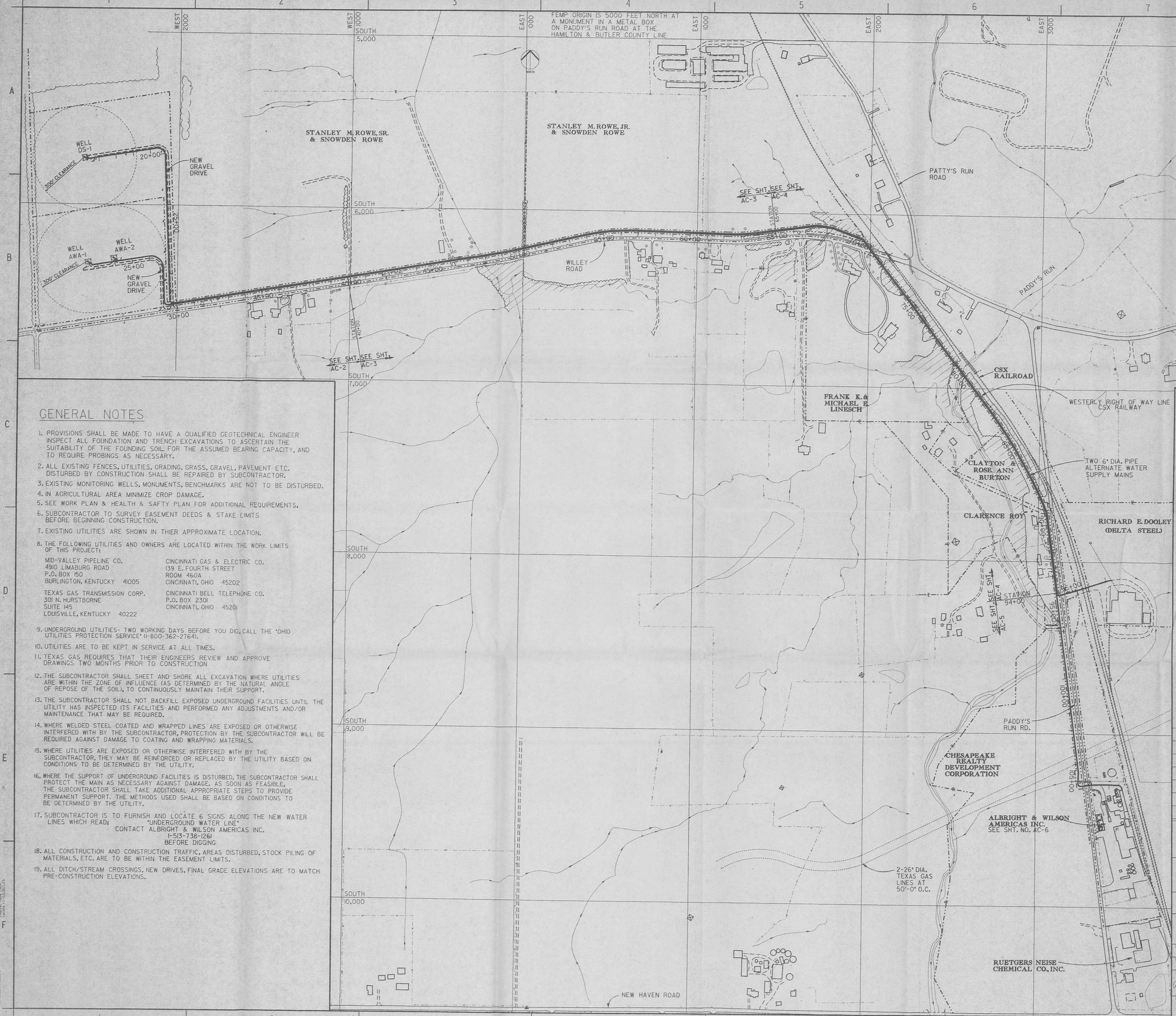
DRAWING TITLE: ALTERNATE WATER SUPPLY SYSTEM COVER SHEET

DRAWN BY	DATE	DESIGNED, CHECKED BY	DATE	CHECKED BY	DATE
TPO	11-90	FWB	11-90	FWB	10-18-91

PLANT/BLDG. NO.	FLOOR	SCALE	CLASS
FEMP		NONE	

SUBMITTED FOR APPROVAL	APPROVAL RECOMMENDED	DRAWING APPROVED
A.W. Sherman 11-1-91		12/16/91
A-E DATE	OPERATING CONTRACTOR DATE	DOE DATE

DOE PROJECT NO.	OPER./CONTR. DRAWING NO.	DRAWING NO.	AMK SHEET NO.	REV. NO.
87-D-159	0087502 WBS 1.1.2.4.04.01	18A-4445-X-01134	X-1	0



GENERAL NOTES

1. PROVISIONS SHALL BE MADE TO HAVE A QUALIFIED GEOTECHNICAL ENGINEER INSPECT ALL FOUNDATION AND TRENCH EXCAVATIONS TO ASCERTAIN THE SUITABILITY OF THE FOUNDING SOIL FOR THE ASSUMED BEARING CAPACITY, AND TO REQUIRE PROBINGS AS NECESSARY.
2. ALL EXISTING FENCES, UTILITIES, GRADING, GRASS, GRAVEL, PAVEMENT ETC. DISTURBED BY CONSTRUCTION SHALL BE REPAIRED BY SUBCONTRACTOR.
3. EXISTING MONITORING WELLS, MONUMENTS, BENCHMARKS ARE NOT TO BE DISTURBED.
4. IN AGRICULTURAL AREA MINIMIZE CROP DAMAGE.
5. SEE WORK PLAN & HEALTH & SAFTY PLAN FOR ADDITIONAL REQUIREMENTS.
6. SUBCONTRACTOR TO SURVEY EASEMENT DEEDS & STAKE LIMITS BEFORE BEGINNING CONSTRUCTION.
7. EXISTING UTILITIES ARE SHOWN IN THIER APPROXIMATE LOCATION.
8. THE FOLLOWING UTILITIES AND OWNERS ARE LOCATED WITHIN THE WORK LIMITS OF THIS PROJECT:

MID-VALLEY PIPELINE CO. 4910 LIMABURG ROAD P.O. BOX 150 BURLINGTON, KENTUCKY 41005	CINCINNATI GAS & ELECTRIC CO. 139 E. FOURTH STREET ROOM 460A CINCINNATI, OHIO 45202
TEXAS GAS TRANSMISSION CORP. 301 N. HURSTBORNE SUITE 145 LOUISVILLE, KENTUCKY 40222	CINCINNATI BELL TELEPHONE CO. P.O. BOX 2301 CINCINNATI, OHIO 45201

9. UNDERGROUND UTILITIES- TWO WORKING DAYS BEFORE YOU DIG, CALL THE 'OHIO UTILITIES PROTECTION SERVICE' (1-800-362-2764).
10. UTILITIES ARE TO BE KEPT IN SERVICE AT ALL TIMES.
11. TEXAS GAS REQUIRES THAT THEIR ENGINEERS REVIEW AND APPROVE DRAWINGS TWO MONTHS PRIOR TO CONSTRUCTION
12. THE SUBCONTRACTOR SHALL SHEET AND SHORE ALL EXCAVATION WHERE UTILITIES ARE WITHIN THE ZONE OF INFLUENCE (AS DETERMINED BY THE NATURAL ANGLE OF REPOSE OF THE SOIL), TO CONTINUOUSLY MAINTAIN THEIR SUPPORT.
13. THE SUBCONTRACTOR SHALL NOT BACKFILL EXPOSED UNDERGROUND FACILITIES UNTIL THE UTILITY HAS INSPECTED ITS FACILITIES AND PERFORMED ANY ADJUSTMENTS AND/OR MAINTENANCE THAT MAY BE REQUIRED.
14. WHERE WELDED STEEL COATED AND WRAPPED LINES ARE EXPOSED OR OTHERWISE INTERFERED WITH BY THE SUBCONTRACTOR, PROTECTION BY THE SUBCONTRACTOR WILL BE REQUIRED AGAINST DAMAGE TO COATING AND WRAPPING MATERIALS.
15. WHERE UTILITIES ARE EXPOSED OR OTHERWISE INTERFERED WITH BY THE SUBCONTRACTOR, THEY MAY BE REINFORCED OR REPLACED BY THE UTILITY BASED ON CONDITIONS TO BE DETERMINED BY THE UTILITY.
16. WHERE THE SUPPORT OF UNDERGROUND FACILITIES IS DISTURBED, THE SUBCONTRACTOR SHALL PROTECT THE MAIN AS NECESSARY AGAINST DAMAGE. AS SOON AS FEASIBLE, THE SUBCONTRACTOR SHALL TAKE ADDITIONAL APPROPRIATE STEPS TO PROVIDE PERMANENT SUPPORT. THE METHODS USED SHALL BE BASED ON CONDITIONS TO BE DETERMINED BY THE UTILITY.
17. SUBCONTRACTOR IS TO FURNISH AND LOCATE 6 SIGNS ALONG THE NEW WATER LINES WHICH READ;
    'UNDERGROUND WATER LINE'
    CONTACT ALBRIGHT & WILSON AMERICAS INC.
    1-513-738-1261
    BEFORE DIGGING
18. ALL CONSTRUCTION AND CONSTRUCTION TRAFFIC, AREAS DISTURBED, STOCK PILING OF MATERIALS, ETC. ARE TO BE WITHIN THE EASEMENT LIMITS.
19. ALL DITCH/STREAM CROSSINGS, NEW DRIVES, FINAL GRADE ELEVATIONS ARE TO MATCH PRE-CONSTRUCTION ELEVATIONS.

STATIONING FOLLOWS AWA LINE FROM STATION 30+00 TO 94+00.

LEGEND

- AWA ALBRIGHT & WILSON AMERICAS
- DS DELTA STEEL
- FENCE
- EASEMENT LINE
- PROPERTY LINE
- PROPERTY OWNER
- NEW WATER MAIN
- CONCRETE PIPE ENCASEMENT
- EXIST. CONTOUR LINES
- OVERHEAD LINES
- UNDERGROUND LINE
- FEMP GRID
- CURVE NO.
- HIGH TENSION TOWERS
- CULVERT
- PAVED ROAD
- GRAVEL ROAD/DRIVE
- HIGH TENSION TOWERS
- BUILDINGS
- TREE
- BUSHES
- CREEKS AND DITCHES
- TREE LINE
- MONITORING WELL
- UNDERGROUND LINE MARKER
- POWER POLE
- TELEPHONE POLE
- SIGN
- MAILBOX
- RAILROAD TRACK

TOPO BY WESTON MAY, 1986 AND A.M.KINNEY INC. JULY 2, 1991

0 100 200 400 600 800 1000

SCALE : 1" = 200'

TO CORRELATE REFERENCED ' AMK SHEET No's ' TO FEMP DRAWING NUMBERS, SEE FEMP DRAWING No.: 18A-4445-X-01134

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	INITIALS AND DATE
0	CFC	RPD 11-1-91	12/6/91

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
A. M. KINNEY, INC.
CONSULTING ENGINEERS
CINCINNATI, OHIO

WEMCO SUBCONTRACT NO. N-77207 — A-E PROJECT NO. 02992

PROJECT NAME
ENVIRONMENTAL, HEALTH & SAFETY IMPROVEMENTS

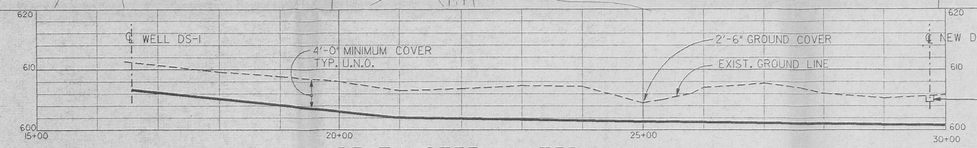
DRAWING TITLE
ALTERNATE WATER SUPPLY SYSTEM
ROUTING LOCATION PLAN

DRAWN BY	DATE	DESIGNED, CHECKED BY	DATE	CHECKED BY	DATE
JTS	8-90	LMS	8-6-91	RPD	10-18-91

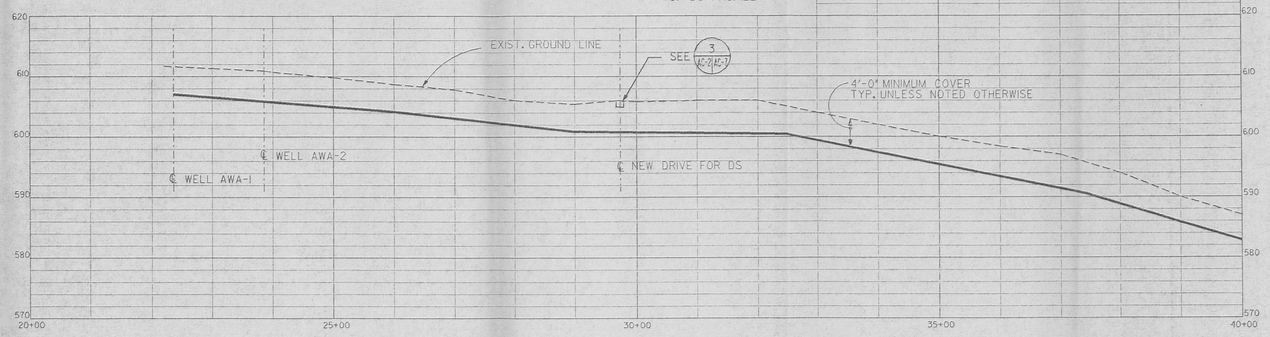
PLANT/BLDG. NO.	FLOOR	SCALE	CLASS
		AS SHOWN	

SUBMITTED FOR APPROVAL: A.M. Kinney 11-1-91 (A-E DATE)
APPROVAL RECOMMENDED: (OPERATING CONTRACTOR) 12/6/91 (DATE)
DRAWING APPROVED: (DOE) 12/6/91 (DATE)

DOE PROJECT NO.	OPERATIONS PROJ. NO.	DRAWING NO.	SHEET NO.	REV. NO.
87-D-159	0087502 WBS1.1.2.4.04.01	18A-4445-C-01135	AC-1	0



DELTA STEEL WATER MAIN

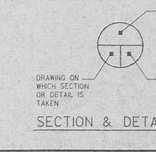


AWA WATER MAIN

PIPING HORIZONTAL CURVE DATA

CURVE NO.	P.I. STA.	RADIUS
1	20+87.9	44.00'
2	29+73.1	20.00'
3	26+79.9	68.00'
4	29+40.2	20.00'

UNLESS OTHERWISE NOTED, A MINIMUM OF 20 FT. RADIUS IS TO BE USED FOR BOTH HORIZONTAL & VERTICAL BENDS IN THE WATER MAINS.



SECTION & DETAIL KEY

LEGEND

- AWA ALBRIGHT & WILSON AMERICAS
- DS DELTA STEEL
- FENCE
- EASEMENT LINE
- PROPERTY LINE
- PROPERTY OWNER
- NEW WATER MAIN
- CONCRETE PIPE ENCASEMENT
- EXIST. CONTOUR LINES
- OVERHEAD LINES
- UNDERGROUND LINE
- FEMP GRID
- CURVE NO.
- HIGH TENSION TOWERS
- CULVERT
- PAVED ROAD
- GRAVEL ROAD/DRIVE
- HIGH TENSION TOWERS
- BUILDINGS
- TREE
- BUSHES
- CREEKS AND DITCHES
- TREE LINE
- MONITORING WELL
- UNDERGROUND LINE MARKER
- POWER POLE
- TELEPHONE POLE
- SIGN
- MAILBOX
- HAMILTON CO. BENCH MARK

TOPO BY WESTON MAY 3, 1986 AND A.M.KINNEY INC. JULY 2, 1991

STATIONING FOLLOWS AWA LINE FROM 30+00 TO 94+00.

01 11 92 1360

NORTH

0 10' 20' 40' 60'

VERTICAL SCALE: 1"=10'

0 50' 100' 200' 300' 400' 500'

HORIZONTAL AND PLAN SCALE : 1" = 100'

TO CORRELATE REFERENCED 'AMK SHEET No's 'TO FEMP DRAWING NUMBERS, SEE FEMP DRAWING No.: 18A-4445-X-01134

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	OPERATOR	DOE
0	CFC	RPD 11-1-91	12/16/91	12/16/91

INITIALS AND DATE

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
A. M. KINNEY, INC.
CONSULTING ENGINEERS
CINCINNATI, OHIO

WEMCO SUBCONTRACT NO. N-72207 A-E PROJECT NO. 02302

PROJECT NAME
ENVIRONMENTAL, HEALTH & SAFETY IMPROVEMENTS

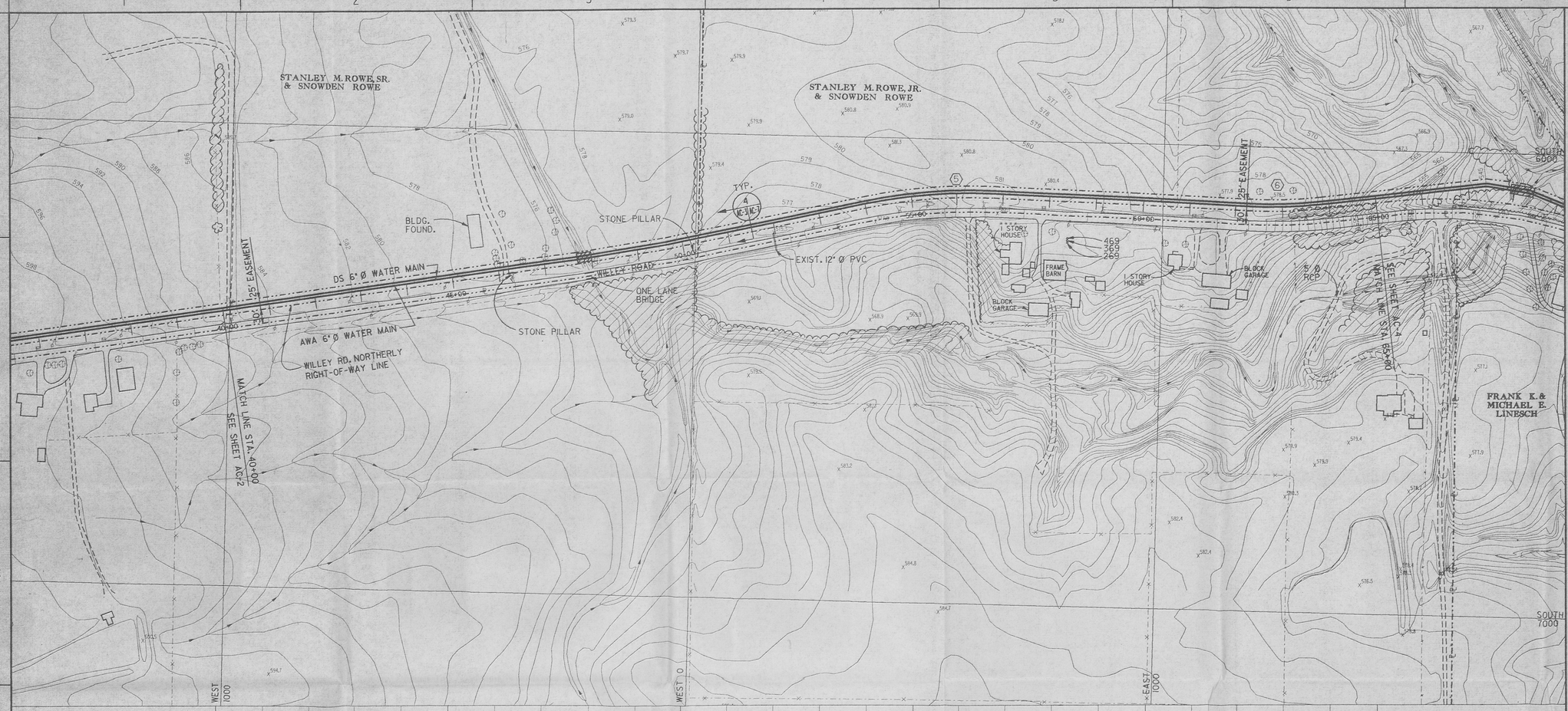
DRAWING TITLE
ALTERNATE WATER SUPPLY SYSTEM
SITE PLAN & PROFILE
SHEET 1 OF 4

DRAWN BY	DATE	DESIGNED, CHECKED BY	DATE	CHECKED BY	DATE
SPF	11-6-90	LMS	8-6-91	RPD	10-18-91

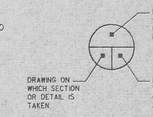
PLANT/BLDG. NO. FLOOR SCALE AS SHOWN CLASS

SUBMITTED FOR APPROVAL: A.W. Plummer 11-1-91 (A-E, DATE)
APPROVAL RECOMMENDED: 12/16/91 (OPERATING CONTRACTOR, DATE)
APPROVED: 12/16/91 (DOE, DATE)

DOE PROJECT NO.	OPER. CONTR. PROJ. NO.	DRAWING NO.	DWG. SHEET NO.	REV. NO.
87-D-159	0087502 WBS 1.1.2.4.04.01	18A-4445-C-01136	AC-2	0



AWA WATER MAIN
(DS MAIN SIMILAR)



SECTION & DETAIL KEY

LEGEND

- AWA ALBRIGHT & WILSON AMERICAS
- DS DELTA STEEL
- FENCE
- EASEMENT LINE
- PROPERTY LINE
- PROPERTY OWNER
- NEW WATER MAIN
- CONCRETE PIPE ENCASEMENT
- EXIST. CONTOUR LINES
- OVERHEAD LINES
- UNDERGROUND LINE
- FEMP GRID
- CURVE NO.
- HIGH TENSION TOWERS
- CULVERT
- PAVED ROAD
- GRAVEL ROAD/DRIVE
- HIGH TENSION TOWERS
- BUILDINGS
- TREE
- BUSHES
- CREEKS AND DITCHES
- TREE LINE
- MONITORING WELL
- UNDERGROUND LINE MARKER
- POWER POLE
- TELEPHONE POLE
- SIGN
- MAILBOX
- RAILROAD TRACK

TOPO BY WESTON MAY 3, 1986

STATIONING FOLLOWS AWA LINE FROM STATION 30+00 TO 94+00.

PIPING HORIZONTAL CURVE DATA

CURVE NO.	P.I. STA.	RADIUS
5	55+40.2	1114.50'
6	63+03.4	960.50'

UNLESS OTHERWISE NOTED, A MINIMUM OF 20 FT. RADIUS IS TO BE USED FOR BOTH HORIZONTAL & VERTICAL BENDS IN THE WATER MAINS.

NORTH

01 11 92 1360

0 10 20 40 60

VERTICAL SCALE : 1" = 10'

0 50 100 200 300 400 500

HORIZONTAL AND PLAN SCALE : 1" = 100'

TO CORRELATE REFERENCED 'AMK SHEET No's' TO FEMP DRAWING NUMBERS, SEE FEMP DRAWING No.: 18A-4445-C-01134

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	OPERATOR	DOE
0	CFC	RPD 11-1-91		

INITIALS AND DATE

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
A. M. KINNEY, INC.
CONSULTING ENGINEERS
CINCINNATI, OHIO

WEMCO SUBCONTRACT NO. N-77207 — A-E PROJECT NO. 02902

PROJECT NAME: ENVIRONMENTAL, HEALTH & SAFETY IMPROVEMENTS

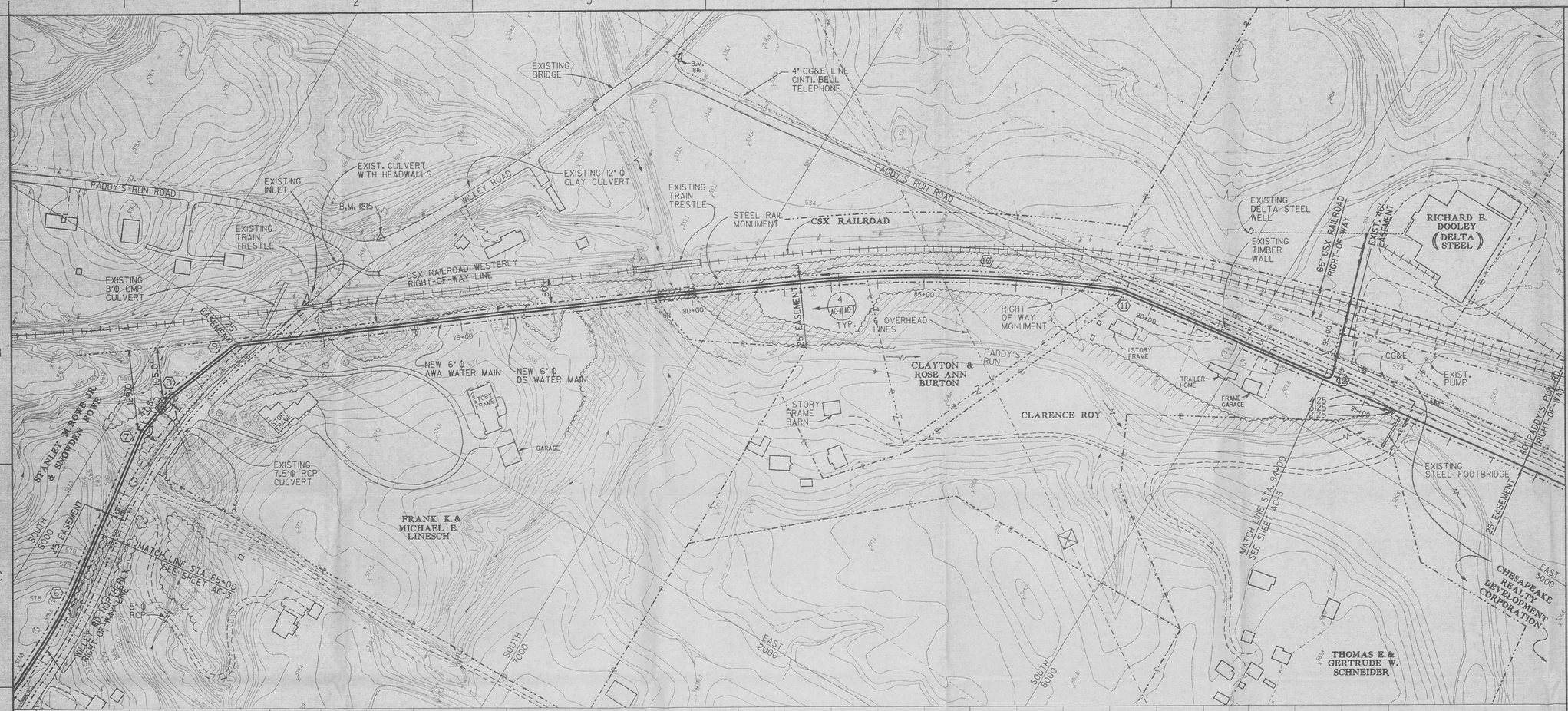
DRAWING TITLE: ALTERNATE WATER SUPPLY SYSTEM SITE PLAN & PROFILE SHEET 2 OF 4

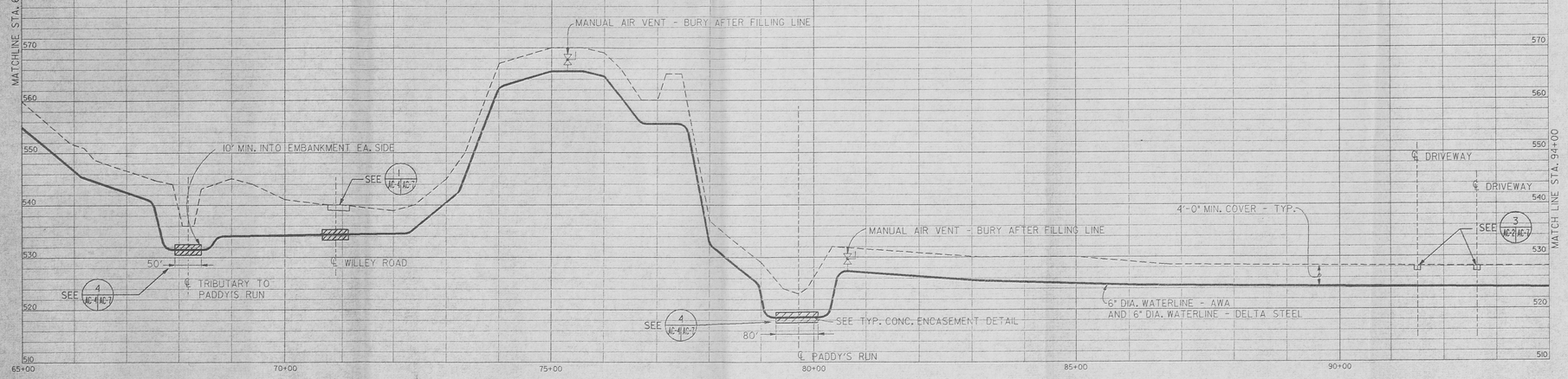
DRAWN BY	DATE	DESIGNED, CHECKED BY	DATE	CHECKED BY	DATE
JAM	11-6-90	LMS	8-6-91	RPD	10-18-91

PLANT/BLDG. NO. — FLOOR — SCALE: AS SHOWN — CLASS

SUBMITTED FOR APPROVAL: A.W. Sprouman 11-1-91 (A-E DATE) — APPROVAL RECOMMENDED: (OPERATING CONTRACTOR) 12/16/91 (DATE) — DRAWING APPROVED: (DOE) 12/16/91 (DATE)

DOE PROJECT NO.	OPER. CONTR. PROJ. NO.	DRAWING NO.	AMK SHEET NO.	REV. NO.
87-D-159	0087502 WBS 1.1.2.4.04.01	18A-4445-C-01137	AC-3	0





AWA WATER MAIN
(DS MAIN SIMILAR)

LEGEND

- AWA ALBRIGHT & WILSON AMERICAS
- DS DELTA STEEL
- FENCE
- EASEMENT LINE
- PROPERTY LINE
- PROPERTY OWNER
- NEW WATER MAIN
- CONCRETE PIPE ENCASEMENT
- EXIST. CONTOUR LINES
- OVERHEAD LINES
- UNDERGROUND LINE
- FEMP GRID
- CURVE NO.
- HIGH TENSION TOWERS
- CULVERT
- PAVED ROAD
- GRAVEL ROAD/DRIVE
- HIGH TENSION TOWERS
- BUILDINGS
- TREE
- BUSHES
- CREEKS AND DITCHES
- TREE LINE
- MONITORING WELL
- UNDERGROUND LINE MARKER
- POWER POLE
- TELEPHONE POLE
- SIGN
- MAILBOX
- RAILROAD TRACK

TOPO BY WESTON MAY 3, 1986

STATIONING FOLLOWS AWA LINE FROM STATION 30+00 TO 94+00.

PIPING HORIZONTAL CURVE DATA

CURVE NO.	P.I. STA.	RADIUS
7	67+39.5	20.00'
8	68+34.9	20.00'
9	70+14.6	20.00'
10	85+70.3	2934.50.00'
11	89+29.1	20.00'

UNLESS OTHERWISE NOTED, A MINIMUM OF 20 FT. RADIUS IS TO BE USED FOR BOTH HORIZONTAL & VERTICAL BENDS IN THE WATER MAINS.

NORTH

01 11 92 1360

0 10 20 40 60

VERTICAL SCALE : 1" = 10'

0 50 100 200 300 400 500

HORIZONTAL AND PLAN SCALE : 1" = 100'

TO CORRELATE REFERENCED ' AMK SHEET No's ' TO FEMP DRAWING NUMBERS, SEE FEMP DRAWING No.: 18A-4445-X-01134

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	OPERATOR	DOE
0	CFC	RPD 9-1-91		

INITIALS AND DATE

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
A. M. KINNEY, INC.
CONSULTING ENGINEERS
CINCINNATI, OHIO

WEMCO SUBCONTRACT NO. N-77207 A-E PROJECT NO. 02902

PROJECT NAME
ENVIRONMENTAL, HEALTH & SAFETY IMPROVEMENTS

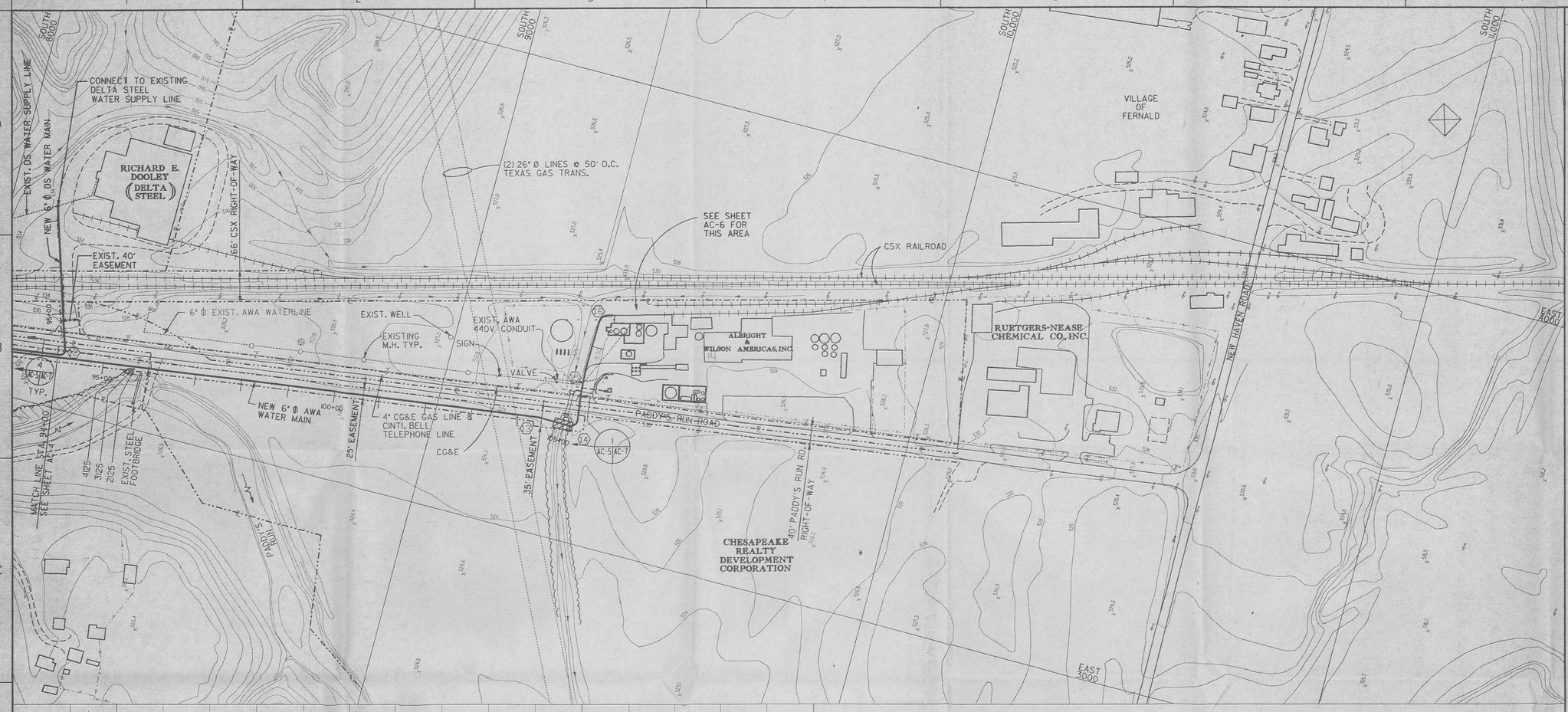
DRAWING TITLE
ALTERNATE WATER SUPPLY SYSTEM
SITE PLAN & PROFILE
SHEET 3 OF 4

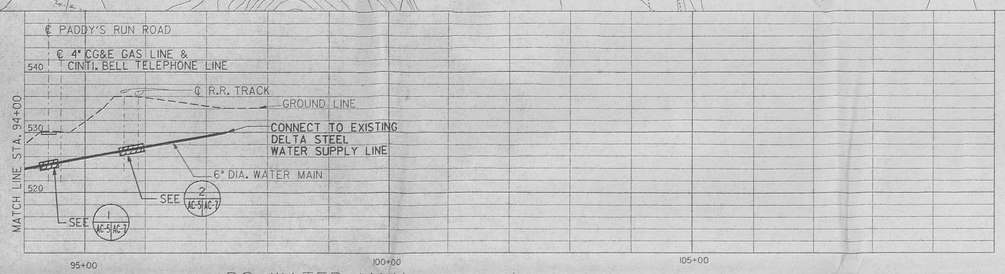
DRAWN BY	DATE	DESIGNED PREPARED BY	DATE	CHECKED BY	DATE
JAM	11-6-90	LMS	8-6-91	RPD	10-18-91

PLANT/BLDG. NO.	FLOOR	SCALE	GLASS
		1" = 100'	

SUBMITTED FOR APPROVAL: A-E DATE 11-1-91
ACCEPTED AND APPROVED: OPERATING CONTRACTOR DATE 12/16/91
DRAWING APPROVED: DOE DATE 12/16/91

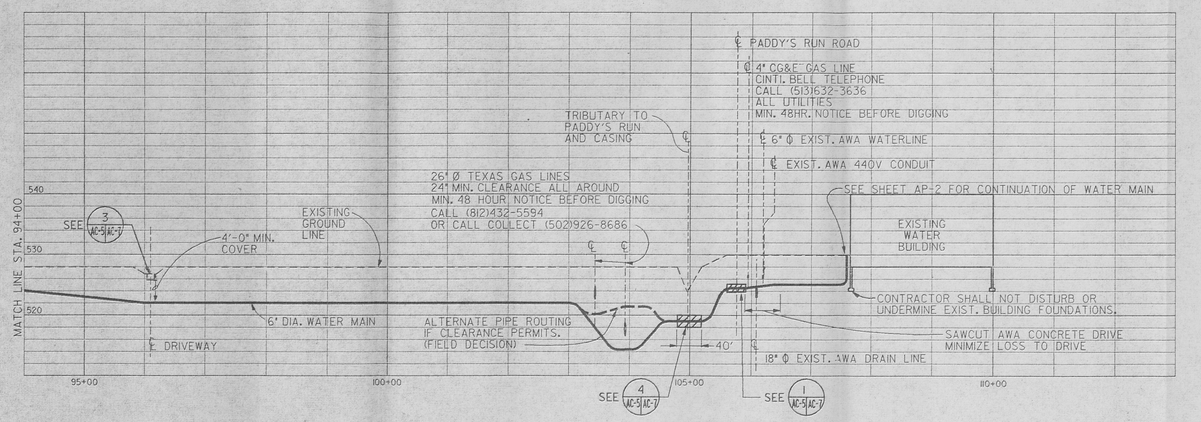
DOE PROJECT NO.	OPER. CONTR. PROJ. NO.	DRAWING NO.	AMK SHEET NO.	REV. NO.
87-D-159	0087502 WBS 1.1.2.4.04.01	18A-4445-C-01138	AC-4	0





SEE AWA PROFILE FOR CONTINUATION OF DS PROFILE

DS WATER MAIN

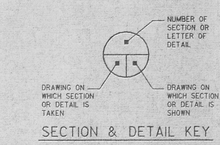


AWA WATER MAIN

PIPING HORIZONTAL CURVE DATA

CURVE NO.	P.I. STA.	RADIUS
12	94+16.4	10.00'
13	104+46.0	20.00'
14	105+29.5	15.00'
15	105+99.6	20.00'
16	107+69.2	20.00'

UNLESS OTHERWISE NOTED, A MINIMUM OF 20 FT. RADIUS IS TO BE USED FOR BOTH HORIZONTAL & VERTICAL BENDS IN THE WATER MAINS.



SECTION & DETAIL KEY

NOTES

LEGEND

- AWA ALBRIGHT & WILSON AMERICAS
- DS DELTA STEEL
- FENCE
- EASEMENT LINE
- PROPERTY LINE
- PROPERTY OWNER
- NEW WATER MAIN
- CONCRETE PIPE ENCASEMENT
- EXIST. CONTOUR LINES
- OVERHEAD LINES
- UNDERGROUND LINE
- FEMP GRID
- CURVE NO.
- HIGH TENSION TOWERS
- CULVERT
- PAVED ROAD
- GRAVEL ROAD/DRIVE
- HIGH TENSION TOWERS
- BUILDINGS
- TREE
- BUSHES
- CREEKS AND DITCHES
- TREE LINE
- MONITORING WELL
- UNDERGROUND LINE MARKER
- POWER POLE
- TELEPHONE POLE
- SIGN
- MAILBOX
- RAILROAD TRACK

TOPO BY WESTON MAY 3, 1986

STATIONING FOLLOWS AWA LINE FROM STATION 30+00 TO 94+00.

NORTH

01 11 92 1360

0 10 20 40 60

VERTICAL SCALE : 1" = 10'

0 50 100 200 300 400 500

HORIZONTAL AND PLAN SCALE : 1" = 100'

TO CORRELATE REFERENCED "AMK SHEET No's" TO FEMP DRAWING NUMBERS, SEE FEMP DRAWING No.: 18A-4445-X-01134

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	OPERATOR	DOE
0	CFC	RPD 11-1-91	12/16/91	12/16/91

INITIALS AND DATE

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
A. M. KINNEY, INC.
CONSULTING ENGINEERS
CINCINNATI, OHIO

WEMCO SUBCONTRACT NO. N-77207 — A-E PROJECT NO. 02902

PROJECT NAME: ENVIRONMENTAL, HEALTH & SAFETY IMPROVEMENTS

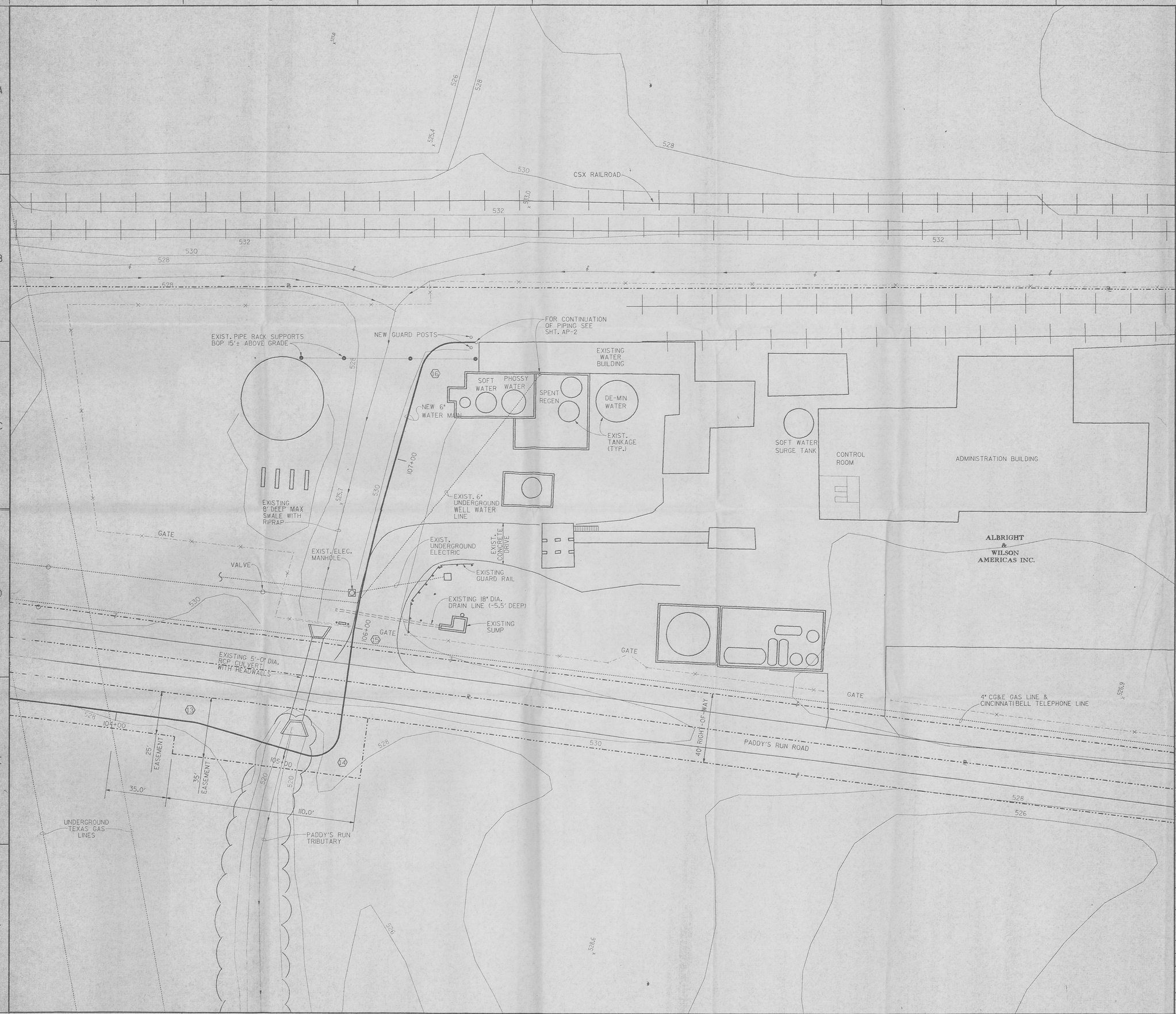
DRAWING TITLE: ALTERNATE WATER SUPPLY SYSTEM SITE PLAN & PROFILE SHEET 4 OF 4

DRAWN BY	DATE	DESIGNED, CHECKED BY	DATE	CHECKED BY	DATE
JAM	11-6-90	LMS	8-6-91	RPD	10-16-91

PLANT/BLDG. NO.: — FLOOR: — SCALE: 1" = 100' — GLASS:

SUBMITTED FOR APPROVAL: A.W. Thomas 11-1-91 (A-E, DATE) — APPROVAL RECOMMENDED: 12/16/91 (OPERATING CONTRACTOR, DATE) — DRAWING APPROVED: 12/16/91 (DOE, DATE)

DOE PROJECT NO.	OPER. CONTR. PROJ. NO.	DRAWING NO.	SHEET NO.	REV. NO.
87-D-159	0087502 WBS 1.1.2.4.04.01	18A-4445-C-01139	AC-5	0



LEGEND

- AWA ALBRIGHT & WILSON AMERICAS
- DS DELTA STEEL
- FENCE
- EASEMENT LINE
- PROPERTY LINE
- **PROPERTY OWNER**
- NEW WATER MAIN
- CONCRETE PIPE ENCASEMENT
- EXIST. CONTOUR LINES
- OVERHEAD LINES
- UNDERGROUND LINE
- FEMP GRID
- CURVE NO.
- HIGH TENSION TOWERS
- CULVERT
- PAVED ROAD
- GRAVEL ROAD/DRIVE
- HIGH TENSION TOWERS
- BUILDINGS
- TREE
- BUSHES
- CREEKS AND DITCHES
- TREE LINE
- MONITORING WELL
- UNDERGROUND LINE MARKER
- POWER POLE
- TELEPHONE POLE
- SIGN
- MAILBOX
- RAILROAD TRACK

TOPO BY WESTON MAY 3, 1986

STATIONING FOLLOWS AWA LINE FROM STATION 30+00 TO 94+00.

PIPING HORIZONTAL CURVE DATA

CURVE NO.	P.I. STA.	RADIUS
13	104+46.0	20.00'
14	105+29.5	15.00'
15	105+99.6	20.00'
16	107+69.2	20.00'

UNLESS OTHERWISE NOTED, A MINIMUM OF 20 FT. RADIUS IS TO BE USED FOR BOTH HORIZONTAL & VERTICAL BENDS IN THE WATER MAINS.

01 11 92 1360

NORTH

0 20 40 80 120

PLAN SCALE : 1" = 20'

TO CORRELATE REFERENCED "AMK SHEET No's" TO FEMP DRAWING NUMBERS, SEE FEMP DRAWING No.: 18A-4445-X-01134

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	OPERATOR	DATE
0	CFC	RPD 11-1-91		12/16/91

INITIALS AND DATE

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
A. M. KINNEY, INC.
CONSULTING ENGINEERS
CINCINNATI, OHIO

WEMCO SUBCONTRACT NO. N-77207 — A-E PROJECT NO. 02902

PROJECT NAME
ENVIRONMENTAL, HEALTH & SAFETY IMPROVEMENTS

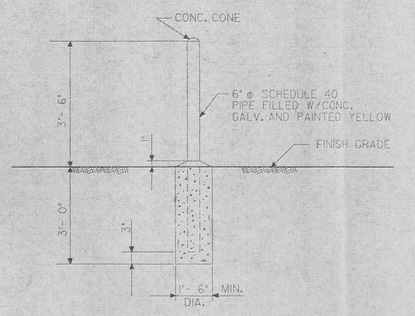
DRAWING TITLE
ALTERNATE WATER SUPPLY SYSTEM
SITE PLAN

DRAWN BY	DATE	DESIGNED, CHECKED BY	DATE	CHECKED BY	DATE
WRC	5-23-91	EBW	7-20-91	RPD	9-16-91

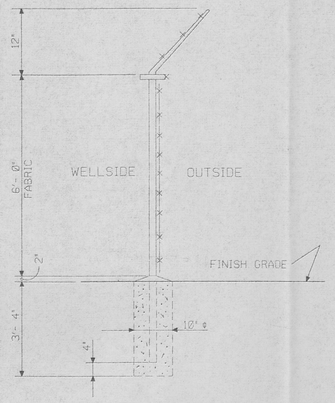
PLANT/BLDG. NO. — FLOOR — SCALE 1" = 20' — CLASS

SUBMITTED FOR APPROVAL: R. W. Sherman 11-1-91 (A-E, DATE)
APPROVAL RECOMMENDED: (OPERATING CONTRACTOR, DATE) 12/16/91
DRAWING APPROVED: (DOE, DATE) 12/16/91

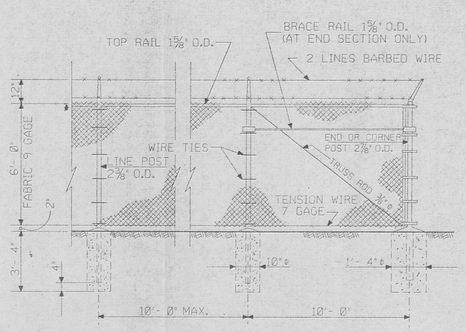
DOE PROJECT NO.	OPER. CONTR. PROJ. NO.	DRAWING NO.	AMK SHEET NO.	REV. NO.
87-D-159	0087502 WBS 1.1.2.4.04.01	18A-4445-C-01140	AC-6	0



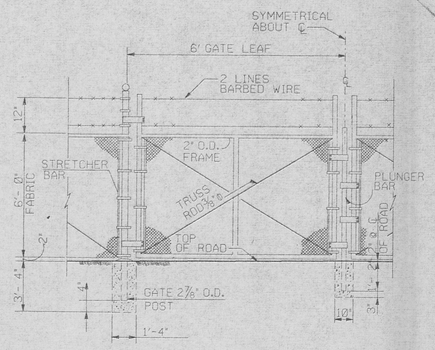
GUARD POST DETAIL
SCALE: NTS



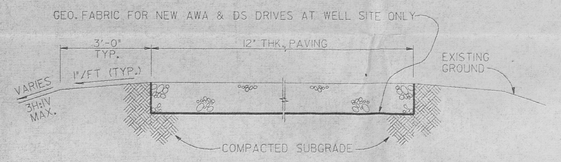
TYP. SECTION
CHAIN LINK FENCE



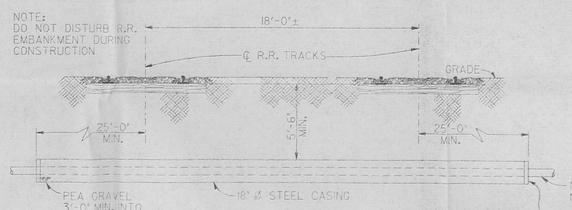
ELEVATION
CHAIN LINK FENCE



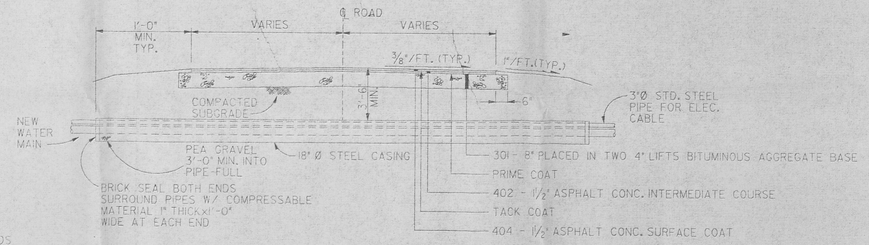
DOUBLE SWING GATE
CHAIN LINK FENCE



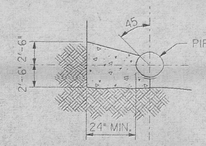
GRAVEL DRIVE (3)
NEW & REPLACEMENT
SCALE: 1/2" = 1'-0"
AC-2 AC-7



RAILROAD CROSSING (2)
SCALE: 1/4" = 1'-0"
AC-5 AC-7

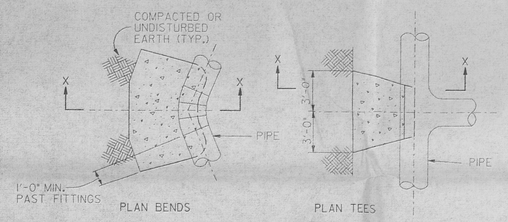


ROADWAY REPLACEMENT (1)
SCALE: 1/4" = 1'-0"
AC-5 AC-7

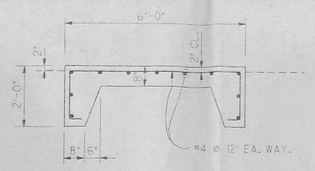


SECTION X-X
BENDS & TEES

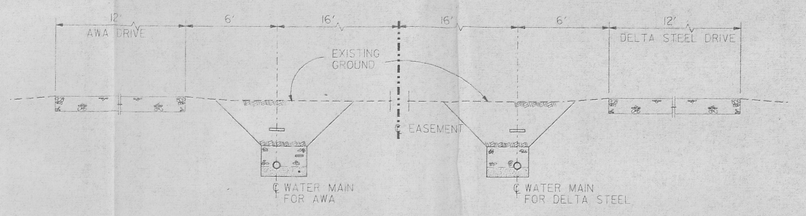
NOTE:
THRUST BLOCKS ARE REQUIRED AT ALL PIPE FITTINGS 45° OR LARGER.



THRUST BLOCKS
SCALE: NTS

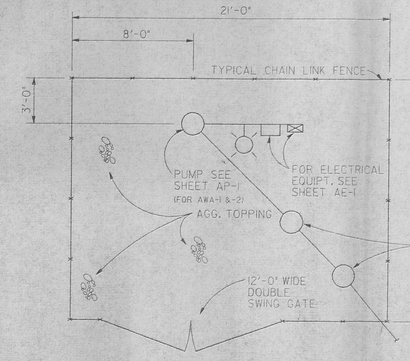


SECTION (6)
SCALE: 1/2" = 1'-0"
AC-7 AC-7

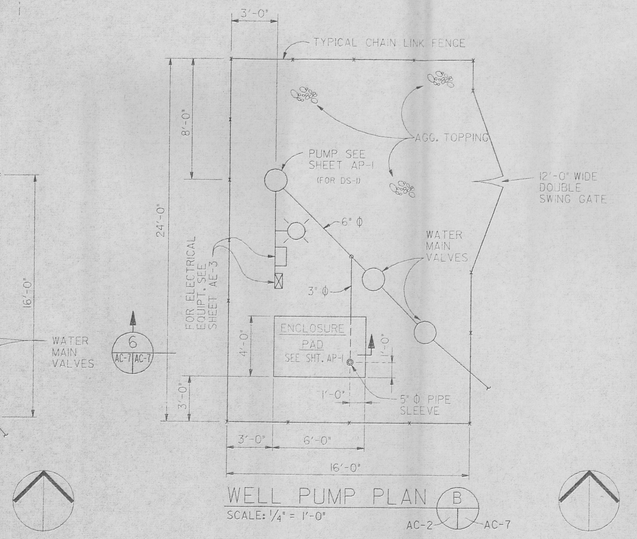


FOR ADDITIONAL INFORMATION SEE SECTIONS 3 & 4, THIS SHEET

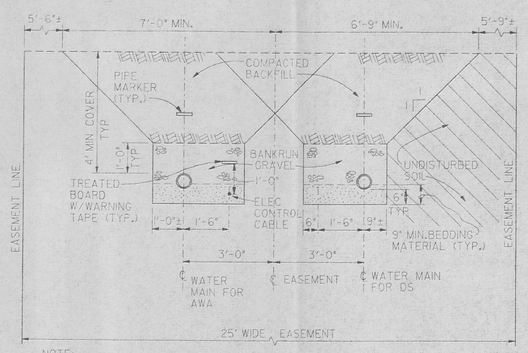
SECTION (5)
SCALE: 1/4" = 1'-0"
AC-2 AC-7



WELL PUMP PLAN (A)
SCALE: 1/4" = 1'-0"
AC-2 AC-7

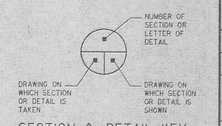


WELL PUMP PLAN (B)
SCALE: 1/4" = 1'-0"
AC-2 AC-7



NOTE:
1. AT CREEK CROSSINGS REPLACE BANKRUN GRAVEL AND BEDDING MATERIAL WITH CONCRETE. INCASE ELEC. CABLE WITH 3"Ø HDPE PIPE CONDUIT. CONDUIT MAY BE SLIT OPEN FOR EASE OF CONSTRUCTION. SURROUND LAST 12" OF HDPE PIPE W/ 1" THICK COMPRESSIBLE MATERIAL EACH END OF CONCRETE.
2. CONSTRUCTION MAY BE ONE TRENCH, AT CONTRACTORS OPTION.

PIPE BEDDING (4)
SCALE: 1/2" = 1'-0"
AC-2 AC-3 AC-4 AC-5 AC-7



SECTION & DETAIL KEY

01 11 92 1360

TO CORRELATE REFERENCED * AMK SHEET No's * TO FEMP DRAWING NUMBERS, SEE FEMP DRAWING No.: 18A-4445-X-01134

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	RPD 8-1-91
0	CFC		

INITIALS AND DATE

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
A. M. KINNEY, INC.
CONSULTING ENGINEERS
CINCINNATI, OHIO

WEMCO SUBCONTRACT NO. N-77207 — A-E PROJECT NO. 92902

PROJECT NAME: ENVIRONMENTAL, HEALTH & SAFETY IMPROVEMENTS

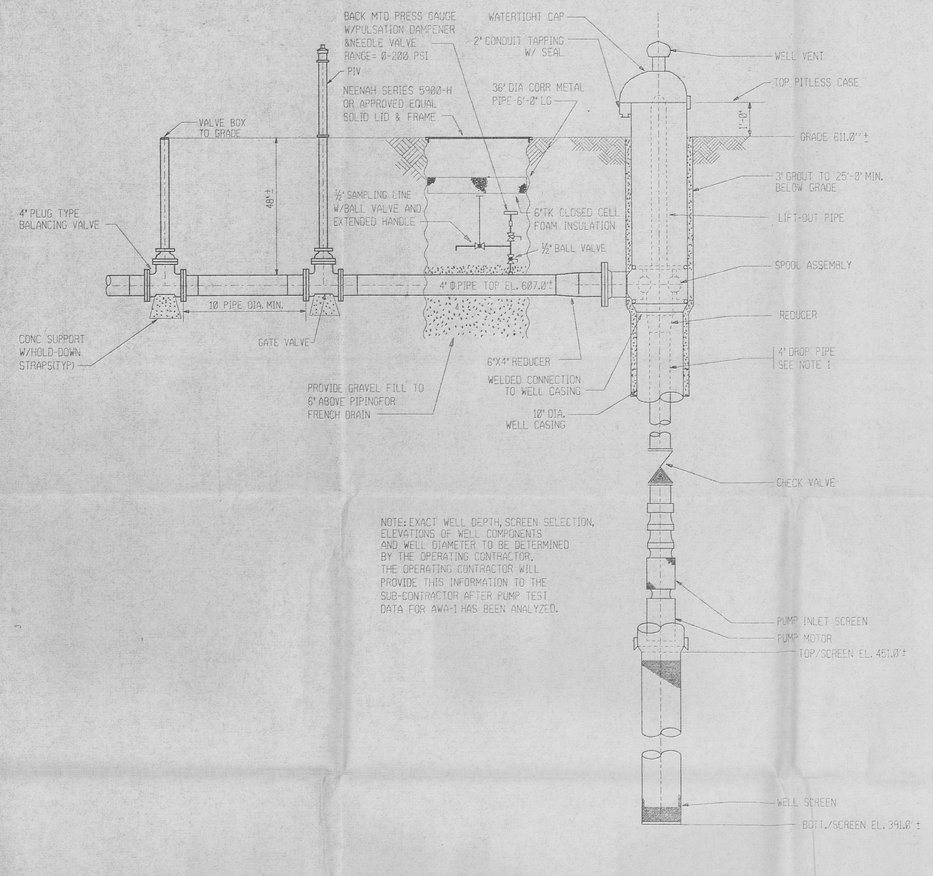
DRAWING TITLE: ALTERNATE WATER SUPPLY SYSTEM SITE DETAILS & SECTIONS

DRAWN BY	DATE	DESIGNED, CHECKED BY	DATE	CHECKED BY	DATE
JAM	8-6-90	LMS	8-6-91	RPD	10-18-91

PLANT/BLDG. NO.: — FLOOR: — SCALE: AS NOTED — CLASS:

SUBMITTED FOR APPROVAL: A-E R.W. Sparman 11-1-91 — APPROVAL RECOMMENDED: OPERATING CONTRACTOR W. J. Estabrooks 12/4/91 DATE — DRAWING APPROVED: DOE 12/16/91 DATE

DOE PROJECT NO.	OPER. CONTRACT NO.	DRAWING NO.	SHEET NO.	REV. NO.
87-D-159	0087502 WBS 1.1.2.4.04.01	18A-4445-C-01141	AC-7	0



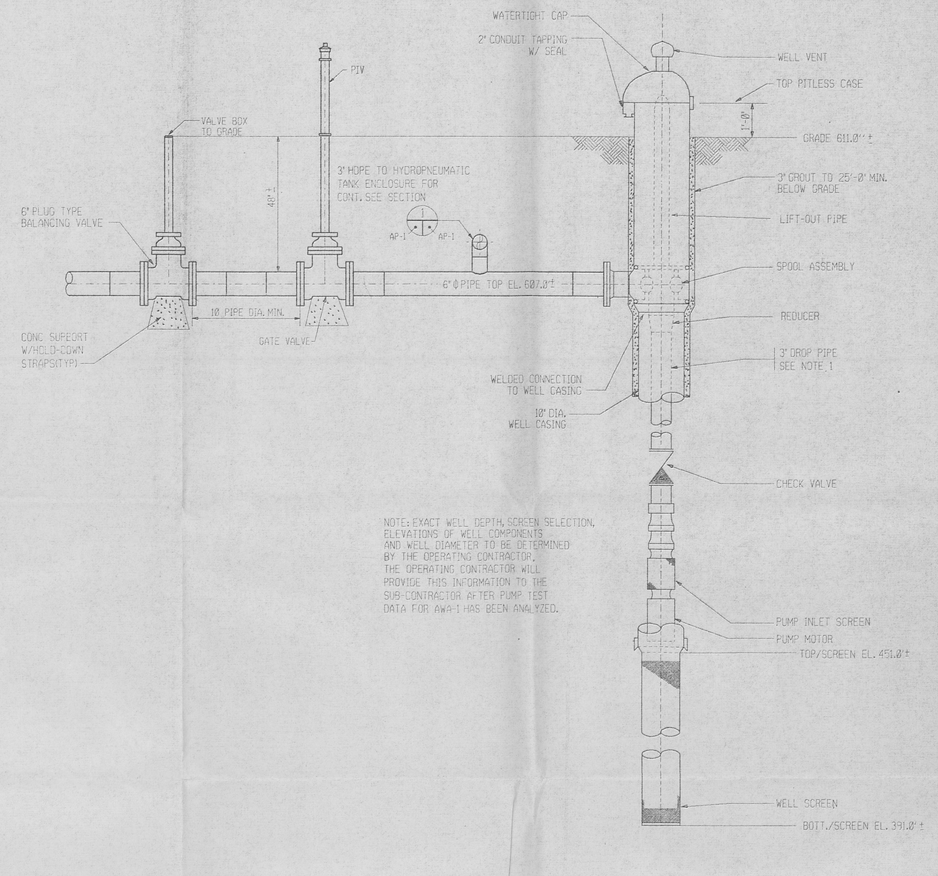
NOTE: EXACT WELL DEPTH, SCREEN SELECTION, ELEVATIONS OF WELL COMPONENTS AND WELL DIAMETER TO BE DETERMINED BY THE OPERATING CONTRACTOR. THE OPERATING CONTRACTOR WILL PROVIDE THIS INFORMATION TO THE SUB-CONTRACTOR AFTER PUMP TEST DATA FOR AWA-1 HAS BEEN ANALYZED.

TYP PITLESS WELLHEAD PUMP DETAIL (AWA-1 & 2) — A

SCALE: NONE

ELEVATION VIEW

AC-7 AP-1



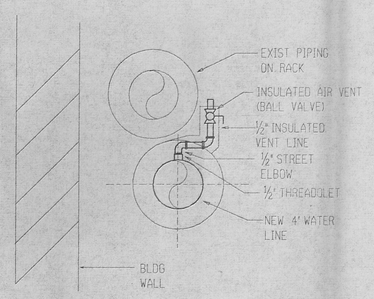
NOTE: EXACT WELL DEPTH, SCREEN SELECTION, ELEVATIONS OF WELL COMPONENTS AND WELL DIAMETER TO BE DETERMINED BY THE OPERATING CONTRACTOR. THE OPERATING CONTRACTOR WILL PROVIDE THIS INFORMATION TO THE SUB-CONTRACTOR AFTER PUMP TEST DATA FOR AWA-1 HAS BEEN ANALYZED.

PITLESS WELLHEAD PUMP DETAIL (DS-1) — D

SCALE: NONE

ELEVATION VIEW

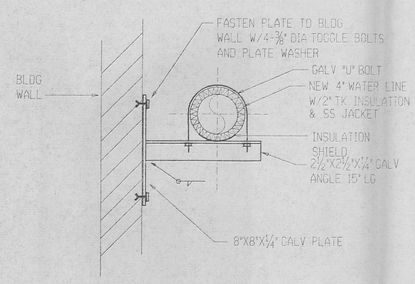
AC-7 AP-1



AIR VENT DETAIL — B

SCALE: NONE

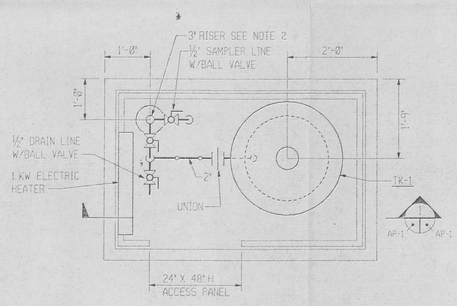
AP-2 AP-1



PIPE SUPPORT DETAIL — C

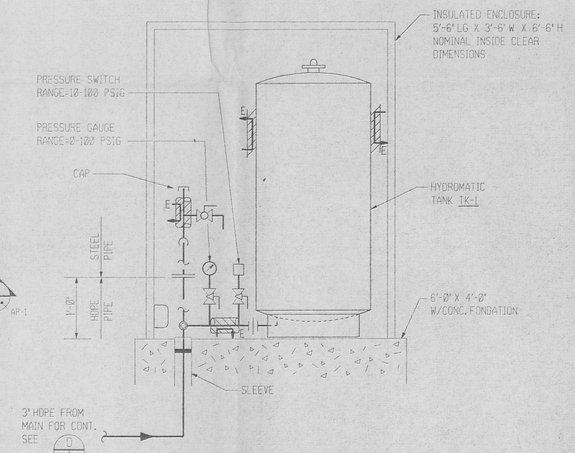
SCALE: NONE

AP-2 AP-1



PARTIAL PLAN-TANK ENCLOSURE — N

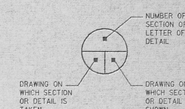
SCALE: ¾" = 1'-0"



SECTION — 1

SCALE: ¾" = 1'-0"

AP-1 AP-1



SECTION & DETAIL KEY

NOTES

1. DROP PIPE TO BE BLACK STEEL, SCHEDULE 40, ASTM A53, THREADED AND COUPLED.
2. ALL ABOVEGROUND PIPING AND HYDROPNEUMATIC TANK INSIDE TANK ENCLOSURE TO BE HEAT TRACED IN ACCORDANCE WITH SPEC. SECTION 16952.

01 11 92 1360

TO CORRELATE REFERENCED " AMK SHEET No's " TO FEMP DRAWING NUMBERS, SEE FEMP DRAWING No.: 18A-4445-X-01134

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	OPERATOR	DOE
0	CFC	FWB 8-9-91		

INITIALS AND DATE

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY:
A. M. KINNEY, INC.
CONSULTING ENGINEERS
CINCINNATI, OHIO

WEMCO SUBCONTRACT NO. N-77207 — A-E PROJECT NO. 02902

PROJECT NAME: ENVIRONMENTAL, HEALTH & SAFETY IMPROVEMENTS

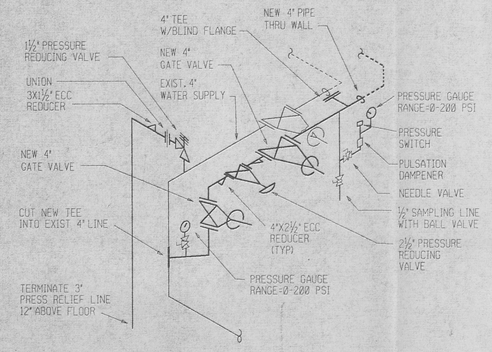
DRAWING TITLE: ALTERNATE WATER SUPPLY SYSTEM PIPING DETAILS

DRAWN BY	DATE	DESIGNED, CHECKED BY	DATE	CHECKED BY	DATE
MRW	8-90	FWB	8-90	JCW	9-91

PLANT/BLDG. NO. — FLOOR — SCALE: NONE — CLASS

SUBMITTED FOR APPROVAL: A-E 11-1-91 DATE
APPROVAL RECOMMENDED: OPERATING CONTRACTOR 12/16/91 DATE
DRAWING APPROVED: DOE 12/16/91 DATE

DOE PROJECT NO.	OPER. CONTRACT NO.	DRAWING NO.	AMK SHEET NO.	REV. NO.
87-D-159	0087502 WBS 1.1.2.4.04.01	18A-4445-P-01142	AP-1	0

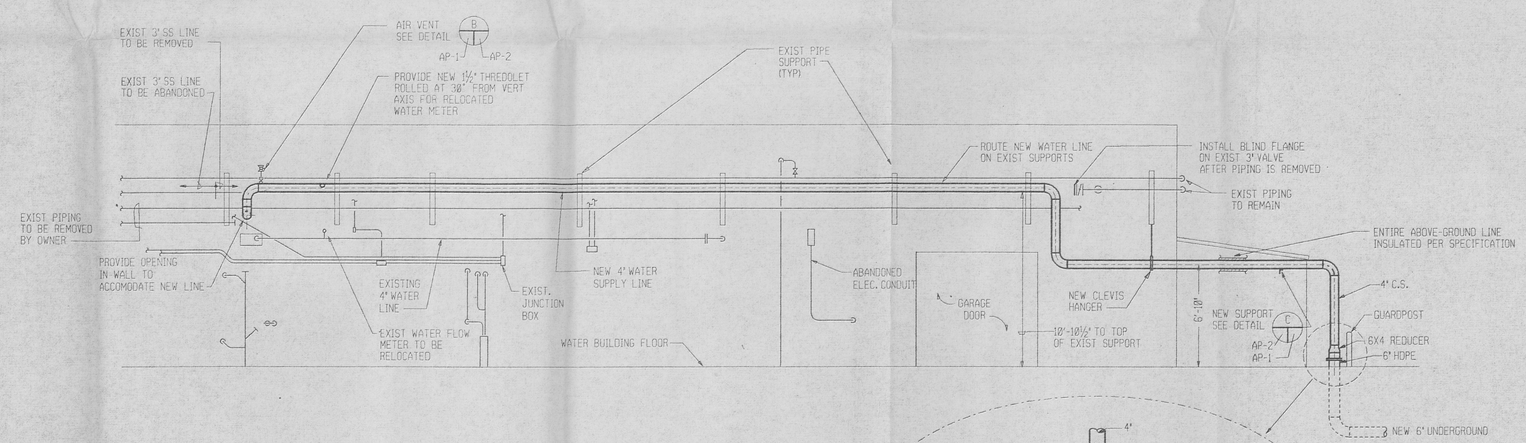


ISOMETRIC-NEW LINE TIE IN

SCALE: NONE

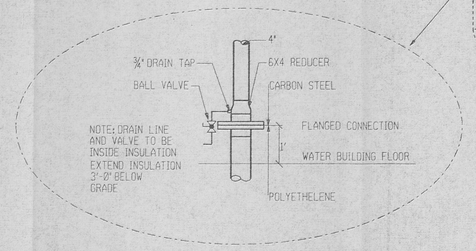
PIPE ROUTING PLAN

SCALE: ¼" = 1'-0"



ELEVATION (LOOKING WEST)

SCALE: ¼" = 1'-0"



NOTES

1. CONTRACTOR SHALL VERIFY EXISTFIELD CONDITIONS PRIOR TO FABRICATION AND CONSTRUCTION.

01 11 92 1360

LEGEND

NEW

EXISTING

SCALE: ¼"=1'-0"

TO CORRELATE REFERENCED "AMK SHEET No's" TO FEMP DRAWING NUMBERS, SEE FEMP DRAWING No.: 18A-4445-X-01134

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	OPERATOR	DOE
0	CFC	FWB 11-1-91		12/16/91

INITIALS AND DATE

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
A. M. KINNEY, INC.
CONSULTING ENGINEERS
CINCINNATI, OHIO

NEMCO SUBCONTRACT NO. N-77207 — A-E PROJECT NO. 02902

PROJECT NAME
ENVIRONMENTAL, HEALTH & SAFETY IMPROVEMENTS

DRAWING TITLE
ALTERNATE WATER SUPPLY SYSTEM
NEW 4" ABOVEGROUND PIPE ROUTING

DRAWN BY	DATE	DESIGNED, CHECKED BY	DATE	CHECKED BY	DATE
MRW	8-90	FWB	8-90	JCW	9-91

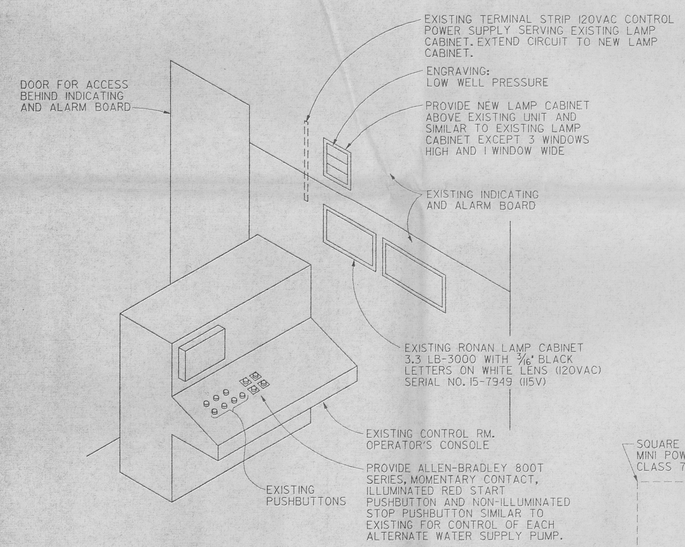
PLANT/BLDG. NO.	FLOOR	SCALE	CLASS

SUBMITTED FOR APPROVAL — A-E — DATE
APPROVAL RECOMMENDED — OPERATING CONTRACTOR — DATE 12/16/91
DRAWING APPROVED — DOE — DATE 12-16-91

DOE PROJECT NO.	OPER. CONTR. PROJ. NO.	DRAWING NO.	SHEET NO.	REV. NO.
87-D-159	0087502 WBS 1.1.2.4.04.01	18A-4445-P-01143	AP-2	0

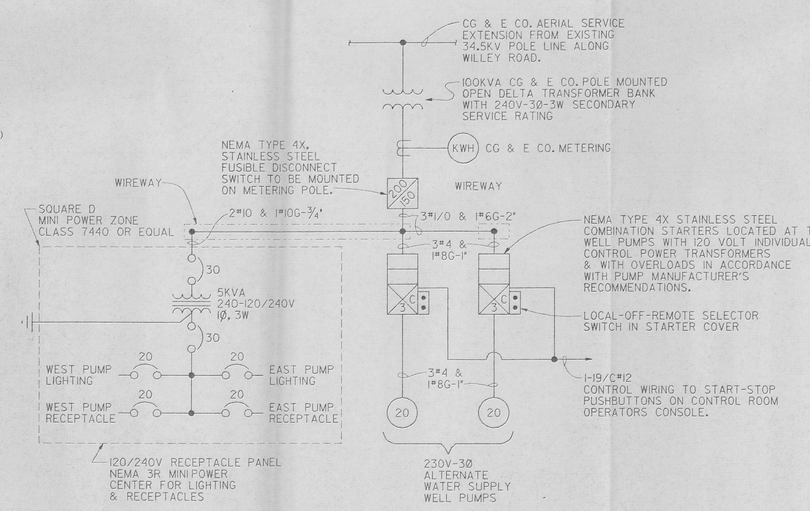
PARTIAL AWA ELECTRICAL PLAN

SCALE: 1"=20'-0"

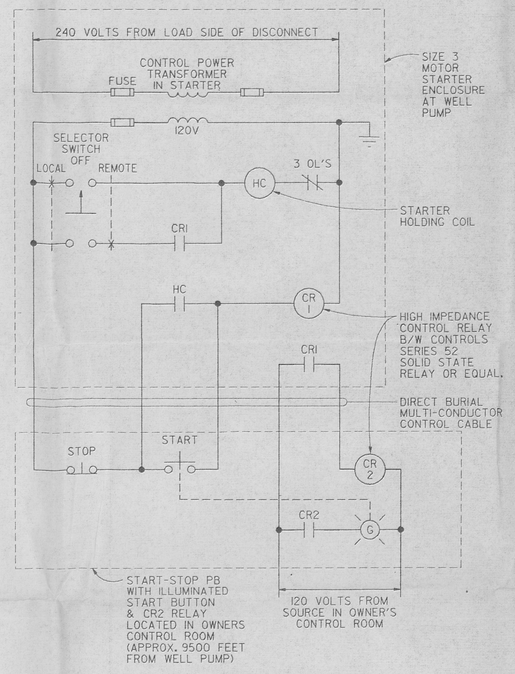


EXISTING AWA CONTROL ROOM SKETCH

SCALE: NONE

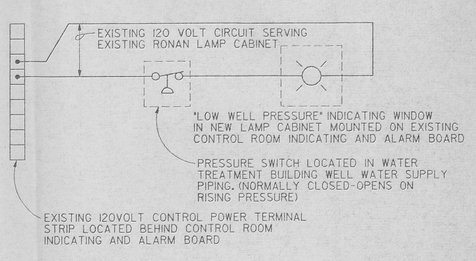


ALTERNATE WATER SUPPLY SINGLE LINE DIAGRAM
AWA WELL PUMPS



ALTERNATE WATER SUPPLY
WELL PUMP CONTROL SCHEMATIC

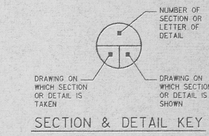
(TYPICAL FOR TWO PUMPS)



WELL WATER SUPPLY
INDICATING LOOP

SCALE: 1"=20'-0"

0 10' 20' 40' 60'



SECTION & DETAIL KEY

NOTES

01 11 92 1360

TO CORRELATE REFERENCED * AMK SHEET No's * TO FEMP DRAWING NUMBERS, SEE FEMP DRAWING No.: 18A-4445-E-01134

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	INITIALS AND DATE
0	CFC	DBP 11-1-91

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
A. M. KINNEY, INC.
CONSULTING ENGINEERS
CINCINNATI, OHIO

NEMCO SUBCONTRACT NO. N-77207 — A-E PROJECT NO. 02902

PROJECT NAME: ENVIRONMENTAL, HEALTH & SAFETY IMPROVEMENTS

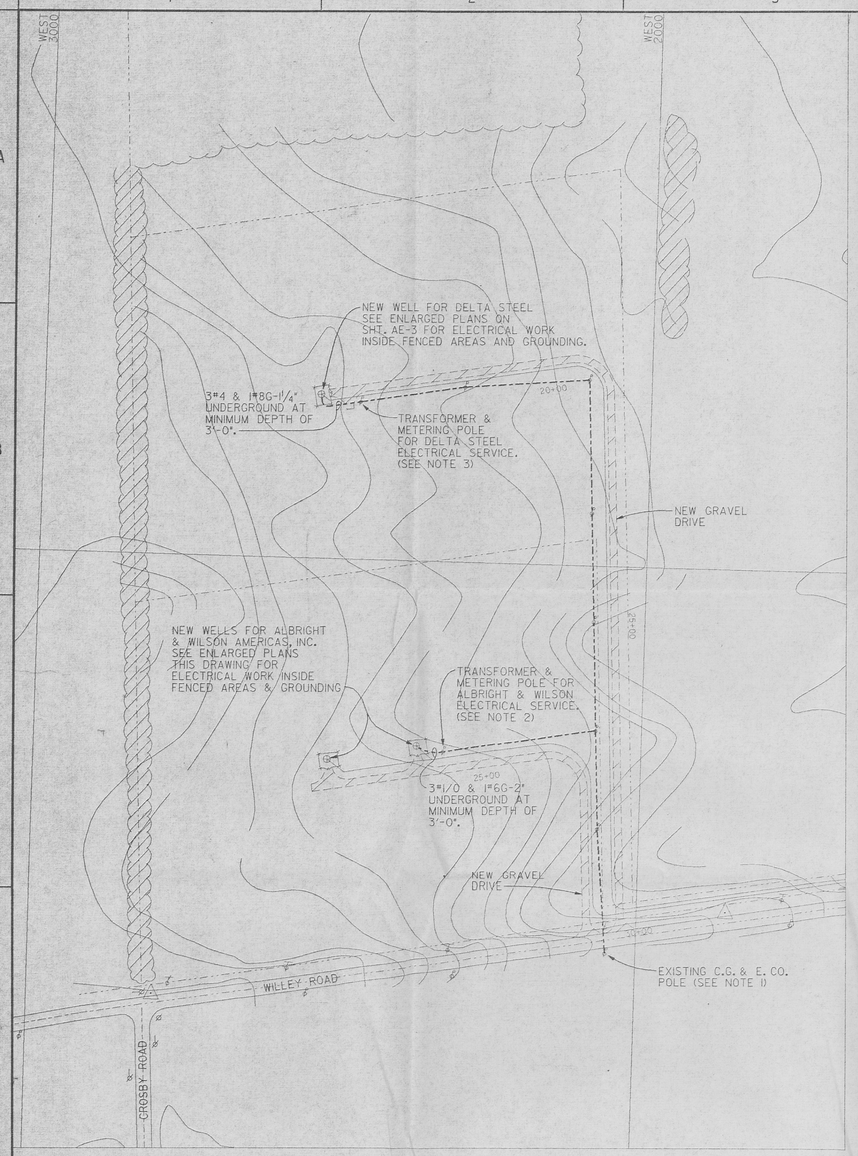
DRAWING TITLE: ALTERNATE WATER SUPPLY SYSTEM ELECTRICAL PLAN - POWER & CONTROL

DRAWN BY	DATE	DESIGNED/CHECKED BY	DATE	CHECKED BY	DATE
PGD	8-22-90	DJB	8-22-90	DBP	10-29-91

PLANT/BLDG. NO. — FLOOR — SCALE: AS NOTED — CLASS

SUBMITTED FOR APPROVAL: A.N. Sherman 11-1-91 — A-E — DATE
APPROVAL RECOMMENDED: OPERATING CONTRACTOR — DATE 11/14/91
DRAWING APPROVED: DOE — DATE 11/14/91

DOE PROJECT NO.	OPER. CONTR. PROJ. NO.	DRAWING NO.	SHEET NO.	REV. NO.
87-D-159	0087502 WBS 1.1.2.4.04.01	18A-4445-E-01144	AE-1	0



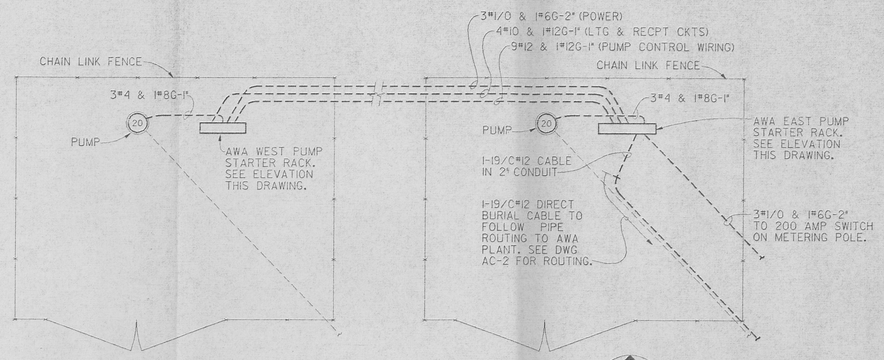
WELL PUMP AREA - ELECTRICAL SITE PLAN

SCALE: 1"=100'-0"

NORTH

ELECTRICAL SITE PLAN NOTES:

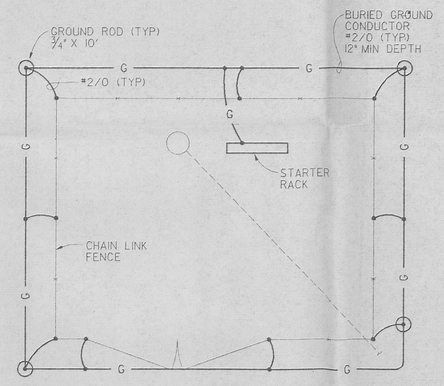
1. OVERHEAD 34.5 KV POLE LINE TO BE EXTENDED FROM EXISTING CINCINNATI GAS & ELECTRIC CO. POLE ON WILLEY ROAD NORTH TO AND INCLUDING METERING POLES FOR ALBRIGHT & WILSON AND DELTA STEEL ELECTRICAL SERVICES BY THE CINCINNATI GAS & ELECTRIC COMPANY.
2. ELECTRICAL CONTRACTOR TO INSTALL 200 AMPERE NEMA 4X STAINLESS STEEL FUSED DISCONNECT SWITCH ON METERING POLE FOR ALBRIGHT & WILSON SERVICE AND ROUTE FEEDER UNDERGROUND TO ALBRIGHT & WILSON WELL SITE.
3. ELECTRICAL CONTRACTOR TO INSTALL 100 AMPERE NEMA 4X STAINLESS STEEL FUSED DISCONNECT SWITCH ON METERING POLE FOR DELTA STEEL SERVICE AND ROUTE FEEDER UNDERGROUND TO DELTA STEEL WELL SITE.



ENLARGED PLAN - AWA WELL PUMP AREA

SCALE: ¼"=1'-0"

NORTH



WELL PUMP GROUNDING PLAN

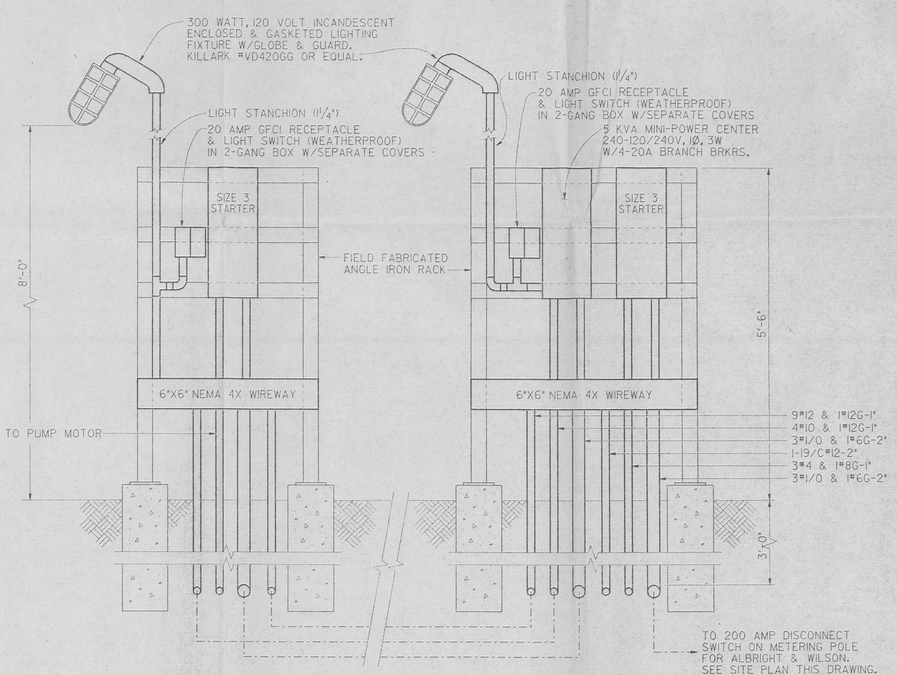
SCALE: ¼"=1'-0"

(TYPICAL FOR 3 LOCATIONS)

NORTH

GROUNDING NOTES:

1. FENCE GROUNDING SHALL COMPLY WITH ANSI C2 (NATIONAL ELECTRICAL SAFETY CODE).
2. UNDERGROUND CONNECTIONS TO BE BRAZED OR FUSION WELDED (CADWELDED) AND ABOVE GROUND CONNECTIONS TO BE MADE WITH CONNECTORS OR STRAPS.



ELEVATION LOOKING NORTH
AWA WEST PUMP STARTER RACK

NTS

ELEVATION LOOKING NORTH
AWA EAST PUMP STARTER RACK

NTS

SECTION & DETAIL KEY

LEGEND

- FENCE
- EASEMENT LINE
- PROPERTY LINE
- NEW WATER MAIN
- EXIST. CONTOUR LINES
- OVERHEAD LINES
- UNDERGROUND LINE
- WEST 2000 — FMPC GRID
- PAVED ROAD
- GRAVEL ROAD
- TREE LINE
- POWER POLE
- TELEPHONE POLE
- SIGN
- HAMILTON CO. BENCH MARK

SCALE: ¼" = 1'-0"

0 2' 4' 8' 12'

SCALE: 1" = 100'-0"

0 50' 100' 200' 300'

01 11 92 1360

TO CORRELATE REFERENCED 'AMK SHEET No's 'TO FEMP DRAWING NUMBERS, SEE FEMP DRAWING No.: 18A-4445-X-01134

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	SPONSOR	DOE
0	CFC	DBP 11-1-91		

INITIALS AND DATE

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
A. M. KINNEY, INC.
CONSULTING ENGINEERS
CINCINNATI, OHIO

FEMPO SUBCONTRACT NO. N-F320-X — A-E PROJECT NO. 00502

PROJECT NAME: ENVIRONMENTAL, HEALTH & SAFETY IMPROVEMENTS

DRAWING TITLE: ALTERNATE WATER SUPPLY SYSTEM ELECTRICAL SITE PLAN & DETAILS WELL PUMP AREA

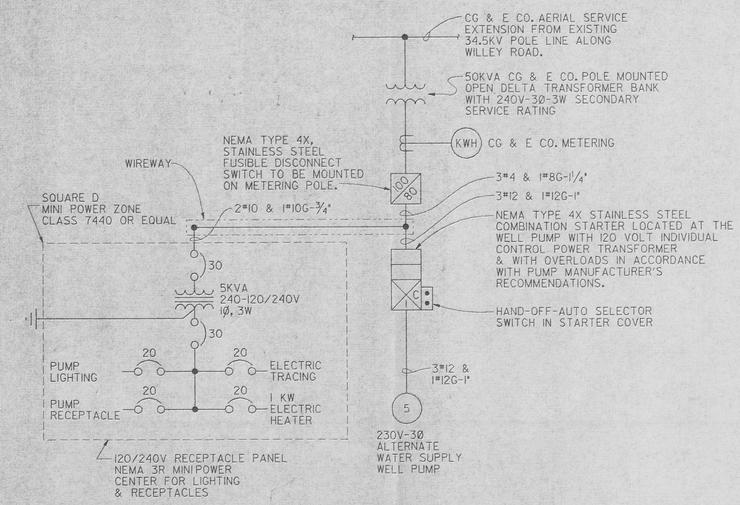
DRAWN BY	DATE	DESIGNED, CHECKED BY	DATE	CHECKED BY	DATE
WRC	7-31-91	DBP	7-31-91	DBP	10-29-91

PLANT/BLDG. NO. — FLOOR — SCALE: AS NOTED — CLASS

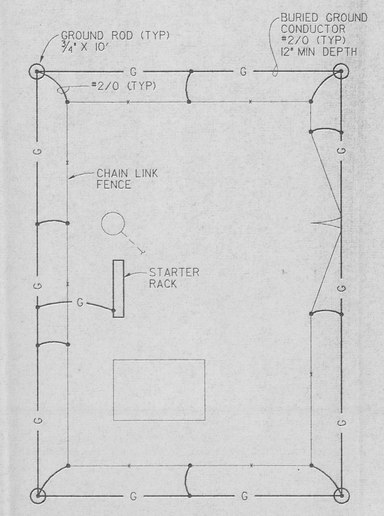
SUBMITTED FOR APPROVAL: D.W. Sperman 11-1-91 — APPROVED: D.J. Bettschader 12/16/91 — DRAWING APPROVED: 12/16/91

A-E DATE — OPERATING CONTRACTOR DATE — DOE DATE

DOE PROJECT NO.	SPLK CONTR. PROJ. NO.	DRAWING NO.	DRW SHEET NO.	REV. NO.
87-D-159	0087502 WBS 1.1.2.4.04.01	18A-4445-E-01145	AE-2	0



ALTERNATE WATER SUPPLY SINGLE LINE DIAGRAM
DELTA STEEL WELL PUMP

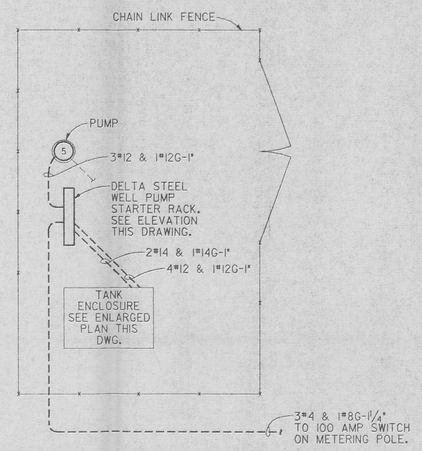


DELTA STEEL WELL PUMP GROUNDING PLAN
SCALE: 1/4"=1'-0"

NORTH

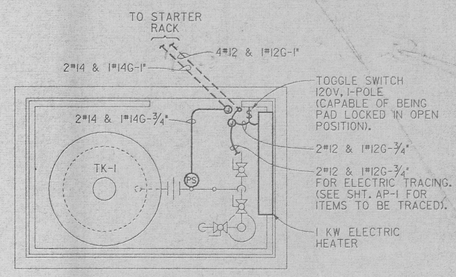
GROUNDING NOTES:

1. FENCE GROUNDING SHALL COMPLY WITH ANSI C2 (NATIONAL ELECTRICAL SAFETY CODE).
2. UNDERGROUND CONNECTIONS TO BE BRAZED OR FUSION WELDED (CADWELDED) AND ABOVE GROUND CONNECTIONS TO BE MADE WITH CONNECTORS OR STRAPS.



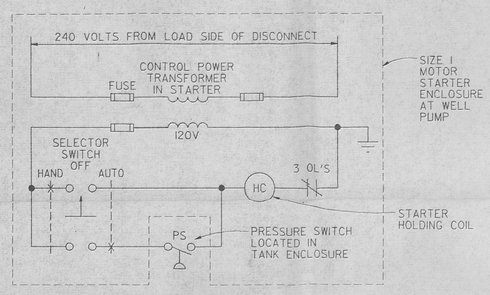
ENLARGED PLAN - DELTA STEEL WELL PUMP AREA
SCALE: 1/4"=1'-0"

NORTH

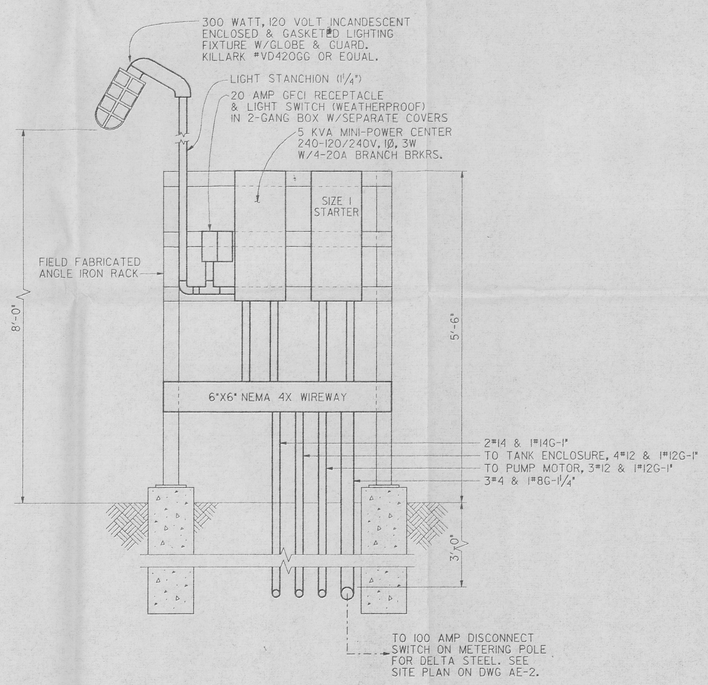


TANK ENCLOSURE
SCALE: ¾" = 1'-0"

NORTH



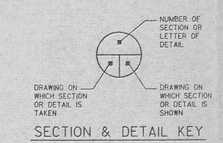
ALTERNATE WATER SUPPLY
WELL PUMP CONTROL SCHEMATIC
(FOR DELTA STEEL WELL PUMP)



ELEVATION LOOKING WEST
DELTA STEEL WELL PUMP STARTER RACK
NTS

SCALE: ¾" = 1'-0"
0 6" 1' 2' 3' 4'

SCALE: 1/4" = 1'-0"
0 2' 4' 8' 12'



SECTION & DETAIL KEY

01 11 92 1360

TO CORRELATE REFERENCED * AMK SHEET No's * TO FEMP DRAWING NUMBERS, SEE FEMP DRAWING No.: 18A-4445-X-01134

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	INITIALS AND DATE		
0	CFC	DBP 11-1-91		
		A-E	OPERATOR	DOE

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
A. M. KINNEY, INC.
CONSULTING ENGINEERS
CINCINNATI, OHIO

WEMCO SUBCONTRACT NO. N-77207 — A-E PROJECT NO. 02902

PROJECT NAME: ENVIRONMENTAL, HEALTH & SAFETY IMPROVEMENTS

DRAWING TITLE: ALTERNATE WATER SUPPLY SYSTEM ELECTRICAL PLANS & DETAILS WELL PUMP AREA

DRAWN BY	DATE	DESIGNED, CHECKED BY	DATE	CHECKED BY	DATE
WRC	8-7-91	DBP	8-7-91	DBP	10-29-91

PLANT/BLDG. NO.	FLOOR	SCALE	CLASS
		AS NOTED	

SUBMITTED FOR APPROVAL: A.M. Kinney 11-1-91 — A-E — DATE
APPROVAL FOR MANAGER: OPERATING CONTRACTOR — DATE
DRAWING APPROVED: DOE — DATE 12/16/91

DOE PROJECT NO.	OPER. CONTR. PROJ. NO.	DRAWING NO.	SHEET NO.	REV. NO.
87-D-159	0087502 WBS 1.1.2.4.04.01	18A-4445-E-01146	AE-3	0

Control Number: 2783

Reference R-009-204.20

The following drawings can be found in the Control Copy of the Administrative Records.

DRAWING TITLE	DRAWING NUMBER
Alternate Water Supply System Cover Sheet	18a-4445-x-01134
Alternate Water Supply system Routing Location Plan	18A-4445-C-01135
Alternate Water Supply System Site Plan & Profile Sheet 1 of 4	18A-4445-C-01136
Alternate Water Supply System Site Plan & Profile Sheet 2 of 4	18A-4445-C-01137
Alternate Water Supply System Site Plan & Profile Sheet 3 of 4	18A-4445-C-01138
Alternate Water Supply System Site Plan & Profile Sheet 4 of 4	18A-4445-C-01139
Alternate Water Supply System Site Plan	18A-4445-C-01140
Alternate Water Supply System Site Details & Sections	18A-4445-C-01141
Alternate Water Supply System Piping Details	18A-4445-P-01142
Alternate Water Supply System New 4" Aboveground Pipe Routing	18A-4445-P-01143
Alternate Water Supply System Electrical Plan - Power & Control	18A-4445-E-01144
Alternate Water Supply system Electrical Site Plan & Details Well Pump Area	18A-4445-E-01145
Alternate Water supply system Electrical Plans & Details Well Pump Area	18A-4445-E-01146